

Avifaunal Diversity at two Ponds of Waghodiya taluka of Vadodara District, India

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Abstract

Wetlands are transitional zone between land and aquatic habitat. It provides habitat for flora and fauna. Amongst fauna birds are the one of the significant indicators of the health of ecosystem as they respond to secondary changes which are caused by primary causes. Alwa and Limda village pond situated at outskirts of the Vadodara city and Limda is surrounded by university and industrial buildings but both the ponds face same climatic conditions. Total species of birds include 35 families, 78 species of birds, amongst them 12 are migratory species at both the ponds. It was recorded that wetland harbours support good environment for migratory as well as residential species of birds. However, Limda is in degrading condition due to the negligence of local people residing at the edge and urban conditions near to the village pond. Hence, it is imperative that appropriate conservation measures be taken for its successful conservation and innovations.

Keywords: Wetland, avifauna, urbanization.

Introduction

The wetlands are the “kidney” of the ecosystems. Further, in recent years the green patches (parks and gardens) and blue spaces (rivers and ponds) in urban areas have gained ecological, social and aesthetic values¹ as the wetland values have been grossly overlooked coupled with excessive exploitation of these resources, the threats have increased drastically leading to severe decline in the extent of many such wetland ecosystems². Wetlands provide biodiversity, and wide range of ecosystem services for instance, food, waste digestion, flood mitigation, control erosion, and ground water recharge etc. In addition, wetlands provide habitat for a vast diversity of wildlife such as invertebrate and vertebrate and plants³. Further, the birds form one of the major fauna in urban area. Further they are one of the important indicators of health of an environment as they respond to secondary changes resulting from primary causes⁴. Due to their high mobility birds react very rapidly to changes in their habitats⁵. Wetland birds play aesthetic role in local communities and as an important component of wetland ecosystem⁶. Although, the changes in habitat are the main cause of species decline, the mechanisms causing fragmentation and the spatial distribution of resources act at different scales⁷. Studies have shown that industrialization and urbanization favour few species, but selects against most, such that the avian community composition of urban environment differs noticeably from local natural environments^{8,9}. That is, some species of birds prefer human settlements while others are reduced in number by the human settlements and with respect to different studies that birds give huge response to industrialization and urbanizations¹⁰. The numbers of such studies in Asia and particularly in India are meager. There are

an estimated 961 resident land and fresh water bird species in the oriental region belonging to 66 families¹¹ with migratory species, 1,225 species of birds are recorded within India¹² that has now moved up by one after identification of new species Bugun Liocichla (*Liocichla bugunorum*) in Northeast India¹³. Almost half of these species i.e., 526 species are recorded in Gujarat¹⁴, of which 244 are in Vadodara district of Central Gujarat¹⁵ while 131 species of birds in and around Harni pond¹⁶ and about 80 species in various terrestrial habitat of the Vadodara city¹⁷.

The present study the influence of industrialization on species richness, density, species diversity and evenness of the avifauna and similarity index of birds between Alwa and Limda village of Waghodiya taluka of Vadodara District are evaluated.

Methodology

These study areas were visited once in a month for one year, 2 hours from sunrise in the morning. Birds were observed using 8×50 binocular and identified using standard reference books^{18,19}. The birds were counted using transect method and / or point count method²⁰. Species richness (number of species) and diversity indices like Shannon Wiener index and equitability²¹ was calculated for individual ponds. Further, Jaccard's similarity indices between two study areas are calculated.

Study areas: The Limda (Lat 22°17'04"N and Long 73°21'54"E) and Alwa (Lat 22°18'45"N and Long 73°19'55"E) ponds are located in Waghodiya Taluka.

Limda pond is located on the eastern side of human habitation of village, along the approach road to the village. The human settlement is situated on south-western side of the pond. The area of the pond is around 1 ha and monsoonal expansion is around 2 to 2.5 ha. Average depth of Limda pond is around 1.5 meter with maximum pond depth of 3 meter. The storage capacity of the pond is 15000 cub m. The pond is generally used for cattle bathing and washing clothes by the nearby residents. Some fishing by local fisher community is done here.

Alva pond is located at the entrance of the village and human settlement is situated on the south and east side of the pond. The total area of Alva pond is 2.6 ha, slightly bigger than Limda pond and the monsoonal expanse of the pond is 4.5 ha. The maximum depth of the Alva pond is 3 m. The storage capacity of the Alva pond is 26000 cub m. The pond at present is used for cattle bathing and one side of the pond is infested with water lily.

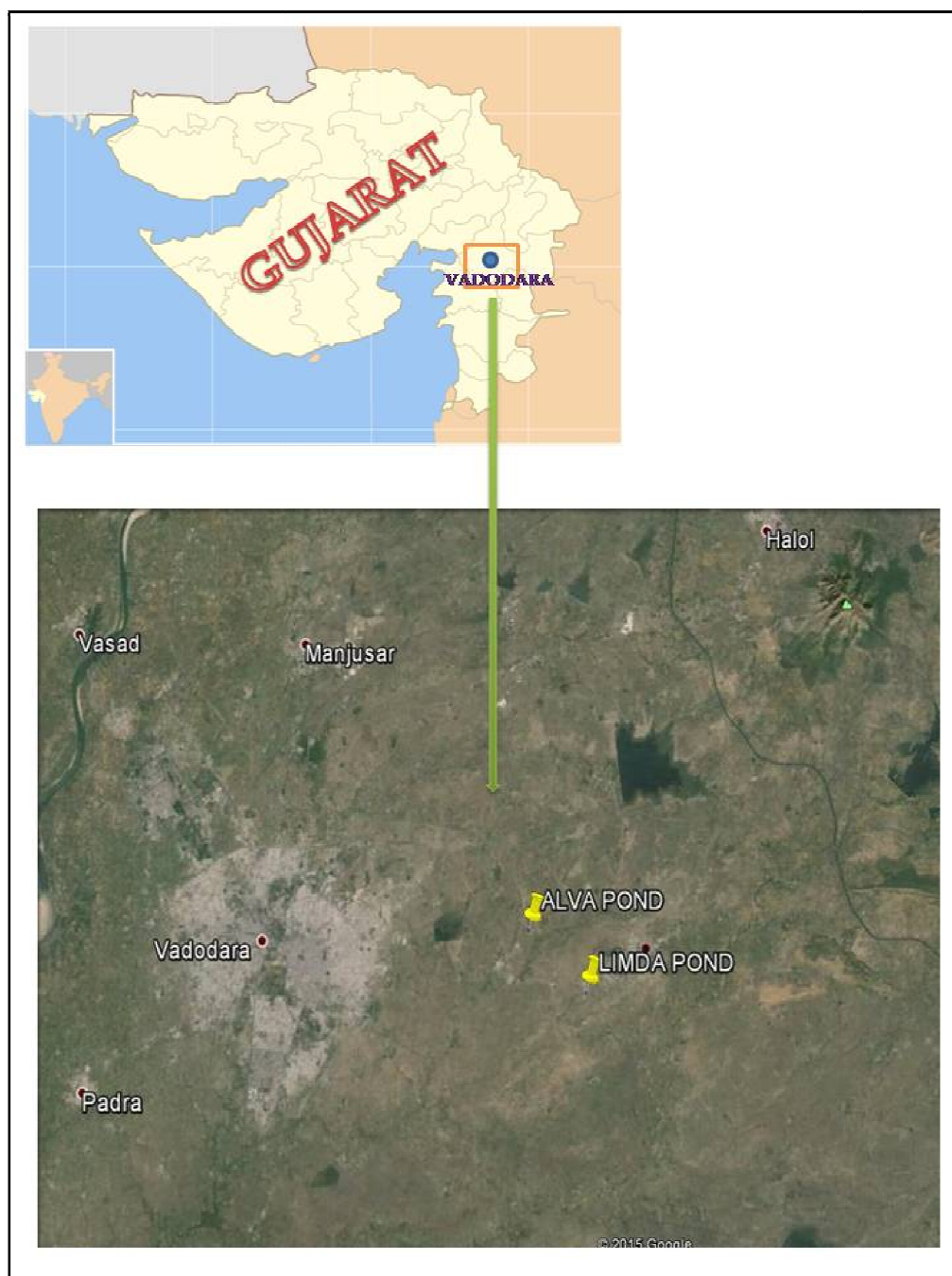


Figure-1
Location map of Limda and Alva ponds

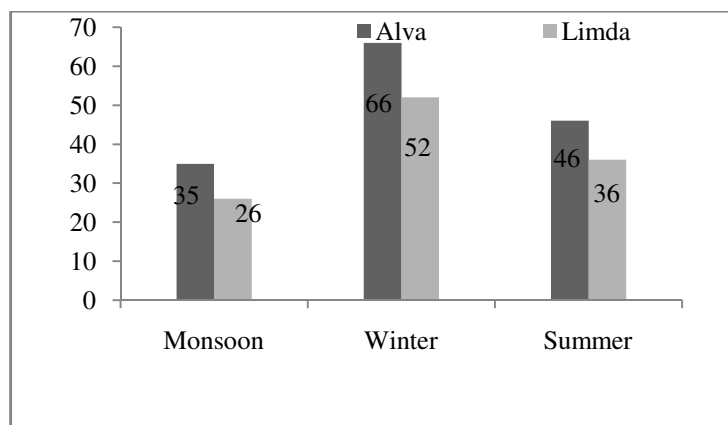


Figure-2
Species richness of birds

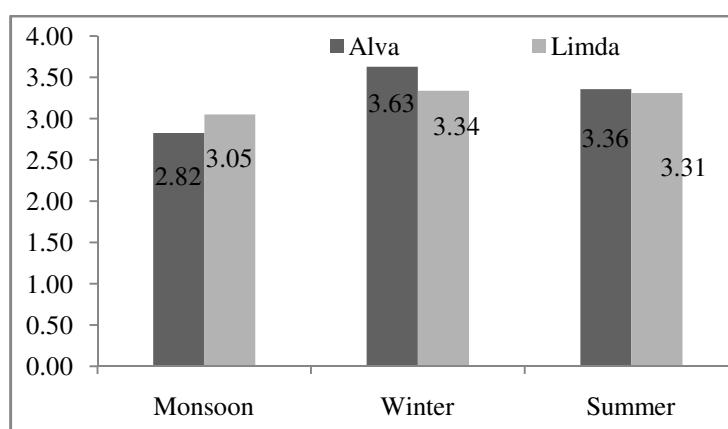


Figure-3
Shannon Wiener Index (H')

Result and Discussion

Species richness: Total species of birds include 35 families, 78 species of birds, amongst them 12 are migratory species at both the ponds. Family Motacillidae dominate the list 7% followed by Monarchinae, Columbidae, Ardeidae (6.4%), Turdinae, Timaliinae, Sturnidae, and Laniidae (5.1%); Accipitridae, Corvidae, and Cuculidae (3.8%), Threskiornithidae, Rallidae, Phasianidae, Jacanidae, Hirundinidae, Estrildidae, Emberizinae, Alcedinidae (2.6%) and other families like Upupidae, Scolopacidae, Pycnonotidae, Psittacidae, Ploceidae, Picidae, Phalacrocoracidae, Passerinae, Nectariniidae, Meropidae, Dicruridae, Coraciidae, Charadriidae, Capitonidae, Apodidae, Alaudidae are only 1.3% of the total water birds (Figure-5 and Table-1). Further, Black-headed Ibis (*Threskiornis melanocephalus*) near threatened species of birds was only noted at Alva village pond which is comparatively less disturbed than Limda village pond. Aquatic birds require elevated and exposed areas within the water bodies to assemble and bask during the winter seasons²². Moreover, Alva supported more number of migratory species of birds as compared to Limda village pond. This is due to presence of vegetation and agricultural field like rice. This is also supported by

Mukherjee²³ usually birds are exploring cultivated areas. Rice field and scrubland support good number of migratory species of birds like buntigs, wagtails and larks. Vegetation of Alva village provide roosting sites for birds like Red vented bulbul (*Pycnonotus cafer*), Red Collared dove (*Streptopelia tranquebarica*), and Cattle egret (*Bubulcus ibis*). Nesting of House crow (*Corvus splendens*), and House sparrow (*Passer domesticus*) at Alva village was also reported.

A total 69 and 59 species of birds was recorded at Alva and Limda village respectively (which included terrestrial as well as aquatic birds) throughout the year. Seasonal variation was recorded in both the ponds and the number of bird species was high during winters. At Limda, species richness (52) and diversity (3.34) of birds were high during winter as compared to other seasons. This is due to presence of migratory species like buntings, Bluethroat (*Luscinia svecica*), Lesser Whitethroat (*Sylvia curruca*), Common Chiff chaff (*Phylloscopus collybita*) etc.

Shannon-Wiener Index: Diversity index was reported more during winters in both the ponds as compared to other seasons.

Index diversity of more than 3 indicates good ecosystem that provides habitat for the birds and the value was maintained in all seasons except during monsoon.

Evenness: Evenness is part and it is an important component of diversity indices^{24,25} and showed evenly distribution of the individuals for the sighted species. At Limda pond the evenness was more than 0.7 in monsoon and summers, due to presence of more individuals of local species. As per ecological rule, higher diversity will show low evenness value and the similar finding

was reported from Alva pond. 52 Species of birds were recorded common at both the study areas. Therefore, the Jaccard's similarity indices between two villages are 68% due to more or less same vegetation, cropping pattern and same climatic conditions. But the anthropogenic pressure at Limda village is high which disturbed the avifauna of the village. Further, limda is also surrounded by industrial as well as university buildings. This has affected the diversity of birds similar to previous reports²⁶.

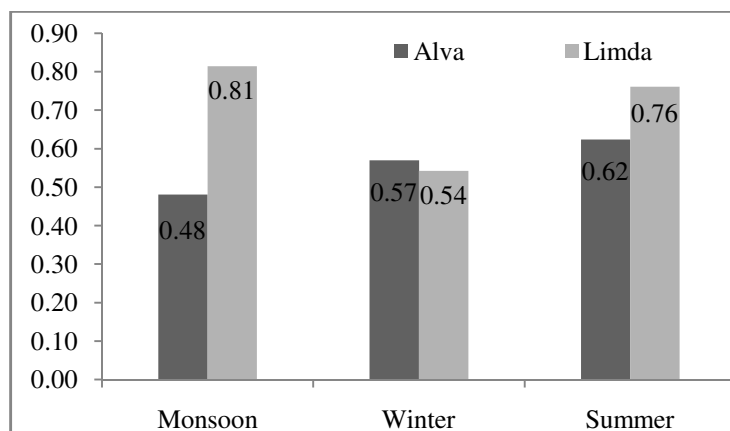


Figure-4
Evenness (E) of birds at two villages

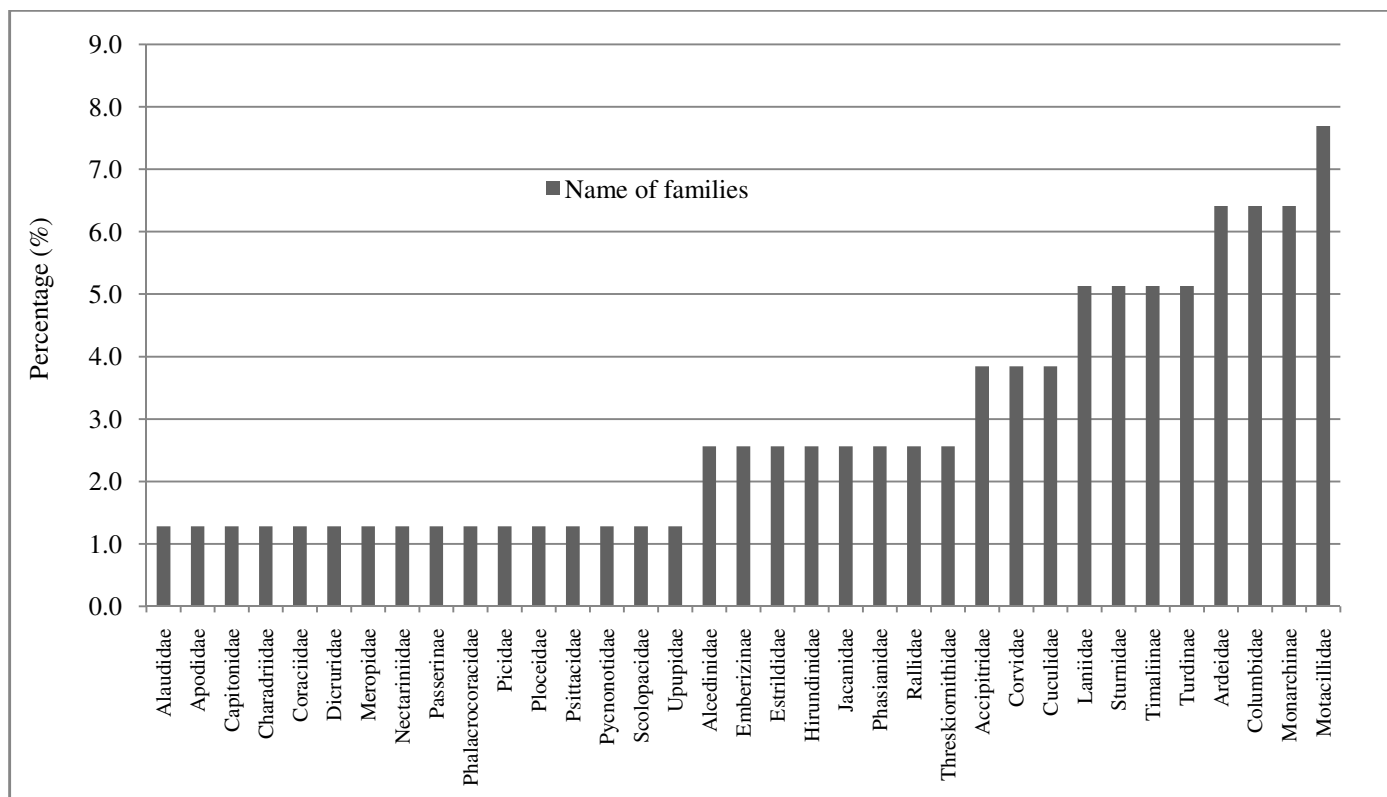


Figure-5
Percentage of Families of birds

Table-1
Checklist of Birds recorded at two ponds

Family	Scientific Name	Common English Name	Status	Status (as per IUCN 2015)
Monarchinae	<i>Prinia socialis</i>	Ashy Prinia	RB	LC
Alaudidae	<i>Eremopterix grisea</i>	Ashy-crowned Sparrow-Lark	RB	LC*
Cuculidae	<i>Eudynamis scolopacea</i>	Asian Koel	RB	LC
Sturnidae	<i>Anastomus oscitans</i>	Asian Openbill-Stork	RB	LC
Ploceidae	<i>Acridotheres ginginianus</i>	Bank Myna	RB	LC
Laniidae	<i>Ploceus philippinus</i>	Baya weaver	RB	LC
Laniidae	<i>Lanius vittatus</i>	Bay-backed Shrike	RB	LC
Dicruridae	<i>Dicrurus macrocercus</i>	Black Drongo	RB	LC
Accipitridae	<i>Milvus migrans</i>	Black Kite	RB	LC
	<i>Elanus caeruleus</i>	Black -winged Kite	RB	LC
Columbidae	<i>Columba livia</i>	Blue Rock Pigeon	RB	LC
Emberizinae	<i>Emberiza melanocephala</i>	Black headed buntigs	M	LC
Sturnidae	<i>Sturnus pagodarum</i>	Brahminy Starling	RB	LC
Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	RB	LC
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered kite	RB	LC
Turdinae	<i>Luscinia svecica</i>	Bluethroat	M	LC
Jacaniidae	<i>Metopidius indicus</i>	Bronze winged Jacana	RB	LC
Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret	RB	LC
Timaliinae	<i>Turdoides caudatus</i>	Common Babbler	RB	LC
Sturnidae	<i>Acridotheres tristis</i>	Common Myna	RB	LC
Monarchinae	<i>Phylloscopus collybita</i>	Common Chiff chaff	M	LC
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	M	LC
Turdinae	<i>Saxicola torquata</i>	Common Stone Chat	M	LC*
Monarchinae	<i>Orthotomus sutorius</i>	Common Tailorbird	RB	LC
Capitonidae	<i>Psilopogon haemacephalus</i>	Coppersmith Barbet	RB	LC
Columbidae	<i>Streptopelia decaocto</i>	Eurasian collared Dove	RB	LC

Family	Scientific Name	Common English Name	Status	Status (as per IUCN 2015)
Cuculidae	<i>Oriolus oriolus</i>	Eurasian golden oriole	RB	LC
Cuculidae	<i>Centropus sinensis</i>	Greater coucal	RB	LC
Meropidae	<i>Merops orientalis</i>	Green bee-eater	RB	LC
Phasianidae	<i>Francolinus pondicerianus</i>	Grey Francolin	RB	LC
Upupidae	<i>Upupa epops</i>	Hoopoe	M	LC
Corvidae	<i>Corvus splendens</i>	House Crow	RB	LC
Passerinae	<i>Passer domesticus</i>	House Sparrow	RB	LC
Apodidae	<i>Apus affinis</i>	House swift	RB	LC
Phasianidae	<i>Pavo Cristatus</i>	Indian Peafowl	RB	LC
Ardeidae	<i>Ardeola grayii</i>	Indian Pond Heron	RB	LC
Turdinae	<i>Saxicoloides fulicata</i>	Indian Robin	RB	LC
Coraciidae	<i>Coracias benghalensis</i>	Indian Roller	RB	LC
Estrildidae	<i>Euodice malabarica</i>	Indian Silver bill	RB	LC
Timaliinae	<i>Turdoides striatus</i>	Jungle Babbler	RB	LC
Corvidae	<i>Corvus macrorhynchos</i>	Large-billed Crow	RB	LC
Timaliinae	<i>Turdoides malcolmi</i>	Large grey babbler	RB	LC
Monarchinae	<i>Sylvia curruca</i>	Lesser Whitethroat	M	LC
Phalacrocoracidae	<i>Phalacrocorax niger</i>	Little Cormorant	RB	LC
Ardeidae	<i>Egretta garzetta</i>	Little Egret	RB	LC
Laniidae	<i>Lanius schach</i>	Long tailed shrike	RB	LC
Ardeidae	<i>Mesophoyx intermedia</i>	Median Egret	RB	LC
Turdinae	<i>Copsychus saularis</i>	Oriental Magpie Robin	RB	LC
Columbidae	<i>Streptopelia orienatalis</i>	Oriental turtle dove	RB	LC
Threskiornithidae	<i>Threskiornis melanocephalus</i>	Black-headed Ibis	RB	NT
Motacillidae	<i>Anthus rufulus</i>	Paddyfield Pipit	R	LC
Jacaniae	<i>Hydrophasianus chirugus</i>	Pheasant-tailed jacana	RB	LC
Motacillidae	<i>Motacilla alba</i>	Pied or White Wagtail	M	LC
Alcedinidae	<i>Ceryle rudis</i>	Pied kingfisher	RB	LC

Family	Scientific Name	Common English Name	Status	Status (as per IUCN 2015)
Monarchinae	<i>Prinia inornata</i>	Plain Prinia	RB	LC
Ardeidae	<i>Ardea purpurea</i>	Purple heron	RB	LC
Rallidae	<i>Porphyrio porphyrio</i>	Purple Moorhen	RB	LC
Nectariniidae	<i>Nectarinia zeylonica</i>	Purple - rumped sunbird	RB	LC
Nectariniidae	<i>Nectarinia asiatica</i>	Purple Sunbird	RB	LC
Columbidae	<i>Streptopelia tranquebarica</i>	Red Collared Dove	RB	LC
Emberizinae	<i>Emberiza bruniceps</i>	Red-headed buntings	M	LC
Threskiornithidae	<i>Pseudibis papillosa</i>	Red-naped Ibis	RB	LC
Pycnonotidae	<i>Pycnonotus cafer</i>	Red Vented Bulbul	RB	LC
Charadriidae	<i>Vanellus indicus</i>	Red-wattled Lapwing	RB	LC
Psittacidae	<i>Psittacula krameri</i>	Roseringed Parakeet	RB	LC
Sturnidae	<i>Sturnus roseus</i>	Rosy Starling	M	LC
Laniidae	<i>Lanius schach</i>	Rufous-backed Shrike	RB	LC
Corvidae	<i>Dendrocitta vagabunda</i>	Rufous treepie	RB	LC
Estrildidae	<i>Lonchura punctulata</i>	Scaly-Breasted Munia	RB	LC
Motacillidae	<i>Anthus campestris</i>	Tawny pipit	M	LC
Alcedinidae	<i>Halcyon smyrnensis</i>	Whitebreasted Kingfisher	RB	LC
Rallidae	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	RB	LC
Hirundinidae	<i>Hirundo smithii</i>	Wiretailed Swallow	RB	LC
Motacillidae	<i>Motacilla alba</i>	White wagtail	M	LC
Motacillidae	<i>Motacilla flava</i>	Yellow Wagtail	M	LC
Picidae	<i>Dendrocopos mahrattensis</i>	Yellow -crowned woodpecker	RB	LC
Columbidae	<i>Treron phoenicoptera</i>	yellow- Footed Green pigeon	RB	LC
Timaliinae	<i>Chrysomma sinense</i>	Yellow-eyed babbler	RB	LC

RB= Resident breeding, LC= Least concern, M= Migratory, R= Resident NT= Near Threatened

Conclusion

Wetlands with less anthropogenic disturbances and agricultural fields support migratory as well as residential species of birds. Further, also support nesting habitat for residential species of birds. Ponds with anthropogenic encroachment showed low

diversity bird diversity. Therefore, there is need for awareness generation among the villagers regarding the water bodies which would facilitate better management and conservation practice of the village ponds.

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