



## Research Article

# Diversity and Abundance of Birds at Dhapchapak Riverine Forest, Dera Ismail Khan, Pakistan

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**Abstract** | This study aims to assess the avifauna diversity in Dhapchapak lake and forest areas. There is no previous record of any detailed research on bird species in Dhapchapak lake and the forest area. The study was conducted to estimate the diversity and abundance of avifauna species found in dhapchapak wetland and forest during winter (2017-18 and 2018-19). As birds are the best indicator for environmental changes hence the migratory birds fauna was observed during September to March of the year 2017-2019. Point transect method was used to explore the avifauna diversity at study site. In current study, total of 13,933 birds belonging to 39 species, 21 families were observed. Among these 39 species, 33 bird's species were terrestrial and the rest of 21 bird's species were aquatic. In water birds species, Great Egret is the most abundant specie of 2017-18 year, while in 2018-19 year, most abundant specie is Little Cormorant. In forest birds species, most abundant species of the study area were recorded as Little Cormorant and Northern Pintail. As migratory birds indicate ecosystem condition, healthy birds species indicate healthy habitat, while declining birds indicate degraded habitat. The objective of this study was to determine the bird species composition, species diversity, species richness, species evenness and status of bird species.

**Received** | April 19, 2021; **Accepted** | July 07, 2021; **Published** | November 06, 2021

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**Citation** | Nisa, N., R. Bibi, B. Riaz, B. Khalil, I. Maheen, Saima, U.I. Khan and I. Ullah. 2021. Diversity and abundance of birds at dhapchapak riverine forest, Dera Ismail Khan, Pakistan. *Journal of Innovative Sciences*, 7(2): 236-243.

**DOI** | <https://dx.doi.org/10.17582/journal.jis/2021/7.2.236.243>

**Keywords** | Dhapchapak wetland, Waterfowls bird, Relative abundance, Diversity, Pakistan

## 1. Introduction

The biosphere is a collection of a variety of ecological zones and each zone is according to the adaptation of species in it. Biological diversity has been greatly enhanced by a smooth interaction between ecosystems and species (Richard, 1998). Biodiversity can significantly be impacted by the quality of the ecological environment (Pei, 2018). The best-studied group of vertebrates on the planet is birds (Whelan *et al.*, 2008). Birds have widespread occurrences; they are mobile and have many ecological

roles (Daniel, 2011). Birds provide supporting services such as pollination, seed dispersal, water purification, and nutrient recycling (Brenner, 2010).

Wetland habitat structure has an impact on bird species composition (Wondiumwolde, 2018). Wetlands are defined as lands transitional between terrestrial and aquatic ecosystems. Wetlands serve as a home for a vast diversity of wildlife such as birds, mammals, fish, frogs, insects, plants (Buckton, 2007). Pakistan has the most extensive canal system, consists of 225 wetlands. Birds are noted as 9993 species worldwide, 2700

species from Asia. However, more than 668 species from Pakistan. In Pakistan, 30% of avian species are long-distance migrants, 43% of species are oriented, or Palearctic 27% are winter visitors (Roberts, 1991). Cranes, ducks, falcons, flamingos, geese, swans, and waders are vital migratory avian species in Pakistan (Ali, 2005)

The underlying biodiversity is closely related to the forest ecosystem and its multifunctionality (Gamefeldt, 2013). Many organisms have been affected by the available forest area and water bodies. Birds diversity yet unknown in the forest and wetland of Dera Ismail Khan Dhapchapak, which is present at KPK and Punjab’s borderline. This study aims to assess the avifauna diversity in Dhapchapak lake and forest areas. There is no previous record of any detailed research on bird species in Dhapchapak lake and the forest area. This study’s objective was to determine the bird species composition, species diversity, species richness, species evenness, and status of bird species.

## 2. Materials and Methods

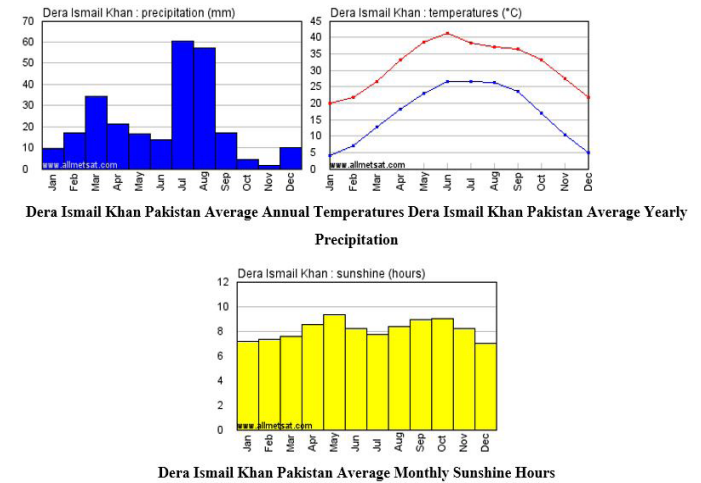
### 2.1 Study site

The study was conducted at Dhapchapak forest and wetland, situated at (31.784703°N,70.971812°E), the border of Khyber Pakhtunkhwa, and Punjab provinces of Pakistan, and is located at river Indus. The area is fertile and is rich in vegetation consisting of trees, herbs, and shrubs. This region serves as essential habitat for migratory birds and waterfowls because it consists of both forest and wetland. This study aims to learn about the avian biodiversity of this region. Dera Ismail Khan has a hot desert climate with sweltering summers and warm winters. Rain mainly falls in two distinct periods: in the late winter and early spring from February to April, and in the monsoon in July and August.

### 2.2 Data collection

Both the forest and wetland of Dhapchapak were surveyed to estimate the number of species of birds twice a day. The survey was carried out each month from September 2017 to March 2018 and September 2018 to March 2019. The study site was visited twice each month. For data collection, we used three methods, i.e., the Point count method, the Line transect method, and direct observation. The survey was conducted at dawn (6 am-8 am) and dusk (5 pm-7

pm). During this time, birds actively perform their functions. For observation of bird species, binocular (42x) was used. The bird’s photography was done with Nikon D7200 (sigma 150-600 mm lens). The location of the avian was recorded by BENQ GPS. Avian species were identified using keys of Woodcock (1980) and Kazmierczak (2000).



For the observation and calculation of birds, a pair of binoculars were used while staying apart distant. Indirect method observation, everything that can be seen or heard to be recorded. They were observing the number of individuals on the forest using the point count method while observing birds along/of wetland using the line-transect method.

### 2.3 Data analysis

The collected data were interned and stored in the Microsoft Excel Spreadsheet. We estimated the following parameters using that data:

(I) We determined the relative abundance of bird species of the area using the following equation

$$(R.A) = n/N \quad \dots(1)$$

Where;

R.A: Relative Abundance n= total number of individuals sighted of a bird species recorded during the surveys. N= total number of individuals sighted of all bird species recorded during the surveys.

(II) whenever we study avian fauna in any area, determining the diversity of bird species is always very significant. For this purpose, Shannon-Weiner Index (H') was calculated to know the species diversity based on species abundance using the following equation:

$$H' = -[\sum Pi * LN(Pi)] \dots(2)$$

Where;

H'= Diversity Index; Pi= proportion of each bird species in the sample; LN(Pi)= natural logarithm of this proportion.

(III) Evenness is another important feature of bird studies, determination of which is needed. Evenness compares the similarity of the different bird species population size in a whole sample (all bird species). We calculated the Evenness Index (J') using the following formula.

$$J=H' /Hmax \dots(3)$$

H'= diversity index; Hmax = natural log of the total number of all bird species.

(IV) We calculated the Simpson Index (D), which is the probability of any two individuals drawn from noticeably large communities belonging to different species.

$$D= 1- \sum n (n-1) / N (N-1) \dots(4)$$

N= total number of individuals of a bird species sighted during the surveys; N= total number of individuals of all bird species sighted during the surveys.

Point transects are like line transects. In the point transect method, several points are chosen within the study area, and each point is visited. The object detected from each point and then recorded, with their distances from the point. Ornithologists are the primary users of a method, which they called such sampling method as variable circular plot sampling.

Direct observation includes those techniques used in the wild that enables us to observe or hear everything that can be put in records in the true sense. Due to this primary reason, the method of automatic video recording is not helpful here compared to the direct observation method. Although this method is very efficient for analyzing some kinds of behaviors, it doesn't need that the observer follows the animal through its habitat.

### 3. Result and Discussion

hapchapak wetland and forest have a complex aquatic

and terrestrial habitat, and due to this reason, they have a great variety of bird species. During the study, a total of 13,933 birds belonging to 39 species, 21 families were observed. Among these 39 species, 33 bird's species were terrestrial, and the rest of 21 bird's species were aquatic.

In waterfowls birds species, Family Anatidae was recorded to be the most diversified during the survey and represented by 11 species; after that, Family Ardeidae was recorded to be the 2<sup>nd</sup> most diversified and denoted seven species. Family Scolopacidae represented by five species, while Families named Charadriidae and Podicipedidae were represented by three species (each). Families named Jacanidae, Laridae, Rallidae, Phoenicopteridae, Phalacrocoridae represented by 2 species (each). In water birds, five species are migratory birds, i.e., *Anas crecca* (622), *Aythya ferina* (661), *Mareca penelope* (639), *Anas platyrhynchos* (504), and *Anas acuta* (702). In waterbird species, Great Egret is the most abundant species of the 2017-18 year, having 183 in number, while in the 2018-19 year, the most abundant species is Little Cormorant having 200 in number. In the 2017-18 year, the most dominated and sub-dominant species are Great Egret (183) and Gadwall (174), respectively, while in the 2018-19 year, the most overpowered and sub-dominated species are Little Cormorant (200) and Gadwall (187), respectively.

In forest bird species, Family Muscicapidae was the most diversified during the survey and represented by four species. The 2<sup>nd</sup> most diversified Families are Columbidae, Laniidae, Accipitridae, Apodidae, Cuculidae, Ploceidae, Meropidae, which were characterized by two species (each). Families named Dicruridae, Upupidae, Falconidae, Sturnidae, Oriolidae, Corvidae, Coraciidae, Sylviidae, Nectariniidae, Pycnonotidae, Charadriidae, Passeridae were represented by 1 species (each). Forest birds were all considered residential birds. During this study, all birds' conservational status is the most minor concern, i.e., having a stable population. The most dominant species of forest birds is House Sparrow (369). The most abundant species of the study area were recorded as Little Cormorant (846) and Northern Pintail (702). 2<sup>nd</sup> most abundant species of the study area are Red Wattled Lapwing (681), Cattle Egret (661), Common Pochard (661), Eurasian Wigeon (639), Intermediate Egret (638), Common Teal (622), Indian Pond Heron (508), Mallard (504).

**Table 1: Abundant bird species of dhapchapak wetland and forest.**

Species name	Total	n/N	H'	D
Alpine Swift	237	0.017009976	-0.0693	0.000288
Asian Koel	67	0.004808727	-0.02567	2.28E-05
Baya Weaver	223	0.016005168	-0.06618	0.000255
Bay-Backed Shrike	93	0.006674801	-0.03344	4.41E-05
Black Drongo	78	0.00559822	-0.02903	3.09E-05
Black headed gull	317	0.02275174	-0.08607	0.000516
Black-Breasted Weaver	144	0.010335175	-0.04725	0.000106
Black-necked grebe	393	0.028206416	-0.10065	0.000794
Blue-Cheeked Bee-Eater	311	0.022321108	-0.08487	0.000497
Cattle egret	661	0.047441326	-0.14461	0.002247
Common Buzzard	53	0.003803919	-0.02119	1.42E-05
Common Hoopoe	70	0.005024044	-0.02659	2.49E-05
Common Kestrel	27	0.001937845	-0.0121	3.62E-06
Common Myna	173	0.012416565	-0.05449	0.000153
Common pochard	661	0.047441326	-0.14461	0.002247
Common sand piper	139	0.009976315	-0.04597	9.88E-05
Common Stone Chat	50	0.003588603	-0.0202	1.26E-05
Common teal	622	0.044642216	-0.1388	0.00199
Eurasian Golden Oriole	66	0.004736955	-0.02535	2.21E-05
Eurasian wigeon	639	0.045862341	-0.14135	0.0021
Fork tailed Swift	121	0.008684418	-0.04122	7.48E-05
Great black headed gull	168	0.012057705	-0.05327	0.000145
Greater Coucal	57	0.004091007	-0.0225	1.64E-05
Green Bee-Eater	158	0.011339984	-0.0508	0.000128
Green shank	134	0.009617455	-0.04467	9.18E-05
Grey Bush Chat	126	0.009043279	-0.04256	8.11E-05
Grey heron	263	0.01887605	-0.07494	0.000355
House Crow	187	0.013421374	-0.05786	0.000179
House Sparrow	369	0.026483887	-0.09617	0.0007
Indian pond heron	508	0.036460202	-0.12074	0.001327
Indian Robin	149	0.010694036	-0.04853	0.000114
Indian Roller	81	0.005813536	-0.02993	3.34E-05
Intermediate egret	638	0.045790569	-0.1412	0.002094
Little cormorant	846	0.060719156	-0.1701	0.003683
Little egret	259	0.018588961	-0.07408	0.000344
Little grebe	612	0.043924496	-0.13728	0.001926
Little ringed plover	261	0.018732506	-0.07451	0.00035
Little stint	382	0.027416924	-0.09861	0.00075
Mallard	504	0.036173114	-0.12007	0.001306
Northern pintail	702	0.05038398	-0.15055	0.002535
Orphean Warbler	52	0.003732147	-0.02087	1.37E-05
Pheasant tail Jacana	149	0.010694036	-0.04853	0.000114
Purple heron	205	0.014713271	-0.06208	0.000215
Species name	Total	n/N	H'	D
Purple Sunbird	73	0.00523936	-0.02751	2.71E-05
Red Backed Shrike	54	0.003875691	-0.02152	1.47E-05
Red Collared Dove	69	0.004952272	-0.02629	2.42E-05

Red shank	291	0.020885667	-0.0808	0.000435
Red wattled lapwing	681	0.048876767	-0.14753	0.002386
Red-Vented bulbul	132	0.009473911	-0.04414	8.91E-05
Red-Wattled Lapwing	115	0.008253786	-0.03959	6.75E-05
Rufous-Tailed Scrub Robin	98	0.007033661	-0.03487	4.9E-05
Shikra	37	0.002655566	-0.01575	6.86E-06
Spanish Sparrow	137	0.009832771	-0.04545	9.6E-05
Spotted Dove	90	0.006459485	-0.03257	4.13E-05
White-tailed plover	201	0.014426182	-0.06115	0.000207
	13933	1	3.675948	0.968515

The least abundant species of the survey were Asian Koel (67), Bay-Backed Shrike (93), Black Drongo (78), Common Buzzard (53), Common Hoopoe (70), Common Kestrel (27), Common Stone Chat (50), Eurasian Golden Oriole (66), Greater Coucal (57), Indian Roller (81), Orphean Warbler (52), Purple Sunbird (73), Red-Backed Shrike (54), Red Collared Dove (69), Rufous-Tailed Scrub Robin (98), Shikra (37).

In the present survey, we developed a checklist of bird diversity in dhapchapak wetland and forest and estimated their relative abundance. Most bird species recorded in dhapchapak forest and wetland belong to Family Phasianidae as it provides a suitable habitat for birds diversity to live and breed. Birds visit this site for drinking water and roosting on trees found around the study area. The total bird diversity of dhapchapak wetland and forest is 13933. In which waterfowls bird species recorded 10237 and forest birds are 3697.

Diversity is the critical component of an ecosystem, and among various organisms, birds have significant possession in an ecosystem because of noticeability and well appreciation by humans. Birds play an essential role in charming public attention to natural habitats. The variety in bird fauna in pristine habitats serves as an indicator of a habitat's natural status (Mahmood *et al.*, 2021).

In a survey conducted during 2008-2009 at a place of kallarkahar lake, a total of 86 bird species which belong to 36 families, were recorded (Rais *et al.*, 2011). Among 86 species, 29 water birds (in which 6 were ducks species and 23 were other waterbird species) were recorded at kalarkahar lake. During the January and February months of 2003, various 30 species of birds were recorded at such areas by Ali and Akhtar. At Taunsabarrage, a survey was conducted during

**Table 2: Birds diversity at dhapchapak wetland and forest.**

Scientific name	Species name	Family	Conservation status	Distribution	Habitat	Abundance
<i>Tachymartis melba</i>	Alpine Swift	Apodidae	Least concern	Residential	Terrestrial	sub-dominant
<i>Eudynamis scolopacea</i>	Asian Koel	Cuculidae	Least concern	Residential	Terrestrial	least abundant
<i>Ploceus philippinus</i>	Baya Weaver	Ploceidae	Least concern	Residential	Terrestrial	sub-dominant
<i>Lanius vittatus</i>	Bay-Backed Shrike	Laniidae	Least concern	Residential	Terrestrial	least abundant
<i>Dicrurus macrocercus</i>	Black Drongo	Dicruridae	Least concern	Residential	Terrestrial	least abundant
<i>Chroicocephalus ridibundus</i>	Black headed gull	Laridae	Least concern	Residential	Aquatic	sub-dominant
<i>Ploceus benghalensis</i>	Black-Breasted Weaver	Ploceidae	Least concern	Residential	Terrestrial	least abundant
<i>Podiceps nigricollis</i>	Black-necked grebe	Podicipedidae	Least concern	Residential	Aquatic	sub-dominant
<i>Merops superciliosus</i>	Blue-Cheeked Bee-Eater	Meropidae	Least concern	Residential	Terrestrial	sub-dominant
<i>Bubulcus ibis</i>	Cattle egret	Ardeidae	Least concern	Residential	Terrestrial	2 <sup>nd</sup> most dominant
<i>Buteo buteo</i>	Common Buzzard	Accipitridae	Least concern	Residential	Terrestrial	least abundant
<i>Upupa epops</i>	Common Hoopoe	Upupidae	Least concern	Residential	Terrestrial	least abundant
<i>Falco tinnunculus</i>	Common Kestrel	Falconidae	Least concern	Residential	Terrestrial	least abundant
<i>Acridothera tristis</i>	Common Myna	Sturnidae	Least concern	Residential	Terrestrial	least abundant
<i>Aythya ferina</i>	Common pochard	Anatidae	Least concern	Migratory	Aquatic	2 <sup>nd</sup> most dominant
<i>Actitis hypoleucos</i>	Common sand piper	Scolopacidae	Least concern	Residential	Aquatic	least abundant
<i>Saxicola rubicola</i>	Common Stone Chat	Muscicapidae	Least concern	Residential	Aquatic	least abundant
<i>Anas crecca</i>	Common teal	Anatidae	Least concern	Migratory	Aquatic	2 <sup>nd</sup> most dominant
<i>Oriolus oriolus</i>	Eurasian Golden Oriole	Oriolidae	Least concern	Residential	Terrestrial	least abundant
<i>Mareca penelope</i>	Eurasian wigeon	Anatidae	Least concern	Migratory	Aquatic	2 <sup>nd</sup> most dominant
<i>Apus pacificus</i>	Fork tailed Swift	Apodidae	Least concern	Residential	Terrestrial	least abundant
<i>Ichthyophaga ichthyaetus</i>	Great black headed gull	Laridae	Least concern	Residential	Aquatic	least abundant
<i>Centropus sinensis</i>	Greater Coucal	Cuculidae	Least concern	Residential	Terrestrial	least abundant
<i>Merops orientalis</i>	Green Bee-Eater	Meropidae	Least concern	Residential	Terrestrial	least abundant
<i>Tringanebularia</i>	Green shank	Scolopacidae	Least concern	Residential	Aquatic	least abundant
<i>Saxicola ferrea</i>	Grey Bush Chat	Muscicapidae	Least concern	Residential	Terrestrial	least abundant
<i>Ardeacinerea</i>	Grey heron	Ardeidae	Least concern	Residential	Aquatic	sub-dominant
<i>Corvus splendens</i>	House Crow	Corvidae	Least concern	Residential	Terrestrial	least abundant
<i>Passer domesticus</i>	House Sparrow	Phasianidae	Least concern	Residential	Terrestrial	sub-dominant
<i>Ardeola grayii</i>	Indian pond heron	Ardeidae	Least concern	Residential	Aquatic	2 <sup>nd</sup> most dominant
<i>Saxicoloides fulvicatus</i>	Indian Robin	Muscicapidae	Least concern	Residential	Terrestrial	least abundant
<i>Coraciabenghalensis</i>	Indian Roller	Coraciidae	Least concern	Residential	Terrestrial	least abundant
<i>Ardeaintermedia</i>	Intermediate egret	Ardeidae	Least concern	Residential	Aquatic	2 <sup>nd</sup> most dominant
<i>Microcarboniger</i>	Little cormorant	Podicipedidae	Least concern	Residential	Aquatic	most dominant
<i>Egretta garzetta</i>	Little egret	Ardeidae	Least concern	Residential	Aquatic	sub-dominant
<i>Tachybaptus ruficollis</i>	Little grebe	Podicipedidae	Least concern	Residential	Aquatic	2 <sup>nd</sup> most dominant
<i>Charadrius dubius</i>	Little ringed plover	Charadriidae	Least concern	Residential	Terrestrial	sub-dominant
<i>Calidris minuta</i>	Little stint	Scolopacidae	Least concern	Residential	Aquatic	Sub-dominant
<i>Anas platyrhynchos</i>	Mallard	Anatidae	Least concern	Migratory	Aquatic	2 <sup>nd</sup> most dominant
<i>Anas acuta</i>	Northern pintail	Anatidae	Least concern	Migratory	Aquatic	most dominant
<i>Sylvia hortensis</i>	Orphean Warbler	Sylviidae	Least concern	Residential	Terrestrial	least abundant
<i>Hydrophasianus chirurgus</i>	Pheasant tail Jacana	Jacaniidae	Least concern	Residential	Aquatic	least abundant
<i>Ardea purpurea</i>	Purple heron	Ardeidae	Least concern	Residential	Aquatic	sub-dominant
<i>Cinnyris asiaticus</i>	Purple Sunbird	Nectariniidae	Least concern	Residential	Terrestrial	least abundant
<i>Lanius collurio</i>	Red Backed Shrike	Laniidae	Least concern	Residential	Terrestrial	least abundant
<i>Streptopelia tranquebarica</i>	Red Collared Dove	Columbidae	Least concern	Residential	Terrestrial	least abundant
<i>Tringatotanus</i>	Red shank	Scolopacidae	Least concern	Residential	Aquatic	sub-dominant
<i>Vanellus indicus</i>	Red wattled lapwing	Charadriidae	Least concern	Residential	Terrestrial	2 <sup>nd</sup> most dominant
<i>Pycnonotus cafer</i>	Red-Vented bulbul	Pycnonotidae	Least concern	Residential	Terrestrial	least abundant
<i>Vanellus indicus</i>	Red-Wattled Lapwing	Charadriidae	Least concern	Residential	Terrestrial	least abundant
<i>Cercotrichas galactotes</i>	Rufous-Tailed Scrub Robin	Muscicapidae	Least concern	Residential	Terrestrial	least abundant
<i>Accipiter badius</i>	Shikra	Accipitridae	Least concern	Residential	Terrestrial	least abundant
<i>Passer hispaniolensis</i>	Spanish Sparrow	Passeridae	Least concern	Residential	Terrestrial	least abundant
<i>Spilopelia chinensis</i>	Spotted Dove	Columbidae	Least concern	Residential	Terrestrial	least abundant
<i>Vanellus leucurus</i>	White-tailed plover	Charadriidae	Least concern	Residential	Terrestrial	sub-dominant

2008-2014, and they recorded 171 species of birds (Bibi *et al.*, 2016).

At Taunsa barrage wildlife sanctuary, 58,598 birds recorded, which belonging to 53 families and 171 species (Bibi and Ali, 2013) and Akhtar reported 126 bird species from chashma, 115 from mammal lake, 110 from rangpur while 103 were reported from uchali lake (Ali *et al.*, 2007). In another study, 110 species of bird population were recorded at Taunsa Barrage wildlife sanctuary (Ali *et al.*, 2011). At Trimmubarrage, a total of 9,699 birds, 89 species belonging to 39 families, and 15 orders were recorded during 2004-2005 (Shahid *et al.*, 2009). At Uchalilake, 11 species were visited in 2010, with their total number up to 1,139. In 2011 total, 34 species with a population of 18,606 birds were recorded there (Arshad *et al.*, 2014).

Birds occurrence at Jiwani coastal wetlands in 2008 the total number of species were 109,77 recorded as migratory birds and 32 as residents Studies have been conducted on same parameters in different parts of the world by other researchers as the birds of Pakistan studied by Robert (1991-92). One hundred twenty species were recorded; 46 as winter visitor; 40 species were recorded as residents; 15 as summer visitor; summer breeders as five species; irregular year-round visitors were recorded as 11 species; 2 was recorded as vagrant and spring visitor was only one species recorded, Grimmatt *et al.* (1998). A total of 101 birds species; 35 winter visitors; residents 39 species; 15 were summer visitors; 2 were recorded as summer breeders; 5 species were recorded as irregular year-round visitors and six species as a vagrant, Mirza (2007) were recorded 84 species at Jiwanicostak wetland, residential birds were 33 species, 25 species of them were winter visitors, summer visitors were 11 species, 4 were summer breeder, 9 were an irregular year-round visitor and 2 of them were vagrant. During the year 2008, 110 bird species were recorded at Taunsa barrage. The avifauna observed during this study belonged to 45 families. Among 110 species, 66 were residents, eight were breeding residents, winter visitors were 34, and summer visitors were only 2.

According to the field survey from March 2009 to December 2009 (Tables 2), a total of (N=176579) individuals were recorded from Karachi University and Safari Park. Out of which (n1=119986) (Table

2) individuals were recorded from Karachi University. Of which 10063 individuals were recorded during March, 10469 during April, 10562 during May, 10997 during June, 11552 during July, 12376 during August, 13768 during September, 13593 during October, 13738 during November, and 12868 during December.

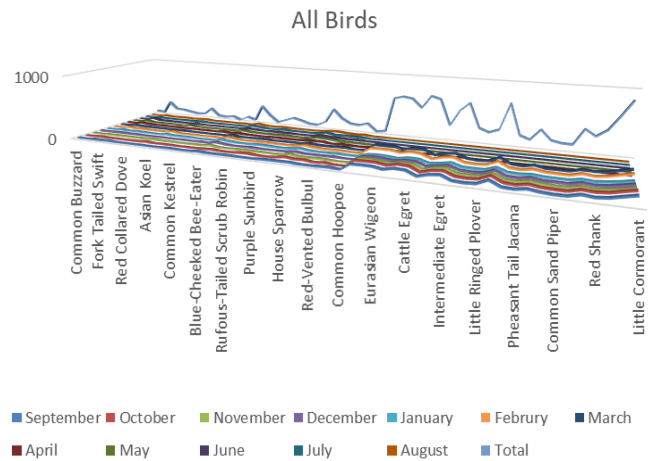


Figure 1: Great variety of birds fauna at dhapchapak wetland and forest.

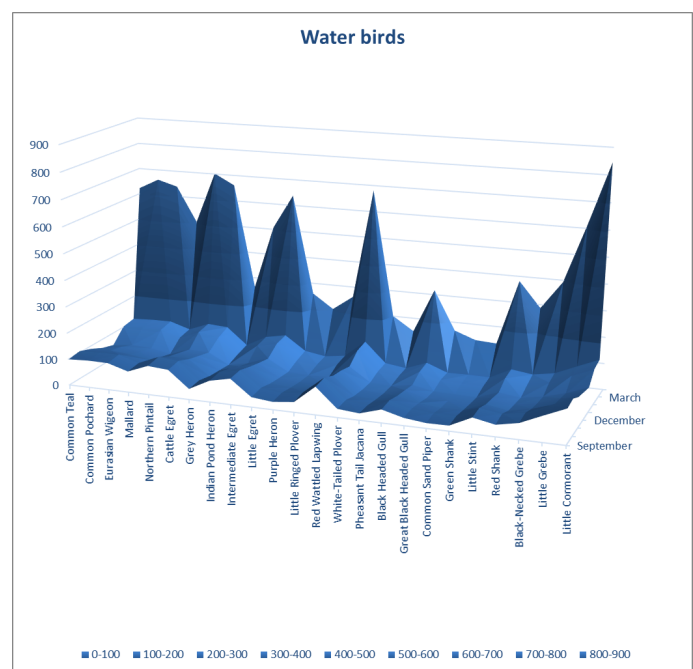
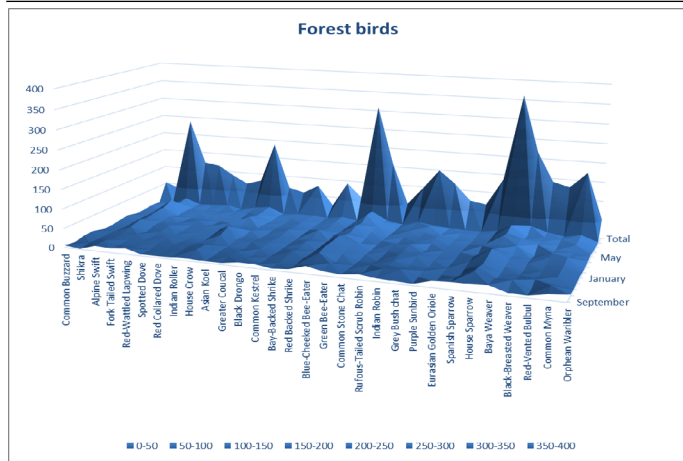


Figure 2: The total number of water birds recorded monthly wise during 2017 to 2019.

While from the Wild habitat of Safari Park area, a total of (n2= 56593) individuals of birds were recorded. Out of these 4838 individuals were recorded during March, 4500 during April, 4675 during May, 4910 during June, 6150 during July, 6532 during August, 6525 during September, 7069 during October, 5842 November, and 5552 during December.



**Figure 3: The total number of forest birds recorded monthly wise during 2017 to 2019.**

### Acknowledgments

Throughout the writing of this thesis I have received a great deal of support and assistance.

First of all would like to express our gratitude to Almighty ALLAH to enabling us to complete this research.

We would like to thank our supervisor Inam Ullah, whose expertise was invaluable in formulating the research questions and methodology. Your insightful feedback pushed me to sharpen my thinking and brought my work to a higher level.

Would particularly like to single out supervisor Ruqia Bibi and Najam-un-Nisa. We want to thank you for your patient support and for all of the opportunities was given to further our research, for their valuable guidance throughout studies. You provided us with the tools that we needed to choose the right direction and successfully complete our dissertation.

In addition, would like to thank our parents for their wise counsel and sympathetic ear. You are always there for us. Finally, this dissertation without saima, balqees riaz, uzma islama khan, iqra maheen, bushra khalil couldn't complete who stimulating discussions as well as happy distractions to rest mind outside of our research and helped a lot in writing the research thesis and provide guidance throughout studies.

### Novelty Statement

The work was conducted first time at this riverine forest area, in which the number of birds species were

explained very clearly and the reasons of declining of birds also discussed.

### Author's Contribution

Inam Ullah designed the data. Ruqia Bibi and Najam Un Nisa reviewed the manuscript. Balqees Riaz wrote the introduction, Uzma Islam Khan and Iqra Maheen wrote the discussion, while Bushra Khalil and Saima wrote the results of the manuscript. Methodology designed by all the authors.

### Conflict of interest

The authors have declared no conflict of interest.

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