Research Journal of Recent Sciences ISSN 2277-2502
Vol. **15(1),** 16-20, January **(2026)** *Res. J. Recent Sci.*

Study of Feeding Guilds and Feeding Diversity of Passerine Birds of the Kota region of Rajasthan, India

Gajanan Charpe* and Meenakshi Mayanger
Department of Zoology, Government College, Kota, Rajasthan, India
gajanancharpe527@gmail.com

Available online at: www.isca.in, www.isca.me
Received 11th December 2025, revised 25th December 2025, accepted 2nd January 2026

Abstract

Perching birds of order Passeriformes is the largest group accounting about 60% of total reported birds around the globe. Due to this great diversity they also represent adaptability to utilise various available resources in different types of habitats. Passerines are best ecological models to understand how species adapt in different habitats to maximise fitness. The Kota district of Rajasthan, India, provides a unique platform for the study of avian feeding diversity due to its varied landscapes, water bodies, and a mixture of deciduous forests and urban areas. As there are various physio-geographical terrains the diversity of passerine birds are also found in good numbers. These perching birds has adapted to different diets available in different habitat types. Many has become generalists birds while forest and wetland associated birds are specialist in terms of their food preference. This study explores the species richness and feeding guild structure of passerine birds emphasizing their ecological roles and dietary adaptations in different habitats.

Keywords: Perching birds, Habitat generalist and specialist, feeding guild, feeding adaptations.

Introduction

Birds of order Passeriformes are commonly known as perching birds or song birds, are the most species-rich group of class Aves. About 6500 passerine species are reported worldwide which counts for nearly sixty per cent of class Aves. Passerine birds constitute the most species-rich and ecologically diverse group of birds globally[1]. In accordance with diversity share these perching birds are inhabitants of all terrestrial environments and they are the major part of different ecosystems[2]. They show diverse food preferences ranging from grains (seeds), fruits, nectar, pollens, insects and their larva, arachnids and other invertebrates, small amphibians and reptiles, and even small mammals. They themselves serve as food for other animals and hence become important part of trophic structure of any ecosystem. Many passerines act as pollinating and seed dispersal agents[3]. These birds have adapted to utilize habitats that are available throughout the year or only at certain times of the year to procure food and nesting sites[4]. Their varied diets and adaptability make them important ecological indicators to assess dynamic changes in their habitat. A few aspects of the ecological impact of passerines are known but new studies unravel their role in specific habitat[5]. The diversity and accessibility of many passerine birds in the wild continue to make them among the best animal models for field-based studies of behavioural ecology, mating systems, life history, and disease resistance, ecological and evolutionary responses to climate change, among many other fields[6-8].

In India, the Kota district of Rajasthan state is characterized by different geographical terrains and river Chambal, reservoirs adjoining dams, wetlands, urban and peri-urban areas and deciduous forests fragment, and crop fields supports a rich avifauna including numerous passerine species[9-11]. This study investigates and analyse the feeding guilds of passerines in different habitat types of the Kota district.

Study Area: Kota district is situated in south-eastern part of Rajasthan. It spans over 527 km² at an elevation of 271m above sea level. Its landscape includes the Chambal River and its tributaries Sukhal, Andheri, Alnia, Ujar, Parwan, and Amajar. These river basins provide irrigation to the agriculture and green patches toward northern parts of Kota district. The southern part of the district is elevated, forming a part of the high tableland of the Malwa Plateau. Mukundara Hills including Darrah forest is a prominent geomorphic feature consists of hills with dry deciduous forest. The Kota region is characterized by a mosaic of habitats, including deciduous forests, wetlands, rivers, reservoirs, urban green spaces, agricultural fields, and rocky terrain. Habitat variation across this landscape plays a critical role in shaping avian communities and their feeding behaviours[12]. These physical geographical features provide diverse habitats for resident and migratory birds.

Methodology

Collection of Field Data: Systematic field observations were conducted year-round during study period (2023 - 2025) using direct visual methods with binoculars, focusing on feeding behaviours, habitats, and food types utilized by passerine species. Passerine birds were identified using field guides and citizen science platforms like Bird International and e-Bird[13-,15].

A bird species observation also includes presence, abundance, and feeding behaviour.

Point Counts / Line Transects method was used to record species, number of individuals and their feeding preference and behaviour[16-18].

Habitat type was also noted because feeding guild structure often varies with: habitat type. For this study we selected four habitat types in Kota district. i. Site 1 – Agriculture landscape, ii. Site 2 – Wetland, lake and riverine areas, iii. Site 3 – Urban core including urban green spaces, iv. Site 4 – Forest (Area of Kolipura range was selected which is a part of Mukundara Hills).

To record passerine birds in these habitat types standard protocols were followed[19-21].

Defining Feeding Guild Categories: Common feeding guilds for passerines based on primary diet[22,23]. i. Insectivores – feed mainly on insects. ii. Frugivores – fruit eaters. iii. Granivores – seed eaters. iv. Nectarivores – nectar feeders. v. Omnivores – mixed diet. vi. Carnivores (small prey) – eat small vertebrates/invertebrates.

Results and Discussion

Observations of Passerine Feeding Guilds in the study area: A total 117 passerine birds were recorded from four habitat types: A – Agriculture landscape, B – Wetland, Man-made Lake and areas adjoining Chambal River, C – Urban core of the Kota City including urban green spaces and D – Forest, only Kolipura area of Mukundara Hill range. Members of 32 families of Order Passeriformes were recorded. Out of 117 passerine 47 species are winter migratory, only one is summer migrant and rest 69 passerine birds are breeding residents in Kota district of Rajasthan. Many species were recorded form more than one habitat types but we mainly focused on total number of passerine birds recorded[24]. Abundance of all passerine birds in each feeding guild was recorded for each selected habitat type. It is number of passerine birds observed during study period (Table-1) These were counted to get total abundance, irrespective of species recorded from a specific habitat type and their feeding guild was recorded[25,26].

Results: On the basis of abundance data collected from each selected habitat type calculations were done to find out guild richness, total abundance, guild proportions, Shannon diversity of guilds and evenness (Table-2). In this study following parameters were calculated i. Guild richness – number of passerine guilds present at particular site. ii. Total abundance – total number of passerine/ individuals recorded from particular site. (iii) Guild proportions (pi) – number of birds of each feeding guild out of total observed in each site (rounded up to 3 decimals). iii. Shannon diversity of each feeding guild of each site.

$H' = -[\sum pi \text{ x } \ln (pi)]$

here H′ is the Diversity Index, Pi is the proportion of each species in the sample, and ln (Pi) is the natural logarithm of this proportion.

Evenness of feeding guild: Evenness of bird species compares the similarity of the population size of each species. Evenness Index (J) was calculated using the ratio of observed diversity to maximum diversity using the equation.

$J' = H' / Hmax$

H′ is the Shannon Wiener Diversity index and *H max* is the natural log of total number of species.

Discussion: It can be easily analysed that the passerine birds explore all habitat types as we find all five types of guilds (insectivores, granivores, omnivores, nectarivores and carnivore) in each habitat type (Figure-1). Species heterogeneity is reported maximum in natural undisturbed habitat like forest. Agriculture landscape is more exploited by seed eating passerines but they are prevalent in all habitats except wetland and riverine areas (Figure-2). Urban core and urban green areas supports generalists birds compared to specialists. Urban areas also shows mark decline in carnivore passerines like crows.

Table-1: Abundance of Passerine Birds of different feeding guilds in each habitat type.

Guild / Sites	Habitat type A Agriculture landscape	Habitat type B Wetland, lakes & riverine	Habitat type C Urban core &urban green spaces	Habitat type D Forest area of Kolipura range
Insectivores	48	40	32	42
Granivores	62	28	63	51
Omnivores	30	42	38	42
Nectarivores	29	30	46	41
Carnivores	38	49	13	32

Table-2: Guild richness, Total abundance, Guild proportion, Shannon diversity and Evenness of each habitat type.

		Habitat type A	Habitat type B	Habitat type C	Habitat type D
Guild richness		5	5	5	5
Total Abundance		207	172	192	208
Guild proportion	Insectivores	0.232	0.233	0.167	0.202
	Granivores	0.300	0.163	0.328	0.245
	Omnivores	0.145	0.244	0.198	0.202
	Nectarivores	0.140	0.076	0.240	0.197
	Carnivores	0.184	0.285	0.068	0.154
Shannon diversity of guild		H' = 1.560	1.545	1.520	1.605
Evenness		J' = 0.97	0.96	0.94	0.998

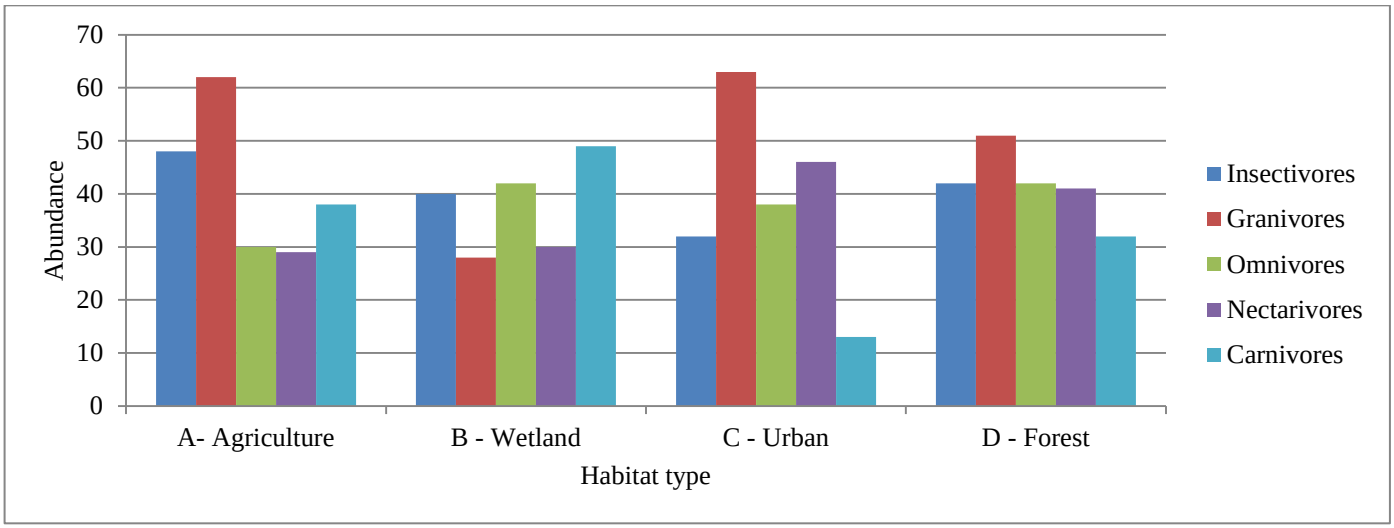

Figure-1: Comparative Abundance of different feeding guilds of Passerine birds in Kota District.

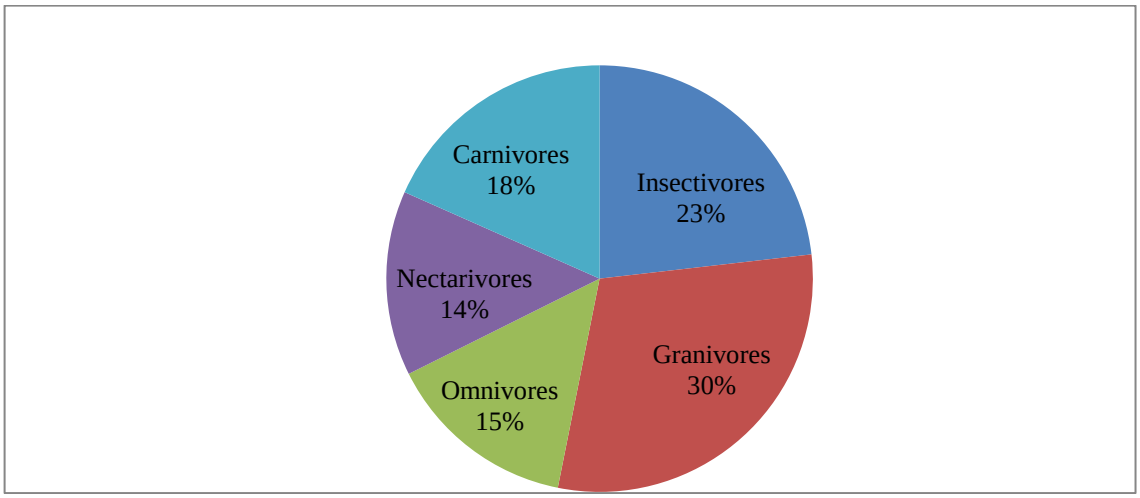

Figure-2: Overall Diversity of Feeding Guilds of Passerine Kota District.

Conclusion

This study find the most diverse site by feeding guild is the Site D (Forest). It has the highest Shannon diversity and almost perfect evenness, meaning all guilds are represented in nearly equal proportions. Least even site is Site C (Urban areas). Urban areas show dominance of granivores and nectarivores but lower evenness. In Site A (Agriculture landscape) granivores birds dominate due to open farmlands and maintain high evenness (0.97). In Site B (wetland) higher carnivores and omnivores passerine birds are typical of wetlands and show moderate evenness.

References

1. Schmitt, C. J. and Edwards, S. V. (2022). Passerine birds. *Current Biology*, 32(20), R1149-R1154. https://doi.org/10.1016/j.cub.2022.08.061.

2. Payevsky, V. A. (2014). Phylogeny and Classification of Passerine Birds, Passeriformes. *Biology Bulletin Reviews*, 4(2), 143–156. https://doi.org/10.1134/S2079086414020054.

3. Mariyappan, M., Rajendran, M., Velu, S., Johnson, A. D., Dinesh, G.K., Solaimuthu, K. & Sankar, M. (2023). Ecological role and ecosystem services of birds: A review. *International Journal of Environment and Climate Change*, 13: 76–87. https://doi.org/10.9734/ijecc/2023/v 13i61800.

4. Katuwal, H. B., Basnet, K. K., Rai, S. K., Gajurel, J. P., Scheidegger, C. and Nobis, M. P. (2016). Seasonal changes in bird species and feeding guilds along elevational gradients of the Central Himalayas, Nepal. *PLoS One*, 11(7): e 0158362. https://doi.org/10.1371/journal.pone. 0158362.

5. Dauber, J., Michaela, H., Dietmar, S., Rainer, W., Annette, O. and Wolters, V. (2003). Landscape structure as an indicator of biodiversity: matrix effects on species richness. *Agriculture Ecosystems & Environment*, 98, 321–329. https://doi.org/10.1016/S0167-8809(03)00092-6.

6. Sun, Q., Wu, H., Zuo, T., Tian, Z., Wang, J. and Hou, J. (2025). Protection of Passeriformes Birds in Wetland Ecological Restoration: A Case Study of the Reed Parrotbill (Paradoxornisheudei) in Baiyangdian. *Diversity*, 17(1), 75. https://doi.org/10.3390/ d17010075.

7. Koskimies, P. (1989). Birds as a tool in environmental monitoring.*Annales Zoological Fennici*26: 153–166.

8. Morrison, M.L. (1986). Bird population as indicators of environmental change. *Current Ornithology*. 3, 429–451.

9. Kumari, Urmila and Goyal, Nidhi (2025). Diversity Distribution and Consideration Status of Avifauna in Chattaneshwer Wetland. *International Journal of Scientific Research in Science, Engineering and Technology*, 12(6). https://doi.org/10.32628/IJSRSET2513 874.

10. Sharma, Anshu, Sharma, Harshit, Shrivastava, Surabhi and Neha (2019). An investigation of biodiversity of avian fauna of ummedganjpakshivihar, Kota, Rajasthan, India. *Accent Journal of Economics Ecology & Engineering*, 4(4), 2nd Conference (ICIRSTM).

11. Mayangar Meenakshi (2019). Checklist of avian diversity of Kota (Rajasthan). *Life Science Bulletin*, 16(1&2), 31-33.

12. Ginoya Darshan, Singh L. P., Deke Marry and Gautam, Gargi (2025). A preliminary study on avifaunal species diversity of University of Kota (UOK) campus, Kota, Rajasthan, India. *International Journal of Fauna and Biological Studies*, 12(2), 94-101. https://www.doi.org/10.22271/23940522.2025.v12.i2b.1089.

13. Ali, S. (2002). *The Book of Indian Birds (13th Revised Edition).* Oxford University Press, New Delhi, 326pp. ISBN: 978-0195665239.

14. Grimmett, R., Inskipp, C. and Inskipp, T. (2011). *Birds of the Indian Subcontinen*t (2nd edition). Oxford University Press. 286-364pp. ISBN: 978-81-93315-09-5.

15. Bird Life International (2023). *State of the world's birds: indicators for our changing world*. Cambridge, UK. www.birdlife.org.

16. Bibby, C.J., Burgess, N.D. and Hill, D.A. (2012). *Bird Census Techniques*. Academic Press, London, 66-86pp. ISBN: 9780080984506.

17. Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L. and Thomas, L. (2004). *Advanced Distance Sampling: Estimating Abundance of Biological Populations*. Oxford University Press, Oxford, 434pp. ISBN: 9780198507833.

18. Hutto, R.L., Pletschet, S.M. and Hendricks, P. (1986). A fixed–radius point count method for non-breeding and breeding season use. *The Auk*, 103(3). https://doi.org/10.1093/auk/103.3.593.

19. Gajera, N.B., Mahato, A.K.R. and Kumar, V.V. (2013). Status, distribution, and diversity of birds in mining environment of Kachchh, Gujarat. *International Journal of Biodiversity*, 1–11. https://doi.org/10.1155/2013/471618.

20. Ghosh, S. (2010). Urban biodiversity of Calcutta: Flowering plants, Butterflies, Birds and Mammals West Bengal, India. *Records of the Zoological Survey of India* 327, 1–250. ISBN: 9878181712813.

21. Hossain, A. and Aditya, G. (2016). Avian diversity in agricultural landscape: Records from Burdwan, West Bengal, India. *Proceedings of the Zoological Society* 69(1), 38–51. https://doi.org/10.1007/s12595-014-0118-3.

22. Prajapati, K.M., Patel, M.I. and Acharya, C.A. (2008). Guild classification for urban birds. *The Asian Journal of Science*, 3(1), 14-18.

23. O'Connell, T. J., Jackson, L. E. and Brooks, R. P. (2000). Bird guilds as indicators of ecological condition in the Central Appalachians. *Ecological Applications*, 10, 1706–1721. https://doi.org/10.1890/1051-0761(2000)010.

24. Gibbons, D.W. and R.D. Gregory (2006). Birds. pp 308–344. Sutherland, W.J. (ed.). *Ecological Census Techniques: A Handbook*. (*2nd edition*). Cambridge University Press, Cambridge, 446pp. ISBN: 9780511790508.

25. Javed, S. & R. Kaul (2000). *Field Methods for Birds Survey*. Bombay Natural History Society, Mumbai, India, 61pp.

26. Jayson, E. and Mathew, D.N. (2000). Diversity and species abundance distribution of birds in the tropical forests of Silent Valley, Kerala. *Journal of the Bombay Natural History Society*, 97, 390–400.