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STUDY OF VERTEBRATE DIVERSITY AT LAL SUHANRA NATIONAL PARK, PAKISTAN

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ABSTRACT

The field surveys of Lal Suhanra National Park (LSNP) Bahawalpur were conducted to study its vertebrate diversity between October and December 2015. The study was commenced to determine the status of fauna of national park, diversity indices and environmental intimidations to their protection. The data was collected by point count method. The fauna observed there included 17 species of mammals including Asiatic wolf that is endangered. Five species of amphibians and 27 species of reptiles were found there. Among reptiles, *Chitra indica* is endangered. The results of study showed that maximum account of 7443 birds of 74 species belong to 35 families and representative of 16 orders were witnessed during the study. The seasonal distribution pattern of birds shown that year around resident were 76%, 7% were summer breeders, 4% were passage migrants while 5% were uncommon and 8% were common winter migrants. Hunting, deforestation, wood logging, disturbance by human activities and habitat loss are the major threats for wild animals at LSNP. Alteration in natural lake and their flows for recreational purposes is also a major threat. Proper attention should be given to existing habitat of study area for conservation of unique fauna of this biosphere reserve.

Key words: National park, Vertebrate diversity, Lal Suhanra, Habitat loss.

INTRODUCTION

Pakistan is home to an ecologically unique fauna. Biodiversity is facing serious threats due to anthropogenic activities like deforestation, species migration and habitat fragmentation) Qasim *et al*. (2017). Among protected areas worldwide, national parks are one of the extensive types, which encompass the highest percentage (23%) of the over-all area covered by protected areas globally (Chape *et al*., 2005). The basic conservation and maintenance tools are national parks and bio reserves that are supposed to guard species and their habitats in the limitations of fixed boundaries declared by the government. This obstinacy may be their "Achilles' heel" as conservation tools in the phase of developing global-scale ecological complications such as change in climate. Increased level of greenhouse effect is triggering global climatic changes, which is life threatening for different species hence changing geographic distribution. With these ecological temperature changes, there originates uncertainty about the future ability of protected areas and gardens to meet their conservation and protection directives Burns *et al*. (2003). Organization of National Parks plays important role in the biodiversity conservation through the defense of ecosystems and threatened species. It also acts as reservoirs of flora and fauna that can reestablish lands where different species have been extinct (Cathcart 2000).

Lal Suhanra Nartional Park (LSNP); in 1972, government declared it a national park on October 26, following commendations compiled by the Wildlife Enquiry Committee in 1971. Originally, it covered an area of 313.549 km^2, of which 209.319 km^2 was desert, 84.880 km^2 irrigated forest plantation and 19.339 km^2 reservoir; it was enlarged by 226.80 km^2. It is famous for its animal diversity that includes black buck, Nilgai antelope, and Rhino. LSNP is first biosphere reserve of Pakistan. Biosphere reserves are the sites recognized under UNESCO's "Human and the Biosphere" (MAB) Program to promote sustainable advancement. They are ideal for testing and demonstration of innovative methodologies to sustainability from local to international standards. Three interconnected functions can be achieved i.e. conservation, development and research through these biosphere reserves. Unesco (2011). The vast lake in the central of the park, which is perfect for bird watching, is an amazing wintering ground. Maan and Chaudhary (2001).

The Lal Suhanra National Park protects the best of our natural heritage: spectacular landscapes, amazing wildlife and splendid forests. Along with other protected areas, they make the basis of our frugal and communal welfare, fascinate millions of visitors per annum, and helps to protect exceptional wildlife by acting as a harbor for threatened species. This study was carried out to enlist the existing vertebrate diversity of LSNP, and to come up with recommendations and strategies for conservation and management of biodiversity in a sustainable manner.

The study provides provision of basic data for fauna and flora of study site for conservation and management of first biosphere reserve of the country.

MATERIALS AND METHODS

Different kind of field methods were applied to accomplish the research work.

I. Study Site: Lal Suhanra National Park ($29^0$24'N-$720^0$1'E) is situated in the east of Bahawalpur at the distance of about 36km in Punjab province. For present research five different sites were selected (Fig.1). Study sites included TDCP rest house area. RD25 was enclosure of black buck sunder semi natural conditions. RD65 was also black buck enclosure but with completely natural environment. Lake is an important wetland; it was also the part of study. Forest area was dense and far from other study sites. It is passing through the dried-up bed of the Hakra River and features an important wetland.

II. Methodology for Biodiversity Estimation:

a. Census Method: The Direct count was applied for estimation of vertebrate (Birds, Mammals, Reptiles and Amphibians) diversity. It is one of the most extensively used approach for determination of the species abundance and diversity (Haldin and Ulfvens 1987). Five vantage points were selected for Animal/Bird's census in LSNP. GPS (GARMIN, GPS map 76CS x) was used for coordinates of vantage points. Equipment included binocular (magnification 10 × 50). Spotting scope (20 × 40 × 60 magnification) with a tripod and a digital camera. Animals/Birds was identified by using books and field guides like Roberts, (1991, 1992, 1997); Khan, (1977); Grimmitte *et al*. (1998, 2008); Mirza, (1998, 2007). The duration of study was three months (5-7 days in each survey). During the study along with direct observations, meeting with officials and local community members were held.

b. Meetings with Local and Concerned Departments: Meetings with local communities were also arranged to collect the traditional knowledge regarding biodiversity. The concerned departments were consulted to determine their policies and strategies for biodiversity conservation.

III. Proposed Analysis: Different types of analysis were conducted to determine the diversity index that tells how many species were present in a dataset and at the same time took into account in what manner the basic entities (individuals) were distributed amongst those types. Different types of diversity analysis were used as stated below:

I- **Species Richness:** R Richness is amongst popular and widely used diversity indices in the field of ecology, being a simple measure, where abundance data are frequently unavailable for the datasets of interest. Diversity takes abundances with it but richness is something different, as it does not take abundances under consideration (Jost 2006).

II- **Shannon-Wiener Index:** The Shannon index is one of the popular and widely used diversity indices in the environmental literature. It is also known as Shannon's diversity index or the Shannon-Wiener index. Shannon (1948).

It was calculated as follows:

$$H' = -\sum_{i=1}^{R} p_i \log p_i$$

Simpson Index (D): The Simpson Index is popular for the calculation of probability of different individuals that belong to distinct species of selected sample. He provided probability of various individuals from a large community connected to different species (Simpson 1949). The given formula for calculation of Simpson Index for current study is given below:

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

Where n is the total number of birds of a particular species

N= the total number of birds of all species

Evenness (E): "The relative abundance calculation of various species is contributing to richness of sample of site is called evenness". It mainly describes the equivalent distribution of various individuals among several species.

The formula of evenness is given below:

$$= \frac{\text{Shannon Weiner Diversity Index}}{\text{ln (log natural) of Total Population}}$$

IV. Informal Meetings with the Locals: The main purpose of these informal meeting and conversation with local individuals was to acquire information about the status and regime of the wildlife and the natural resources of that area. The hunters were also interviewed.

RESULTS AND DISCUSSION

Lal Suhanra National Park (LSNP) was declared as first biosphere reserve in 1977 (Khan 2012). LSNP is diverse in flora and fauna. According to literature the Flora composition of park included 212 species of trees belongs to 50 families of plants of which 14 are major families containing 147 species that includes Poaceae, Fabaceae, Asteraceae, Chenopodiaceae, Euphorbiaceae, Boraginaceae, Amaranthaceae, Aizoaceae, Cucurbitaceae, Mimosaceae and Solanaceae, Capparidaceae, Caryophyllaceae and Scrophulariaceae (Wariss *et al*., 2014). These families are supported

through suitable soil, which is generally made up of muddy deposits and clayey loam, minerals and water availability. The fauna observed there included 17 species of mammals (Table.4) while one of them (*Antilope cervicapra*) is categorized as near threatened and Asiatic Wolf as endangered (IUCN Red list, Web.1). Five species of amphibians and 27 species of reptiles (table.3) were found there. Among amphibians one species namely is categorized as Vulnerable. Out of 27 reptile species *Chitra indica* is Endangered and *Aspidereted gangeticus* is Vulnerable (table.3). Maan and Chaudhry, 2001 found 10 species of mammals, 2 species of amphibians and six species of reptiles in the study at LSNP. It was observed that completely natural environment was rich in avian diversity. The results of the study showed that a maximum number of 7,443 birds of 74 species that belong to 35 families and representative of 16 orders were witnessed during October to December 2015 while only 40 species of birds were found in 2001 (Maan and Chaudhry 2001). The Maximum values of diversity indices were also documented in study year 2015 i.e. Shannon-Weiner Diversity Index was 4.18; Census Index was 8.5/km^2, Simpson's Diversity Index was 0.98 and species evenness was 0.971. According to these indices, the study site was rich in diversity. The vegetation and its composition that forms a key element of their habitations mainly determined the distribution and abundance of several bird species. As vegetation, flora and its composition alters along complex biological and ecological gradients, a specific bird species can appear, disappear, increase or decrease in number as there are fluctuations in habitat. Lee and Rotenberry (2005). According to literature, the lake is vital wintering ground for different migratory waterfowl (Maan and Chaudhry 2001). Nineteen percent of total birds were migratory in our findings (Fig.2). It was seen that due to recreational purposes lake, which is habitat of many birds, is under process of reforming that might decrease avian diversity of that area. Suitable temperature, food availability, less predation risk and favorable conditions might have caused them to come here in winter season. Major species of LSNP are given in (Table.2). Plenty of food, insects, small mammals and perfect vegetation have buoyed them. Passeriformes were best supported by the study site. LSNP has sustained black shouldered kite through its scattered tree area, hence caused it to be one of the most abundant species of study site. Other abundant species were sustained through remarkable open forest, tall trees and food like insects, crustaceans, arachnids etc. insectivores, carnivore and omnivore birds hold the major fauna (Fig. 3). Three major orders that are best sustained by LSNP other than Passeriformes are Coraciiformes (9 spp.), Acciptriformes (7 spp.), Pelecaniformes (4 spp.). Twenty-three families of order Passeriformes were reported during study of avifauna at Mangla dam, which may be due to better ecological conditions and amazing flora (Khan 2015). Food plays vital role for the diversity of various birds' orders. Breeding area, season, food and proper climatic conditions might have close association with bird's abundance at particular place (Bibi and Ali 2013). The families observed there were belonged to Falconiformes (3 spp.), Piciformes contained 2 species belonging to family Picidae. Upupidae (2 spp.), Coraciidae (1 sp.), Halcyonidae (1sp.), Alcedinidae (1 sp.), Meropidae (2 spp.), Cuculidae (2 spp.) belonged to order Coraciiformes. Stigiformes included Strigidae (5 spp.), Columbidae contained 5 species that belonged to columbiformes. Rallidae was representative of Gruiformes contained 2 species. Rostratulidae contained only one species that belonged to order Ciconiiformes. Charadriiformes included Burhinidae (1 sp.), Recurvirostridae (1 sp.) and Charadriidae (2 spp.). Sturnidae (2 spp.), Emberizidae (1 sp.), Motacillidae (1 sp.), Alaudidae (1 sp.), Passeridae (1 sp.), Laniidae (2 spp.), Zosteropidae (1 sp.), Corvidae (2 spp.), Dicruridae (1 sp.), Muscicapidae (3 spp.), Pycnonotidae (2 spp.), Cisticolidae (4 spp.), Leiothrichidae (1 sp.), Hirundinidae (1 sp.) belonged to Passeriformes. Accipitridae (7 spp.) is member of order Acciptriformes. Podicipediformes contained 1 species of family Podicipedidae. Ardeidae belonged to Pelecaniformes contained 6 species. Anatidae contained 2 species that were representative of order Anseriformes. Psittaculidae is member of family Psittaciformes contained 1 species. Phasianidae contained 2 species of Phasianoidiformes and Gruidae included 1 species of Guiformes. Access of water, food, tall trees, and dense vegetation has supported these bird species. The diversity of Birds, Amphibians, Reptiles and Mammals is given in tables 3&4.According to IUCN red list *Chitra indica* is an endangered species, was also seen near the lake of LSNP. The lake was less polluted hence suitable for the endangered species. Four out of seven families of lizards in Pakistan were found there. The area holds four species of Agamidae. The diurnal species was easily identified by their acrodonts.Colubrids are advanced snakes were found there and occur nearly worldwide.

Prevailing arid ecological conditions are less suitable for amphibians in Pakistan that caused the country to be an amphibian poor country. Nonetheless, with the moist riparian environment in the Indus Valley, torrents and streams in the "northern Himalayan sub-mountainous region", and the subterranean water canals in the western Baluchistan upland, there stand 25 amphibian species known from Pakistan. Khan (2002, 2004, 2006).

Out of 25 species in Pakistan 5 species were found in LSNP. The Balochistan toad, *Bufo viridis zugmayeri,* found around Quetta, and southward to Chagai, Baluchistan Khan (2006). It was seen in a small lake of RD 65. RD 65 was natural enclosure for black bucks. They also camouflaged themselves that helped

them hiding from predators. *Microhyla ornata*, stayed near to water, hiding under leaf litter during day, and emerged to hunt at night. It was found during evening survey in pond area on park. It feeds on termites. It was observed that the calling male sat away from the water, hidden in grass. Amphibians were often recognized by their call as some float in water and some sit on the wet ground might burrowing themselves. The call of *Hoplobatrachus tigertnus* is" kang, kang, kangi'; the call of *Fejemarya limnocharis* and *Fejervarya syhadrensls* is "tak, tak, tak". It really helped in their identification. The Indus Valley bullfrog, *Hoplobatrachus figerinus* that was found in park has a snout-vent of approximately 130-145 mm length. It is mostly used in demonstration of human anatomy in Pakistan. Literature showed that it is the most common frog of the Indo-Gangetic plains. It was found mostly in cultivated areas and swampy wetlands. In Pakistan this species does not extend into Baluchistan but it has been reported in Afghanistan close to Khyber Pass. Khan (2006).

Black buck was specialty of park. Black bucks were reintroduced there through *ex situ* breeding after their extinction from Pakistan. They were present in two different enclosures RD25 and RD65. RD25 was semi natural and RD65 was completely natural environment. No artificial food or medication was given to the animal in RD65 enclosure. Only small salt blocks were present there.Blue bull, smooth coated otter, wild boar, red fox and short-tailed mole rat were seen during evening survey. Insufficient resources, lack of staff, less security and damaged fences are posturingsevere threats to survival of threatened and rare wild species at Lal Suhanra National Park. Sufficient supply of canal water is also essential for safety of fauna and flora at the LSNP. Major threat to fauna of an area is loss of habitat, as trees are habitation of many birds and deforestation can cause a great loss to astonishing wildlife. Other threats are illegal hunting, wood logging pollution and unawareness.

Most extortions to the park were anthropogenic which would in turn harm human beings, as there is strong connection between wildlife, biodiversity and humans. Biodiversity loss can affect community traditions also.

These types of climatic changes have already been noted in birds in Europe and Costa Rica Greenwood and Baillie (1993); Pounds *et al*. (1999), trees, and forbs in Europe. Grabherr *et al*. (1994).From an operational perspective, the major issue is how to design policies for the efficient management of ecosystems for sustainability of an equitable provision of ecosystem service. Carpenter *et al*. (2006). Even with an understanding of natural complexities, if there is lack of appropriate institutional framework to provide incentives for the provision of public goods and internalize externalities we will not succeed at efficient and sustainable management of ecosystems.

There should be trio of conservation, reservation and management. Protection and reestablishment of such places along with species within them help us in understanding the transformation of natural ecology by earlier lineages. Management plan for a national park has to be constant with the General Policy for National Parks. Fisher *et al*., (2011). Habitats should be conserved and illegal hunting should be strongly prohibited through strict legislation and penalties. Proper arrangements should be made for transportation of visitors from neighboring cities to park. Different educational, recreational and research facilities be provided if proper attention is provided. Awareness about wildlife and its importance should be given to public through print media and electronic media along with some major steps like reforestation.

Table 1. Diversity of Avian at Lal Suhanrah National Park.

Order	Family	Species Recorded	Occurrence	IUCN Status	n	R.A	C.I	diet
Falconiformes	Falconidae	Grey Francolin *Francolinus pondicerianus*	YRR	LC	90	1.20919	0.102975	O
	Falconidae	Laggar Falcon *Falco jugger*	YRR	NT	65	0.873304	0.074371	C
	Falconidae	Black Francolin *Francolinus francolinus*	YRR	LC	70	0.940481	0.080092	I
Piciformes	Picidae	Yellow Crowned Woodpecker *Leiopicus mahrattensis*	YRR	LC	85	1.142013	0.097254	I
	Picidae	Black Rumped Flameback *Dinopium benghalense*	YRR	LC	65	0.873304	0.074371	I
Coraciiformes	Upupidae	Common Hoopoe *Upupa epops*	YRR	LC	80	1.074835	0.091533	C
	Upupidae	European Hoopoe *Upupa epops*	PM	LC	55	0.738949	0.062929	C
	Coraciidae	Indian Roller *Coracias benghalensis*	YRR	LC	45	0.604595	0.051487	I
	Halcyonidae	White Throated Kingfisher *Halcyon smyrnensis*	YRR	LC	85	1.142013	0.097254	P
	Alcedinidae	Common Kingfisher *Alcedo atthis*	YRR	LC	85	1.142013	0.097254	P
	Meropidae	Blue Cheeked Bee-Eater *Merops persicus*	SB	LC	51	0.685208	0.058352	I
	Meropidae	Green Bee-Eater *Merops orientalis*	YRR	LC	89	1.195754	0.101831	I
	Cuculidae	Pied Cuckoo *Clamator jacobinus*	SB	LC	38	0.510547	0.043478	I
	Cuculidae	Greater Coucal *Centropus sinensis*	YRR	LC	78	1.047965	0.089245	TO
stigiformes	Strigidae	Collard Scops Owl *Otus lettia*	YRR	LC	85	1.142013	0.097254	C
	Strigidae	Spotted Owlet *Athene brama*	YRR	NT	122	1.639124	0.139588	C
	Strigidae	Short Eared Owl *Asio flammeus*	UWM	LC	39	0.523982	0.044622	C
	Strigidae	Eurasian Eagle Owl *Bubo bubo*	YRR	LC	119	1.598818	0.136156	C
	Strigidae	Dusky Eagle Owl *Bubo coromandus*	YRR	LC	79	1.0614	0.090389	C
Columbiformes	Columbidae	Rock Pigeon *Columba livia*	YRR	LC	142	1.907833	0.162471	G
	Columbidae	Yellow Footed Green Pigeon *Treron phoenicoptera*	UWM	LC	41	0.550853	0.046911	F
	Columbidae	Red Collard Dove *Streptopelia tranquebarica*	SB	LC	97	1.303238	0.110984	G
	Columbidae	Laughing Dove *Streptopelia senegalensis*	YRR	LC	144	1.934704	0.16476	G
	Columbidae	Collard Dove *Streptopelia decaocto*	YRR	LC	144	1.934704	0.16476	G
Gruiformes	Rallidae	Purple Swamphen *Porphyrio porphyria*	YRR	NR	99	1.330109	0.113272	O
	Rallidae	White Breatsed Waterhen *Amaurornis phoenicurus*	YRR	LC	100	1.343544	0.114416	O
Ciconiiformes	Rostratulidae	Greater Panited Snipe *Rostratula benghalensis*	YRR	LC	135	1.813785	0.154462	O
Charadriiformes	Burhinidae	Eurasian thick knee *Burhinus oedicnemus*	YRR	LC	103	1.383851	0.117849	I
	Recurvirostridae	Black Winged Stint *Himantopus himantopus*	YRR	LC	85	1.142013	0.097254	P
	Charadriidae	White Tailed Lapwing *Vanellus leucurus*	WM	LC	118	1.585382	0.135011	I
	Charadriidae	Red Wattled Lapwing *Vanellus indicus*	YRR	LC	95	1.276367	0.108696	I
Passeriformes	Sturnidae	Common Myna *Acridotheres tristis*	YRR	LC	185	2.485557	0.21167	O
	Sturnidae	Bank Myna *Acridotheres ginginianus*	YRR	LC	65	0.873304	0.074371	O
	Emberizidae	Reed Bunting *Emberiza schoeniclus*	WM	LC	20	0.268709	0.022883	O
	Motacillidae	White Browed Wagtail *Motacilla maderaspatensis*	YRR	LC	95	1.276367	0.108696	I
	Alaudidae	Sand Lark *Calandrella raytal*	YRR	LC	69	0.927046	0.078947	O
	Passeridae	House Sparrow *Passer domesticus*	YRR	LC	325	4.366519	0.371854	G
	Laniidae	Bay Backed Shrike *Lanius vittatus*	YRR	LC	83	1.115142	0.094966	P

	Laniidae	Long Tailed Shrike *Lanius schach*	YRR	LC	79	1.0614	0.090389	P
	Zosteropidae	Oriental White Eye *Zosterops palpebrosus*	YRR	LC	45	0.604595	0.051487	O
	Corvidae	Rufous Treepie *Dendrocitta vagabunda*	YRR	LC	124	1.665995	0.141876	O
	Corvidae	House Crow *Corvus splendens*	YRR	LC	425	5.710063	0.48627	O
	Dicruridae	Black Drongo *Dicrurus macrocercus*	YRR	LC	95	1.276367	0.108696	I
	Muscicapidae	Indina Robin *Saxicoloides fulicatus*	YRR	LC	58	0.779256	0.066362	I
	Muscicapidae	Pied Bushchat *Saxicola caprata*	YRR	LC	85	1.142013	0.097254	I
	Muscicapidae	Oriental Magpie Robin *Copsychus saularis*	YRR	LC	90	1.20919	0.102975	I
	Pycnonotidae	White Eared Bulbul *Pycnonotus leucotis*	YRR	LC	145	1.948139	0.165904	O
	Pycnonotidae	Red Vented Bulbul *Pycnonotus cafer*	YRR	LC	125	1.67943	0.143021	O
	Cisticolidae	Rufous Fronted Prinia *Prinia buchanani*	YRR	LC	81	1.088271	0.092677	I
	Cisticolidae	Ashy Prinia *Prinia socialis*	YRR	LC	95	1.276367	0.108696	I
	Cisticolidae	Rufous Vented Prinia *Prinia burnesii*	YRR	NT	100	1.343544	0.114416	I
	Cisticolidae	Zitting Cisticola *Cisticola juncidis*	YRR	LC	109	1.464463	0.124714	O
	Leiothrichidae	Large Grey Bebbler *Turdoides malcolmi*	YRR	LC	125	1.67943	0.143021	O
	Hirundinidae	Plain Martin *Riparia paludicola*	YRR	LC	115	1.545076	0.131579	I
Accipitriformes	Accipitridae	Black Shouldered Kite *Elanus axillaris*	YRR	LC	245	3.291683	0.28032	P
	Accipitridae	Pallard Fish Eagle *Haliaeetus leucoryphus*	YRR	VU	90	1.20919	0.102975	C
	Accipitridae	Egyptian Vulture*Neophron percnopterus*	YRR	EN	42	0.564289	0.048055	C
	Accipitridae	Shikra *Accipiter badius*	YRR	LC	89	1.195754	0.101831	C
	Accipitridae	Tawny Eagle *Aquila rapax*	YRR	LC	57	0.76582	0.065217	P
	Accipitridae	Eurasian Sparrow Hawk *Accipiter nisus*	UWM	LC	86	1.155448	0.098398	C
	Accipitridae	Imperial Eagle *Aquila heliaca*	UWM	LC	104	1.397286	0.118993	C
Podicipediformes	Podicipedidae	Little Grebe *Tachybaptus ruficollis*	YRR	LC	85	1.142013	0.097254	I
Pelecaniformes	Ardeidae	Little Egret *Egretta garzetta*	YRR	LC	107	1.437592	0.122426	C
	Ardeidae	Purple Heron *Ardea purpurea*	YRR	LC	99	1.330109	0.113272	C
	Ardeidae	Cattle Egret *Bubulcus ibis*	YRR	LC	106	1.424157	0.121281	C
	Ardeidae	Black Crowned Heron *Nycticorax nycticorax*	YRR	LC	90	1.20919	0.102975	C
	Ardeidae	Great Egret *Ardea alba*	WM	LC	105	1.410721	0.120137	C
	Ardeidae	Black Bittern *Ixobrychus flavicollis*	SB	LC	75	1.007658	0.085812	C
Anseriformes	Anatidae	Gadwall *Anas strepera*	WM	LC	84	1.128577	0.09611	H
	Anatidae	Mallard *Anas platyrhynchos*	WM	LC	90	1.20919	0.102975	O
Psittaciformes	Psittaculidae	Rose Ringed Parakeet *Psittacula krameri*	WM	LC	130	1.746608	0.148741	F
Phasianoidea	Phasianidae	Rain Quail *Coturnix coromandelica*	SB	LC	95	1.276367	0.108696	I
	Phasianidae	Common Quail *Coturnix coturnix*	PM	LC	90	1.20919	0.102975	O
Guiformes	Gruidae	Demosille Crane *Grus virgo*	PM	LC	108	1.451028	0.12357	I
					7443	100	8.516018	

Seasonal Distribution:

YRR = Year Round Residents; WM= Winter Migratory; SB= Summer Breeder; PM & IYRV= Passage Migratory & Irregular Year Round Visitor

IUCN Red List Status:

EN =Endangered; VU= Vulnerable; NT= Near Threatened; LC =Least Concern; DD= Data Deficient, NR= Not Recognized

Major five species of Lal Suhanra are given below:

Table 2. Major Birds Species.

Birds Species	Total	Relative Abundance	Density Birds/km^2
Corvus splendens	425	0.597	0.00237
Passer domesticus	325	0.491	0.00158
Elanus axillaris	245	0.00163	0..00280
Acridotheres tristis	185	0.00021	0.00301
Pycnonotus leucotis	145	0.000016	0.000805

Table 3. List of Amphibians and Reptiles.

Order	Family	Species Identified	Status
		Frogs	
Anura	Microhylidae	*Microhyla ornata*	LC
	Bufonidae	*Bufo viridis zugmayeri*	LC
	Dicroglossidae	*Fejervarya syhadrensis*	LC
	Dicroglossidae	*Fejervarya limnocharis*	LC
	Dicroglossidae	*Hoplobatrachus tigerinus*	LC
		Turtles	
Testudines	Geoemydidae	*Kachuga smithi*	LC
	Geoemydidae	*Geoclemys hamiltonii*	VU
	Trionychidae	*Chitra indica*	EN
	Trionychidae	*Lissemys punctata andersoni*	LC
	Trionychidae	*Aspidereted gangeticus*	VU
		Lizards	
Squamata	Agamidae	*Calotes versicolor*	LC
	Agamidae	*Laudakia melanura*	LC
	Agamidae	*Trapellus agillis pakistensis*	LC
	Agamidae	*Trapellus megalonyx*	LC
	Gekkonidae	*Crossobamon orientalis*	LC
	Gekkonidae	*Hemidactulus flaviviridis*	LC
	Agamidae	*Uromastyx hardwickii*	LC
	Lacertidae	*Acanthidactylus cantoris*	LC
	Varanidae	*Varanus bengalensis*	LC
		Snakes	
	Typhlopidae	*Typhlops ductuliformes*	LC
	Boidae	*Eryx johnii*	LC
	Boidae	*Eryx conicus conicus*	LC
	Colubridae	*Argyrogena fasciolata*	LC
	Colubridae	*Ampheiasma stolatum*	LC
	Colubridae	*Lycodon aulicus aulicus*	LC
	Colubridae	*Oligodon arnensis*	LC
	Colubridae	*Platyceps ventromaculatus*	LC
	Colubridae	*Ptyas mucosus*	LC
	Colubridae	*Spalerosophis diadema*	LC
	Colubridae	*Xenochrosphis sanctijohannis*	LC
	Colubridae	*Xenochrophis piscator piscator*	LC
	Elapidae	*Naja naja naja*	LC

Table 4: List of Mammals of Lal Suhanra National Park

COMMON NAME	SCIENTIFIC NAME	STATUS
Black Buck	*Antilope cervicapra*	Near Threatened
Blue Bull	*Boselaphus tragocamelus*	Least Concern
Jungle Fox	*Vulpes bengalensis*	Least Concern

Jungle Cat	*Felis chaus*	Least Concern
Civet Cat	*Civettictis civetta*	Least Concern
Asian Budger	*Meles leucurus*	Least Concern
Wild Boar	*Sus scrofa*	Least Concern
Long Eared Hedgehog	*Hemiechinus auritus*	Least Concern
Red Fox	*Vulpes vulpes*	Least Concern
Smooth Coated Otter	*Lutrogale perspicillata*	Least Concern
Golden Jackal	*Canis aureus*	Least Concern
Mouse Tailed Bat	*Rhinopoma* Spp.	Least Concern
Asiatic Wolf / Dhole	*Cuon alpinus*	Endangered
Indian Grey Mongoose	*Herpestes edwardsii*	Least Concern
Short Tailed Mole Rat	*Nesokia indica*	Least Concern
Desert Hare	*Lepus tibetanus*	Least Concern
Indian Crested Porcupine	*Hystrix indica*	Least Concern

Figure 1. Map of Lal Suhanra National Park

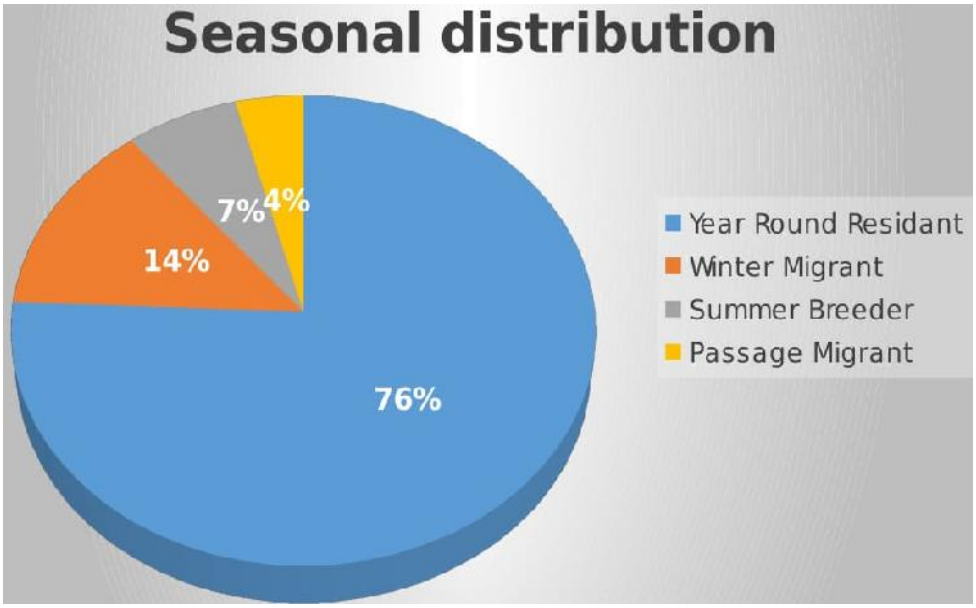

Figure 1. Seasonal Distribution of Birds at Lal Suhanra National Park

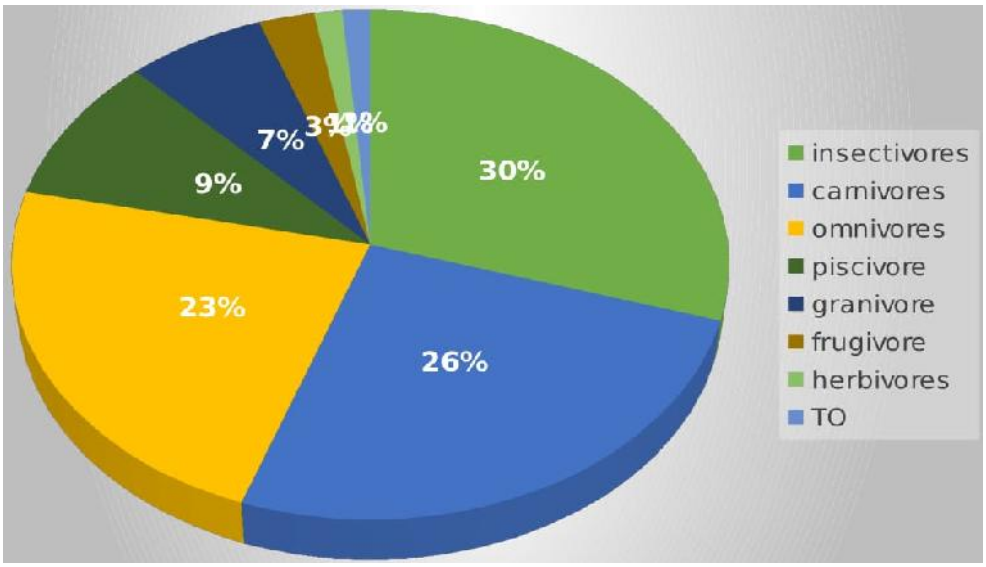

Figure 3. Distribution Based on Food Habit of Birds at Lal Suhanra National Park.

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