

DISTRIBUTION AND STATUS OF THE VERTEBRATE BIODIVERSITY OF KORANGI AND PHITTI CREEKS, KARACHI COAST, SINDH, PAKISTAN

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ABSTRACT

The study of the distribution and status of the vertebrate fauna of Korangi and Phitti Creek areas was undertaken during the period 2013-2017. As many as 15 species of mammals, 134 species of birds, 19 species of reptiles, 03 species of amphibians and 20 species of fishes were recorded. Only 02 Threatened/Near threatened species of mammal viz. Fishing Cat (*Prionailurus viverrinus*) and Indian Humpback Dolphin (*Sousa plumbea*) were recorded. Among the birds, out of 134 species, 62 species were resident and 72 species were migratory. Three species of birds viz. Egyptian Vulture (*Neophron percnopterus*), Dalmatian pelican (*Pelecanus crispus*) and Greater Spotted Eagle (*Aquila clanga*) were recorded as Threatened and Black-bellied Tern (*Sterna acuticauda*), Black-tailed Godwit (*Limosa limosa*) and Eurasian Curlew (*Numenius arquata*) were recorded as Near-threatened. Among reptiles, one snake viz. Yellow Sea Snake (*Hydrophis spiralis*) was recorded from the marine environment while other 18 species of reptiles were recorded from the coastal area. No threatened species of reptiles was recorded from the area. The amphibians are scarcely distributed in the area. Only 01 toad and 02 frogs species were recorded. No Threatened species of amphibians was recorded. 20 species of marine fishes belonging to 11 families were recorded from the creek areas. 19 species of fishes were recorded from the marine area while 01 species viz. Mozambique Tilapia (*Oreochromis mossambicus*) was recorded from the marshy area. These are very commonly found in marine/ coastal habitat. Large scale boat fishing takes place in the area. The prevalent threats to the species are poaching, disturbance, loss of habitat, degradation of habitat, pollution and lack of conservation and management efforts. The area is a part of Indus Delta Ramsar Site and it needs to be managed as such.

Keywords: Coastal area, Vertebrates biodiversity, Status, Distribution, Korangi Creek, Phitti Creek.

INTRODUCTION

Pakistan is the land of varied geophysical and climatic conditions. System of natural wetlands and related habitat supports variety of fauna and flora from Himalayas to the sea level coastal mangrove forests. These mangroves forests serve as natural shield for the protection of heavily populated coastal areas and serve as nursery grounds for aquatic biodiversity (Khurshid, 2004).

The Sindh province is located between Latitude 23° 35' and 28° 30' N and Longitude 66° 42' and 71° 10' E and occupies four major elements that include west fringe hills, east sandy desert, and alluvial plains between west and east and the Indus Delta. The desert lying in the eastern part is known as the Thar Desert. The Indus Delta comprises of low lying plains in Thatta District and the creeks system (Khan *et al.*, 2014). The coast of Karachi is approximately 90 km long and provides variety of features that include rocky shores, pure sandy beaches (marine turtle's habitat), salt pans, mud flats, tidal creeks and mangrove forest (Afsar *et al.*, 2013). Coastal climate is tropical dry influenced by the monsoon. The average rainfall on the coast of Sindh is 220 mm (<https://www.worlddata.info/asia/pakistan/climate-sindh.php>, 2018).

The Karachi coast is a significant area due to habitats for threatened and rare species, important corridor for migratory species, feeding, breeding, resting and wintering area for birds, area of high species richness, nursery and spawning area for biodiversity, area of cultural and traditional significance.

Karachi coast forms the part of the outer Indus Delta. Indus Delta is a Ramsar Site. The outer part of the Delta includes a vast complex of creeks and channels, mangrove and mudflats areas are stretching for more than 150 kilometers, Korangi Creek to Sir Creek at the Border of India (Scott, 1989). Thus, the Karachi coast is important due to its important biodiversity features such as mangroves and many suitable habitats which provide feeding, resting, roosting, and staging places for a wide variety of birds particularly during the migratory season. In spite of changing ecology of the coastal area, Karachi coast is stronghold of waterbirds particularly the waders. The objective of present work was undertaken to study the distribution and status of the Vertebrate Biodiversity of the selected sites on Karachi Coast.

MATERIALS AND METHODS

Main Sites of the Study Area:

Korangi Creek

It is an important creek for biodiversity having dense mangrove forest which provides sites for cetaceans, water birds, particularly the Waders such as Herons, Egrets, Redshank, Godwits, Curlews, Whimbrel, Stints, Gulls, Terns. Korangi Creek faces severe problem of aquatic pollution due to entering of untreated municipal and industrial waste in the area.

Phitti Creek

Phitti creek is an important site for fishes and supports water birds also. It also provides a favorable habitat for migrant species of birds.

Adjacent/Nearby Areas

Malir River Area

This river carries rain water, domestic sewage and industrial effluents to the Korangi Creek area. It provides favorable habitats for small mammals, aquatic and terrestrial birds like birds of prey and egrets, reptiles, amphibians and even for a few fish species. Mostly catchment area of Malir River remains dry year round. The edges of the river support small mammals, birds, reptiles and amphibians species.

Mangrove Forest

The study area contains dense mangrove forest and *Avicennia marina* is the dominant species. Dense patches of mangroves in the area provide breeding grounds to shrimps and fishes. The muddy area provides favorable habitat for Inter-tidal Mudskippers. These mangrove forests provide shelter to the coast from sea storm. Large patches of mangrove forest are present between these channels. Indian Humpback Dolphins occasionally visits these channels.

Korangi Fish Harbor and Jetties

A well established fish Harbor is present in the area and three private fish landing jetties are also present. Surrounding channel areas of harbor and jetties are very important for shrimps and fish breeding. A biodiversity rich ecosystem is present in the area. This area is also important for aquatic birds.

Data Collection Methods

Vertebrate faunal data of the study area were collected by using different methods for each group of animals as described below. During the field work, locations within the different habitats that exist in the study area were surveyed. The sampling locations were identified in habitats, ensuring that in each habitat type sufficient locations were selected so that maximum number of species could be encountered and recorded (Table 1, Fig. 1).

Table 1. GPS Coordinates of observation sites.

| S. No. | Location | Latitude | Longitude |
|--------|-------------------|------------------|------------------|
| 1 | Ghizri Creek | 24°49'92.70440"N | 67°5'23.92800"E |
| 2 | Korangi Creek | 24°47'35.87640"N | 67°5'30.88680"E |
| 3 | Chashma Goth | 24°48'41.99760"N | 67°11'58.67520"E |
| 4 | Rehri Creek | 24°48'52.28640"N | 67°13'48.94680"E |
| 5 | Russian Beach | 24°46'41.35440"N | 67°24'32.79600"E |
| 6 | Phitti Creek | 24°43'19.63560"N | 67°9'33.56280"E |
| 7 | Chann Waddo Creek | 24°43'28.41690"N | 67°12'11.61720"E |
| 8 | Bundal Island | 24°42'52.96320"N | 67°8'26.71800"E |
| 9 | Buddo Island | 24°44'6.11520"N | 67°10'52.93560"E |
| 10 | Kadiro Creek | 24°47'2.67720"N | 67°13'56.47800"E |

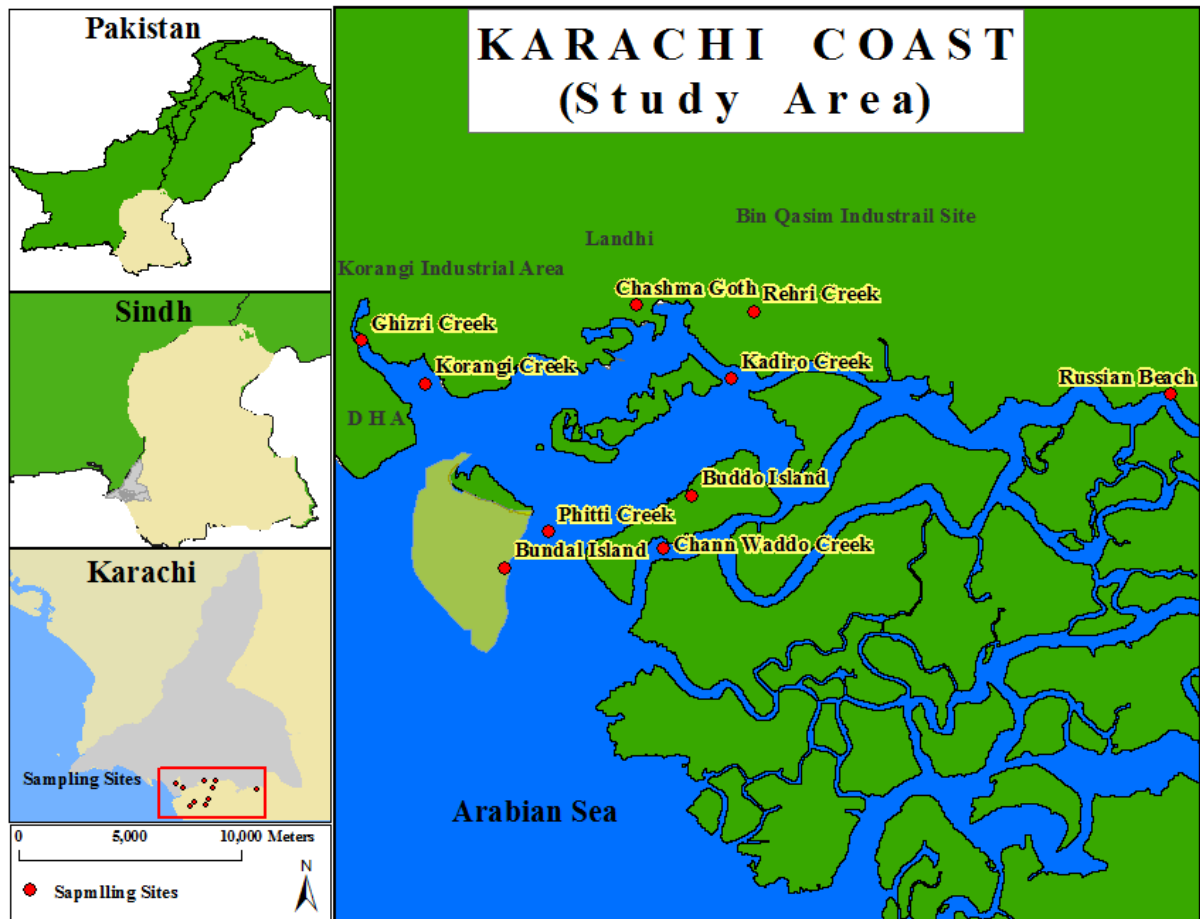


Fig. 1. Selected points for vertebrates surveys.

The following methods were used for recording the occurrence of different species.

1. Point surveys
2. Roadside counts
3. Track counts
4. Line transects
5. Incidental sightings
6. Pellet counts
7. Interviews with local fishermen and community
8. Habitat searching
9. Fixing of baits and traps

(i) Methods for survey of Mammals

Point count and line transect methods were used for survey of mammals. Track counts and incidental sightings were also taken into account.

(ii) Survey of Birds

Extensive field surveys were made to record the migratory, winter visitors, passage migrants and resident birds. Line Transect method and Point count methods were used for the survey of bird fauna in creek areas. Field equipment and field guides were used for identification.

(iii) Survey of Reptiles and Amphibians

Methods used for the survey of reptiles and amphibian included Active searching, Trapping, Hand capturing, Noosing and tracks searching. There are standard methods for the studies of Amphibians and Reptiles (Foster and Gent, 1996; Hayek and Martin, 1997). For the population estimation strip census technique has been used (Ahmed, 1988 and Khan *et al.*, 2010).

(iv) Survey of Fishes

Boat was used for fish survey. Scoop net, cast nets were used for fish collection from the study area. Some fishes were caught by angling mostly bottom dwelling species i.e. Cat fishes etc.

(v) Fish Collection from fish catches

Fishes were obtained from fish catch as made by the local fishermen of the study area. These fishes were preserved and transported to wildlife laboratory of Zoology Department University of Karachi for identification.

RESULTS

During the present study, following main habitats have been recorded in the study area.

Mudflats

These are barren flat areas having stunted bushes of mangroves alongside and a salinity indicator plant species *Arthrocnemum indicum*. Mudflats mostly support mangrove species of *Avicennia marina*. The mangrove extends from Korangi, Phitti Creeks to vast mangrove complex of the Indus Delta.

Sandy Beaches

Small sandy beaches are present near Hassan Shah Mazar and Russian Beach. These beaches provide habitat for mammals, birds and reptiles. Near Phitti Creek aquatic birds are found as particularly Gulls and Terns.

Rehri Creek

Rehri creek is a small and very important creek of the area and supports more than 12,000 Black Kites. Fishing communities are settled and salt pans are also present in the area.

Lath Basti

This is a very small creek but carry large amount of animal dung from Cattle Colony to the marine ecosystem. Coastal area of the Lath Basti and Port Qasim area support population of small mammals, birds, reptiles and fishes.

Fauna recorded

Based on our present study data, a total of 15 species of mammals, 134 species of birds, 19 species of reptiles, 03 species of amphibians and 20 species of fishes were recorded. The study area comprised of two main habitats viz. Marine area and the Coastal area including mangroves area zone.

• Mammals

During study period, 15 species of mammals belonging to 07 orders and 11 families were recorded from the area (Table 2).

Threatened species of Mammals

Indian Humpback Dolphin (*Sousa plumbea*) (E) and Fishing cat (*Prionailurus viverrinus*) (VU) are threatened species recorded from the area.

• Birds

Total 134 Species of birds belonging 12 orders, 40 families were recorded in both the study areas (Table 3). These comprise of following four main groups.

1. Waterbirds, (Pelicans, Cormorants, Herons, Egrets, Storks, Ibises, Spoonbill, Common Coot, Ducks, Oyster Catcher, Charadriids, Scolopacids, Painted Snipe, Skuas, Black winged Stilt, Avocet, Crab Plover, Arctic Skua and Great Thick-knee). The Waders are the dominant and widespread group in the coastal areas, followed by the Ardeids and birds of prey.
2. Birds of Prey (Kites, Buzzard, Shikra, Vulture, Osprey, Marsh Harrier, Eagles, Kestrels, Peregrine Falcon and Hobby).
3. Passerines (Mynas, Swallows, Martins, Wagtails, Purple Sunbird, Black Drongo, Tailor Bird, Indian Robin, Common Babbler, Warblers, Shrikes, House Crow, Larks, Sparrows and White Eye).

4. Others (Kingfishers, Bee-eaters, Pigeons, Common Hoopoe, Indian Roller, Asian Koel, Doves, Grey Partridge)

Table. 2. List of mammals recorded from Korangi Creek and Phitti Creek Areas.

| S.No. | Order | Family | Scientific Name | Common Name | Korangi Creek | Phitti Creek |
|-------|---------------|--------------|--------------------------------|----------------------------|---------------|--------------|
| 1 | Rodentia | Muridae | <i>Mus musculus</i> | House Mouse | + | - |
| 2 | Rodentia | Muridae | <i>Rattus rattus</i> | Common Rat | + | + |
| 3 | Rodentia | Sciuridae | <i>Funambulus pennantii</i> | Northern Palm Squirrel | + | - |
| 4 | Rodentia | Hystericidae | <i>Hystrix indica</i> | Indian Porcupine | + | + |
| 5 | Insectivora | Erinaceidae | <i>Hemiechinus collaris</i> | Long-eared Desert Hedgehog | + | - |
| 6 | Eulipotyphyla | Soricidae | <i>Suncus murinus</i> | Asian House Shrew | + | + |
| 7 | Chiroptera | Pteropodidae | <i>Rousettus aegyptiacus</i> | Egyptian Fruit Bat | + | - |
| 8 | Chiroptera | Pteropodidae | <i>Rousettus leschenaultii</i> | Fulvous Fruit Bat | + | - |
| 9 | Carnivora | Felidae | <i>Prionailurus viverrinus</i> | Fishing Cat | + | + |
| 10 | Carnivora | Felidae | <i>Felis chaus</i> | Jungle Cat | + | - |
| 11 | Carnivora | Herpestidae | <i>Herpestes javanicus</i> | Small Indian Mongoose | + | - |
| 12 | Carnivora | Herpestidae | <i>Herpestes edwardsii</i> | Indian Grey Mongoose | + | + |
| 13 | Carnivora | Canidae | <i>Canis aureus</i> | Indian Jackal | + | - |
| 14 | Artiodactyla | Suidae | <i>Sus scrofa</i> | Indian Wild Boar | + | - |
| 15 | Cetacea | Delphinidae | <i>Sousa plumbea</i> | Indian Humpback Dolphin | + | + |

Table 3. List of Birds Recorded

| S.No. | Order | Family | Scientific Name | Common Name | Korangi Creek | Phitti Creek |
|-------|-----------------|--------------|------------------------------|-----------------------|---------------|--------------|
| 1 | Accipitriformes | Accipitridae | <i>Milvus migrans</i> | Black Kite | + | + |
| 2 | Accipitriformes | Accipitridae | <i>Elanus caeruleus</i> | Black-shouldered Kite | + | + |
| 3 | Accipitriformes | Accipitridae | <i>Haliastur Indus</i> | Brahminy Kite | + | + |
| 4 | Accipitriformes | Accipitridae | <i>Buteo buteo</i> | Common Buzzard | + | + |
| 5 | Accipitriformes | Accipitridae | <i>Accipiter badius</i> | Central Asian Shikra | + | + |
| 6 | Accipitriformes | Accipitridae | <i>Circus aeruginosus</i> | Marsh Harrier | + | + |
| 7 | Accipitriformes | Accipitridae | <i>Aquila rapax</i> | Tawny Eagle | + | + |
| 8 | Accipitriformes | Accipitridae | <i>Aquila nipalensis</i> | Steppe Eagle | + | + |
| 9 | Accipitriformes | Accipitridae | <i>Aquila clanga</i> | Greater Spotted Eagle | + | -- |
| 10 | Accipitriformes | Accipitridae | <i>Neophron percnopterus</i> | Egyptian Vulture | + | + |
| 11 | Accipitriformes | Pandionidae | <i>Pandion haliaetus</i> | Osprey | + | + |
| 12 | Falconiformes | Falconidae | <i>Falco tinnunculus</i> | Kestrel | + | + |
| 13 | Falconiformes | Falconidae | <i>Falco peregrines</i> | Peregrine Falcon | + | + |
| 14 | Anseriformes | Anatidae | <i>Anas acuta</i> | Pintail | + | + |

| | | | | | | |
|----|---------------------|-------------------|----------------------------------|-------------------------------------|---|----|
| 15 | Anseriformes | Anatidae | <i>Anas crecca</i> | Common Teal | + | -- |
| 16 | Anseriformes | Anatidae | <i>Anas clypeata</i> | Shoveller | + | + |
| 17 | Anseriformes | Anatidae | <i>Anas Penelope</i> | Wigeon | + | + |
| 18 | Anseriformes | Anatidae | <i>Anas platyrhynchos</i> | Mallard | + | -- |
| 19 | Anseriformes | Anatidae | <i>Anas strepera</i> | Gadwall | + | + |
| 20 | Anseriformes | Anatidae | <i>Aythya ferina</i> | Common Pochard | + | + |
| 21 | Anseriformes | Anatidae | <i>Tadorna tadorna</i> | Common Shelduck | + | + |
| 22 | Pelecaniformes | Pelecanidae | <i>Pelecanus crispus</i> | Dalmatian Pelican | + | + |
| 23 | Pelecaniformes | Pelecanidae | <i>Pelecanus onocrotalus</i> | White or Rosy Pelican | + | + |
| 24 | Pelecaniformes | Phalacrocoracidae | <i>Phalacrocorax fuscicollis</i> | Indian Shag | + | + |
| 25 | Pelecaniformes | Phalacrocoracidae | <i>Phalacrocorax carbo</i> | Large Cormorant | + | + |
| 26 | Pelecaniformes | Phalacrocoracidae | <i>Phalacrocorax niger</i> | Little Cormorant | + | + |
| 27 | Ciconiiformes | Ardeidae | <i>Ardea cinerea</i> | Grey heron | + | + |
| 28 | Ciconiiformes | Ardeidae | <i>Ardea purpurea</i> | Purple Heron | + | + |
| 29 | Ciconiiformes | Ardeidae | <i>Ardeola grayii</i> | Indian Pond Heron | + | + |
| 30 | Ciconiiformes | Ardeidae | <i>Bubulcus ibis</i> | Cattle Egret | + | + |
| 31 | Ciconiiformes | Ardeidae | <i>Egretta alba</i> | Large or Great white Egret | + | + |
| 32 | Ciconiiformes | Ardeidae | <i>Egretta garzetta</i> | Little Egret | + | + |
| 33 | Ciconiiformes | Ardeidae | <i>Butorides striatus</i> | Little Green Heron | + | + |
| 34 | Ciconiiformes | Ardeidae | <i>Egretta gularis</i> | Indian Reef Heron | + | + |
| 35 | Ciconiiformes | Ardeidae | <i>Egretta intermedia</i> | Intermediate Egret | + | + |
| 36 | Ciconiiformes | Ardeidae | <i>Nycticorax nycticorax</i> | Night Heron | + | + |
| 37 | Ciconiiformes | Threskiomithidae | <i>Plegadis falcinellus</i> | Glossy Ibis | + | + |
| 38 | Ciconiiformes | Threskiomithidae | <i>Platalea leucorodia</i> | Eurasian Spoon Bill | + | + |
| 39 | Phoenicopteriformes | Phoenicopteridae | <i>Phoenicopterus roseus</i> | Greater Flamingo | + | + |
| 40 | Charadriiformes | Burhinidae | <i>Esacus recurvirostris</i> | Great Stone Plover/Great Thick-Knee | + | + |
| 41 | Charadriiformes | Haematopodidae | <i>Haematopus ostralegus</i> | Eurasian Oyster catcher | + | + |
| 42 | Charadriiformes | Rostratulidae | <i>Rostratula benghalensis</i> | Painted Snipe | + | + |
| 43 | Charadriiformes | Dromadidae | <i>Dromas ardeola</i> | Crab Plover | + | + |
| 44 | Charadriiformes | Recuvirostridae | <i>Himantopus himantopus</i> | Black-winged Stilt | + | + |
| 45 | Charadriiformes | Recuvirostridae | <i>Recurvirostra avosetta</i> | Pied Avocet | + | + |
| 46 | Charadriiformes | Charadriidae | <i>Vanellus malabaricus</i> | Yellow-wattled Lapwing | + | + |
| 47 | Charadriiformes | Charadriidae | <i>Vanellus indicus</i> | Red-wattled Lapwing | + | + |
| 48 | Charadriiformes | Charadriidae | <i>Vanellus leucurus</i> | White -tailed Lapwing | + | + |
| 49 | Charadriiformes | Charadriidae | <i>Pluvialis squatarola</i> | Grey Plover | + | + |
| 50 | Charadriiformes | Charadriidae | <i>Charadrius hiaticula</i> | Ringed Plover | + | + |
| 51 | Charadriiformes | Charadriidae | <i>Charadrius dubius</i> | Little-ringed | + | -- |

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|----|-----------------|----------------|---------------------------------|-----------------------------------|---|----|
| | | | | Plover | | |
| 52 | Charadriiformes | Charadriidae | <i>Charadrius alexandrinus</i> | Kentish Plover | + | + |
| 53 | Charadriiformes | Charadriidae | <i>Charadrius mongolus</i> | Lesser Sand Plover | + | + |
| 54 | Charadriiformes | Scolopacidae | <i>Limosa limosa</i> | Black-tailed Godwit | + | + |
| 55 | Charadriiformes | Scolopacidae | <i>Limosa lapponica</i> | Bar-tailed Godwit | + | + |
| 56 | Charadriiformes | Scolopacidae | <i>Numenius phaeopus</i> | Whimbrel | + | + |
| 57 | Charadriiformes | Scolopacidae | <i>Numenius arquata</i> | Eurasian Curlew | + | + |
| 58 | Charadriiformes | Scolopacidae | <i>Tringa erythropus</i> | Spotted Redshank | + | + |
| 59 | Charadriiformes | Scolopacidae | <i>Tringa nebularia</i> | Green Shank | + | + |
| 60 | Charadriiformes | Scolopacidae | <i>Tringa ochropus</i> | Green Sandpiper | + | + |
| 61 | Charadriiformes | Scolopacidae | <i>Tringa stagnatilis</i> | Marsh Sandpiper | + | + |
| 62 | Charadriiformes | Scolopacidae | <i>Tringa tetanus</i> | Red Shank | + | + |
| 63 | Charadriiformes | Scolopacidae | <i>Xenus cinereus</i> | Terek Sandpiper | + | + |
| 64 | Charadriiformes | Scolopacidae | <i>Actitis hypoleucos</i> | Common Sandpiper | + | + |
| 65 | Charadriiformes | Scolopacidae | <i>Limicola falcinellus</i> | Broad-billed Sandpiper | + | -- |
| 66 | Charadriiformes | Scolopacidae | <i>Philomachus pugnax</i> | Ruff | + | + |
| 67 | Charadriiformes | Scolopacidae | <i>Arenaria interpres</i> | Ruddy Turnstone | + | + |
| 68 | Charadriiformes | Scolopacidae | <i>Calidris alba</i> | Sanderling | + | + |
| 69 | Charadriiformes | Scolopacidae | <i>Calidris alpine</i> | Dunlin | + | + |
| 70 | Charadriiformes | Scolopacidae | <i>Calidris minuta</i> | Little Stint | + | + |
| 71 | Charadriiformes | Scolopacidae | <i>Calidris temminckii</i> | Temminck's Stint | + | + |
| 72 | Charadriiformes | Scolopacidae | <i>Calidris tenuirostris</i> | Great Knot | + | + |
| 73 | Charadriiformes | Scolopacidae | <i>Calidris ferruginea</i> | Curlew-Sandpiper | + | -- |
| 74 | Charadriiformes | Stercorariidae | <i>Stercorarius parasiticus</i> | Arctic Skua | + | + |
| 75 | Charadriiformes | Laridae | <i>Larus argentatus</i> | Herring Gull | + | + |
| 76 | Charadriiformes | Laridae | <i>Larus hemprichii</i> | Sooty Gull | + | + |
| 77 | Charadriiformes | Laridae | <i>Larus fuscus</i> | Lesser Black-backed Gull | + | + |
| 78 | Charadriiformes | Laridae | <i>Larus ichthyæus</i> | Great Black-headed or Pallas Gull | + | + |
| 79 | Charadriiformes | Laridae | <i>Larus brunnicephalus</i> | Brown-headed Gull | + | + |
| 80 | Charadriiformes | Laridae | <i>Larus ridibundus</i> | Black-headed Gull | + | + |
| 81 | Charadriiformes | Laridae | <i>Larus genei</i> | Slender-billed Gull | + | + |
| 82 | Charadriiformes | Sternidae | <i>Gelochelidon nilotica</i> | Gull-billed Tern | + | + |
| 83 | Charadriiformes | Sternidae | <i>Sterna caspia</i> | Caspian Tern | + | + |
| 84 | Charadriiformes | Sternidae | <i>Chlidonias leucopterus</i> | White-winged Black Tern | + | + |
| 85 | Charadriiformes | Sternidae | <i>Chilonias hybridus</i> | Indian Whiskered Tern | + | + |
| 86 | Charadriiformes | Sternidae | <i>Sterna hirundo</i> | Common Tern | + | + |
| 87 | Charadriiformes | Sternidae | <i>Sterna repressa</i> | White-cheeked Tern | + | + |
| 88 | Charadriiformes | Sternidae | <i>Sterna albifrons</i> | Little Tern | + | + |
| 89 | Charadriiformes | Sternidae | <i>Sterna bergii</i> | Great Crested Tern | + | + |

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|-----|-----------------|---------------|----------------------------------|---------------------------------|---|----|
| 90 | Charadriiformes | Sternidae | <i>Sterna acuticauda</i> | Black-bellied Tern | + | + |
| 91 | Charadriiformes | Sternidae | <i>Sterna bengalensis</i> | Lesser Crested Tern | + | + |
| 92 | Charadriiformes | Sternidae | <i>Sterna sandvicensis</i> | Sandwich Tern | + | + |
| 93 | Coraciiformes | Meropidae | <i>Merops superciliosus</i> | Blue cheeked Bee-eater | + | + |
| 94 | Coraciiformes | Meropidae | <i>Merops orientalis</i> | Little Green Bee-eater | + | + |
| 95 | Coraciiformes | Upupidae | <i>Upupa epops</i> | Common Hoopoe | + | + |
| 96 | Coraciiformes | Alcedinidae | <i>Ceryle rudis</i> | Pied Kingfisher | + | + |
| 97 | Coraciiformes | Alcedinidae | <i>Alcedo atthis</i> | Common Kingfisher | + | + |
| 98 | Coraciiformes | Alcedinidae | <i>Halcyon smyrnensis</i> | White-breasted Kingfisher | + | + |
| 99 | Coraciiformes | Coraciidae | <i>Coracias benghalensis</i> | Indian Roller or Blue Jay | + | + |
| 100 | Apodiiformes | Apodidae | <i>Apus affinis</i> | House Swift | + | + |
| 101 | Cuculiformes | Cuculidae | <i>Eudynamys scolopacea</i> | Asian Koel | + | + |
| 102 | Columbiformes | Columbidae | <i>Columba livia</i> | Blue Rock Pigeon | + | + |
| 103 | Columbiformes | Columbidae | <i>Streptopelia senegalensis</i> | Little Brown Dove/Laughing Dove | + | -- |
| 104 | Columbiformes | Columbidae | <i>Streptopelia decaocto</i> | Eurasian Collard Dove | + | -- |
| 105 | Galliformes | Phasianidae | <i>Francolinus pondicerianus</i> | Grey Partridge | + | + |
| 106 | Passeriformes | Sturnidae | <i>Acridotheres tristis</i> | Common Myna | + | + |
| 107 | Passeriformes | Sturnidae | <i>Acridotheres ginginianus</i> | Bank Myna | + | + |
| 108 | Passeriformes | Sturnidae | <i>Sturnus vulgaris</i> | Common Starling | + | + |
| 109 | Passeriformes | Hirundinidae | <i>Hirundo rustica</i> | Common or Barn Swallow | + | + |
| 110 | Passeriformes | Hirundinidae | <i>Hirundo daurica</i> | Redrumped Swallow | + | + |
| 111 | Passeriformes | Hirundinidae | <i>Riparia paludicola</i> | Indus Sand Martin | + | + |
| 112 | Passeriformes | Motacillidae | <i>Motacilla alba</i> | White Wagtail | + | + |
| 113 | Passeriformes | Motacillidae | <i>Motacilla cinerea</i> | Grey Wagtail | + | + |
| 114 | Passeriformes | Motacillidae | <i>Motacilla citreola</i> | Citrine Wagtail | + | + |
| 115 | Passeriformes | Motacillidae | <i>Motacilla flava</i> | Yellow Wagtail | + | + |
| 116 | Passeriformes | Nectariniidae | <i>Nectarinia asiatica</i> | Purple Sunbird | + | + |
| 117 | Passeriformes | Dicruridae | <i>Dicrurus macrocercus</i> | Black Drongo | + | + |
| 118 | Passeriformes | Sylviidae | <i>Orthotomus sutorius</i> | Tailor Bird | + | + |
| 119 | Passeriformes | Turdidae | <i>Laticilla burnesii</i> | Long-tailed Grass Warbler | + | -- |
| 120 | Passeriformes | Turdidae | <i>Saxicoloides fulicata</i> | Indian Robin | + | + |
| 121 | Passeriformes | Timallidae | <i>Turdoides caudatus</i> | Common Babbler | + | -- |
| 122 | Passeriformes | Pyconotidae | <i>Pycnonotus leucogenys</i> | White-cheeked Bulbul | + | + |
| 123 | Passeriformes | Pyconotidae | <i>Pycnonotus cafer</i> | Red-vented Bulbul | + | + |
| 124 | Passeriformes | Pyconotidae | <i>Prinia buchanani</i> | Rufousfronted Wren-Warbler | + | + |
| 125 | Passeriformes | Laniidae | <i>Lanius excubitor</i> | Southern Grey | + | + |

| | | | | | | |
|-----|---------------|------------|---------------------------------|--|---|----|
| | | | | Shrike | | |
| 126 | Passeriformes | Laniidae | <i>Lanius vittatus</i> | Bay-backed Shrike | + | + |
| 127 | Passeriformes | Laniidae | <i>Lanius isabellinus</i> | Isabelline Shrike / Rufous tailed Shrike | + | + |
| 128 | Passeriformes | Corvidae | <i>Corvus splendens</i> | Sind House Crow | + | + |
| 129 | Passeriformes | Alaudidae | <i>Alaemon alaudipes</i> | Hoopoe Lark | + | -- |
| 130 | Passeriformes | Alaudidae | <i>Galerida cristata</i> | Crested Lark | + | + |
| 131 | Passeriformes | Alaudidae | <i>Galerida raytal</i> | Indus Sand Lark | + | + |
| 132 | Passeriformes | Passeridae | <i>Passer domesticus</i> | House Sparrow | + | + |
| 133 | Passeriformes | Passeridae | <i>Passer pyrrhonotus</i> | Sind Jungle Sparrow | + | + |
| 134 | Passeriformes | Passeridae | <i>Zosterops palpebrosa</i> | White Eye | + | + |

Seasonal status of the birds

The status of the birds recorded has been determined as Resident (62 Species), Winter Visitors (59 Species), Summer Visitors (03 Species), Summer Breeding Visitors (03 Species) and Migrant (07 species) (Table 4).

Table 4. Seasonal status of birds recorded.

| S.No. | Category | Number of Species |
|-------|--------------------------|-------------------|
| 1 | Residents | 62 |
| 2 | Winter Visitors | 59 |
| 3 | Summer Visitors | 03 |
| 4 | Summer Breeding Visitors | 03 |
| 5 | Migrants | 07 |
| | Total | 134 |

Endangered, Threatened / Near-threatened species of Birds

01 species of bird viz. Egyptian Vulture (*Neophron percnopterus*) is Endangered, 05 species of birds are Threatened/Near –threatened. Dalmatian Pelican (*Pelecanus crispus*) and Great Spotted Eagle (*Aquila clanga*), are threatened while Black-bellied Tern (*Sterna acuticauda*), Black-tailed Godwit (*Limosa limosa*) and Eurasian Curlew (*Numenius arquata*) are Near threatened (Table 5).

Table. 5. Threatened / Near-threatened Birds recorded.

| S.No. | Birds Common Name | Scientific Name | Status |
|-------|-----------------------|------------------------------|--------|
| | Egyptian Vulture | <i>Neophron percnopterus</i> | E |
| 1 | Dalmatian Pelican | <i>Pelecanus crispus</i> | VU |
| 2 | Greater Spotted Eagle | <i>Aquila clanga</i> | VU |
| 3 | Blackbellied Tern | <i>Sterna acuticauda</i> | NT |
| 4 | Blacktailed Godwit | <i>Limosa limosa</i> | NT |
| 5 | Eurasian Curlew | <i>Numenius arquata</i> | NT |

Legends: E = Endangered, VU = Vulnerable, NT = Near-threatened

• Reptiles

During study period, 19 species of reptiles falling under 01 order and 09 families were recorded in the study area (Table 6). The group includes 10 lizards, 01 marine snake, 08 terrestrial snakes including 02 venomous snakes and 06 non-poisonous snakes.

Table 6. List of Reptiles recorded.

| S.No. | Order | Family | Scientific Name | Common Name | Korangi Creek | Phitti Creek |
|-------|----------|-------------|----------------------------------|---------------------------|---------------|--------------|
| 1 | Squamata | Agamidae | <i>Calotes versicolor</i> | Common Tree Lizard | + | + |
| 2 | Squamata | Gekkonidae | <i>Hemidactylus brookii</i> | Spotted Barn Gecko | + | + |
| 3 | Squamata | Gekkonidae | <i>Hemidactylus flaviviridis</i> | Yellow-belly Gecko | + | -- |
| 4 | Squamata | Gekkonidae | <i>Hemidactylus persicus</i> | Persian House Gecko | + | + |
| 5 | Squamata | Lacertidae | <i>Agamura persica</i> | Blunt-tailed spider Gecko | + | + |
| 6 | Squamata | Lacertidae | <i>Crossobamon orientalis</i> | Sindh Gecko | + | + |
| 7 | Squamata | Lacertidae | <i>Acanthodactylus cantoris</i> | Blue-tail Sand Lizard | + | + |
| 8 | Squamata | Lacertidae | <i>Mesalina watsonana</i> | Spotted Lacerta | + | -- |
| 9 | Squamata | Scincidae | <i>Ophiomorus raithmati</i> | Three-finger Sand Swimmer | + | + |
| 10 | Squamata | Varanidae | <i>Varanus bengalensis</i> | Bengal Monitor | + | + |
| 11 | Squamata | Boidae | <i>Eryx conicus</i> | Sindh Sand-Boa | + | + |
| 12 | Squamata | Boidae | <i>Eryx johnii</i> | Red Sand-Boa | + | + |
| 13 | Squamata | Colubridae | <i>Platycephalus rhodorachis</i> | Cliff Racer | + | + |
| 14 | Squamata | Colubridae | <i>Sphalerosophis diadema</i> | Blotched Diadem Snake | + | + |
| 15 | Squamata | Colubridae | <i>Ptyas mucosus</i> | Indian Rat Snake | + | -- |
| 16 | Squamata | Colubridae | <i>Xenochrophis cerasogaster</i> | Red-belly Marsh Snake | + | + |
| 17 | Squamata | Colubridae | <i>Naja naja</i> | Black Cobra | + | + |
| 18 | Squamata | Viperidae | <i>Echis carinatus</i> | Saw-scaled Viper | + | + |
| 19 | Squamata | Hydrophidae | <i>Hydrophis spiralis</i> | Yellow Sea Snake | + | + |

Threatened species of Reptiles

No threatened species of reptiles was recorded.

- Amphibians**

During study period, 03 species of amphibians comprising of 01 order 02 families were recorded viz. Indus Toad (*Bufo stomaticus*), Skittering Frog (*Euphlyctis cyanophlyctis*) and Bull Frog (*Hoplobatrachus tigerinus*) (Table 7).

Table 7. List of Amphibians recorded.

| S.No. | Order | Family | Scientific Name | Common Name | Korangi Creek | Phitti Creek |
|-------|-------|---------|---------------------------------|-----------------|---------------|--------------|
| 1 | Anura | Bufo | <i>Bufo stomaticus</i> | Indus Toad | + | + |
| 2 | Anura | Ranidae | <i>Euphlyctis cyanophlyctis</i> | Skittering Frog | + | + |
| 3 | Anura | Ranidae | <i>Hoplobatrachus tigerinus</i> | Bull Frog | + | - |

Threatened species of Amphibians

No threatened species of Amphibians was recorded.

- Fishes**

Total 20 species of fishes belonging to 04 orders and 10 families were recorded in study area (Table 8).

DISCUSSION**Comparison of the present studies with the earlier studies on the subject**

Very few faunal studies have been undertaken on the coastal areas of Sindh. Hassan and Ahmed (2008) have studied the birds and marine mammals of Karachi coast. They have recorded 2 mammalian species viz. Bottlenose Dolphin and Finless Porpoise from their study area. Kiani and Waerebeek (2015) reviewed the status of Indian Humpback Dolphin (*Sousa plumbea*) in the coastal area of Pakistan. The present authors have recorded 15 species of mammals from the area but the two species of marine mammals previously recorded were not recorded by us

during the present study. They have also recorded 55 species of birds from the inshore area of Karachi coast. Out of which only Common Coot (*Fulica atra*) was not recorded by us from the area.

Table 8. List of Fishes recorded.

| S.No. | Order | Family | Scientific Name | Common Name | Korangi Creek | Phitti Creek |
|-------|--------------|---------------|----------------------------------|------------------------|---------------|--------------|
| 1 | Beloniformes | Hemiramphidae | <i>Hyporhamphus sindensis</i> | Sind Halfbeak | + | + |
| 2 | Siluriformes | Ariidae | <i>Arius arius</i> | Threadfin Sea Catfish | + | + |
| 3 | Siluriformes | Ariidae | <i>Arius maculatus</i> | Spotted Catfish | + | + |
| 4 | Siluriformes | Ariidae | <i>Arius subrostratus</i> | Shovelnose Sea Catfish | + | + |
| 5 | Siluriformes | Ariidae | <i>Arius sumatranus</i> | Goat Catfish | + | + |
| 6 | Clupeiformes | Engraulidae | <i>Thryssa mystax</i> | Moustached Thryssa | + | + |
| 7 | Clupeiformes | Engraulidae | <i>Thryssa dussumieri</i> | Dussumier's Thryssa | + | + |
| 8 | Perciformes | Sciaenidae | <i>Jhonijs glaucus</i> | Pale Spot Fin Croaker | + | + |
| 9 | Perciformes | Sciaenidae | <i>Otolithes ruber</i> | Tigertooth Croaker | + | + |
| 10 | Perciformes | Sciaenidae | <i>Otlithoides biauritus</i> | Bronze Croaker | + | + |
| 11 | Perciformes | Sciaenidae | <i>Nioibea maculata</i> | Blotched Croaker | + | + |
| 12 | Perciformes | Gobiidae | <i>Boleophthalmus dussumieri</i> | Mudskipper | + | + |
| 13 | Perciformes | Gobiidae | <i>Periophthalmus waltoni</i> | Walton's Mudskipper | + | + |
| 14 | Perciformes | Lobotidae | <i>Lobotes surinamensis</i> | Tripletail | + | + |
| 15 | Perciformes | Sparidae | <i>Acanthopagrus latus</i> | Yellowfin Seabream | + | + |
| 16 | Perciformes | Sparidae | <i>Acanthopagrus berda</i> | Picnic Seabream | + | + |
| 17 | Perciformes | Terapontidae | <i>Terapon jarbua</i> | Jarbua Terapon | + | + |
| 18 | Perciformes | Terapontidae | <i>Terapon puta</i> | Small-Scaled Terapon | + | + |
| 19 | Perciformes | Scatophagidae | <i>Scatophagus argus</i> | Spotted Scat | + | + |
| 20 | Perciformes | Cichlidae | <i>Oreochromis mossambicus</i> | Mozambique Tilapia | + | + |

Jabeen *et al.* (2014) have recorded 96 species of birds from the Western back water mangrove forest at Karachi. The species Tufted Duck, Indian River Tern, White Pelican, Desert Lark, Pale Sand Martin, Wood Pigeon and Red Turtle Dove were not recorded by us mainly due to the difference of habitats between the two sites.

Ghalib *et al.* (2017) have recorded 159 species of birds from Sindh coastal areas. 25 species of birds recorded in that study viz. House Bunting, Desert Warbler, Brown Necked Raven, Hume's Short Toed Lark, Desert Lark, Bartailed Lark, Indian Roller, House Swift, Pomarine Skua, Red-necked Phalarope, Common Snipe, Large Sand Plover, Common Coot, Tufted Duck, Hobby, Cinereous Vulture, Black Ibis, Black-headed Ibis, Indian Darter, Black Stork, Painted Stork, Saunder's Tern, Great Crested Grebe, Little Grebe and Black-necked Grebe were not recorded during the present study for our area being much smaller in extent to the entire coastal area of Sindh.

14 species of marine snakes have been recorded from Pakistan. Out of these, 11 species have been recorded by Khan *et al.* (2010) from the Karachi coastal area. We recorded only one sea snake viz. Yellow Sea Snake from the nearby coastal area. Eight terrestrial snakes were recorded during the present study, while three terrestrial snakes were recorded in the previous study. 9 Geckos were recorded previously, while 10 species have been recorded during the present study. Blotched House Gecko and Mediterranean House Gecko recorded previously were not recorded in our study.

Khan *et al.* (2010) recorded three species of marine turtles from Karachi Coast. These species were not recorded during the present study as there were no suitable habitats available for marine turtles in the study area.

Khan *et al.* (2010a) recorded 5 species of Amphibians from Karachi district. Out of these, Common Asian Toad (*Bufo melanostictus*) and Indian Burrowing Frog (*Tomopterna breviceps*) was not recorded during the present study.

Ahmed *et al.* (1999) recorded 12 species of marine fishes from Korangi Creek area. Out of these, the following species viz. *Liza subviridis*, *Sillago sihama*, *Aphanius dispar*, *Lutjanus sp.*, *Ambassis commersonii*, *Platycephalus indicus*, *Coicella crocodila*, *Acentrogobius dayi* and *Glossogobius giuris* were not recorded during the present study.

Ghalib *et al.* (2018) have reviewed the distribution and status of wildlife of Sindh as a whole. It may be noted that the present study was limited to Korangi and Phitti Creek areas for detailed studies regarding the vertebrate biodiversity of the area.

Current status of the vertebrate fauna in the area

Mammals

15 species of mammals were recorded comprising of 14 terrestrial and 01 marine mammals. Mostly, the terrestrial mammals and bats are quite scarce except Wild Boar and Indian Jackal which are frequent in the area particularly near Port Qasim Area. Indian Humpback Dolphin is occasionally seen in the deeper creek area.

Birds

A majority of 72 species are migratory while 62 species are resident in the area. The area is important as some important species of birds like Dalmatian Pelican, Avocet, Little Green Heron, Crab Plover, Lesser-crested Tern have been recorded from the area. The migratory birds start arriving in the area in late August and early September and generally, the first to arrive here are little stints, dunlins and plovers. The majority of migratory birds leave by May. The peak season for birds is December to February. The most numerous birds on the coast are shorebirds or waders and a variety of gulls, which are seen throughout most part of the year. Though Anatids (ducks) are rarely observed on the coast but they have regularly been observed on passage on the saline ponds in the backwaters of the main coast. As many as eight species of ducks were recorded. Avocets and Flamingos are regularly observed on the saline ponds in flocks numbering more than a hundred birds. The Charadriids (Plovers) and Scolopacids (Sandpipers, Stints, Curlew, Godwits) visit the area in large numbers. Some waders like Curlew, Whimbrel, Dunlin, Little Stint, Little ringed Plover and Kentish Plover are mainly winter visitors but some stay in summer as over summering birds. The gulls are mostly observed near the fish landing sites and the areas where fish is easily available. Black-headed Gull, Slender-billed Gull and Herring Gull are most numerous. Brown-headed Gull is less common and Sooty Gull is seen in summer only in very small numbers. Among Terns, Sandwich Tern and Little tern are more frequent. The least abundant species of terns were Whiskered Tern, White Cheeked Tern, Great Crested Tern and Lesser Crested Tern. Among birds of prey, Black Kite and Brahminy Kite are resident in the area. The area supports a large population of Black Kites as many as 10,000 Common Kites are seen near Chashma Goth shoreline area. Brahminy Kite and Shikra are found mainly in the mangrove areas. Common and White-breasted Kingfishers are usually seen sitting on the branches of mangroves at the water's edge and flying over water and scanning it for food. The Blue-cheeked and Little Green Bee-eater are also common and mainly found near mangroves. Among passerines, Crested Lark, Sand Lark and White-cheeked Bulbuls are common. The passerines resident in the area, mainly near mangroves are Indian Robin, Rufous fronted Prinia, Purple Sunbird and White Eye. The Rufous-fronted Prinia has been found nesting in mangroves. Common and Bank Myna and House Sparrow are also common in the area.

As regards the species found to be restricted to (marine) Coastal areas, five species of birds have been recorded only from this particular habitat. These include: Sooty Gull, Sandwich Tern, Great Crested Tern, Lesser Crested Tern, and White-cheeked Tern.

05 species of birds have been recorded either to be rare or localized over the coast. These include: Oystercatcher, Sanderling, Avocet, Crab Plover, and White-cheeked Tern. These migratory species may be classified as Winter Visitors (59 species), 03 Summer Breeding Visitors (Yellow-wattled Lapwing, Southern Grey Shrike, Blue Cheeked Bee-eater), 03 Summer Visitors (Common Tern, White cheeked Tern and Sooty Gull), 07

irregular year round migrants (Crab Plover, Caspian Tern, Whiskered Tern, Large Crested Tern, Lesser Crested Tern and Sandwich Tern).

Reptiles

Snakes both marine and terrestrial are quite scarce in the area. Only one marine snake viz. Yellow sea Snake (*Hydrophis spiralis*) was recorded. Monitor Lizard and Spotted Lacerta are also scarce, while Geckos and Lizards are Less Common.

Amphibians

Skittering Frog (*Euphlyctis cyanophlyctis*) was found to be the most common frog species while Indus Toad (*Bufo stomaticus*) was the less common toad, in both areas. Bull Frog (*Hoplobatrachus tigerinus*) was not recorded in the Phitti Creek area.

Fishes

20 species of marine fishes were recorded. The common species of fishes include Tilapia, Sea Catfishes, Croakers, Sea breams and Mudskippers. These are the fishes most commonly netted by the local fishermen.

THREATS

There is a significant decline in the numbers of majority of waterbirds visiting the coastal areas due to hunting, habitat degradation, loss of habitat (particularly at Karachi Coast) and disturbance and unsustainable fisheries practices. Actually, the species diversity and their numbers have considerably declined during the recent years mainly due to loss of habitat through land reclamation on the Karachi coast.

Due to the habitat destruction and commercial utilization, the population of Bull Frog has been declining. Overexploitation of the fish is one of the major threats to the species. Ban on fishing in the close season needs to be fully implemented.

CONCLUSION

The study has highlighted the importance of the area as a part of Important Bird and Biodiversity Area and also as a part of Ramsar Site. The area supports vast assemblages of birds particularly the waders and the Common Kites. It is also important due to the presence of Fishing Cat and Jackals. The area is quite important due to the presence of mangroves and serves also as a breeding place for fishes and shrimps whose large scale netting takes place in the mangrove area.

There is high level of aquatic pollution in the area which needs to be controlled.

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