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FROM SPARROW TO EAGLE: AN IN-DEPTH ANALYSIS OF AVIFAUNA AT RIE BHOPAL CAMPUS

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Abstract: Birds are the indicator of a healthy ecosystem. Any ecosystem that houses diverse birds is sustainable, balanced and healthy. This concept ignited a curiosity to find out about our ecosystem through birds. In this order, authors embarked on a nine-month-long study, spanning from August 2022 to April 2023, to meticulously monitor the avian population within the campus of Regional Institute of Education (RIE), Bhopal, India. Throughout this duration, authors witnessed a captivating array of birds, including both resident and migratory species. The cumulative tally unveiled an impressive count of 67 distinct bird species. These findings led us to the resolute conclusion that the RIE Bhopal campus is endowed with remarkable richness and diversity. To uphold this magnificence, it becomes imperative to implement sustainable measures for its preservation and conservation.

Keywords: Avifauna, Biodiversity, Eagle, Migratory birds, Residential birds, Urban green spaces.

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INTRODUCTION

The human species possesses the highest level of cranial capacity among all animals, indicating exceptional cognitive efficiency. Harnessing this intellectual prowess, humans have delved into the depths of their existence, seeking to unravel the underlying causes and purposes of their being. Nevertheless, despite acquiring a perfect extensive knowledge about its own existence and the surrounding world, humanity has regrettably grown indifferent to the intricate interconnections that form its immediate ecosystem. This interconnected web, which comprises the surrounding environment, has become overshadowed and undervalued in the pursuit of understanding the broader aspects of existence. Balanced ecosystem and sustainable development are the two aspects for the rich biodiversity that in turn responsible for the survival and existence of all living organisms including humans (Ashok, 2017; Verma, 2018).

College campuses provide a valuable opportunity to investigate the diversity of bird species within urban ecosystems. These dynamic environments often comprise a mix of habitats, such as buildings, trees, lawns, and gardens, which collectively support a wide array of bird species. The examination of avian fauna in urban regions holds utmost significance as it offers insights into the adaptability of wildlife amidst evolving urban landscapes (Jain *et al.,* 2005). This research highlights both the resilience of bird species in urban environments and the potential challenges they face, emphasizing the importance of safeguarding their survival in such settings. For the preservation and administration of urban ecosystems, it is crucial to comprehend the variety and distribution of birds on college campuses (Narvey *et al.,* 2021). Despite the increasing urbanization of cities worldwide, citified green spaces such as RIE campus remain significant habitats for wildlife, including birds. The birds are the masters of air having bipedal locomotion (Verma and Prakash, 2020a). Excessive anthropogenic activities, pollution and electronic wastes are badly affecting the biodiversity including birds (Verma and Prakash, 2020b; Prakash and Verma, 2022). Bird watching allows humans to experience aesthetic and recreational satisfaction as they observe these magnificent creatures in their natural habitats. Some birds act like eternal symbol of marital fidelity (Prakash and Ashok, 2016).

A number of researchers including Aggarwal *et al.* (2015), Kumar *et al.* (2021), Rather *et al.* (2022), Sharma and Kirar (2023) and so on did a lot on diversity of birds in different parts of India but RIE campus Bhopal is still not well explored. Although, Regional Institute of Education (RIE) Campus in Bhopal, Madhya Pradesh, is a beautiful space for education and nature lovers, particularly bird enthusiasts. The campus is home to a diverse range of avian fauna, both resident and migratory, adding to the natural charm of the campus and providing an opportunity for students, faculty, and visitors to witness and appreciate the avian world. From the majestic Indian Peafowl to the charming Red-vented Bulbul and from the striking Golden Oriole to the cute Asian Green Bee-eater, the campus offers a rich diversity of birdlife. The RIE campus is a significant urban green space comprising natural and artificial habitats. However, the lack of knowledge on the diverseness and distribution of birds in this region hinders efforts to conserve the avian fauna. This study aims to identify and catalogue the bird species found on the RIE campus.

MATERIALS AND METHODS

Time-span

The study on avian fauna in RIE Campus Bhopal was conducted for nine months, between August 2022 and April 2023.

Research Methods

Direct observation of birds on the campus was carried out by a team of experienced bird watchers and a photographer. Tools used for observations are CASON Professional prism binocular telescope with 8x40 HD folding lens and 8x zooming power for spotting and identification, and Nikon D750 24-120mm lens, Canon 5D Mark 4 70-200 mm lens, and Canon EOS M50 Mark 2 15-45 mm lens cameras for photography. The birds were identified using the field guides such as Ali and Ripley (1996) and Grimmett *et al.* (2016) and call recording was done by mobile applications. The field of study

Fig. 1a: Map showing Bhopal city in Madhya Pradesh state of India.

Fig. 1b: Map showing R.I.E. campus in Bhopal district.

was regularly surveyed by systematic walking on defined paths. The observation was carried out from 6:00 to 9:00 morning hours and from 4:00 to 6:00 evening hrs. However, birds spotted at other times were also recorded. Manakadan and Pittie (2001) were followed for nomenclature and Gill *et al.* (2023) for taxonomic arrangement. Keeping in mind the birds' high sensitivity towards anthropogenic activity, birding ethics were followed such as maintaining a safe distance. Observations were confirmed with the help of Avibase bird count and eBird (eBird 2021; Lepage, 2023). The birds were also classified as frugivores, carnivores, insectivores, granivores, omnivores, and nectarivores, based on their feeding habits. The study also involved the classification of birds on the basis of feeding habits, identification of bird habitats within the campus, and an assessment of their importance for avian fauna, through field observations and analysis of satellite imagery.

Area Search

The study on avian fauna was conducted at the Regional Institute of Education (RIE), (23°14'13.326"N 77°22'59.4768"E) campus in Bhopal, Madhya Pradesh, India. The campus covers an area of approximately 102 acres (41.2779 ha) with an average elevation of 590 m meters (1935.7 ft). Situated on picturesque

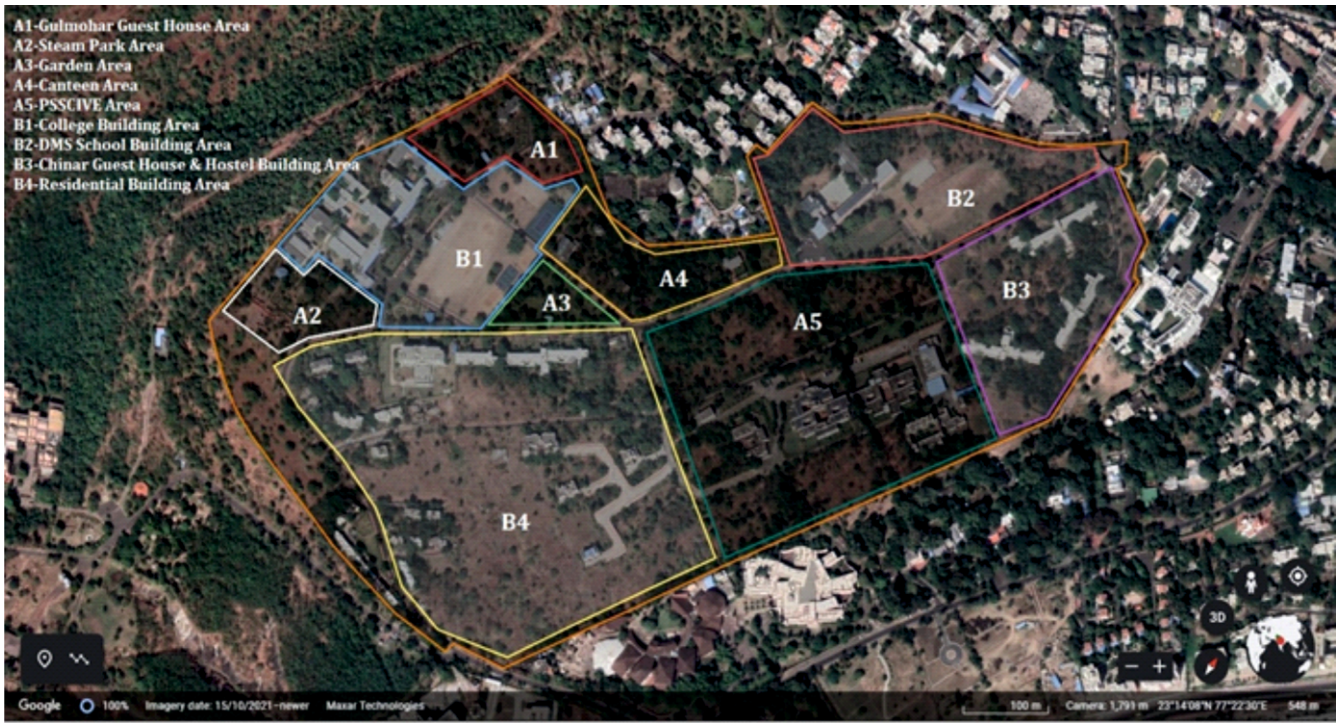

Fig. 1c: Map showing 9 sighting area patches in R.I.E. campus: A1 (Gulmohar Guest House Area), A2 (Steam Park Area), A3 (Garden Area), A4 (Canteen Area), A5 (PSSCIVE Area), B1 (College Building Area), B2 (DMS School Building Area, B3 (Chinar Guest House and Hostel Building Area) and B4 (Residential Building Area).

hillock-Shyamla Hills, RIE Bhopal has hilly terrain. The campus houses admirable gardens with a variety of floral and faunal diversity. The substantial vegetation includes grasslands, open scrub forests, dry deciduous forests, and bamboo groves. The trees include *Butea monosperma, Bombax ceiba, Pithecellobium dulce, Eucalyptus tereticorni, Terminalia tomentosa, Lagerstroemia parviflora, Cassia fistula, Leucaena leucocephala* etc. Due to the diverse fauna, the whole campus was covered for the study. The study was conducted in 9 patches transects covering an area of 41.2 hectare campus (Fig. 1a). According to general landscape attributes and vegetation, these patches, as illustrated in Fig. 1b, were divided into two habitats:

(i) Undisturbed areas consist of A1, A2, A3, A4, and A5 have open scrub comprising mainly grasslands *of Lagerstroemia parviflora, Ailanthus excelsa,* and scarce vegetation of *Leucaena leucocephala, Bombax ceiba* , etc.

(ii) Built-up areas consist of B1, B2, B3, and B4 have dry deciduous comprising grass species, *Hardwickia binata,* scrubs, *Jatropha curcas, Azadirachta indica, Terminalia tomentosa* etc.

The details about transects and habitats into which the campus was divided are given in (Fig. 1c). These habitats are structured by different levels of human disturbance varying from activities like renovation and maintenance, human settlements and the presence of dogs.

RESULTS AND DISCUSSION

The study on avian fauna in RIE Campus, Bhopal, recorded 67 species of birds belonging to 16 orders and 41 families (Fig. 6; Table 1). Passeriformes and Columbiformes were the most abundant orders observed, comprising 35 and 4 species, respectively. Figure 4 illustrates the distribution of orders observed on the RIE campus Bhopal, including Ciconiiformes, Acciptriforms, Coraciiformes, Piciformes, and Psittaciformes. The most common species observed here were the Red-Vented Bulbul (*Pycnonotus cafer)*, Laughing Dove (*Spilopelia chinensis*), Rock Pigeon *Columba livia*, Black Drongo (*Copsychus fulicatus*), Rose-ringed parakeet (*Psittacula krameri)* and Jungle Babbler (*Turdoides striata*).

Birds' categorization into dominant and rare categories showed that, out of 67 species in the present study, only the Egyptian Vulture belongs to the endangered category according to the IUCN Red List (IUCN, 2022). According to the Indian Wildlife (Protection) Act, 1972, most species come under Schedule II except 4 species, the Egyptian Vulture, Black Eagle, Shikra and Indian Peafowl, included in Schedule I.

Based on the feeding guild, 30% of the birds belong to omnivores, 30% to insectivores, 24% to carnivores, 9% to granivores, 4% to frugivores, and 3% to nectarivorous (Fig. 2). However, the feeding guild of one or more species may overlap with other species. According to the distribution

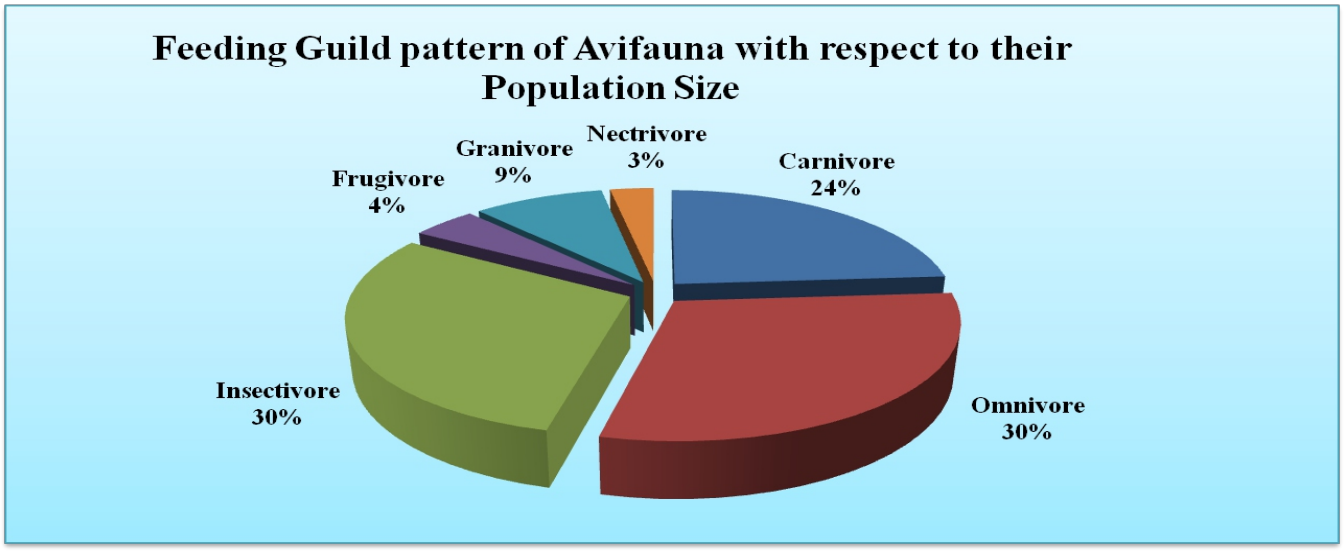

Fig. 2: Graphical representation of feeding guild of documented birds.
(Some birds may belong to more than one feeding guild, as they may have a varied diet)

of areas (Fig. 3), the undisturbed area recorded the highest diversity leading from A4 (13 orders), A5 (12 orders), A1 (11 orders), A2 (10 orders), to A3(15 orders). The built-up areas demonstrated 11 orders in B1, followed by 5 orders in B2, 7 in B3, and 8 in B4. Figure 5 illustrates the sighting of all the orders in areas A1 to B4.

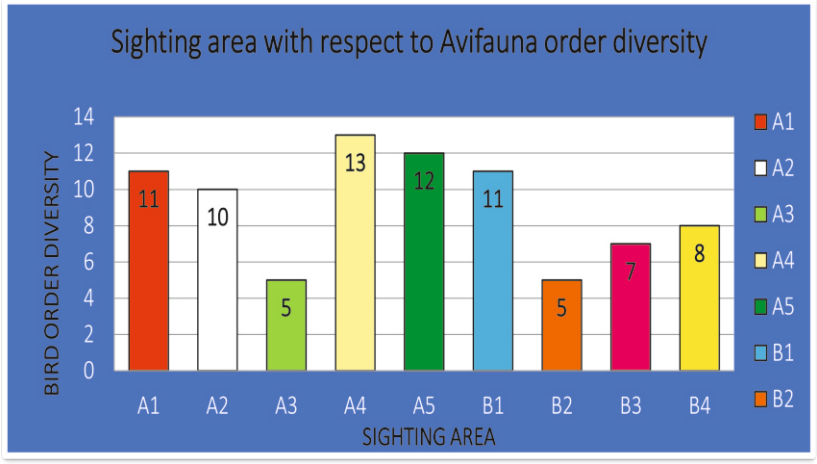

Fig. 3: Graph representing the area wise bird diversity in the institute campus.

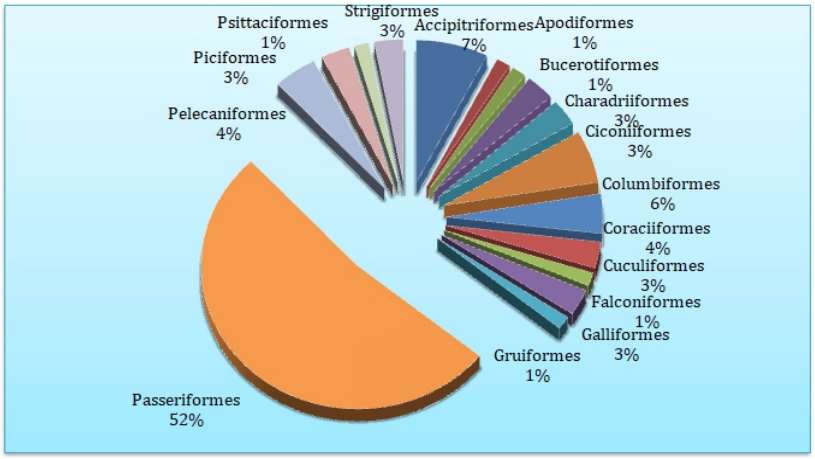

Fig. 4: Percentage prevalence of respective orders.

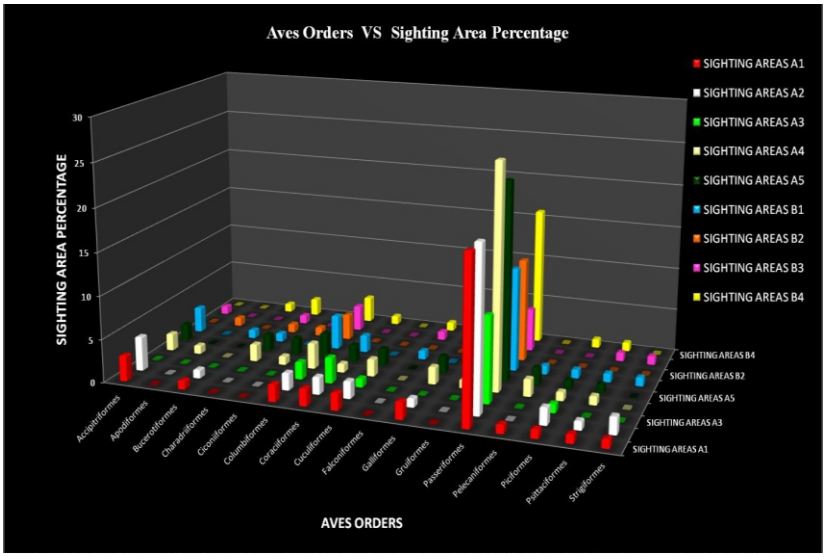

Fig. 5: Graph representing the area-wise prevalence of all documented orders.

Fig. 6: Glimpses of the birds spotted in the institute campus.
A- *Copsychus saularis;* B-*Zosterops palpebrosus;* C-*Ficedula superciliaris;* D-*Sturnia pagodarum;* E-*Saxicoloides fulicata;* F-*Sylvia curruca;* G-*Gracupica contra;* H-*Cyornis tickelliae;* I-*Merops orientalis;* J-*Ficedula parva;* K-*Spilopelia senegalensis;* L-*Psittacula krameri;* M-*Euodice malabarica;* N-*Oriolus kundoo;* O-*Phoenicurus ochruros;* P-*Oenanthe fusca;* Q-*Ocyceros birostris;* R-*Pycnonotus cafér;* S-*Psilopogon haemacephalus;* T-*Cinnyris asiaticus;* U-*Eudynamys scolopaceus;* V-*Ardea intermedia;* W-*Phylloscopus collybita;* X-*Apus affinis.*

Table 1: Checklist of bird species observed from August 2022 to April 2023, with reference to their Feeding guild, Endemicity and Migratory status.

S. No.	Common Name	Scientific Name	Family	Order	WLPA status	Endemicity	Status	Feeding guild
1.	Egyptian Vulture	*Neophron percnopterus* (Linnaeus, 1758)	Accipitridae	Accipitriformes	S I	NE	R	C
2.	Black Eagle	*Ictinaetus malaiensis* (Temminck, 1822)	Accipitridae	Accipitriformes	S I	NE	R	C
3.	Shikra	*Accipiter badius* (Gmelin, 1788)	Accipitridae	Accipitriformes	S I	NE	R	C
4.	Black-Shouldered Kite	*Elanus caeruleus* (Vieillot, 1816)	Accipitridae	Accipitriformes	S II	NE	R	C
5.	Black Kite	*Milvus migrans* (Boddaert, 1783)	Accipitridae	Accipitriformes	S II	NE	R	C
6.	Little Swift or Indian House Swift	*Apus affinis* (J.E. Gray, 1830)	Apodidae	Apodiformes	S II	NE	R	I
7.	Indian Grey Hornbill	*Ocyceros birostris* (Scopoli, 1786)	Bucerotidae	Bucerotiformes	S II	SA	R	O
8.	Red-Wattled Lapwing	*Vanellus indicus* (Boddaert, 1783)	Charadriidae	Charadriiformes	S II	NE	R	O
9.	Yellow Wattled Lapwing	*Vanellus malabaricus* (Boddaert, 1783)	Charadriidae	Charadriiformes	S II	SA	R	O
10.	Indian Pond Heron	*Ardeola grayii* (Sykes, 1832)	Ardeidae	Ciconiiformes	S II	NE	R	C
11.	Yellow Bittern	*Ixobrychus sinensis* (Gmelin, 1789)	Ardeidae	Ciconiiformes	S II	NE	R	C
12.	Yellow Footed Green Pigeon	*Treron phoenicoptera* (Linnaeus, 1766)	Columbidae	Columbiformes	S II	NE	R	F
13.	Rock Pigeon	*Columba livia* (Gmelin, 1789)	Columbidae	Columbiformes	S IV	NE	R	G
14.	Spotted Dove	*Spilopelia chinensis* (Scopoli, 1768)	Columbidae	Columbiformes	S II	NE	R	G
15.	Laughing Dove	*Spilopelia senegalensis* (Linnaeus, 1766)	Columbidae	Columbiformes	S II	NE	R	G
16.	White Throated Kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)	Alcedinidae	Coraciiformes	S II	NE	R	C
17.	Indian Roller	*Coracias benghalensis* (Linnaeus, 1758)	Coraciidae	Coraciiformes	S II	NE	R	C
18.	Asian Green Bee Eater	*Merops orientalis* (Latham, 1802)	Meropidae	Coraciiformes	S II	NE	R	I
19.	Greater Coucal	*Centropus sinensis* (Stephens, 1815)	Cuculidae	Cuculiformes	S II	NE	R	O
20.	Asian Koel	*Eudynamys scolopaceus* (Linnaeus, 1758)	Cuculidae	Cuculiformes	S II	NE	R	O
21.	Peregrine Falcon	*Falco peregrines* (Linnaeus, 1771)	Falconidae	Falconiformes	S I	NE	R	C
22.	Gray Francolin	*Francolinus pondicerianus* (Gmelin, 1789)	Phasianidae	Galliformes	S II	NE	R	O
23.	Indian Peafowl	*Pavo cristatus* (Linnaeus, 1758)	Phasianidae	Galliformes	S I	SA	R	O
24	White-Breasted Waterhen	*Amaurornis phoenicurus* (Pennant, 1769)	Rallidae	Gruiformes	S II	NE	R	O

25.	Booted Warbler	*Iduna caligata* (Blanford, 1871)	Acrocephalidae	Passeriformes	S II	NE	M	I
26.	Common Iora	*Aegithina tiphia* (Linnaeus, 1758)	Aegithinidae	Passeriformes	S II	NE	R	I
27.	Indian Spotted Creeper	*Salpornis spilonotus* (Sykes, 1832)	Certhiidae	Passeriformes	S II	SA / I / CI	R	I
28.	Ashy Prinia	*Prinia socialis* (Sykes, 1832)	Cisticolidae	Passeriformes	S II	SA	R	I
29.	Plain Prinia	*Prinia inornata* (Sykes, 1832)	Cisticolidae	Passeriformes	S II	NE	R	I
30.	Large-Billed Crow	*Corvus macrorhynchos* (Wagler, 1827)	Corvidae	Passeriformes	S II	NE	R	O
31.	Rufous Treepie	*Dendrocitta vagabunda* (Latham, 1790)	Corvidae	Passeriformes	S II	NE	R	O
32.	Thick-Billed Flowerpecker	*Dicaeum agile* (Tickell, 1833)	Dicaeidae	Passeriformes	S II	NE	R	N
33.	Ashy Drongo	*Dicrurus leucophaeus* (Vieillot, 1817)	Dicruridae	Passeriformes	S II	NE	LM	I
34.	Black Drongo	*Dicrurus macrocercus* (Vieillot, 1817)	Dicruridae	Passeriformes	S II	NE	R	I
35.	White Bellied Drongo	*Dicrurus caerulescens* (Daudin, 1800)	Dicruridae	Passeriformes	S II	SA	R	I
36.	Indian Silverbill	*Euodice malabarica* (Linnaeus, 1766)	Estrildidae	Passeriformes	S II	NE	R	G
37.	Scaly Breasted Munia	*Lonchura punctulata* (Linnaeus, 1758)	Estrildidae	Passeriformes	S II	NE	R	G
38.	Dusky Crag Martin	*Ptyonoprogne concolor* (Blyth, 1845)	Hirundinidae	Passeriformes	S II	NE	R	I
39.	Indian Golden Oriole	*Oriolus kundoo* (Sykes, 1832)	Icteridae	Passeriformes	S II	NE	LM	F
40.	Brown Shrike	*Lanius cristatus* (Linnaeus, 1758)	Laniidae	Passeriformes	S II	NE	M	C
41.	Jungle Babbler	*Turdoides striata* (Dumont, 1823)	Leiothrichidae	Passeriformes	S II	SA	R	O
42.	White Browed Wagtail	*Motacilla maderaspatensis* (Gmelin, 1789)	Motacillidae	Passeriformes	S II	NE	R	I
43.	Tickell'S Blue Flycatcher	*Cyornis tickelliae* (Jerdon, 1845)	Muscicapidae	Passeriformes	S II	SA	R	I
44.	Ultramarine Flycatcher	*Ficedula superciliaris* (Blyth, 1843)	Muscicapidae	Passeriformes	S II	NE	LM	I
45.	Red-Breasted Flycatcher	*Ficedula parva* (Bechstein, 1792)	Muscicapidae	Passeriformes	S II	NE	M	I
46.	Black Redstart	*Phoenicurus ochruros* (Gmelin, 1774)	Muscicapidae	Passeriformes	S II	NE	LM	I
47.	Brown Rock Chat	*Oenanthe fusca* (Boddaert, 1783)	Muscicapidae	Passeriformes	S II	NE	R	O
48.	Oriental Magpie Robin	*Copsychus saularis* (Linnaeus, 1758)	Muscicapidae	Passeriformes	S II	NE	R	I
49.	Indian Robin	*Saxicoloides fulicata* (Linnaeus, 1758)	Muscicapidae	Passeriformes	S II	SA	R	O
50.	Purple Sunbird	*Cinnyris asiaticus* (Latham, 1790)	Nectariniidae	Passeriformes	S II	NE	R	N
51.	Cinereous Tit or Great Tit	*Parus cinereus* (Vieillot, 1818)	Paridae	Passeriformes	S II	NE	R	I

52.	House Sparrow	*Passer domesticus* (Linnaeus, 1758)	Passeridae	Passeriformes	S II	NE	R	G
53.	Red-Vented Bulbul	*Pycnonotus cafer* (Linnaeus, 1766)	Pycnonotidae	Passeriformes	S II	NE	R	O
54.	Common Chiffchaff	*Phylloscopus collybita* (Vieillot, 1817)	Phylloscopidae	Passeriformes	S II	NE	M	I
55.	Brahminy Starling	*Sturnia pagodarum* (Gmelin, 1789)	Sturnidae	Passeriformes	S II	NE	R	O
56.	Common Myna	*Acridotheres tristis* (Linnaeus, 1766)	Sturnidae	Passeriformes	S II	NE	R	O
57.	Indian Pied Starling or Asian Pied Starling	*Gracupica contra* (Linnaeus, 1758)	Sturnidae	Passeriformes	S II	NE	R	O
58.	Lesser Whitethroat	*Sylvia curruca* (Linnaeus, 1758)	Sylviidae	Passeriformes	S II	NE	M	I
59.	Indian White Eye or Oriental White Eye	*Zosterops palpebrosus* (Temminck, 1826)	Zosteropidae	Passeriformes	S II	NE	R	O
60.	Little Cormorant	*Microcarbo niger* (Vieillot, 1817)	Phalacrocoracidae	Pelecaniformes	S II	NE	R	C
61.	Great Egret	*Ardea alba* (Linnaeus, 1758)	Ardeidae	Pelecaniformes	S II	NE	R	C
62.	Intermediate Egret	*Ardea intermedia* (Wagler, 1829)	Ardeidae	Pelecaniformes	S II	NE	R	C
63.	Black Rumped Flameback or Lesser Goldenback	*Dinopium benghalense* (Linnaeus, 1766)	Picidae	Piciformes	S II	SA	R	O
64.	Coppersmith Barbet	*Psilopogon haemacephalus* (Linnaeus, 1766)	Capitonidae	Piciformes	S II	NE	R	O
65.	Rose-Ringed Parakeet	*Psittacula krameri* (Scopoli, 1769)	Psittacidae	Psittaciformes	S II	NE	R	F
66.	Indian Scops Owl	*Otus bakkamoena* (Pennant, 1769)	Strigidae	Strigiformes	S II	SA	R	C
67.	Spotted Owlet	*Athene brama* (Temminck, 1821)	Strigidae	Strigiformes	S II	SA / I	R	C

Abbreviations: EN-Endangered; S l–Scheduled 1**; S ll- Scheduled 2; S lV-Scheduled 4; NE-Non Endemic; SA- South Asia; I-India; CI-Central India; R-Resident; LM-Local Migratory; M-Migratory; C-Carnivore; O-Omnivore; I-Insectivore; F-Frugivore; G-Granivore; N-Nectrivore.

**Scheduled 1 means Endangered Species, granted protection from poaching, killing, trading etc.; Scheduled 2 means high protection with the prohibition on their trade; Scheduled 4 means Not Endangered but protected from hunting.

The RIE Campus provides a suitable habitat for a diverse range of bird species due to its location in the heart of Bhopal city, a mix of natural and artificial features such as trees, shrubs, water bodies and buildings. The presence of these habitats has resulted in the availability of food and nesting sites for various bird species. Additionally, the campus is situated on the migratory route of several bird species, allowing for sightings of rare and exotic birds during certain times of the year.

The dominance of Passeriformes and Columbiformes in the study is not surprising, as these two orders adapt well to urban environments due to their ability to utilize simulated structures and vegetation for nesting and foraging. The high number of Laughing Dove and Rock Pigeons observed in the study indicates their success in urban areas worldwide and their adaptability to human settlements. The Jungle Babbler, another commonly observed species in RIE Campus, is a resident bird known for its distinctive territorial calls and aggressive behavior towards other birds. Red-vented bulbul, one of the passeriform, is also found abundantly on the campus. Overall, the study on avian fauna in RIE Campus Bhopal

provides valuable insights into the distribution, diversity and abundance of bird species in urban environments. The study's findings have following significance:

1. **Conservation of urban green spaces:** It is important to note that while RIE Campus provides a suitable habitat for several bird species, the increasing urbanization and over anthropogenic activities and pollution in the surrounding areas could threaten their survival. Therefore, the study highlights the importance of preserving green spaces within urban environments by planting of native plants and the creation of bird-friendly habitats, such as nests and bird feeders, to go a long way in preserving the avian fauna of RIE Campus and other urban areas.

2. **Importance of migratory bird species:** One notable aspect of the study is the sighting of migratory birds within the RIE Campus, indicating the presence of their suitable habitats. The study emphasizes the significance of maintaining habitats that support migratory bird species, as these birds play a critical role in maintaining ecological balance and indicate healthy ecosystems (Vyas and Veerwal, 2014).

3. **Contribution to environmental education:** The study contributes to environmental education by raising awareness about the importance of urban wildlife conservation. Authors suggest this study as an educational tool for the public about the significance of green spaces within urban environments and their role in supporting avian fauna and biodiversity (Aryaa and Kumar, 2023).

4. **Potential for creating bird-friendly habitats:** The study's findings can contribute to developing strategies for creating bird-friendly habitats within urban environments. The study highlights the importance of creating habitats that support a diverse range of bird species and can serve as a model for creating sustainable urban environments that support wildlife and biodiversity.

CONCLUSION

In a nutshell, this exploration provides a comprehensive record of avian diversity within the Regional Institute of Education campus in Bhopal, Madhya Pradesh, and identifies a total of 67 bird species, belonging to 41 families and 16 orders. The study highlights the heterogeneity and abundance of bird species in the RIE Campus and accentuates the importance of preserving urban green spaces for conserving avian fauna and creating sustainable urban environments. Future studies on the relationship between biodiversity and behavior, breeding, and feeding ecology of birds on campus will advance our understanding of birds and open the door to more effective conservation strategies.

CONFLICT OF INTEREST

Authors declare that they have no conflict of interest.

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