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An Account of the Early-winter Migrant and Resident Birds in a Wetland Habitat of the Indian Wild Ass Sanctuary in the Dasada Taluka, Surendra Nagar, Gujarat

The Indian Wild Ass Sanctuary, although famous for conserving the endemic Asiatic Wild Ass, is also an Important Bird and Biodiversity Area (IBA site) as it is a wintering and breeding site for many migrant birds. This study aims to record the structural aspects of the regional bird community during early migration season. Authors have surveyed a particular site during November-December months for three consecutive years (2013-2015). A total of 79 bird species belonging to 63 genera and 36 families have been recorded using point count, line transect, night surveys and opportunistic encounters. Among all recorded species, the Lesser Flamingo was most abundant. An increase in species richness is likely to occur later in the migration season upon further arrival of immigrant avifauna. The recorded species abundance distribution of this community is a perfect fit with the log-normal model. This proves an equitable distribution of individuals among different species of this community and also testifies of its high diversity. After studying the feeding guild composition, fourteen different shared feeding guilds were identified, among which the insectivorous guild was most abundant. Through this study, it can be said that this habitat has been well conserved over the years. Extensive surveys in different sites of this sanctuary need to be conducted, to assess the need for revising current conservation protocols.

***Key words**:* Avian diversity; Wetland; Water-birds; Migratory birds; Indian Wild Ass Sanctuary, Gujarat.

This article is the first scientific documentation of early-winter avian diversity for the surveyed region of the Indian Wild Ass Sanctuary in the Little Rann of Kutch, Gujarat.

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Introduction

Geophysical cycles *viz*., the diurnal and annual periodicity play a major role in defining the environmental conditions for most living beings on our planet. In order to survive and reproduce, migration has become a common response among birds to the Earth's periodic changes in environmental conditions (Berthold, 1993). The Indian Wild Ass Sanctuary acts as a breeding and wintering ground for many such migratory avifauna. The role of this region in supporting migrant avifauna is so crucial that it has been recognized as an IBA site under the Important Bird and Biodiversity Areas (IBA) Program launched by the Bird Life International organization (Bird Life International, 2018).

The Indian Wild Ass Sanctuary is one of the more popular tourist destinations in the state of Gujarat. The Wild Ass Sanctuary is a vast, flat desert, which gets filled up in many areas during monsoon and attract water-birds of numerous varieties. During good rainfall years, in many low-lying areas, water remains till winter in the form of seasonal wetlands.Vast flocks of ducks and waders are found in the many temporary wetlands for brief periods. The region is inhabited by huge flocks of Lesser and Greater Flamingos, Great White Pelican, Painted Stork, Spoonbill, Northern Shoveler, Pied Avocet and Black-tailed Godwit (Mundkur *et al*., 1989; Singh *et al*., 1999).

Being the ideal bio-indicators, the bird community are useful models for studying a variety of environmental problems (Newton, 1995). A basic approach in doing this is to measure diversity through time; as then any species gain or loss could be used to gauge the trends in biodiversity (Van, 1977). The reason for such gain or loss can also be chalked out by

correlating the patterns in biodiversity change with that of the varied biotic or abiotic factors. This current study will add to the list of surveys that have been performed till date in this region.

In the past, quite a few studies have been carried out on the resident and migrant avifauna of this region. In the most recent one, 81 terrestrial and 97 water birds (42 of which were migratory) have been recorded from 16 different sites of the Wild Ass Sanctuary (Singh, 2001). In another earlier study, more than 150 bird species were reported from the site (Shah *et al.*, 1995). However, in the recent years, there are no published reports on the bird community of this region. The present study aims to fill up this gap in information.

This study focuses solely on the early migrant and resident bird species of the concerned area. We have used rank-abundance curves to assess the species abundance distribution model with which our recorded data best fits. To this effect, we have also used proper statistical tests for drawing any conclusion on the matter. None of the surveys carried out before had done this. Another unique approach taken in this study is to classify the recorded bird species according to their feeding guilds in order to predict bird responses to habitat structure.

Study area

The Wild Ass Sanctuary, within the Little Rann of Kutch, represents a unique true saline desert-cum-wetland habitat. The region falls under Province 3B of Desert Bio-geographic Zone (Rodgers and Panwar, 1988). There are 258 natural seasonal wetlands that have been delineated in Kutch covering approximately 21772 km^2 area, which is more than 80% of the entire Gujarat State (Stanley, 2004). We chose one such wetland in a part of the sanctuary falling under the jurisdiction of the Dasada taluka in Surendra Nagar district.

The studied wetland was in the vicinity of the Wild Ass Nature Education Camp (locally known as the Tundi Camp). It was studied during the early migration periods (November-December) of the years 2013 to 2015. We restricted our survey within 23°08'59" to 23°09'03" N and 71°44'35" to 71°44'56" E. The wetland is fed by a non-perennial river called the Okaro-Kharaghoda. There was sparse vegetation cover around the wetland; but a much denser cover (mostly consisting of the shrub *Ziziphus nummularia*) spanned adjacent to our campsite. We will refer to the latter vegetation cover as 'scrublands' from this point on.

Methods

Bird species survey

Information on bird species composition and abundances were obtained through surveys using the Line Transect and Point Count methods, separately (Gibbons and Gregory, 2006). During each year, a total of 12 transects with 1km length each were conducted; 6 along the wetland and another 6 within the scrublands. During transect surveys, the counting distance was restricted to 50m for identification purposes. Birds that flew overhead but did not land within the counting radius were also recorded. We also selected 25 sites (16 around the wetland and 9 in the scrublands) for carrying out point counts closed to a radius of 100m. Each round of counting lasted for 30 minutes and 10 such rounds were performed daily (6 in the morning and 4 in the evening).

During the surveys, birds were identified early in the morning from 06:00 to 10:00 hours and late afternoon from 16:00 to 18:30 hours. Additional efforts were also made between 20:00 to 22:30 hours for identifying nocturnal birds. Bird species recorded from these night-time surveys and chance encounters have been included in the checklist. Birds were identified following Grimmett *et al*. (2011). The checklist was prepared following the standardized common and scientific names of the birds of India by Praveen *et al.* (2016).

Diversity analyses

Bird density at a given transect was calculated as a cumulative number of individual birds of each species that were seen at a given site. It was computed using averaged three-year counts. Bird species richness was calculated as the cumulative number of bird species seen in a point (Ludwig and Reynolds, 1988). Whereas, general bird diversities and bird equities were calculated in accordance to Shannon-Weaver index (Shannon and Weaver, 1998) and Hill's modified ratio (Hill, 1973; Alatalo, 1981), respectively. Diversity indices take into account both number of species present in a given site, as well as their relative proportions in a community. More diverse communities exhibit greater evenness of abundance across species and harbour greater number of species. The bird species were also classified according to their feeding guild and migration status following Ali and Ripley (1987).

Species abundance distributions can be used to understand how communities are organized by identifying, describing, and explaining general patterns that underlie the structure of communities. It can also indicate the evenness of a community (Ludwig and Reynolds, 1988). In order to study the bird species abundance pattern, a Rank Abundance Curve has been plotted in Fig.1 by arranging the log of abundance values for each species in descending order along the y axis (Bower *et al*., 1997). By plotting this curve, we can visually see which species abundance distribution model has been generated by our sample data. We further tested the distribution for normality using the Kolmogorov-Smirnov test (Zar, 1999), which is recommended for fitting data to abundance distribution models (Hill and Hamer, 1998). The null hypothesis for this test states that the abundance distribution of bird species is normal.

Results

Species densities and composition

Seventy-nine species of birds, belonging to 63 genera and 36 families have been recorded during the study period. The observed birds belong to only two IUCN Categories, *viz*. Least Concerned (LC) and Near Threatened (NT) [IUCN, 2017]. Among the observed 79 avian species, 96.2%, belong to the LC category and 3.8% belong to the NT category. Further classification according to their migration status has shown that 44% are Resident (R), 36% are Resident-Migrant (RM) and remaining 20% is Migratory (M). Thus 56%(combining RM and M categories) of the recorded bird species are migratory. The mean species density per square kilometer of the habitat are provided in Appendix 1. Lesser

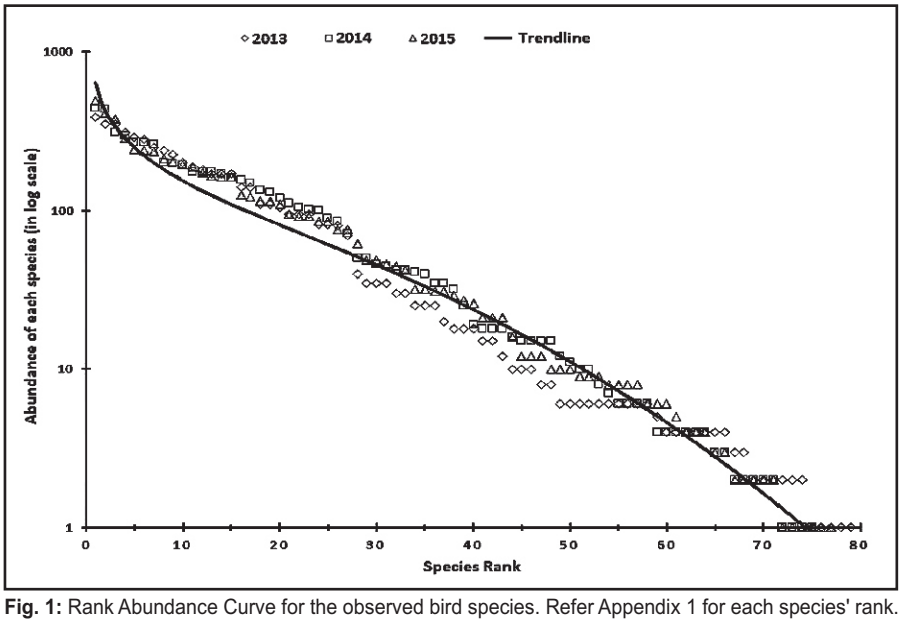

Fig. 1: Rank Abundance Curve for the observed bird species. Refer Appendix 1 for each species' rank.

Flamingos have the highest recorded density in this habitat, whereas Bonelli's Eagle has the least.

This study recorded a total of eight species of raptors from four families (five from Accipitridae; one each from Falconidae, Strigidae and Pandionidae). Among these, Osprey has maximum density (243.3 birds/km^2) and Bonelli's Eagle has the least (6.7 birds/km^2). Furthermore, 34 species of water-birds belonging to 13 families have been identified. The maximum number of water-bird species (n = 10) is from the family Anatidae. Lesser Flamingo has the highest density (4416.7 birds/km^2) among all water-birds; whereas Western Marsh Harrier is of least density (20 birds/km^2.). We have also observed 44 species of terrestrial birds (affiliated to 22 families) in the habitat, among which White-eared Bulbul shows the highest species density of 2673.3 birds / km^2.

Out of the 79 recorded species, five have been registered only once throughout our study tenure. Within the 36 families, the maximum species belong to Anatidae (12.66%). A family-wise list depicting the birds' common name, scientific name, IUCN status, residential status, feeding habits and respective species density are given in Appendix 1.

Feeding guilds

The recorded bird species have been classified into fourteen (14) different shared feeding guilds. The number of species sharing each such guild has been derived to give percent composition of these guilds in the community (Table 1). The highest number of birds belong to the Insectivorous guild and the lowest numbers to Nectarivore, Ophidiovore and Plankton-feeder guilds.

Diversity analyses

Species diversity and evenness values are given in Table 2; whereas the Rank Abundance curve is depicted in Fig. 1. The trend-line on the figure matches with the lognormal model of species abundance distribution. It also shows that the studied community exhibits a high amount of diversity; as can be inferred from the petite angle of intersection and the right-hand side alignment of the curve [the straight line cutting its X-axis].Upon statistical testing, we found that the null hypothesis from the Kolmogorov-Smirnov test has been accepted (p= 0.283). Therefore, the species abundance distribution fits the lognormal model. This, in turn, indicates that the abundance distribution is fairly equitable and also testifies for our sampling efforts being efficient enough to include most of the species present in this community.

Discussion

The Wild Ass Sanctuary is home to a plethora of species among which the endemic Asiatic Wild Ass calls for a special mention. The landscape supports among many others, a huge variety of resident avifauna and also serves as wintering ground for many species of bird migrants, including the Sarus Crane (Gopi *et al.*, 2000).

Table 1: Differential feeding guild affiliations of the observed avifauna arranged in descending order

Sr. No.	Name of the Feeding Guild	Percent species richness in the community
1.	Insectivore and other terrestrial invertebrate feeder	30
2.	Aquatic invertebrate-feeder	12
3.	Piscivore	11
4.	Grainivore	9
5.	Amphibian-feeder	7
6.	Herbivore	7
7.	Reptile-feeder	6
8.	Predatory	5
9.	Weedivore	5
10.	Frugivore	3
11.	Carrion-feeder	2
12.	Nectarivore	1
13.	Ophidiovore	1
14.	Plankton-feeder	1

All this has rightfully earned the region a place among the IBA sites of the world. Previously, many studies have been conducted on the bird community of this region, as a whole and on many varied aspects of the wintering avifauna. The present study, perhaps, is the first that systematically estimated abundance of wetland birds in this landscape of Gujarat. It is also the first to highlight early winter migrants of this region.

Species density and composition

The region is fairly rich in the number of species that inhabit here. In a previous study, Shah *et al.* (1995) recorded close to 160 bird species. More recently, Singh (2001) reported 178 bird species from 16 sites in the Wild Ass Sanctuary. Our results show a much less species richness (N = 79), mainly because it was carried out in only one site and the late winter migrants had not yet arrived.

A pristine habitat rich in fauna comprising of 34 species of waterfowls, 7 species of marshy birds, 44 species of terrestrial birds, 8 species of raptors and 27 species of passerines was recorded from the point counts and line transects. Sufficient vegetation cover has provided the habitat with enough niches to support more terrestrial avifauna, that mostly occur in grassy and other habitats. Other important recorded avifauna included Greater Flamingo, Lesser Flamingo, Siberian Chiffchaff, Indian Roller, Indian Little Nightjar, Western Marsh Harrier, and Northern Pintail. We have also noted large flocks of Greater Flamingo, Lesser Flamingo, Asian Openbill, Painted Stork, Gadwall, White-eared Bulbul and Red-wattled Lapwings occurring in the habitat.

The presence of open scrub woodlands makes it ideal for the roosting of raptors. But, we did not observe any such activity. Raptors were either in flight or perching from a vantage point during our observation period. This landscape is also an important breeding refuge for birds. But, as our study is concentrated on the early-winter months, we did not record any breeding activities. There are reports of breeding and nesting activities in the Greater and Lesser Flamingo populations of this region (Ali, 1974). Besides these two species of flamingos, Rosy Pelicans and Pied Avocets also breed here (Singh, 2001). The region may be playing a similar role for many other bird species, which may have not been reported yet. This gives an indication of the precarious status of avifauna found in this region and the conservation significance of the landscape.

Table 2: Species diversity and equity values for the surveyed bird community

Name of the Indices	Value
Diversity Index	
Shannon -Weaver Index (H')	3.570
Equity Index	
Modified Hill's Ratio (F_2^1)	0.727

Feeding guilds

In the case of birds, feeding guilds are usually shared among species. This essentially means that, a bird may be affiliated to two or more feeding guilds while keeping its trophic level constant (except in case of omnivores). By further categorizing guilds into respective trophic levels, we can see that, in the studied community 26% species are primary consumers, 42% are secondary consumers, 30% are tertiary consumers and the remaining 2% are carrion-feeders.

The distribution of bird feeding guilds in any habitat is strongly affected by the varied resources present there. A good majority (30%) of the birds being insectivores, indicates that there is a significant number of insect species residing in this habitat. In the same way, ophidiovores (1%) and nectarivores (1%) having the least percent richness, hints towards the presence of few ophids and flowering plants here. Contrastingly, even though only 1% of this community are plankton-feeders, there is no reason to think that planktons are scarce in this wetland. The plankton community is as abundant as any other community of this habitat; since they support a vast number of flamingos feeding on them. Therefore, we can say that the number of birds in a certain guild is positively correlated with the abundance of the exploited resource.

Interestingly, most of the frugivores observed here also share the insectivorous guild. This indicates that the birds have adapted to seasonal availability of fruits, by directly changing their trophic levels. This kind of an adaptive shifting of trophic levels is rather common among birds and makes them a better colonizing species (Zakaria *et al.*, 2005). Since, insectivores are particularly sensitive to habitat disturbance and fragmentation (Sekercioglu *et al.*, 2002); the higher presence of this guild goes to show that the studied habitat is devoid of such degradations.

Diversity analyses

Shannon's index (H') is the most approved measure of diversity used by community ecologists. Its value can be zero when there is only one species; otherwise it keeps increasing with the number of individuals and species richness of the sample (Ludwig and Reynolds, 1988). For a fixed number of species, H' reaches its maximum value only when there is a perfectly even distribution of their abundances (Ludwig and Reynolds, 1988). For this reason, we cannot conclude much about the diversity of this community by just considering the H' value. It has now become imperative to calculate the evenness of our sample.

We chose to follow a version of the Hill's ratio, as modified by Alatalo (1981), in order to calculate evenness. The modified Hill's Ratio is preferred over other evenness indices because it approaches 0 as a single species become more and more dominant in a community; which is a desirable property for an evenness index (Peet, 1974). Further, an evenness index should be independent of the number of species in the sample. Intuitively, it would seem reasonable that regardless of the number of species present, an evenness index should not change. Peet (1974) has shown that this index remains relatively unaffected by species richness, even with the addition of one rare species to a sample. The calculated value of 0.727 for this metric goes to show that there is a significant evenness in the sampled community.

Heip *et al.* (1998) have clearly stated that the various implications of evenness indices deserve further studies

and hence, should still be heeded with caution. Instead, the use of species-abundance plots is a more judicious approach (Heip *et al.*, 1998). In accordance with this, we have plotted a rank-abundance curve in Fig. 1. Species are ranked from highest to lowest abundance along the x-axis, and their abundances are plotted, with the y-axis in log scale (Plotkin and Muller-Landau, 2002; Magurran, 2004). A trendline of the dataset plotted in the graph clearly show the specific abundance distribution model which it follows.

According to Whittaker (1965); May (1975) and Gray (1987), if a habitat is rich in species and is stressed by many environmental factors; then the species abundance distributions of any community residing in that habitat tends to follow a lognormal model. Since, the Wild Ass Sanctuary is rich in species (Mundkur *et al.*, 1989; Shah *et al.*, 1995; Singh *et al.*, 1999; Singh, 2001) and influenced by many environmental factors, such as water scarcity, high salinity stress, seasonal inundation and xeric conditions (Rodgers and Panwar, 1988); we have accordingly postulated that the bird community in this region may fit the lognormal abundance distribution. In Fig. 1, the pattern followed matches very closely with this model. For further assurance, the recorded abundance data has been tested for normality using the Kolmogorov-Smirnov test. The result of this test yielded that their abundance distribution fits the lognormal model, with some species being highly abundant, some very rare and most of intermediate abundances.

By summing it all up, we can see that the sampled community has a high evenness; as inferred from the high equity index value (modified Hill's ratio = 0.727) and the abundance distribution having a perfect fit with the lognormal model. Because of this high evenness, it can be concluded that the obtained H' value of 3.57 is very close to its maximum possible value for this community. Hence, our results indicate to the presence of a highly diverse avian community in this region.

Conclusion

Even distribution and high diversity values of the avian community, means that resource distribution is not clumped. A random distribution of resources is the most likely scenario. We have found that more than 50% of the bird community consists of migrants. Therefore, during the onset of migration season, the available resources must increase. The habitat must also be a well-structured ecosystem with numerous available niches. Otherwise, such a diverse avian community could not be supported. This kind of habitats characteristically show a great response to even the slightest of disturbances. Therefore, a proper conservation regimen aimed at preserving this habitat should be implemented as soon as possible so that no threat can arise to this IBA site in the future.

The results of this study, does not represent the landscape-level scenario of this region but merely provides a picture of the bird community at a local scale. Only by combining data from many more such local surveys we can come to get a true representation of this landscape. Hence, it is likely that bird richness in this landscape will increase if further observations are made.

We would also like to mention here that this study has largely focused at summarizing the structural aspects of this avian community and has made an attempt at quantifying its functional aspects in the light of feeding guild composition. These functional aspects of a community often cannot be readily studied by simply observing their resultant structures. Further studies involving suitable experimental protocols need to be conducted in order to truly understand the mechanisms that have chiseled the community's structure into its current form.

दासाड़ा तालुका, सुरेन्द्र नगर, गुजरात में भारतीय जंगली गधा अभयारण्य के एक आर्द्रभूमि आवास में प्रारम्परिक-सरदी प्रवासी एवं आवासी पक्षियों का विवरण

अभिषेक चटर्जी, सुदेशना घोषाल, एवं पिनाकीरंजन चक्रवर्ती

सारांश

स्थानिक एशियाई जंगली गधों के संरक्षण के लिए प्रसिद्ध भारतीय जंगली गधा अभयारण्य एक महत्वपूर्ण पक्षी एवं जैवविविधता क्षेत्र (आई बी ए स्थल) भी है क्योंकि यह अनेकों प्रवासी पक्षियों के लिए एक शीतलन एवं प्रजनन स्थल है। इस अध्ययन का उद्देश्य प्रारम्भिक प्रवसन मौसम के दौरान पक्षी समुदायों के संरचनात्मक पहलुओं का अभिलेखन करना था। लेखको ने तीन क्रमिक वर्षों (2013-2015) के लिए नवम्बर-दिसम्बर माह के दौरान एक विशेष स्थल का सर्वेक्षण किया। प्वांइट गणना, लाइन ट्रांजैक्ट, रात्रि सर्वेक्षण और समयानुवर्ती मुठभेड़ का उपयोग करके 63 वंश तथा 36 कुलों से संबंधित कुल 79 पक्षी प्रजातियों को अभिलिखित किया। अभिलिखित सभी प्रजातियों में लैसर फ्लेमिंगो सबसे प्रचुर मात्रा में थी। प्रवासी पक्षिप्राणिजात के अधिक मात्रा में पहुंचने पर प्रवसन मौसम में बाद में प्रजाति समृद्धता में बढ़ोतरी हो सकती है। इस समुदाय का अभिलिखित प्रजाति प्रचुरता वितरण लॉग-नार्मल मॉडल के साथ परिपूर्ण फीट है। यह इस समुदाय की विभिन्न प्रजातियों में एकलों के उचित वितरण के सिद्ध करता है तथा इसकी उच्च विविधता को प्रमाणित भी करता है। संभरण संघ संयोजन का अध्ययन करने के उपरांत चौदह अलग-अलग हिस्सा संभरण संघों की पहचान की गई, जिनमें से कीट भक्षी संघ सबसे प्रचुर थे। इस अध्ययन के माध्यम से यह कहा जा सकता है कि इस आवास को वर्षों से अच्छी तरह से संरक्षित किया गया हैं। इस अभयारण्य के विभिन्न स्थलों में गहन सर्वेक्षण करने की आवश्यकता है ताकि वर्तमान संरक्षण प्रोटोकॉलों को संशोधित करने की आवश्यकता का मूल्यांकन किया जा सके।

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Appendix 1: Checklist of the diverse avifauna observed at the study site, in Indian Wild Ass Sanctuary, along with their respective migration status, feeding habit, IUCN category, mean density and abundance-based rank

S. No.	Common name	Family	Scientific name	Migration status	Feeding guild	IUCN category	Mean species density (individuals/ km^2.)	Species rank
1.	Great White Pelican	Pelecanidae	*Pelecanusonocrotalus*	RM	P	LC	2460.0	7
2.	Little Cormorant	Phalacrocoracidae	*Microcarboniger*	RM	P	LC	1096.7	20
3.	Indian Cormorant	Phalacrocoracidae	*Phalacrocoraxfuscicollis*	RM	P	LC	450.0	29
4.	Grey Heron	Ardeidae	*Ardeacinerea*	R	P, A	LC	713.3	27
5.	Purple Heron	Ardeidae	*Ardeapurpurea*	RM	P, A, OP	LC	1273.3	18
6.	Great Egret	Ardeidae	*Ardea alba*	R	P, A	LC	1723.3	11
7.	Cattle Egret	Ardeidae	*Bubulcus ibis*	R	I, P, A	LC	343.3	34
8.	Painted Stork	Ciconiidae	*Mycterialeucocephala*	RM	P, IN	NT	2133.3	8
9.	Asian Openbill	Ciconiidae	*Anastomusoscitans*	RM	P, IN	LC	2986.7	4
10.	Indian Black Ibis	Threskiornithidae	*Pseudibispapillosa*	R	I, G, RP	LC	783.3	26
11.	Black-headed Ibis	Threskiornithidae	*Threskiornismelanocephalus*	R	A, IN, I, W	NT	866.7	25
12.	Eurasian Spoonbill	Threskiornithidae	*Platalealeucorodia*	RM	A, IN, I, W	LC	96.7	48
13.	Greater Flamingo	Phoenicopteridae	*Phoenicopterus roseus*	RM	IN, PL	LC	4023.3	2
14.	Lesser Flamingo	Phoenicopteridae	*Phoenicopterus minor*	RM	PL	NT	4416.7	1
15.	Bar-Headed Goose	Anatidae	*Anserindicus*	M	H	LC	2006.7	10
16.	Ruddy Shelduck	Anatidae	*Tadornaferruginea*	RM	IN, P, RP, C	LC	1716.7	12
17.	Indian Spot-Billed Duck	Anatidae	*Anas poecilorhyncha*	RM	W, H	LC	956.7	23
18.	Lesser Whistling Duck	Anatidae	*Dendrocygnajavanica*	RM	H, G, IN, P	LC	1090.0	21
19.	Greylag Goose	Anatidae	*Anseranser*	M	W, IN	LC	1136.7	19
20.	Mallard	Anatidae	*Anas platyrhynchos*	RM	H	LC	323.3	36
21.	Northern Pintail	Anatidae	*Anas acuta*	M	H, IN	LC	1683.3	13
22.	Comb Duck	Anatidae	*Sarkidiornismelanotos*	R	G, H, IN	LC	1416.7	17
23.	Common Teal	Anatidae	*Anas crecca*	M	G, H	LC	1616.7	14
24.	Gadwall	Anatidae	*Marecastrepera*	M	H	LC	3463.3	3
25.	Tawny Eagle	Accipitridae	*Aquila rapax*	R	C, PD	LC	48.3	63
26.	Brahminy Kite	Accipitridae	*Haliasturindus*	R	P, A, OP, I, PD	LC	93.3	50
27.	Western Marsh Harrier	Accipitridae	*Circus aeruginosus*	M	P, A, C, PD	LC	20.0	73
28.	Booted Eagle	Accipitridae	*Hieraaetuspennatus*	RM	PD, RP	LC	13.3	76
29.	Bonelli's Eagle	Accipitridae	*Aquila fasciata*	R	PD	LC	6.7	79
30.	Common Kestrel	Falconidae	*Falco tinnunculus*	RM	I, RP, PD	LC	28.3	68
31.	Osprey	Pandionidae	*Pandion haliaetus*	RM	P	LC	243.3	39
32.	Demoiselle Crane	Gruidae	*Grus virgo*	M	W, G, RP, I	LC	157.0	43
33.	Purple Swamphen	Rallidae	*Porphyrioporphyrio*	R	W, I, IN	LC	290.0	37
34.	Common Moorhen	Rallidae	*Gallinulachloropus*	RM	H, I, IN	LC	506.7	28
35.	Common Coot	Rallidae	*Fulicaatra*	RM	IN, W, H	LC	2530.0	6
36.	Red-wattled Lapwing	Charadriidae	*Vanellusindicus*	RM	I, IN	LC	2083.3	9
37.	Green Sandpiper	Scolopacidae	*Tringaochropus*	M	IN, I	LC	176.7	42
38.	Common Snipe	Scolopacidae	*Gallinagogallinago*	RM	I	LC	150.0	44
39.	Black-winged Stilt	Recurvirostridae	*Himantopushimantopus*	R	IN	LC	446.7	30
40.	Rock Pigeon	Columbidae	*Columba livia*	R	G	LC	366.7	32
41.	Red Collared Dove	Columbidae	*Streptopeliatranquebarica*	R	G	LC	183.3	41
42.	Laughing Dove	Columbidae	*Streptopelia senegalensis*	R	G	LC	1593.3	15
43.	Spotted Owlet	Strigidae	*Athene brama*	R	I, RP, PD	LC	100.0	45
44.	Indian Nightjar	Caprimulgidae	*Caprimulgusasiaticus*	R	I	LC	233.3	40
45.	Indian House Swift	Apodidae	*Apus affinis*	RM	I	LC	330.0	35
46.	Pied Kingfisher	Alcedinidae	*Cerylerudis*	R	P, A, IN	LC	70.0	55
47.	CommonKingfisher	Alcedinidae	*Alcedoatthis*	RM	P, A, IN	LC	56.7	60
48.	Green Bee-eater	Meropidae	*Meropsorientalis*	R	I	LC	1590	16
49.	Indian Roller	Coraciidae	*Coraciasbenghalensis*	R	I, RP	LC	253.3	38
50.	Common Hoopoe	Upupidae	*Upupaepops*	RM	I	LC	83.3	53
51.	Eurasian Wryneck	Picidae	*Jynxtorquilla*	M	I	LC	10.0	77
52.	Indian Bushlark	Alaudidae	*Mirafraerythroptera*	R	I, W	LC	18.7	74
53.	Tawny Pipit	Motacillidae	*Anthuscampestris*	M	I	LC	26.7	69
54.	Paddyfield Pipit	Motacillidae	*Anthusrufulus*	R	I	LC	45.7	64
55.	Western Yellow Wagtail	Motacillidae	*Motacilla flava*	RM	I	LC	86.7	51

S. No.	Common name	Family	Scientific name	Migration status	Feeding guild	IUCN category	Mean species density (individuals/ km^2)	Species rank
56.	Grey Wagtail	Motacillidae	*Motacillacinerea*	M	I	LC	95.0	49
57.	White Wagtail	Motacillidae	*Motacilla alba*	M	I	LC	423.3	31
58.	White-eared Bulbul	Pycnonotidae	*Pycnonotusleucotis*	R	FU, I	LC	2673.3	5
59.	Red-vented Bulbul	Pycnonotidae	*Pycnonotuscafer*	R	FU, I, H	LC	80.0	54
60.	Bay-backed Shrike	Laniidae	*Laniusvittatus*	R	I, RP	LC	65.0	57
61.	Long Tailed Shrike	Laniidae	*Laniusschach*	R	I, RP, PD	LC	85.7	52
62.	Isabelline Shrike	Laniidae	*Laniusisabellinus*	M	I	LC	25.3	70
63.	Blue Rock Thrush	Muscicapidae	*Monticolasolitarius*	RM	I, FU	LC	43.3	65
64.	Bluethroat	Muscicapidae	*Lusciniasvecica*	RM	I	LC	23.3	71
65.	Isabelline Wheatear	Muscicapidae	*Oenantheisabellina*	RM	I	LC	10.0	78
66.	Pied Bushchat	Muscicapidae	*Saxicolacaprata*	M	I	LC	16.7	75
67.	Red-breastedFlycatcher	Muscicapidae	*Ficedulaparva*	M	I	LC	63.3	58
68.	Indian Robin	Muscicapidae	*Saxicoloidesfulicatus*	R	I	LC	99.0	46
69.	Common Babbler	Leiotrichidae	*Argyacaudata*	R	I, FU, G	LC	876.7	24
70.	Jungle Prinia	Cisticolidae	*Prinia sylvatica*	R	I	LC	60.0	59
71.	Rufous-Fronted Prinia	Cisticolidae	*Priniabuchanani*	R	I	LC	37.0	66
72.	Zitting Cisticola	Cisticolidae	*Cisticola juncidis*	R	I	LC	53.7	61
73.	Common Tailorbird	Cisticolidae	*Orthotomussutorius*	R	I, N	LC	68.3	56
74.	Booted Warbler	Acrocephalidae	*Idunacaligata*	RM	I	LC	21.7	72
75.	Clamorous Reed Warbler	Acrocephalidae	*Acrocephalusstentoreus*	R	I	LC	98.3	47
76.	Common Chiffchaff	Phylloscopidae	*Phylloscopuscollybita*	M	I	LC	30.0	67
77.	Yellow-throated Sparrow	Passeridae	*Gymnorixanthocollis*	R	G	LC	50.0	62
78.	Brahminy Starling	Sturnidae	*Sturniapagodarum*	R	FU	LC	1036.7	22
79.	Black Drongo	Dicruridae	*Dicrurusmacrocercus*	R	I, N	LC	360.0	33

Abbreviations used:

Migration status = Resident-Migrant: RM; Resident: R; Migrant: M

Feeding habit = Frugivore: FU; Nectarivore: N; Piscivore: P; Grainivore: G; Insect and other terrestrial invertebrate feeder: I; Plankton feeder: PL; Aquatic Invertebrate feeder: IN; Amphibian feeder: A; Ophidiovore: OP; Reptile feeder: RP; Weedivore: W; Herbivore: H; Carrion feeder: C; Predatory: PD

IUCN status = Near Threatened: NT; Least Concern: LC