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Preliminary study on bird species and feeding guild composition inside the Sambalpur University Campus of Western Odisha, India

Basudev Bacha[1,*] & Chumkijini Chhatria[2]

[1]School of Life Sciences, Sambalpur University, Jyoti Vihar-768019, Sambalpur, Odisha, India
[2]P.G. Department of Biotechnology and Bioinformatics, Sambalpur University, Jyoti Vihar-768019, Sambalpur, Odisha, India
*Corresponding author: e-mail: basudev.bacha18@gmail.com

ABSTRACT

Birds are an important component of terrestrial ecosystems. These groups are called masters of air and play an essential role in ecological functions and responses to climate change and habitat destruction. Globally, the bird population is continually facing a decline in numbers due to the destruction of their habitat and atmospheric pollution. However, it has been observed that institutional habitat contributes to maintaining bird populations. In this study, we investigated the bird species assemblages inside the Sambalpur University campus, which is enclosed within the semi-urban stress. The survey was carried out within a calendar year, May to December 2024. The bird survey was conducted early morning and evening, using point counting method. During this, a total of 75 bird species were recorded belonging to 39 families and 16 orders. The university contains the three WPA schedule category bird species schedule I, II, and IV consisting of 5.33%, 21.33%, and 73.33%, respectively. Residential birds (Re) are 63, followed by 7 species of local migratory birds (Lm) and 5 species of migratory birds (M). The migratory species include *Acrocephalus dumetorum*, *Copsychus saularis*, *Merops philippinus* and *Terpsiphone paradisi.* The most common bird species include *Columba livia*, *Egretta garzetta*, *Bubulcus ibis coromandus*, *Corvus splendens*, *Argya striata*, *Phylloscopus trochilodes*, *Pycnonotus cafer*, *Acridotheres tristis*, *Amaurornis phoenicurus* and *Gracupica contra.* It can be concluded that the presence of different anthropogenic activities could reduce the migration of birds. Among the ten feeding guilds, the insectivores were the most dominant followed by another family i.e. Omnivorous, Carnivorous, Granivore, Frugivore, Piscivore, Molluscivore, and Nectarivore, additionally; two feeding guilds are consuming both insectivores-frugivorous, and granivores-insectivores respectively. This finding suggests that human interference such as urban development could lead to the destruction of their natural habitats which affects bird species richness and feeding guilds composition inside the university campus.

KEY WORDS Avian Community; Species Richness; Dominate; Feeding Guild; Western Odisha.

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INTRODUCTION

Bird is the most dominating group in the terrestrial ecosystem, adapted to both natural as well as manmade urban habitats. They are also indicators of ecosystem conditions (Schlegel & Rupf, 2010). Birds act as scavengers, pollinators, seed dispersers, and pest predators in different environmental and

geographic conditions (Mariyappan et al., 2023). There are more than 9,000 birds recorded globally, the subcontinent region, like India, contains more than 1408 bird species, whereas 524 species are still documented in the Odisha state (Lenka & Singh, 2020). Globally, it has been observed that landscape alteration affects habitat quality and composition (Lu et al., 2024), as well as endangered predator species population (Demerdzhiev et al., 2022). The earlier research has observed that academic campuses are protecting a wide variety of bird species by providing habitat, food, and shelter to them (Guthula et al., 2022; Sanllorente et al., 2023). Some literature has observed that anthropogenic activity and geographic stress have an impact on the composition and distribution of bird species in different institutes and university campuses in Odisha (Das et al., 2010; Pattnaik et al., 2016; Bagha & Sahoo, 2022; Mallik et al., 2015; Lenka et al., 2022).

The Sambalpur University is situated on 270 hectares of land area and is surrounded by Burla town, which is encircled by the Dehuri Dungri natural forest which contains 27 families of plant species (Khamari et al., 2021). The university is conducting many management activities, i.e. buildup habitat, rice cropping, and tree plantation. The world's longest earthen dam, Hirakud Dam, is located close to this campus's eastern edge. The earlier diversity study inside the Sambalpur University campus has documented 75 butterfly species belonging to 53 genera in 17 sub-families of six families across the university campus (Bacha et al., 2023) and 39 Odonata species belonging to eight families with 26 genera (Bacha et al., 2024). This suggested that this semi-urban landscapes also provides a potential conservation role in biodiversity and conservation the ecosystem.

However, there is no record of bird assemblage being carried out inside this Sambalpur University campus. The birds are one of the most important elements of the terrestrial ecosystem, and their richness and feeding guild patterns make them an excellent indication of a better environmental quality (Barzan et al., 2025).

In this study we will study the bird richness and feeding richness across the university campus and we will provide a base checklist of birds inside the campus as well as help in analysing future prospective on bird diversity in this semi-arid region of Western part of Odisha.

MATERIAL AND METHODS

Study area

The present study area is located in the Sambalpur district of the western part of Odisha, and lies in the geographic location of 21.47°N and 83.970°E of latitude and longitude, respectively, present at an altitude of 150.75 m. The university campus is encircled by the complex's topography features like Dehuri Dungri reserve forest, urban settlement and agricultural practice habitat (Fig. 1). There are three major seasonal patterns observed, namely summer (March to June), rainy (July to September), and winter (October to February). Maximum temperature (30 °C) was recorded in March, and minimum (28 °C) was recorded in July. This district receives an average rainfall of 650 mm annually. According to the Indian State Forest Report (2019), the Sambalpur district is a semi-arid area with 498.99 square kilometers, covered with dense forest cover (Indian State Forest Report, 2019). Consequently, the study area also faces many urbanized stresses such as mining, industrialization, and agricultural expansion (Pradhan & Ormsby 2020), which are prime courses for degradation of forest cover (Tripathi et al., 2019).

Data collection

The field survey was covered within a calendar year from May to December 2024 at regular interval across the different microhabitats of university campus such as aquatic habitats, wetlands, agricultural, human-resident gardens, fragmented and unregimented forest, and pasture land to understand the bird species assemblage and feeding guild composition field survey was conducted in the early morning and evening, using point counting methods. A total of thirty 50-meter radius points were established across the university campus. The distance between the points was 100 m; spending 15 minutes at each point. Birds were identified visually by using a 20×50-magnification binocular. Bird photographs were taken with Nikon 5300D cameras. Bird species nomenclature and identification were prepared by using the field guide handbook followed by Ali et al. (2013) and Grimmett et al. (2016).

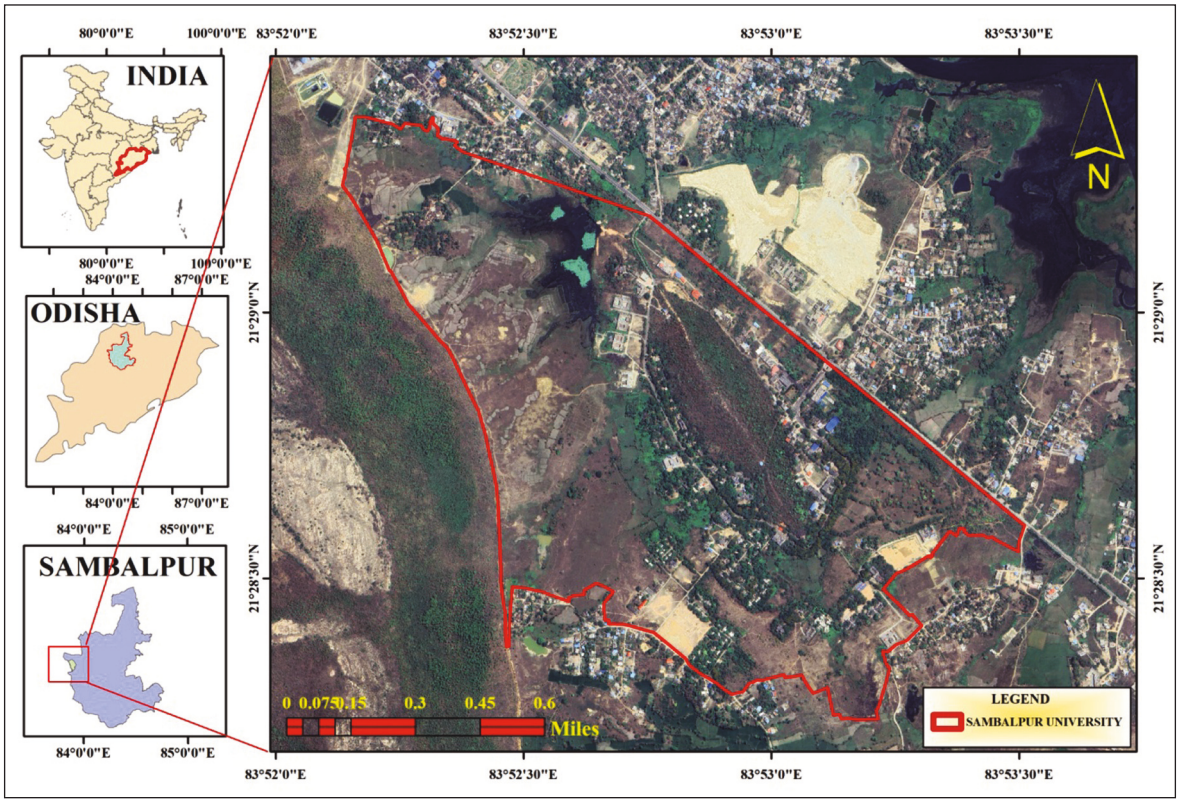

Figure 1. Study area: Sambalpur University Campus of Western Odisha India.

Data Analysis

The campus bird species residential status is classified as Resident (Re), Local migrant (Lm), and Migrant (M). To assess the influencing factors on priority species diversity in this study area based on the IUCN Red List (2024) the collected bird species were classified into different threatened species. All recorded bird species were categorized into different schedule categories based on the Indian Wildlife Protection Act schedule of 1972. The relative abundance of the feeding guild group was calculated as the total number of each feeding guild group divided by the total number of feeding guilds (Mahanta et al., 2025).

RESULTS AND DISCUSSION

The checklist bird species, feeding guild, IUCN (2024) and residential status is given in Table 1. Our study found that all collected species fall under the IUCN "Least Concern" category. During the study, out of 75 bird species, 36 families and 14 orders were recorded from Sambalpur university campus. The Passeriformes was the most dominant order of this study area, consisting of 34 species, followed by Caraciiformes with 8 species, Cuculiformes and Gruiformes with 5 species each. Accipitriformes, Charadriiformes and Pelecaniformes consist of 4 species each. Piciformes consist of 3 species. Bucerotiformes, Psittaciformes, and Strigiformes each consist of 2 species and only 1 species recorded from both Apodiformes and Phalacrocoracidae orders (Fig. 2). Some common bird species located inside the Sambalpur University campus are given in Figs. 3–14. The highest species richness was recorded from both the Cuculidae and Rallidae family, which consists of 5 species, and single species richness was recorded from families like Apodidae, Upupidae, Bucerotidae, Charadriidae, Jacanidae, Charadriidae, Laridae, Coraciidae, Acrocephalidae, Alcippeidae, Cisticolidae, Oriolidae, Phylloscopidae, Passeridae, Zosteropidae, Hirundinidae, and Phalacrocoracidae. In this

study, a total of three WPA schedule groups i.e. I, II, and IV were recorded in which four species were categorized under WPA Schedule I, 14 species were under WPA Schedule II and the rest were under the WPA Schedule IV category. Sixty-one (61) bird species were residential to this study area including 7 were local migratory (LM) birds, and only 4 were migratory (M) birds. The migratory species include *Acrocephalus dumetorum, Copsychus saularis, Merops philippinus, Motacilla maderaspatensis* and *Terpsiphone paradise.* The dominated bird species on this university campus include *Culumba livia, Egretta garzetta, Bubulcus ibis coromandus*, *Corvus splendens*, *Argya striata*, *Phylloscopus trochilodes*, *Pycnonotus cafer*, *Acridotheres tristis*, *Amaurornis phoenicurus* and *Gracupica contra* observed frequently across the campus. The heterogeneity of both terrestrial and aquatic habitats may contribute significantly to the bird species richness in the studied area. Further, this species diversity inside the university campus represent is comparable with previous reports at various universities of this state, i.e., Pattnaik et al. (2016) as they reported the occurrence of 63 species of birds in 31 families and 12 orders on the Utkal University Campus, Bhubaneswar, and Odisha, India; Mallik et al. (2015) reported 95 species from 43 families and 15 orders in the agronomy field of O.U.A.T. Campus, Bhubaneswar, India. Our study found less species richness as compared to Lenka and Singh (2020) who conducted a diversity study of bird at Berhampur University, Ganjam, and reported 108 species of birds belonging to 19 orders, 48 families, and 86 genera; Sethy et al. (2015) also reported 130 bird species under 94 genera and 50 families recorded in and around North Orissa University, Takatpur, Baripada, Mayurbhanj, Odisha. These differences in species richness in our study may be due to the presence of semi-urban effect which may drive out an avian population. The current study's findings also corroborate those of previous work across the Indian investigations (Menon & Rangaswamy, 2016; Anthony & Tiwari, 2022; Kale et al., 2018). Hirakud Dam, one of the world's longest earthen dams, extends up to 55 km and provides suitable habitat for large migratory bird species. It is assumed that the presence of 5 migratory birds inside the university campus may be due to the migration of birds from Hirakud reservoir bird for foraging activity.

There are a total of ten feeding guild groups observed inside the university campus i.e. Carnivorous (C), Insectivorous (I), Granivore (G), Molluscivore (M), Omnivorous (O), Frugivore (F), Piscivore (P) Nectarivore (N), as well as two dual

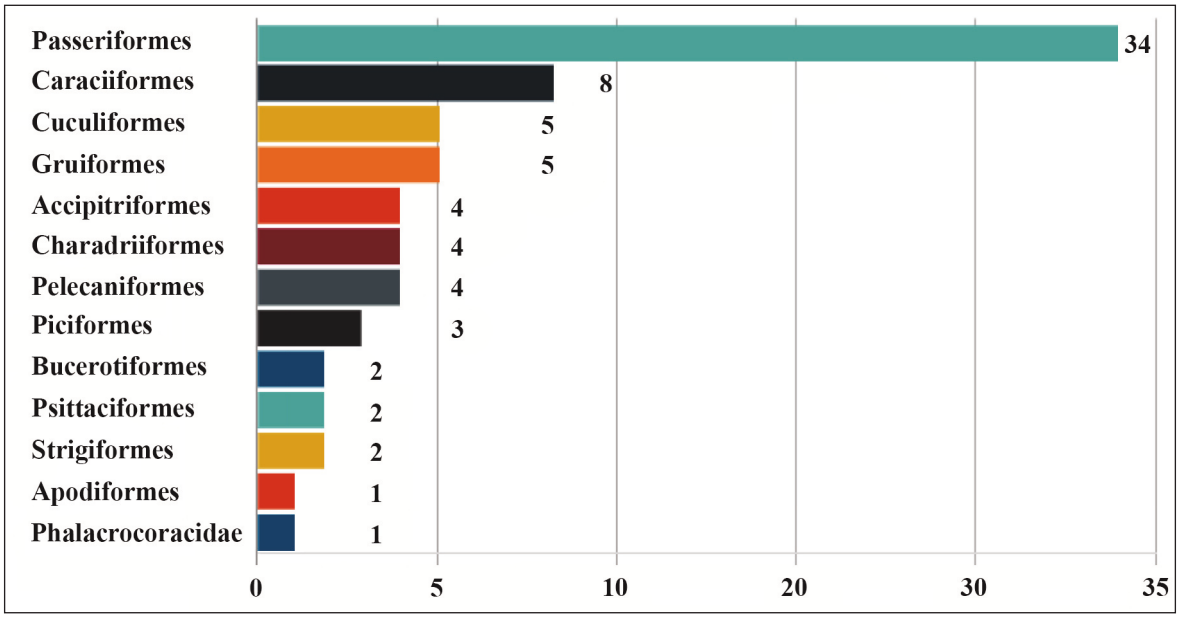

Figure 2. Family wise dominance of bird species richness inside the Sambalpur University Campus of Western Odisha, India.

Figures 3-14. Photographs of some common birds inside the Sambalpur University campus of Western Odisha India. Fig. 3: *Egretta garzetta*. Fig. 4: *Ardeola grayii*. Fig. 5: *Pycnonotus cafer.* Fig. 6: *Halcyon smyrnensis.* Fig. 7: *Acridotheres tristis.* Fig. 8: *Gracupica contra*. Fig. 9: *Argya striata*. Fig. 10: *Spilopelia chinensis*. Fig. 11: *Dicrurus macrocercus*. Fig. 12: *Hirundo smithii*. Fig. 13: *Merops orientalis*. Fig. 14: *Copsychus saularis.*

No	Name	Scientific name	(IUCN, 2024)	Resident status	Feeder	WPA
1	Black-winged kite	*Elanus caerules* (Desfontaines, 1789)	LC	Re	C	I
2	Black kite	*Milvus migrans* (Boddaert, 1783)	LC	Re	C	I
3	Brahminy Kite	*Haliastur indus* (Boddaert, 1783)	LC	Re	C	I
4	Shikra	*Accipiter badius* (Boddaert, 1783)	LC	Re	C	I
5	Little swift	*Apus affinis* (J.E. Gray, 1830	LC	Re	I	II
6	Common hoopoe	*Upupa epops* (Linnaeus, 1758)	LC	Re	I	IV
7	Indian grey hornbill	*Ocyceros birostris* (Scopoli, 1786)	LC	Re	F	IV
8	Rock Pigeon	*Columba livia* (Gmelin, 1789)	LC	Re	G	IV
9	Spotted dove	*Streptopelia chinensis* (Scopoli, 1786)	LC	Re	G	IV
10	Domestic pigeon	*Columba livia domestica* (Gmelin, 1789)	LC	Re	G	IV
11	Red Wattled lapwing	*Vanellus indicus* (Boddaert, 1783)	LC	Re	1,G	IV
12	Bronze winged Jacana	*Metopidius indicus* (Latham, 1790)	LC	Re	O	IV
13	Indian little ringed plover	*Charadrius dubius* (Scopoli, 1786)	LC	Re	I	IV
14	Great black-headed gull	*Ichthyaetus ichthyaetus* (Pallas, 1773)	LC	M	C	IV
15	Asian openbill	*Anastomus oscitans* (Boddaert, 1783)	LC	Re	M	IV
16	Asian koel	*Eudynamys scolopaceus* (Linnaeus, 1758)	LC	Re	O	IV
17	Southern coucal	*Centropus sinensis* (Stephens, 1815)	LC	Re	O	IV
18	Grey-bellied cuckoo	*Cacomantis passerinus* (Vahl, 1797)	LC	Lm	1	IV
19	Common hawk-cuckoo	*Hierococcyx varius* (Vahl, 1797)	LC	Re	I	IV
20	Common kingfisher	*Alcedo atthis* (Linnaeus, 1758)	LC	Lm	C	IV
21	Lesser pied kingfisher	*Ceryle rudis* (Linnaeus, 1758)	LC	Lm	C	IV
22	White-throated kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)	LC	Re	C	IV
23	Pied kingfisher	*Ceryle rudis* (Linnaeus, 1758)	LC	Re	I,F	II
24	Indian Roller	*Coracias benghalensis* (Linnaeus, 1758)	LC	Re	C	IV
25	Asian green bee-eater	*Merops orientalis* (Latham, 1801)	LC	Re	I	IV
26	Blue-tailed bee-eater	*Merops philippinus* (Linnaeus, 1767)	LC	M	I	IV
27	Grey-headed swamphen	*Porphyrio poliocephalus* (Latham, 1801)	LC	Re	O	IV
28	White-breasted waterhen	*Amaurornis phoenicurus* (Pennant, 1769)	LC	Re	O	IV
29	Brown crake	*Zapornia akool* (Sykes, 1832)	LC	Re	O	II
30	Eurasian Moorhen	*Gallinula chloropus* (Linnaeus, 1758)	LC	M	O	IV
31	Ruddy-breasted crake	*Zapornia fusca* (Linnaeus, 1766)	LC	Re	C	II

32	Brown fish owl	*Ketupa zeylonensis* (Gmelin, 1788)	LC	Re	C	IV
33	Spotted owlet	*Athene brama* (Temminck, 1821)	LC	Re	C	IV
34	Little Egret	*Egretta garzetta* (Linnaeus, 1766)	LC	Re	P	IV
35	Indian pond heron	*Ardeola grayii* (Sykes, 1832)	LC	Re	P	IV
36	Cattle egret	*Bubulcus ibis* (Linnaeus, 1758)	LC	Re	I	IV
37	Intermediate egret	*Ardea intermedia* (Wagler, 1829)	LC	Re	P	IV
38	Blyth's reed warbler	*Acrocephalus dumetorum* (Blyth, 1849)	LC	M	I	IV
39	Brown-cheeked fulvetta	*Alcippe poioicephala* (Jerdon, [1841])	LC	Re	I	IV
40	Common tailorbird	*Orthotomus sutorius* (Pennant, 1769)	LC	Re	I	IV
41	House crow	*Corvus splendens* (Vieillot, 1817)	LC	Re	O	IV
42	Indian Jungle crow	*Corvus culminatus* (Sykes, 1832)	LC	Re	O	IV
43	Rufous treepie	*Dendrocitta vagabunda* (Latham, 1790)	LC	Lm	O	IV
44	Black drongo	*Dicrurus macrocercus* (Vieillot, 1817)	LC	Re	I	IV
45	Thick-billed Flowerpecker	*Pachyglossa agilis* (Tickell, 1833)	LC	Re	O	IV
46	Indian silverbill	*Euodice malabarica* (Linnaeus, 1758)	LC	Re	G	II
47	Spotted munia	*Lonchura punctulata* (Linnaeus, 1758)	LC	Re	G	II
48	Red avadavat	*Amandava amandava* (Linnaeus, 1758)	LC	Lm	G	II
49	Jungle babbler	*Argya striata* (Dumont, 1823)	LC	Re	I	IV
50	Indian paradise flycatcher	*Terpsiphone paradisi* (Linnaeus, 1758)	LC	Lm	I	IV
51	White-browed wagtail	*Motacilla maderaspatensis* (Gmelin, 1789)	LC	M	C	IV
52	Paddyfield pipit	*Anthus rufulus* (Vieillot, 1818)	LC	Lm	I	IV
53	Bar-winged Flycatcher-shrike	*Hemipus picatus* (Sykes, 1832)	LC	Re	I	IV
54	Daurian redstart	*Phoenicurus auroreus* (Pallas, 1776)	LC	Re	I	IV
55	Orintal Magpie-robin	*Copsychus saularis* (Linnaeus, 1758)	LC	M	I	IV
56	Little spiderhunter	*Arachnothera longirostra* (Latham, 1790)	LC	Re	N	IV
57	Garden sunbird	*Cinnyris jugularis* (Linnaeus, 1766)	LC	Re	N	IV
58	Purple-rumped sunbird	*Leptocoma zeylonica* (Linnaeus, 1766)	LC	Re	N	IV
59	Indian Golden oriole	*Oriolus kundoo* (Sykes, 1832)	LC	Re	O	IV
60	Greenish warbler	*Phylloscopus trochiloides* (Sundevall, 1837)	LC	Re	I	IV
61	House sparrow	*Passer domesticus* (Linnaeus, 1758)	LC	Re	G	II
62	Red-whiskered bulbul	*Pycnonotus jocosus* (Linnaeus, 1758)	LC	Re	F	II
63	Red-vented bulbul	*Pycnonotus cafer* (Linnaeus, 1766)	LC	Re	F	II

64	Common myna	*Acridotheres tristis* (Linnaeus, 1766)	LC	Re	O	IV
65	Indian pied myna	*Gracupica contra* (Linnaeus, 1758)	LC	Re	O	IV
66	Jungle myna	*Acridotheres fuscus* (Wagler, 1827)	LC	Re	O	IV
67	Chestnut-tailed starling	*Sturnia malabarica* (Gmelin, 1789)	LC	Re	O	IV
68	Indian white-eye	*Zosterops palpebrosus* (Temminck, 1824)	LC	Re	I	II
69	Streak-throated swallow	*Petrochelidon fluvicola* (Blyth, 1855)	LC	Re	I	II
70	Little cormorant	*Microcarbo niger* (Vieillot, 1817)	LC	Re	P	IV
71	Brown-capped pygmy woodpecker	*Yungipicus nanus* (Vigors, 1832)	LC	Re	I	IV
72	White-naped woodpecker	*Chrysocolaptes festivus* (Boddaert, 1783)	LC	Re	I	II
73	Crimson-breasted barbet	*Psilopogon haemacephalus* (Statius Müller, 1776)	LC	Re	F	II
74	Rose-ringed parakeet	*Psittacula krameri* (Scopoli, 1769)	LC	Re	F	II
75	Alexandrine parakeet	*Psittacula eupatria* (Linnaeus, 1766)	LC	Re	F	II

Table 1. The checklist bird species, IUCN 3.1 status residential status, feeding guild, and WPA schedule category inside the Sambalpur University campus of Western Odisha India.

feeder species also recorded i.e. Insectivorous-Granivore (IG) and Insectivorous-Frugivore (IF) (Fig. 4). The percentage of different feeding guilds inside the Sambalpur University campus is shown in Fig. 15, which illustrates that the insectivores were the most dominant (23 species or 30.67%), followed by omnivorous (16 species or 21.33%), carnivorous (13 species or 17.33%), granivores (7 species or 9.33%), frugivorous (6 species or 8%), piscivore (4 species or 5.33%), and lastly others consist of 2.66% in which nectarivores contain 3 species while molluscivore (M) only 1 species. Additionally, two feeding guilds are consuming both insectivores and frugivorous, as well as granivores and insectivores each containing a single species.

This finding indicates a wide range of feeding guild patterns. This diversity in feeding guilds may be due to the presence of a more diversified forest, agricultural, and grassland habitat. In addition to this, the university campus contain a wide variety of fruit trees and bushes, and the basal areas and tree density fall within the range for tropical forest (Khamari et al., 2021). An abundance of insects group like 75 butterfly species (Bacha et al., 2023) and 39 Odonata species (Bacha et al., 2024), may provide vital food and habitat for different feeding guild groups. Insectivores are the most dominating feeding guild found compared to others, this finding is consistent with previous studies which explain that insectivorous guilds are often found most diverse around the tropical deciduous habitat (Loser & Vaughan, 2006; Lenka et al., 2022). Presences of fewer numbers of frugivorous, molluscivore, nectarines, and piscivorous number may highlights that differences in feeding guild composition which may be due to urban effect as well as absences of wetland habitat across the campus. These habitats contain structural complexity and resource availability increases feeding guilds composition, for example frugivorous and piscivorous birds have a strongly correlation with wetland, forest, and park environments, habitats (Panda et al., 2021). In dry deciduous forests habitats, fleshy fruit accessibility impacts frugivore populations (Espejo & Morales, 2019), while flowering plants availability impacts nectarivorous guild composition (Ocampo-Ariza et al., 2024). Sambalpur University is located in a tropical dry deciduous habitat (Bacha & Sahoo, 2018) and also experiences dry climatic condition in both pre- and post- monsoon season. This dry climatic condition not only affects the vegetation cov-

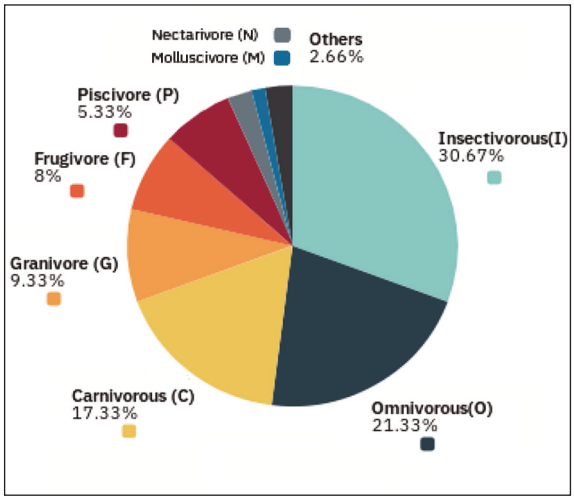

Figure 15. Percentage different feeding guild inside the Sambalpur University campus of Western Odisha India.

erage but also aquatic and land condition. These differences in dry climatic conditions may affect the feeding group across the university campus. Shrub density benefits bird groups in dry lands by offering vital resources for shelter and food (Hillier-Weltman et al., 2024). In such environments, birds modify their foraging strategies according to the shrubs and other flora available. The available evidence on dry climatic effects also supports our findings.

Avifaunas are known as indicators of environmental health and provide different ecosystem services like pest control, seed disposal, and pollination (Wenny et al., 2011). However, toxic chemicals, agricultural pests, extreme weather, habitat destruction, and forest fragmentation can reduce plant reproductive output, potentially leading to the loss of these ecosystem services (Kevan & Viana, 2003). Therefore, continuous monitoring of avifauna diversity at different regional scales is needed to understand the environment's quality and the sustained ecosystem.

CONCLUSIONS

The present study showed that Sambalpur University has abundant number of bird species diversity. The vegetation cover, Dehuri Dungri reserve forest, and nectar plants could provide suitable habitat for bird species. The common bird species in this study region included rock pigeon, spotted dove, little Egret, black drongo, spotted munia, Jungle babbler, greenish warbler, red-vented bulbul, and common myna. The bird species assemblage is comparable with other universities' campus status, indicating the necessity for long-term monitoring assessment. In addition to this, continuous anthropogenic pressure is affecting the migratory bird population, and there is a high chance that it may affect the native bird species of this study region. The availability of larger insect groups may support higher insectivorous populations and also suggests potential conservation roles in biodiversity across the university campus. Therefore, proper management strategies such as citizen awareness programs, afforestation and the construction of aquatic habitats may attract various water and terrestrial bird species to the university campus.

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