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# RELATIVE ABUNDANCE AND DISTRIBUTION OF AVIFAUNA AT DIFFERENT STATIONS OF KHUTAGHAT DAM OF RATANPUR DISTRICT BILASPUR CHHATTISGARH (INDIA)

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**ABSTRACT:**
Birds are an essential part of the food chain in every ecosystem. They play a vital role as scavengers, pollinators, seed dispersal agents, and predators of insect pests. Wetlands are essential habitats crucial for supporting terrestrial and aquatic bird communities, and the presence or absence of birds reflects the condition of the wetlands. Therefore, an attempt has been made to study birds' abundance and distribution in different Khutaghat Dam stations from June 2021 to May 2023 in all four seasons. Beltline transect and point count methods were employed to investigate the abundance of birds. Station-wise data were summarised in the Excel sheet throughout the study period. Relative abundance was calculated using MS Excel. This study revealed 37087 individuals and 140 bird species belonging to 15 orders and 40 families. Passeriformes was the most abundant order in all seasons. One-way ANOVA was used to determine the effect of seasons on the abundance of birds, and ANOVA was also used to know the effect of stations on the abundance of birds. The ANOVA result divulged that bird abundance significantly differed in different seasons ($p<0.05$). ANOVA test shows no significant differences ($P>0.05$) in the mean abundance of birds recorded from various stations of Kharung dam in the autumn, winter and rainy seasons. In contrast, summer birds' mean abundance significantly differed ($p<0.05$) among various stations. Our findings support that the dam is a suitable habitat for the residential and migratory birds; however, the birds recorded in and around are significantly affected by anthropogenic activity like fishing activity, washing cloth, direct bathing, washing livestock, immersion of idols, pollution due to spraying of insecticides on the crop in the catchment area. Prospects of the present research work would contribute to conserving the avifauna of the study area by safeguarding their habitats.

**Keywords:-** *Avifauna, Khutaghat dam, Wetland, Biodiversity Beltline transect technique..*

## INTRODUCTION :

India is recognised as a megadiverse country (Chandrakar,2019), covering 2.2% of the world's terrestrial landmass. It is home to approximately 13% of bird species worldwide (Praveen & Jayapal, 2023). This accounts for about 1250 bird species, making India one of the top ten countries in the world in terms of the most significant number of bird species (Grimmett et al., 2013; Mewada, 2017; Patel & Raval, 2019; Manakadan & Pittie, 2001; Sibley & Monroe, 1990). This exceptional diversity can be attributed to unique biogeography, ecological history, diverse physical features, and a wide range of eco-climatic conditions, encompassing tropical to temperate regions. Birds are essential in maintaining biodiversity and provide significant ecological, economic, and aesthetic benefits (Girmay et al., 2020). They are an indispensable part of the food chain in every ecosystem (Mariappan, 2013; Singh et al., 2018). Wetlands are essential habitats crucial for supporting terrestrial and aquatic bird communities, and the presence or absence of birds reflects the condition of the wetlands. Globally, 20% (approximate) of the avian species utilise wetlands directly or indirectly for foraging, breeding, resting, and overwintering (Stewart et al., 2001; Veeramani et al., 2018). Bird populations and their geographical distributions are subject to fluctuations influenced by various factors such as environmental shifts, climate change, habitat modifications, and human interventions (Lodhi and Rao, 2017). In conjunction with species-specific habitat sensitivity, these factors may ultimately impact



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birds' abundance and distribution within a particular area. This dynamic nature of bird abundance and distribution is crucial for effective conservation and management efforts (Somveille, 2016). Relative species abundance refers to how common and rare a species is relative to other species in a defined location and community. Henceforth, the present course of investigation was carried out to explore the relative abundance and distribution of avifauna at different stations of the Kharung dam of Ratanpur District under Bilaspur region of Chhattisgarh state, India.

**MATERIAL AND METHODS**

A landlocked state, Chhattisgarh in Central India has abundant natural resources. The high mountain peaks of the Maikal range, dense forests, and mountain rivers contribute to the state's biological diversity. (Rahalkar et al., 2012). Ratanpur is just 25 km away from Bilaspur city. It is home to a famous historical and religious monument called "The City of Pond". The Khutaghat Dam, also known as Sanjay Gandhi Jalashay, is a large freshwater storage reservoir constructed on the Kharung River, a tributary of the Shivnath River. It is situated in Ratanpur town, at 22° 17' N latitude and 83° 13' E longitude. The Khutaghat Dam lies in central Chhattisgarh and has a vast expanse. Five sampling stations were selected along the bank of Kharung dam for the present study, namely Dhanwa, Bapaputi, Ramdei, Main Canal and Lalpur. Five study areas had different surrounding habitats. These study sites were named after the nearby small village on the bank of the Kharung Dam.

Throughout the study, weekly visits were made to all study sites from June 2021 to May 2023. One hundred twenty samples were taken to record avian species. Each visit involved data collection in the morning; however, sometimes in the evening, as per weather conditions. Various methods were used, including belt line transect and point count methods. The total count and Block flock count methods were applied to the point count method (Sutherland et al., 2004). We observed birds using binoculars (125X) and took photographs using a digital camera (Nikon 125X Wide Optical Zoom Camera). The photographs of each avian species were identified and classified using a field guide by Ali & Ripley (1987), Ali (2012) and Grimmett et al. (2013). Data was collected and analysed for each season to study the seasonal changes in avian species. This included winter (December to February), summer (March to May), monsoon (June to August), and autumn (September to November).

**Data analysis**

Data on the abundance of birds per season during the study period were processed, and graphs were plotted in the Excel spreadsheet. MS Excel was also used for the statistical analysis (ANOVA). The effect of seasons on species abundance was analysed using one-way ANOVA, which was also used to analyse the impact of the habitat of Kharung Dam stations on birds' abundance. Differences were considered statistically significant at the 5% level. Relative abundance for each species was calculated using the following formula:

$$RA = \frac{n}{N} \times 100$$

Where,
n - number of individuals of a species observed
N - number of individuals of all the species observed.

**Results**

During the four seasons of the study period, 37088 individuals, 140 bird species belonging to 40 families, and 15 orders were recorded from the studied areas (Table 1).

**Species Composition**



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During the rainy season, 93 bird species were recorded; 120 were observed in autumn, while 133 were spotted in winter. The exact number of bird species, 133, were also observed in summer among the 140 species of observed birds. 85 species of birds were common during all the seasons. Passeriformes was the most dominant order, with 16 Families and 61 species. Birds only confined to the winter season were ferruginous pochard, yellow-wattled lapwing, Black-headed gull, Eurasian wryneck, Forest wagtail, yellow-eyed babbler, etc. Birds only confined in the summer were little bittern, brahminy shelduck, Indian short toad lark, House sparrow etc.

**Relative abundance of bird species on different sites during various seasons**

Out of the total birds observed during the study period, the maximum number of birds was 11283.5 (RA 30.43 %) recorded from Dhanwa station, followed by Bapaputi with 8174.5 birds individuals (RA 22.05 %), Ramdei 6522 (RA 17.59 %), Main Canal 5837 (RA 15.74%), Lalpur 5271 (RA 14.22 %). One-way ANOVA analysis shows the insignificant difference in the mean abundance of birds among five selected stations with different habitats. ($F=1.554$, $P>0.05$).

Out of the 37088 bird individuals recorded during the study period, The highest number of bird individuals recorded was 15745.50 (RA 42.45%) in the winter season, followed by 9703(RA 26.16%), 6533.50 (RA 17.61%), and 5206 (RA 13.76%) in the summer, autumn, and rainy seasons, respectively. ANOVA result revealed that bird abundance was significantly varied ($p<0.05$) among various seasons. ($F=3.569$, $p<0.05$).

**Discussion**

Biodiversity encompasses the vast range and variability of life on our planet. Birds play a crucial role in faunal diversity, enriching ecosystems by thriving in various habitats. During the study period, 37088 individuals were observed across the four seasons. The observations included 140 bird species from 40 families and 15 orders (Table 1). The high number of species and individuals in a particular area implies the area's importance for species conservation (Mengesha & Bekele, 2008). The diverse range of habitats around the dam, including mudflats, marshy areas, islands, numerous trees along the banks, and the surrounding irrigated crop fields, maybe the reason for various species of birds at the dam. The variety of habitats comprising the terrestrial and aquatic vegetation makes the number of bird species more diverse (Gibru et al., 2019). These habitats likely offer different food sources and opportunities for the birds to find their preferred micro-habitats within the wetland. Various studies have shown that the diversity of vegetation strata providing heterogeneous habitats is a critical factor influencing the distribution of bird species. (Rajpar *et al.*,2011; Demeke *et. al.*, 2019; Giri *et al.*, 2020). In the present study, Among the 15 orders of bird species, Passeriformes was found to be the most dominant order in the study area, with 16 Families and 61 species, because of their ecological position. The majority of Passeriformes are herbivores, and few are omnivorous and insectivorous. Therefore, many passeriformes belong to herbivore strata of the ecological pyramid. Hence, their number is high compared to those of the higher strata. Various studies have indicated that Passerines are highly diverse birds because they can live in multiple environments and eat various foods (Chopra *et al.*, 2017; Patel & Raval, 2019; Rai & Vanita, 2021). Earlier, several researchers have revealed the dominance of this species in various regions of India, such as Ghosh (2016), Chopra *et al.* (2017), and Dey *et al.* (2017).



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Bird communities are dynamic and can change the number of birds and the species composition throughout the year. In this study, we found statistically significant variation in the abundance of birds among the various seasons. Seasonal movement patterns, habitat changes at the local and regional levels, large-scale population changes, and climatic conditions could be the reasons for significant seasonal variation in the abundance of bird species (Aynalem & Bekele, 2008; Gaston *et al.*, 2000). The vegetation composition, a significant part of their habitat, influences the abundance of bird species. Again, the vegetation composition and structure are affected by rainfall patterns, which change among the seasons.

**CONCLUSION**

There was an insignificant difference in the abundance of birds among various stations ($p>0.05$). This might be due to the similarity in foraging opportunities, their geographical proximity, and similar extent of disturbance. Habitats close to one another can share the same number of species (Demeke et al., 2019). However, in contradiction to Tsegaye et al. (2019) and Demeke et al. (2019), there was a significant difference in the abundance of birds among different seasons ($P<0.05$). Takele and Endale (2019) reported that the relative abundance of bird species between seasons was significantly varied ($P < 0.05$).

The highest number of bird individuals recorded in the winter season, and minimum in the rainy seasons. The reason for the high relative abundance of birds during the winter was the influx of a large number of migratory bird's individuals from various regions of the globe. During the winter season, due to severe snow formation, the availability of food and cover is severely impacted; in response, birds are forced to migrate to warm tropical zones. The abundance of birds could increase with the arrival of new bird species during the winter season. During the rainy season, food and water are available throughout the nearby water bodies, and bird species also spread everywhere.

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**Fig 1. Geographical representation of the Study area**

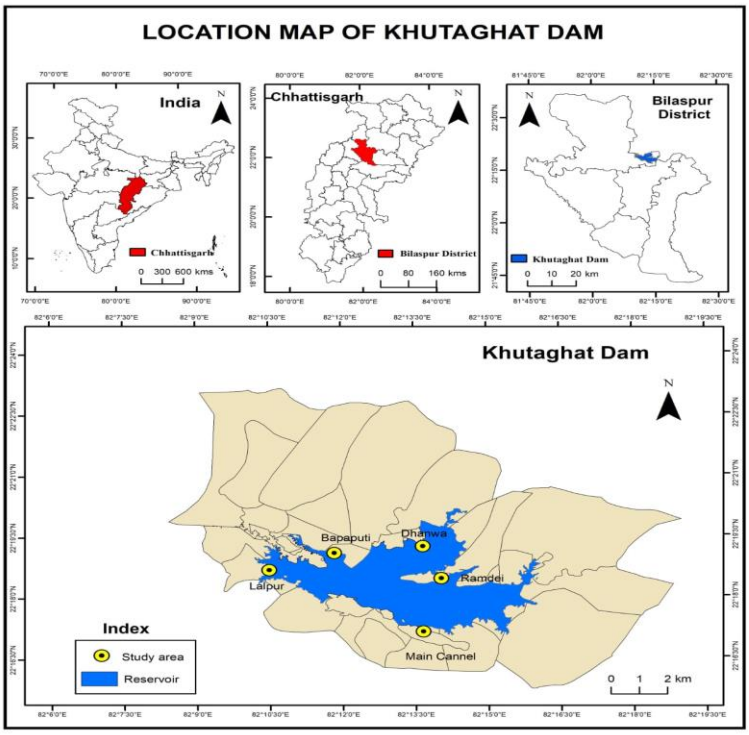




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**Table 1** Species checklist, abundance in various seasons of bird in Khutaghat dam Chhattisgarh, India

| *S. No.* | Order/Family/Generic Name of Birds | Common Name of Birds | Rainy | RA | Autumn | RA | Winter | RA | Summer | RA |
|---|---|---|---|---|---|---|---|---|---|---|
| | ***Podicipediformes (Podicipitidae)*** | | | | | | | | | |
| *1.* | *Tachybaptus ruficollis* | Little Grebe | 16 | 0.313 | 0 | 0 | 3 | 0.019 | 34.5 | 0.356 |
| | ***Pelecaniformes (Phalacrocoracidae)*** | | | | | | | | | |
| *2.* | *Phalacrocorax niger* | Little Cormorant | 223 | 4.367 | 165 | 2.526 | 212 | 1.346 | 361.5 | 3.726 |
| | **Ciconiiformes (Ciconiidae)** | | | | | | | | | |
| *3.* | *Anastomus oscitans* | Asian openbill-stork | 562 | 11 | 365 | 5.587 | 64 | 0.406 | 112.5 | 1.159 |
| *4.* | *Ciconia episcopus* | White-necked stork | 1.5 | 0.029 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| | ***Ardeidae*** | | | | | | | | | |
| *5.* | *Ardeola grayii* | Indian pond-heron | 100.5 | 1.968 | 110 | 1.684 | 143.5 | 0.911 | 144.5 | 1.489 |
| *6.* | *Ardea purpurea* | Purple heron | 17.5 | 0.343 | 8.5 | 0.13 | 18.5 | 0.117 | 21 | 0.216 |
| *7.* | *Nycticorax nycticorax* | Black-crowned night-heron | 119.5 | 2.34 | 60 | 0.918 | 0 | 0 | 2 | 0.021 |
| *8.* | *Ixobrychus cinnamomeus* | chestnut bittern | 3.5 | 0.069 | 6 | 0.092 | 0 | 0 | 4.5 | 0.046 |
| *9.* | *Ixobrychus minutus* | little bittern | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| *10.* | *Bubulcus ibis* | cattle egret | 228.5 | 4.474 | 290.5 | 4.447 | 325.5 | 2.067 | 349 | 3.597 |
| *11.* | *Egretta garzetta* | Little egret | 27.5 | 0.538 | 34.5 | 0.528 | 43 | 0.273 | 34.5 | 0.356 |
| *12.* | *Mesophoyx intermedia* | Median egret | 16 | 0.313 | 14 | 0.214 | 9.5 | 0.06 | 16.5 | 0.17 |
| *13.* | *Casmerodius albus* | Large egret | 7 | 0.137 | 9.5 | 0.145 | 10.5 | 0.067 | 12.5 | 0.129 |
| | ***Threskiornithidae*** | | | | | | | | | |
| *14.* | *Pseudibis papillosa* | Black ibis | 9.5 | 0.186 | 8.5 | 0.13 | 5 | 0.032 | 8.5 | 0.088 |
| *15.* | *Threskiornis melanocephalus* | Oriental white ibis | 1 | 0.02 | 0 | 0 | 1 | 0.006 | 2.5 | 0.026 |
| | **Anseriformes (Anatidae)** | | | | | | | | | |
| *16.* | *Dendrocygna javanica* | Lesser whistling-duck | 179.5 | 3.515 | 274.5 | 4.202 | 480 | 3.048 | 762 | 7.853 |
| *17.* | *Tadorna ferruginea* | Brahminy shelduck | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 0.216 |
| *18.* | *Nettapus coromandelianus* | Cotton teal | 120 | 2.35 | 106.5 | 1.63 | 194.5 | 1.235 | 239.5 | 2.468 |
| *19.* | *Anas poecilorhyncha* | Spot-billed duck | 8 | 0.157 | 4.5 | 0.069 | 6.5 | 0.041 | 6 | 0.062 |
| *20.* | *Anas acuta* | Northern pintail | 0 | 0 | 119.5 | 1.829 | 975 | 6.192 | 186.5 | 1.922 |
| *21.* | *Anas strepera* | Gadwall | 0 | 0 | 46.5 | 0.712 | 538 | 3.417 | 61 | 0.629 |
| *22.* | *Anas querquedula* | Garganey | 0 | 0 | 19.5 | 0.299 | 318 | 2.02 | 143 | 1.474 |
| *23.* | *Rhodonessa rufina* | Red-crested pochard | 0 | 0 | 322.5 | 4.937 | 2996 | 19.02 | 224 | 2.309 |
| *24.* | *Aythya farina* | Common pochard | 0 | 0 | 11.5 | 0.176 | 161.5 | 1.026 | 82.5 | 0.85 |
| *25.* | *Aythya fuligula* | Tufted pochard | 0 | 0 | 22.5 | 0.344 | 280.5 | 1.781 | 62 | 0.639 |
| *26.* | *Aythya marila* | Greater scaup | 0 | 0 | 12 | 0.184 | 208 | 1.321 | 37.5 | 0.386 |
| *27.* | *Aythya nyroca* | Ferruginous pochard | 0 | 0 | 0 | 0 | 4.5 | 0.029 | 0 | 0 |
| | ***Falconiformes (Falconidae)*** | | | | | | | | | |



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|---|---|---|---|---|---|---|---|---|---|---|
| 28. | *Elanus caeruleus* | Black-shouldered kite | 16.5 | 0.323 | 10.5 | 0.161 | 15 | 0.095 | 16.5 | 0.17 |
| 29. | *Accipiter badius* | Shikra | 10 | 0.196 | 4 | 0.061 | 11 | 0.07 | 19 | 0.196 |
| 30. | *Milvus migrans* | Black kite | 45 | 0.881 | 29 | 0.444 | 42.5 | 0.27 | 43.5 | 0.448 |
| ***Galliformes (Phasianidae)*** | | | | | | | | | | |
| 31. | *Francolinus pondicerianus* | Grey Francolin | 17.5 | 0.343 | 19 | 0.291 | 20.5 | 0.13 | 28 | 0.289 |
| ***Gruiformes (Rallidae)*** | | | | | | | | | | |
| 32. | *Fulica atra* | Common coot | 0 | 0 | 117 | 1.791 | 3272 | 20.78 | 822 | 8.472 |
| 33. | *Rallina eurizonoides* | Slaty-legged crake | 0 | 0 | 0 | 0 | 1 | 0.006 | 1 | 0.01 |
| 34. | *Gallinula chloropus* | Common moorhen | 39.5 | 0.773 | 46 | 0.704 | 64.5 | 0.41 | 47.5 | 0.49 |
| 35. | *Amaurornis phoenicurus* | White-breasted waterhen | 46 | 0.901 | 43.5 | 0.666 | 65 | 0.413 | 57.5 | 0.593 |
| 36. | *Porphyrio porphyrio* | Purple moorhen | 36.5 | 0.715 | 38.5 | 0.589 | 50 | 0.318 | 106.5 | 1.098 |
| 37. | *Gallicrex cinerea* | Watercock | 14.5 | 0.284 | 18 | 0.276 | 15 | 0.095 | 19 | 0.196 |
| ***Charadriiformes (Jacanidae)*** | | | | | | | | | | |
| 38. | *Hydrophasianus chirurgus* | Pheasant-tailed jacana | 61 | 1.194 | 48.5 | 0.742 | 81.5 | 0.518 | 107 | 1.103 |
| 39. | *Metopidius indicus* | Bronze-winged jacana | 67 | 1.312 | 80.5 | 1.232 | 69.5 | 0.441 | 132.5 | 1.366 |
| ***Charadriidae*** | | | | | | | | | | |
| 40. | *Tringa nebularia* | Common greenshank | 0 | 0 | 13.5 | 0.207 | 22 | 0.14 | 4 | 0.041 |
| 41. | *Actitis hypoleucos* | Common sandpiper | 0.5 | 0.01 | 25 | 0.383 | 67 | 0.426 | 21.5 | 0.222 |
| 42. | *Tringa glareola* | Wood sandpiper | 0 | 0 | 9.5 | 0.15 | 14 | 0.089 | 5.5 | 0.057 |
| 43. | *Tringa stagnatilis* | Marsh sandpiper | 0 | 0 | 7 | 0.11 | 7.5 | 0.048 | 4.5 | 0.046 |
| 44. | *Charadrius dubius* | Little ringed plover | 0 | 0 | 12 | 0.184 | 63 | 0.4 | 8.5 | 0.088 |
| 45. | *Charadrius alexandrines* | Kentish plover | 0 | 0 | 2.5 | 0.038 | 2 | 0.013 | 0 | 0 |
| 46. | *Pluvialis fulva* | Pacific golden-plover | 4 | 0.078 | 35 | 0.536 | 74.5 | 0.473 | 4.5 | 0.046 |
| 47. | *Calidris minuta* | little stint | 0 | 0 | 52.5 | 0.804 | 55 | 0.349 | 2 | 0.021 |
| 48. | *Vanellus indicus* | Red-wattled lapwing | 57.5 | 1.126 | 66 | 1.01 | 54.5 | 0.346 | 64 | 0.66 |
| 49. | *Vanellus malabaricus* | Yellow-wattled lapwing | 0 | 0 | 0 | 0 | 1 | 0.006 | 0 | 0 |
| 50. | *Glareola lactea* | Small pratincole | 0 | 0 | 0 | 0 | 114.5 | 0.727 | 89 | 0.917 |
| 51. | *Rostratula benghalensis* | Greater painted-snipe | 0 | 0 | 2 | 0.031 | 1.5 | 0.01 | 1 | 0.01 |
| 52. | *Gallinago gallinago* | Common snipe | 0 | 0 | 1.5 | 0.023 | 6.5 | 0.041 | 0.5 | 0.005 |
| ***Recurvirostridae*** | | | | | | | | | | |
| 53. | *Himantopus Himantopus* | black-winged stilt | 47.5 | 0.93 | 61.5 | 0.941 | 80 | 0.508 | 96.5 | 0.995 |
| ***Laridae*** | | | | | | | | | | |
| 54. | *Larus ridibundus* | Black-headed gull | 0 | 0 | 0 | 0 | 36 | 0.229 | 0 | 0 |
| ***Columbiformes (Columbidae)*** | | | | | | | | | | |
| 55. | *streptopelia senegalensis* | Little brown dove | 168.5 | 3.299 | 196 | 3 | 130.5 | 0.829 | 156.5 | 1.613 |
| 56. | *Streptopelia chinensis* | Spotted dove | 71.5 | 1.4 | 95 | 1.454 | 76.5 | 0.486 | 54.5 | 0.562 |
| 57. | *Treron phoenicoptera* | yellow-legged green-pigeon | 0 | 0 | 10 | 0.153 | 3 | 0.019 | 3.5 | 0.036 |
| 58. | *Streptopelia tranquebarica* | Red collared-dove | 21 | 0.411 | 29.5 | 0.452 | 17.5 | 0.111 | 34 | 0.35 |



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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 59. | *Columba livia* | Blue rock pigeon | 0 | 0 | 2.5 | 0.038 | 1 | 0.006 | 1 | 0.01 |
| ***Pteroclididae*** | | | | | | | | | | |
| 60. | *Pterocles orientalis* | Black-bellied sandgrouse | 4 | 0.078 | 0 | 0 | 1.5 | 0.01 | 1 | 0.01 |
| ***Psittaciformes (Psittacidae)*** | | | | | | | | | | |
| 61. | *Psittacula cyanocephala* | Plum headed parakeet | 12 | 0.235 | 39.5 | 0.605 | 39.5 | 0.251 | 29.5 | 0.304 |
| 62. | *Psittacula krameria* | Rose-ringed parakeet | 0 | 0 | 2.5 | 0.038 | 2 | 0.013 | 3 | 0.031 |
| ***Cuculiformes (Cuculidae)*** | | | | | | | | | | |
| 63. | *Centropus sinensis* | Greater coucal | 20 | 0.392 | 20.5 | 0.314 | 18.5 | 0.117 | 21 | 0.216 |
| 64. | *Eudynamys scolopacea* | Asian koel | 14.5 | 0.284 | 6 | 0.092 | 16.5 | 0.105 | 28 | 0.289 |
| 65. | *Cuculus Micropterus* | Indian cuckoo | 6 | 0.117 | 2.5 | 0.038 | 5 | 0.032 | 2.5 | 0.026 |
| 66. | *Hierococcyx varius* | Brainfever bird | 5.5 | 0.108 | 3 | 0.046 | 9.5 | 0.06 | 17 | 0.175 |
| ***Strigiformes (Strigidae)*** | | | | | | | | | | |
| 67. | *Athene brama* | Spotted owlet | 5.5 | 0.108 | 6.5 | 0.1 | 8.5 | 0.054 | 13.5 | 0.139 |
| ***Coraciiforme (Alcedinidae)*** | | | | | | | | | | |
| 68. | *Halcyon smyrnensis* | White-breasted kingfisher | 26 | 0.509 | 21 | 0.321 | 24.5 | 0.156 | 29 | 0.299 |
| 69. | *Alcedo atthis* | Small Blue kingfisher | 15 | 0.294 | 9.5 | 0.145 | 21.5 | 0.137 | 16 | 0.165 |
| 70. | *Ceryle rudis* | Lesser pied kingfisher | 21.5 | 0.421 | 22.5 | 0.344 | 27 | 0.171 | 30.5 | 0.314 |
| ***Meropidae*** | | | | | | | | | | |
| 71. | *Merops orientalis* | Small bee-eater | 31 | 0.607 | 174.5 | 2.671 | 146 | 0.927 | 54.5 | 0.562 |
| ***Coraciidae*** | | | | | | | | | | |
| 72. | *Coracias benghalensis* | Indian roller | 31.5 | 0.617 | 26 | 0.398 | 27.5 | 0.175 | 28 | 0.289 |
| | Upupidae | | | | | | | | | |
| 73. | *Upupa epops* | Common hoopoe | 10 | 0.196 | 19 | 0.291 | 24.5 | 0.156 | 26 | 0.268 |
| ***Bucerotidae*** | | | | | | | | | | |
| 74. | *Ocyceros birostris* | Indian grey hornbill | 2 | 0.039 | 12 | 0.184 | 27.5 | 0.175 | 4.5 | 0.046 |
| 75. | *Anthracoceros albirostris* | Oriental pied hornbill | 0 | 0 | 1.5 | 0.023 | 3 | 0.019 | 1 | 0.01 |
| ***Piciformes (Capitonidae)*** | | | | | | | | | | |
| 76. | *Megalaima haemacephala* | coppersmith barbet | 24 | 0.47 | 45 | 0.689 | 46 | 0.292 | 39.5 | 0.407 |
| *Picidae* | | | | | | | | | | |
| 77. | *Dendrocopos mahrattensis* | Yellow-fronted pied woodpecker | 4 | 0.078 | 11.5 | 0.176 | 11 | 0.07 | 10 | 0.103 |
| 78. | *Dendrocopos nanus* | Brown-capped pygmy woodpecker | 7 | 0.137 | 7.5 | 0.115 | 7.5 | 0.048 | 5 | 0.052 |
| 79. | *Jynx torquilla* | Eurasian wryneck | 0 | 0 | 0 | 0 | 0.5 | 0.003 | 0 | 0 |
| ***Passeriformes (Alaudidae)*** | | | | | | | | | | |
| 80. | *Eremopterix grisea* | Ashy-crowned sparrow-lark(M) | 14 | 0.274 | 71.5 | 1.095 | 117.5 | 0.746 | 70.5 | 0.727 |
| 81. | *Ammomanes phoenicurus* | Rufous-tailed finch-lark | 24 | 0.47 | 65.5 | 1.003 | 111 | 0.705 | 55.5 | 0.572 |
| 82. | *Calandrella raytal* | Indian short-toed lark | 0 | 0 | 0 | 0 | 0 | 0 | 90 | 0.928 |
| 83. | *Galerida deva* | Sykes's crested lark | 52 | 1.018 | 81.5 | 1.248 | 122 | 0.775 | 119 | 1.226 |
| ***Hirundinidae*** | | | | | | | | | | |



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|---|---|---|---|---|---|---|---|---|---|---|
| *84.* | *Hirundo smithii* | Wire-tailed swallow | 53 | 1.038 | 150.5 | 2.304 | 309.5 | 1.966 | 102.5 | 1.056 |
| *85.* | *Hirundo rustica* | Common swallow | 0 | 0 | 130 | 1.99 | 197 | 1.251 | 46 | 0.474 |
| | **Daniidae** | | | | | | | | | |
| *86.* | *Lanius Schach* | Rufous-backed shrike | 11.5 | 0.225 | 11 | 0.168 | 10.5 | 0.067 | 19 | 0.196 |
| *87.* | *Lanius vittatus* | Bay-backed shrike | 7 | 0.137 | 13 | 0.199 | 13 | 0.083 | 19.5 | 0.201 |
| *88.* | *Lanius cristatus* | brown shrike | 0 | 0 | 10 | 0.153 | 22 | 0.14 | 3.5 | 0.036 |
| *89.* | *Hemipus picatus* | pied flycatcher-shrike | 3.5 | 0.069 | 1 | 0.015 | 1.5 | 0.01 | 2 | 0.021 |
| | **Oriolidae** | | | | | | | | | |
| *90.* | *Oriolus chinensis* | Black-naped oriole | 1 | 0.02 | 20.5 | 0.314 | 20 | 0.127 | 5 | 0.052 |
| *91.* | *Oriolus oriolus* | Eurasian golden oriole | 0 | 0 | 3 | 0.046 | 8.5 | 0.054 | 0.5 | 0.005 |
| | Dicruridae | | | | | | | | | |
| *92.* | *Dicrurus macrocercus* | Black drongo | 92.5 | 1.811 | 106.5 | 1.63 | 115 | 0.73 | 100.5 | 1.036 |
| | ***Sturnidae*** | | | | | | | | | |
| *93.* | *Acridotheres tristis* | Common myna | 232.5 | 4.553 | 223.5 | 3.421 | 265.5 | 1.686 | 365.5 | 3.767 |
| *94* | *Sturnus contra* | Asian Pied starling | 191.5 | 3.75 | 225 | 3.444 | 309.5 | 1.966 | 336 | 3.463 |
| *95* | *Sturnus pagodarum* | brahminy starling | 43.5 | 0.852 | 41.5 | 0.635 | 46 | 0.292 | 50 | 0.515 |
| *96.* | *Sturnus roseus* | rosy starling | 0 | 0 | 0 | 0 | 146.5 | 0.93 | 520 | 5.359 |
| | ***Corvidae*** | | | | | | | | | |
| *97.* | *Corvus splendens* | House crow | 45.5 | 0.891 | 81 | 1.24 | 48 | 0.305 | 57.5 | 0.593 |
| *98.* | *Corvus macrorhynchos* | Jungle crow | 14 | 0.274 | 11.5 | 0.176 | 8 | 0.051 | 11 | 0.113 |
| *99.* | *Dendrocitta vagabunda* | Indian treepie | 3 | 0.059 | 7.5 | 0.115 | 4.5 | 0.029 | 14 | 0.144 |
| | ***Campephagidae*** | | | | | | | | | |
| *100* | *Pericrocotus cinnamomeus* | Small minivet | 0 | 0 | 7 | 0.107 | 14.5 | 0.092 | 1.5 | 0.015 |
| | Irenidae | | | | | | | | | |
| *101* | *Aegithina tiphia* | Common iora | 0 | 0 | 8.5 | 0.13 | 9.5 | 0.06 | 3 | 0.031 |
| | Pycnonotidae | | | | | | | | | |
| *102* | *Pycnonotus cafer* | Red-vented bulbul | 148.5 | 2.908 | 130.5 | 1.998 | 90 | 0.572 | 138.5 | 1.427 |
| *103.* | *Pycnonotus luteolus* | White-browed bulbul | 0 | 0 | 2.5 | 0.038 | 2.5 | 0.016 | 0.5 | 0.005 |
| | ***Muscicapidae*** | | | | | | | | | |
| *104* | *terpsiphone paradisi* | Asian paradise-flycatcher | 0.5 | 0.01 | 2.5 | 0.038 | 1 | 0.006 | 2 | 0.021 |
| *105* | *Ficedula parva* | Red-throated flycatcher | 0 | 0 | 0 | 0 | 19.5 | 0.124 | 15 | 0.155 |
| *106* | *Copsychus saularis* | Oriental magpie-robin | 32.5 | 0.636 | 35 | 0.536 | 49.5 | 0.314 | 46 | 0.474 |
| *107* | *Saxicola caprata* | Pied Bushchat | 26 | 0.509 | 36.5 | 0.559 | 44 | 0.279 | 34 | 0.35 |
| *108* | *Saxicola torquate* | Common stonechat | 0 | 0 | 7 | 0.107 | 11.5 | 0.073 | 2 | 0.021 |
| *109* | *Turdoides striatus* | Jungle babbler | 125 | 2.448 | 160 | 2.449 | 122 | 0.775 | 93 | 0.958 |



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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *110* | *Turdoides malcolmi* | Large grey babbler | 0 | 0 | 0 | 0 | 18.5 | 0.117 | 3 | 0.031 |
| *111* | *Chrysomma sinense* | Yellow-eyed babbler | 0 | 0 | 0 | 0 | 1.5 | 0.01 | 0 | 0 |
| *112* | *Turdoides caudatus* | Common babbler | 25.5 | 0.499 | 33.5 | 0.513 | 23.5 | 0.149 | 30.5 | 0.314 |
| *113* | *Hippolais caligata* | Booted warbler/ | 11 | 0.215 | 69.5 | 1.064 | 44 | 0.279 | 3 | 0.031 |
| *114* | *Acrocephalus dumetorum* | Blyth's reed-warbler | 0 | 0 | 10.5 | 0.161 | 46 | 0.292 | 11 | 0.113 |
| *115* | *Sylvia hortensis* | Orphean warbler | 0 | 0 | 0 | 0 | 13 | 0.083 | 12 | 0.124 |
| *116* | *Phylloscopus trochiloides* | Greenish leaf-warbler | 0 | 0 | 2.5 | 0.038 | 19 | 0.121 | 15.5 | 0.16 |
| *117* | *Cisticola juncidis* | Streated fantail-warbler | 61 | 1.194 | 140.5 | 2.151 | 148 | 0.94 | 111.5 | 1.149 |
| *118* | *Prinia sylvatica* | Jungle prinia | 29 | 0.568 | 39 | 0.597 | 23 | 0.146 | 15 | 0.155 |
| *119* | *Prinia inornate* | Plain prinia | 17 | 0.333 | 30 | 0.459 | 18.5 | 0.117 | 12 | 0.124 |
| *120* | *Prinia socialis* | Ashy prinia | 14 | 0.274 | 28.5 | 0.436 | 18 | 0.114 | 15 | 0.155 |
| *121* | *Prinia gracilis* | Graceful prinia | 2 | 0.039 | 3 | 0.046 | 2.5 | 0.016 | 2.5 | 0.026 |
| *122* | *Orthotomus sutorius* | Common tailorbird | 2.5 | 0.049 | 5 | 0.077 | 4.5 | 0.029 | 2 | 0.021 |
| | | ***Motacillidae*** | | | | | | | | |
| *123* | *Saxicoloides fulicata* | Indian robin | 50.5 | 0.989 | 47.5 | 0.727 | 45.5 | 0.289 | 49 | 0.505 |
| *124* | *Anthus rufulus* | Paddyfield pipit | 70 | 1.371 | 106.5 | 1.63 | 129 | 0.819 | 116.5 | 1.201 |
| *125* | *Dendronanthus indicus* | Forest wagtail | 0 | 0 | 0 | 0 | 1 | 0.006 | 0 | 0 |
| *126* | *Motacilla alba* | White wagtail | 0.5 | 0.01 | 38.5 | 0.589 | 47.5 | 0.302 | 5.5 | 0.057 |
| *127* | *Motacilla maderaspatensis* | Large pied wagtail | 26.5 | 0.519 | 41.5 | 0.635 | 33 | 0.21 | 17.5 | 0.18 |
| *128* | *Motacilla flava* | Yellow wagtail | 0 | 0 | 25.5 | 0.39 | 35 | 0.222 | 3 | 0.031 |
| | Nectariniidae | | | | | | | | | |
| *129* | *Nectarinia asiatica* | Purple Sunbird | 22.5 | 0.441 | 36 | 0.551 | 47.5 | 0.302 | 32.5 | 0.335 |
| *130* | *Nectarinia zeylonica* | Purple-rumped sunbird | 8 | 0.157 | 11 | 0.168 | 11 | 0.07 | 11 | 0.113 |
| | | ***Ploceidae*** | | | | | | | | |
| *131* | *Lonchura malabarica* | White-throated munia | 170.5 | 3.339 | 211 | 3.23 | 249.5 | 1.585 | 282 | 2.906 |
| *132* | *Amandava amandava* | Red munia/Red Avadavat | 132.5 | 2.594 | 125 | 1.914 | 119.5 | 0.759 | 226.5 | 2.334 |
| *133* | *Lonchura malacca* | Black-headed munia | 123 | 2.408 | 125 | 1.914 | 109.5 | 0.695 | 70.5 | 0.727 |
| *134* | *Lonchura punctulate* | Spotted munia | 146.5 | 2.869 | 119.5 | 1.829 | 154 | 0.978 | 920.5 | 9.487 |
| *135* | *Ploceus philippinus* | Baya weaver | 457 | 8.949 | 52.5 | 0.804 | 30.5 | 0.194 | 153 | 1.577 |
| *136* | *Phoenicurus ochruros* | Black redstart | 0 | 0 | 46 | 0.704 | 61 | 0.387 | 7 | 0.072 |
| *137* | *Luscinia svecica* | Bluethroat | 0.5 | 0.01 | 16 | 0.245 | 39.5 | 0.251 | 4 | 0.041 |
| *138* | *Petronia xanthocollis* | Yellow-throated sparrow | 8.5 | 0.166 | 8 | 0.122 | 11.5 | 0.073 | 3 | 0.031 |
| *139* | *Passer domesticus* | House sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0.031 |
| | | ***Emberizidae*** | | | | | | | | |
| *140* | *Melophus lathami* | crested bunting | 2.5 | 0.049 | 1.5 | 0.023 | 2 | 0.013 | 1 | 0.01 |
| | | | **5107** | **100** | **6533** | **100** | **15746** | **100** | **9703** | **100** |



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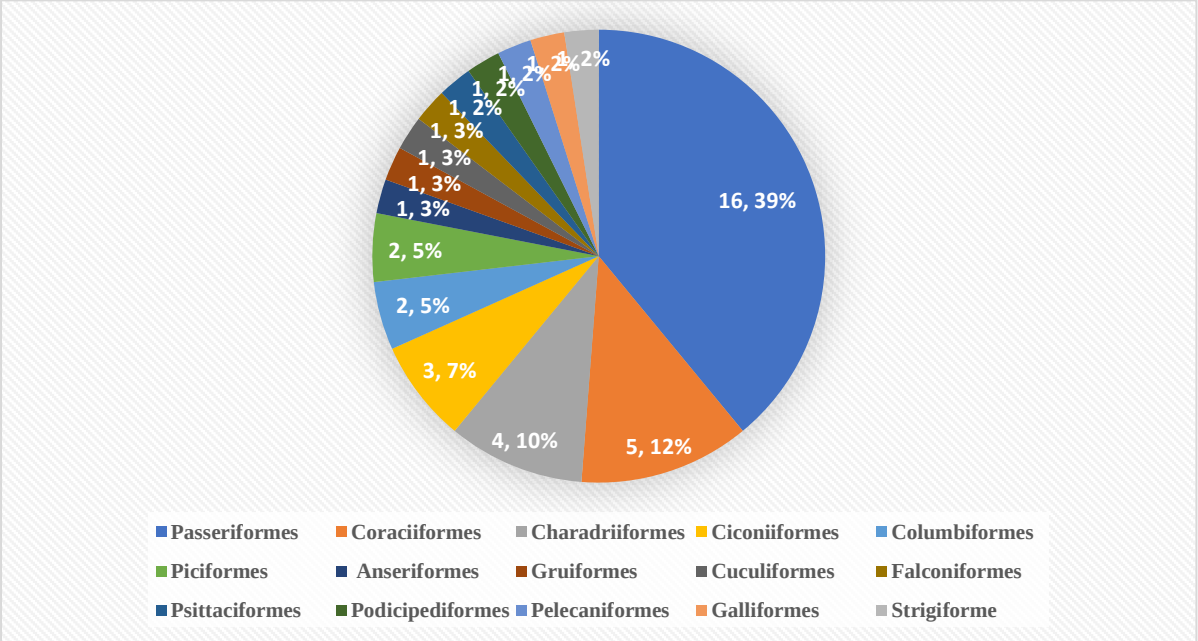


**Fig 2 Number of species recorded from different orders**

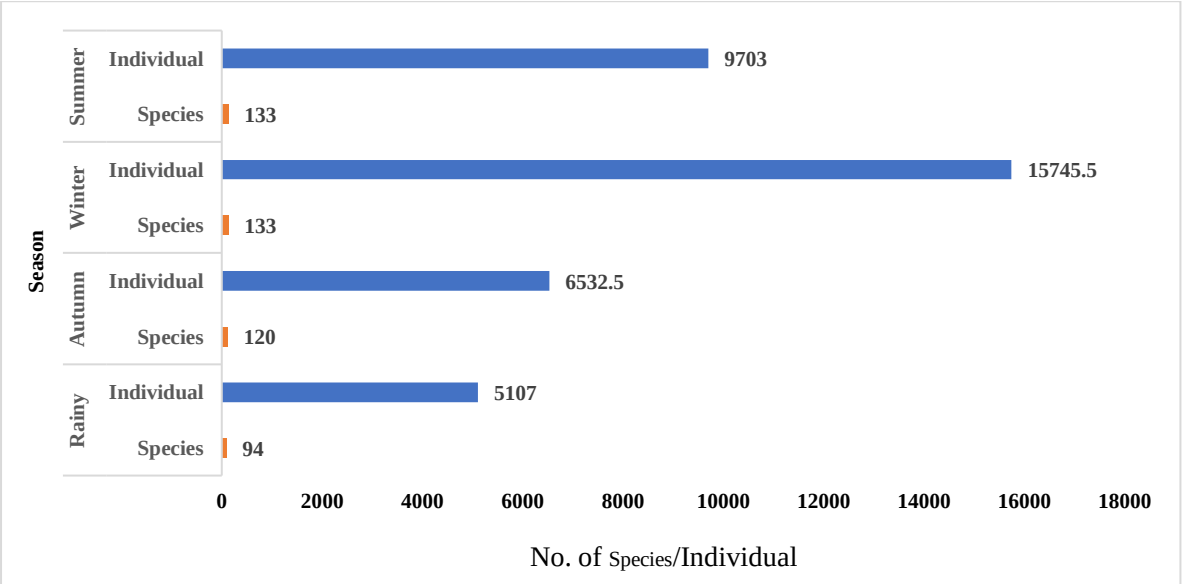


**Fig 3 No. of bird species and individuals recorded during various season**



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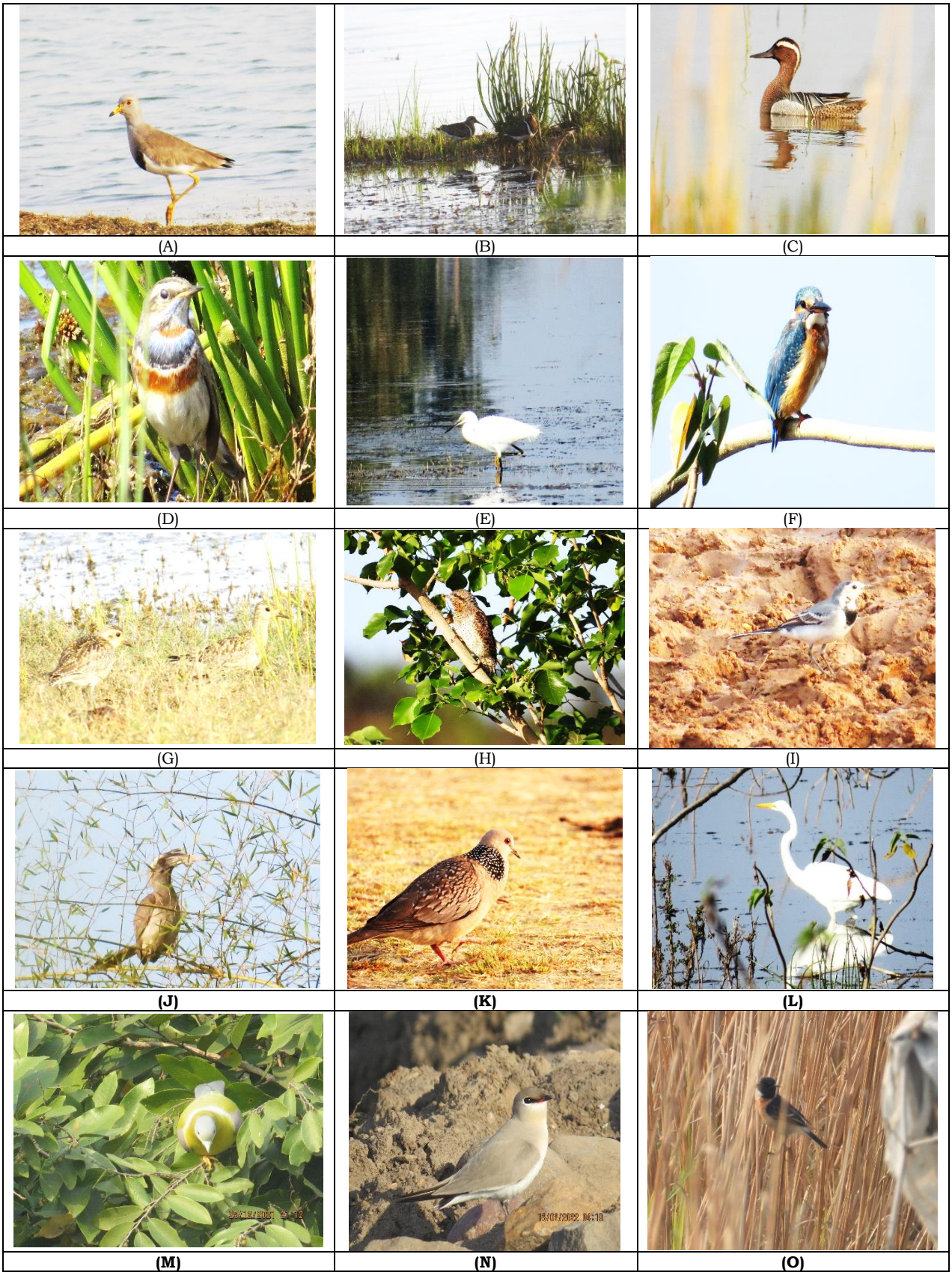

**A)** *Vanellus malabaricus* (Yellow-wattled lapwing), **(B)** *Rostratula benghalensis* (Greater painted-snipe), **(C)** *Anas querquedula* (Garganey), **(D)** *Luscinia svecica* (Bluethroat), **(E)** *Egretta garzetta* (Little egret), **(F)** *Alcedo atthis* (Small Blue kingfisher), **(G)** *Pluvialis fulva* (Pacific golden-plover), **(H)** *Jynx torquilla* (Eurasian wryneck), **(I)** *Motacilla alba* (White wagtail), **(J)** *Anthracoceros albirostris* (Oriental pied hornbill), **(K)** *Streptopelia chinensis* (Spotted dove), **(L)** *Casmerodius albus* (Large egret), **(M)** *Treron phoenicoptera* (yellow-legged green-pigeon) **)** *Glareola lacteal* (Small pratincole), **(O)** *Saxicola torquate* (Common stonechat)



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