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Cover: Indian Grey Wolf *Canis lupus pallipes* and Smooth-coated Otter *Lutrogale perspicillata* sharing the territory in Chambal basin. Digital art on Procreate by Aakanksha Komanduri.



Avifaunal diversity with reference to their feeding guilds of Mahadare Conservation Reserve, Maharashtra, India

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Abstract: The study aims to provide baseline data on avian diversity and their feeding guilds in the Mahadare Conservation Reserve. Surveys were conducted over a period of two years, from April 2021 to May 2023, with point count methods. A total of 126 species of birds were recorded, with the order Passeriformes being dominant, followed by Accipitriformes. The findings also showed that the Insectivore guild had the highest number of species, followed by Carnivore and Omnivore guilds, respectively. Furthermore, the study also recorded high feeding guild diversity ($H'_{FD} = 2.247$), which provides a basis for diversity and feeding behavior. The records include seven endemic, three 'Vulnerable', and two 'Near Threatened' species, along with seven winter migrants and 23 local migrant species, highlighting the avifaunal significance of the area. The study area is surrounded by human settlements and still holds a diversity of birds, and attention is required to understand more about the guilds, along with their distribution and preferences. This first-time study documents avifaunal diversity, evaluates feeding guilds, and assesses the conservation significance of Mahadare Conservation Reserve.

Keywords: Baseline data, bird conservation, ecotone, feeding behavior, functional diversity, guild distribution, scheduled species, Western Ghats.

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Author contributions: Riya Patil contributed to conceptualisation, field surveys, data collection, and manuscript writing. Gayatri Pawar contributed to manuscript writing and editing. Sunil Bhoite contributed to conceptualisation and manuscript editing. Neha Bendre contributed to manuscript writing and editing. Aruna Shelar contributed to field surveys and data collection.

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INTRODUCTION

Birds are recognized as excellent biodiversity indicators due to their diverse range of habitats and distribution (Fraixedas et al. 2020). Since they belong to higher trophic levels in a food web, they are easily affected by the variations or effects caused on the lower levels. They are also effective bio-controllers, thus reducing their harmful effects on the environment as well as human health (Gregory et al. 2003; Manigandan et al. 2024). Food and feeding habits of birds influence their reproductive success and also provide more details about the constitution of a habitat (Molokwu-Odozi et al. 2007; Archana et al. 2024). Livestock grazing, human encroachment, extraction of resources, an increase in agricultural land, and non-native monoculture plantations lead to degradation of the habitat. These major threats are the genesis of habitat fragmentation, forming discontinuous systems and producing the edge effect in birds (Kale et al. 2010). Logging has caused significant ecosystem damage to the region, exposing the avian population to edge effects, human activities, predators, and brood parasites. The resulting loss of forest cover and leaf litter also affects the forest interior-dependent birds, which rely on closed canopy forest conditions away from habitat edge (Zakaria et al. 2014; Shafie et al. 2023).

Bird feeding guilds provide valuable insights into functional diversity and ecosystem functioning by reflecting resource use, trophic interactions, and habitat quality, making them effective indicators of ecological integrity (Naveen et al. 2026). In the biodiversity-rich Western Ghats, conservation reserves play a crucial role in safeguarding heterogeneous habitats and their avifauna, yet information on the functional structure of bird communities in many reserves remains limited. Mahadare forest lies in the northwestern part of Satara District, Maharashtra (Mohite et al. 2020). It comprises evergreen, semi-evergreen, and deciduous forest types, forming a unique ecotone region, and was declared a conservation reserve in 2022 (WLP.06.22/CR-170/F-1). The forest also consists of paddy cultivation, adding to the lepidopteran and arachnid diversity. Mahadare is a fragmented patch situated within the city and is surrounded by settlements, making it susceptible to anthropogenic activities such as logging, light pollution, and constant disturbance. It is also a part of the Western Ghats and is therefore home to a diversity of organisms. However, there exists a gap in the study of avian diversity in the region, making this the first methodical avifaunal survey of the area with an aim to document

avifaunal diversity, evaluate functional composition through feeding guilds, and assess the conservation significance of Mahadare Conservation Reserve.

MATERIALS AND METHODS

Study area

Mahadare Conservation Reserve (MCR) (17.247° N, 73.963° E) situated at an average elevation of 800 m, lies in the northern Western Ghats, with temperatures ranging from 19–31 °C. Its topography includes paddy fields, human settlements, teakwood plantations, grassland, and wetlands with a total area of 105 ha. The reserve consists of two major water bodies, one being a reservoir and the second an irrigation tank (Sutar et al. 2025)

Data collection

Field surveys were carried out for a period of two years, from April 2021 to May 2023, twice a week in four-hour time blocks (600–1,000 h; 1,000–1,400 h; 1,400–1,800 h), which were covered on alternate days using the point count method and opportunistic sightings. The points were allotted empirically in the form of concentric zones (Image 1) around the point (approximately 100 m), and birds were identified with their audio and visual cues (Roy et al. 2013). A total of eight points (human settlement, teak plantations, forest area, paddy field, grassland 1, grassland 2, Mahadare Lake, Elephant Lake) were identified in the area with a minimum distance of 100 m between them. Bird observations and documentation were done with the help of a camera (Nikon D5300) and Nikon Action EX 7 x 50 binoculars. The standard field guides were referred to for species identification (Grimmett et al. 1998; Ali 2002). Feeding guilds were assigned based on field observations (Aggarwal et al. 2015; Mukhopadhyay & Mazumdar 2019; Bernard et al. 2023). The migratory status of birds was followed (Bhuyan et al. 2024). Species present year-round were classified as Resident (R), those observed only in winter were marked as Winter Migratory (WM), and those migrating locally as Local Migratory (LM). IUCN Red List categories: Vulnerable (VU), Near Threatened (NT), and Least Concern (LC) have been mentioned for the respective species (Derebe et al. 2023). The Wildlife Protection Act status: Schedule I and II were followed (Gaur et al. 2021).

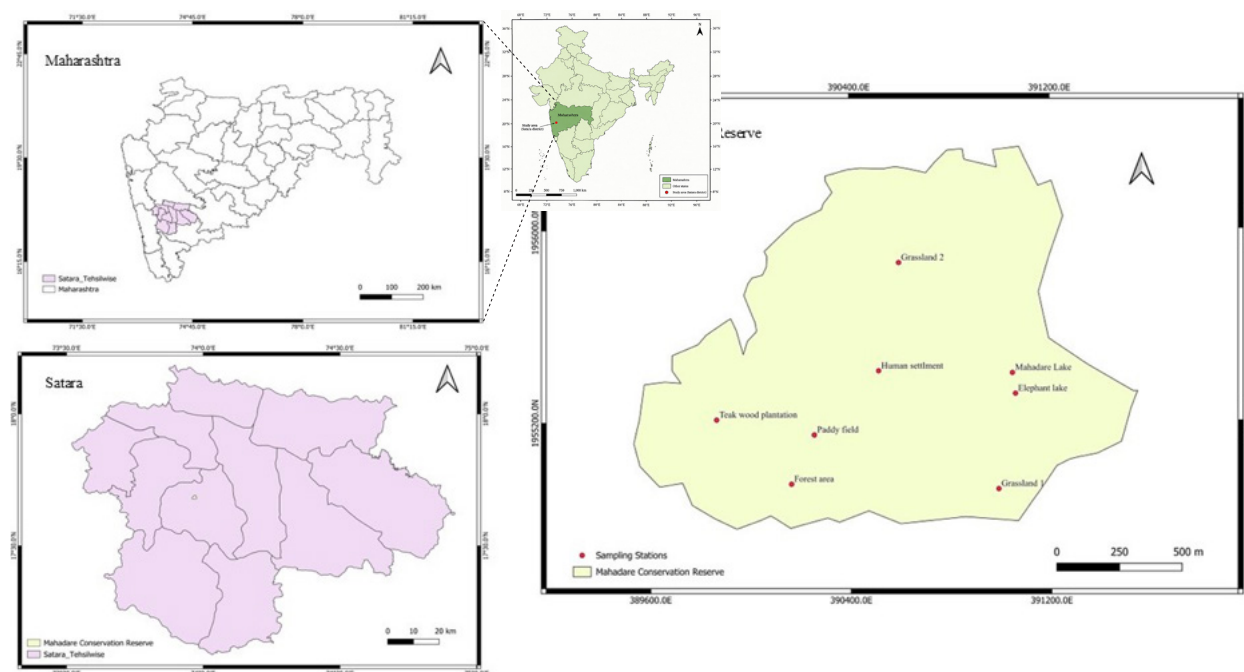


Image 1. Location map of Mahadare Conservation Reserve, Satara, Maharashtra, India.

Data analysis

The Shannon–Wiener index (Shannon & Weaver 1963) was used to understand the feeding guild richness (Gamito & Furtado 2009).

It is calculated as: $H'_{FD} = -\sum_{i=1}^n (p_i \log_2 p_i)$

Where p_i is the relative abundance of the i^{th} feeding group, obtained as $p_i = fg_i / \sum_{i=1}^n fg_i$ with fg_i representing the number of individuals belonging to the i^{th} feeding group, and n being the total number of feeding groups. This index varied between 0 and H'_{FD} maximum ($H'_{FD} \text{ max} = \log_2 n$); that is, for six feeding guilds, it would range between 0–2.584. The evenness index (Pielou 1969) would help in understanding the feeding guild distribution in species with the equation: $J_{FD} = H'_{FD} / H'_{FD} \text{ max}$, which varies between 0–1. All graphs (Pie charts and bar plots) were prepared in Microsoft Excel 365.

RESULTS AND DISCUSSION

In the present study, a total of 126 species of birds, belonging to 19 different orders and 55 families, were recorded (Table 1). Among these, order Passeriformes (58) represented the highest number of species, followed by order Accipitriformes (10). The fewest species were found in order Sulliformes (1), Podicipediformes (1), and Ciconiiformes (1) (Image 2). The families that recorded

the highest number of species are Accipitridae (10), Muscipidae (8) and Cuculidae (6). In addition, 124 (98%) of the recorded bird species were listed under the Wildlife Protection Act of 1972. Of these, a total of 17 (13%) birds were categorised under Schedule I and 107 (84%) under Schedule II. According to the IUCN Red List criteria, two ‘Near Threatened’ species, Asian Woolly-necked Stork *Ciconia episcopus*, and Indian Courser *Cursorius coromandelicus*, and three ‘Vulnerable’ species, Tawny Eagle *Aquila rapax*, River Tern *Sterna aurantia*, and Great Hornbill *Buceros bicornis*, were observed. The remaining 121 species were listed under ‘Least Concern’.

Additionally, the study also reports seven species in the region that are endemic to India, namely Indian Scimitar-Babbler *Pomatorhinus horsfieldii*, Indian Yellow Tit *Machlolophus aplonotus*, Spot-breasted Fantail *Rhipidura albogularis*, White-cheeked Barbet *Psilopogon viridis*, Grey Junglefowl *Gallus sonneratii*, Malabar Lark *Galerida malabarica*, and Malabar Whistling-Thrush *Myophonus horsfieldii* (Table 1). The studies of Sayyed (2016) recorded 208 avian species across 10,48,000 ha of Satara District, whereas our study, conducted within just 105 ha, recorded 126 avian species, which accounts for approximately 61% of the total species reported in the district. This underscores the ecological importance of the present habitat. The nearest Important Bird and Biodiversity Area (IBA) site, Koyna Wildlife Sanctuary

Table 1. Checklist of birds from Mahadare Conservation Reserve, Satara, Maharashtra, India.

Order	Family	Scientific name	Common name	IUCN Red List status	Migratory status (for India)	Feeding guild
Podicipediformes	Podicipedidae	<i>Tachybaptus ruficollis</i> (Pallas, 1764) ¹¹	Little Grebe	LC	LM	Car
Sulliformes	Phalacrocoracidae	<i>Microcarbo niger</i> (Vieillot, 1817) ¹¹	Little Cormorant	LC	R	Car
Pelicaniformes	Ardeidae	<i>Ardea cinerea</i> (Linnaeus, 1758) ¹¹	Grey Heron	LC	LM	Car
		<i>Nycticorax nycticorax</i> (Linnaeus, 1758) ¹¹	Black-crowned Night Heron	LC	LM	Car
		<i>Ardeola grayii</i> (Sykes, 1832) ¹¹	Indian Pond Heron	LC	R	Car
		<i>Ardea coromanda</i> (Linnaeus, 1758) ¹¹	Eastern Cattle Egret	LC	R	Car
		<i>Egretta garzetta</i> (Linnaeus, 1766) ¹¹	Little Egret	LC	R	Car
	Threskiornithidae	<i>Threskiornis melanocephalus</i> (Latham, 1790) ¹¹	Black-headed Ibis	LC	LM	Car
		<i>Pseudibis papillosa</i> (Temminck, 1824) ¹¹	Red-naped Ibis	LC	LM	Car
Ciconiiformes	Ciconiidae	<i>Ciconia episcopus</i> (Boddaert, 1783) ¹¹	Asian Woolly-necked Stork	NT	LM	Car
Anseriformes	Anatidae	<i>Anas poecilorhyncha</i> (Forster, 1781) ¹¹	Indian Spot-billed duck	LC	R	Omn
		<i>Tadorna ferruginea</i> (Pallas, 1764) ¹¹	Ruddy Shelduck	LC	LM	Omn
		<i>Anas crecca</i> (Linnaeus, 1758) ¹¹	Green-winged Teal	LC	WM	Omn
Accipitriformes	Accipitridae	<i>Elanus caeruleus</i> (Desfontaines, 1789) ¹¹	Black-winged kite	LC	R	Car
		<i>Pernis ptilorhynchus</i> (Temminck, 1821) ¹¹	Crested Honey Buzzard	LC	R	Car
		<i>Milvus migrans</i> (Boddaert, 1783) ¹¹	Black Kite	LC	R	Car
		<i>Haliastur indus</i> (Boddaert, 1783) ¹	Brahminy Kite	LC	R	Car
		<i>Tachyspiza badia</i> (Gmelin, JF, 1788) ¹	Shikra	LC	R	Car
		<i>Aquila rapax</i> (Temminck, 1828) ¹	Tawny Eagle	VU	LM	Car
		<i>Nisaetus cirratus</i> (Gmelin, JF, 1788) ¹	Changeable Hawk- Eagle	LC	R	Car
		<i>Aquila fasciata</i> (Vieillot, 1822) ¹	Bonelli's Eagle	LC	LM	Car
		<i>Ictinaetus malaiensis</i> (Temminck, 1822) ¹	Black Eagle	LC	LM	Car
		<i>Spilornis cheela</i> (Latham, 1790) ¹	Crested Serpent Eagle	LC	R	Car
Falconiformes	Falconidae	<i>Falco tinnunculus</i> (Linnaeus, 1758) ¹¹	Common Kestrel	LC	R	Car
		<i>Falco peregrinus</i> (Tunstall, 1771) ¹	Peregrine Falcon	LC	WM	Car
Galliformes	Phasianidae	<i>Perdica asiatica</i> (Latham, 1790) ¹¹	Jungle Bush Quail	LC	R	Gran
		<i>Gallus sonneratii</i> (Temminck, 1813) ^{1*}	Grey Junglefowl	LC	R	Gran
		<i>Pavo cristatus</i> Linnaeus, 1758 ¹	Indian Peafowl	LC	R	Gran
Gruiformes	Rallidae	<i>Amaurornis phoenicurus</i> (Pennant, 1769) ¹¹	White-breasted waterhen	LC	R	Omn
		<i>Porphyrio poliocephalus</i> (Latham, 1801) ¹¹	Grey-headed swamphen	LC	R	Omn
Charadriiformes	Recurvirostridae	<i>Himantopus himantopus</i> (Latham, 1801) ¹¹	Black-winged Stilt	LC	LM	Car
	Glareolidae	<i>Cursorius coromandelicus</i> (Gmelin, JF, 1789) ¹	Indian Courser	NT	LM	Car
	Charadriidae	<i>Vanellus indicus</i> (Boddaert, 1783) ¹¹	Red-wattled Lapwing	LC	R	Car
	Laridae	<i>Sterna aurantia</i> (Gray, JE), 1831 ¹	River Tern	VU	LM	Car
Columbiformes	Columbidae	<i>Treron phoenicopterus</i> (Latham, 1790) ¹¹	Yellow-footed Green Pigeon	LC	R	Gran
		<i>Columba livia</i> (Gmelin JF, 1789)	Rock Pigeon	LC	R	Gran
		<i>Spilopelia chinensis</i> (Scopoli, 1786) ¹¹	Spotted Dove	LC	R	Gran
		<i>Spilopelia senegalensis</i> (Linnaeus, 1766) ¹¹	Laughing Dove	LC	R	Gran
		<i>Chalcophaps indica</i> (Linnaeus, 1758) ¹¹	Asian Emerald Dove	LC	LM	Gran
Psittaciformes	Psittaculidae	<i>Psittacula krameri</i> (Scopoli, 1769) ¹¹	Rose-ringed Parakeet	LC	R	Frug
		<i>Psittacula eupatria</i> (Linnaeus, 1766) ¹¹	Alexandrine Parakeet	LC	R	Frug
		<i>Psittacula cyanocephala</i> (Linnaeus, 1766) ¹¹	Plum-headed Parakeet	LC	R	Frug
		<i>Loriculus vernalis</i> (Sparrman, 1787) ¹¹	Vernal Hanging Parrot	LC	LM	Frug

Order	Family	Scientific name	Common name	IUCN Red List status	Migratory status (for India)	Feeding guild
Cuculiformes	Cuculidae	<i>Cuculus micropterus</i> (Gould, 1838) ¹	Indian Cuckoo	LC	R	Omn
		<i>Hierocaccyx varius</i> (Vahl, 1797) ¹	Common Hawk Cuckoo	LC	R	Ins
		<i>Cacomantis passerinus</i> (Vahl, 1797) ¹	Grey-bellied Cuckoo	LC	LM	Ins
		<i>Clamator coromandus</i> (Linnaeus, 1766) ¹	Chestnut-winged Cuckoo	LC	LM	Omn
		<i>Eudynamys scolopaceus</i> (Linnaeus, 1758) ¹	Asian Koel	LC	R	Omn
		<i>Centropus sinensis</i> (Stephens, 1815) ¹	Greater Coucal	LC	R	Omn
Strigiformes	Tytonidae	<i>Tyto javanica</i> (Scopoli, 1769) ¹	Eastern Barn Owl	LC	R	Car
	Strigidae	<i>Bubo bengalensis</i> (Franklin, 1831) ¹	Rock Eagle- Owl	LC	R	Car
		<i>Athene brama</i> (Temminck, 1821) ¹	Spotted Owlet	LC	R	Car
Caprimulgiformes	Apodidae	<i>Apus affinis</i> (Hodgson, 1837) ¹	Little Swift	LC	R	Ins
	Caprimulgidae	<i>Caprimulgus indicus</i> (Latham, 1790) ¹	Jungle Nightjar	LC	LM	Ins
Coraciiformes	Alcedinidae	<i>Ceryle rudis</i> (Linnaeus, 1758) ¹	Pied Kingfisher	LC	R	Car
		<i>Alcedo atthis</i> (Linnaeus, 1758) ¹	Common Kingfisher	LC	R	Car
		<i>Halcyon smyrnensis</i> (Linnaeus, 1758) ¹	White-throated Kingfisher	LC	R	Car
	Meropidae	<i>Merops orientalis</i> (Latham, 1801) ¹	Asian Green Bee-eater	LC	R	Ins
	Coraciidae	<i>Coracias benghalensis</i> (Linnaeus, 1758) ¹	Indian Roller	LC	LM	Omn
Bucerotiformes	Upupidae	<i>Upupa epops</i> (Linnaeus, 1758) ¹	Common Hoopoe	LC	LM	Omn
	Bucerotidae	<i>Buceros bicornis</i> (Linnaeus, 1758) ¹	Great Hornbill	VU	LM	Frug
		<i>Ocyrceros birostris</i> (Scopoli, 1786) ¹	Indian Grey Hornbill	LC	R	Frug
Piciformes	Megalaimidae	<i>Psilopogon hemacephalus</i> (S. Müller, 1776) ¹	Coppersmith Barbet	LC	R	Frug
		<i>Psilopogon zeylanicus</i> (Gmelin JF, 1788) ¹	Brown-headed Barbet	LC	R	Frug
		<i>Psilopogon viridis</i> (Boddaert, 1783) ^{1*}	White-cheeked Barbet	LC	R	Frug
	Picidae	<i>Leiopicus maharattensis</i> (Latham, 1801) ¹	Yellow-crowned Woodpecker	LC	R	Ins
		<i>Dinopium benghalense</i> (Linnaeus, 1758) ¹	Black-rumped Flameback	LC	R	Ins
		<i>Dryocopus javensis</i> (Horsfield, 1821) ¹	White-bellied Woodpecker	LC	R	Ins
Passeriformes	Alaudidae	<i>Galerida malabarica</i> (Scopoli, 1786) ^{1*}	Malabar Lark	LC	LM	Omn
	Hirundinidae	<i>Hirundo rustica</i> Linnaeus, 1758 ¹	Barn Swallow	LC	R	Ins
		<i>Petrochelidon fluvicola</i> (Blyth, 1855) ¹	Streak-throated Swallow	LC	R	Ins
		<i>Hirundo smithii</i> (Leach, 1818) ¹	Wire-tailed Swallow	LC	R	Ins
	Laniidae	<i>Lanius schach</i> (Linnaeus, 1758) ¹	Long-tailed Shrike	LC	R	Ins
	Oriolidae	<i>Oriolus kundoo</i> (Sykes, 1832) ¹	Indian Golden Oriole	LC	R	Omn
	Dicruridae	<i>Dicrurus macrocercus</i> (Vieillot, 1817) ¹	Black Drongo	LC	R	Omn
		<i>Dicrurus leucophaeus</i> (Vieillot, 1817) ¹	Ashy Drongo	LC	WM	Omn
		<i>Dicrurus caerulescens</i> (Linnaeus, 1758) ¹	White-Bellied Drongo	LC	R	Omn
	Sturnidae	<i>Sturnia pagodarum</i> (Gmelin, JF, 1789) ¹	Brahminy Starling	LC	R	Omn
		<i>Acridotheres tristis</i> (Linnaeus, 1766) ¹	Common Myna	LC	R	Omn
		<i>Acridotheres fuscus</i> (Wagler, 1827) ¹	Jungle Myna	LC	R	Omn
	Corvidae	<i>Dendrocitta vagabunda</i> (Latham, 1790) ¹	Rufous Treepie	LC	R	Ins
		<i>Corvus splendens</i> (Vieillot, 1817)	House Crow	LC	R	Omn
		<i>Corvus macrorhynchos</i> Wagler, 1827 ¹	Large-billed Crow	LC	R	Omn
	Vangidae	<i>Tephrodornis pondicerianus</i> (Gmelin JF, 1789) ¹	Common Woodshrike	LC	R	Omn
	Campephagidae	<i>Lalage melanopectera</i> (Rüppell, 1839) ¹	Black-headed Cuckooshrike	LC	LM	Omn
		<i>Pericrocotus speciosus</i> (Latham, 1790) ¹	Scarlet Minivet	LC	R	Ins
		<i>Pericrocotus cinnamomeus</i> (Linnaeus, 1766) ¹	Small Minivet	LC	R	Ins

Order	Family	Scientific name	Common name	IUCN Red List status	Migratory status (for India)	Feeding guild
Passeriformes	Aegithinidae	<i>Aegithina tiphia</i> (Linnaeus, 1758) ¹	Common Iora	LC	R	Ins
	Pycnonotidae	<i>Pycnonotus cafer</i> (Linnaeus, 1766) ¹	Red-vented Bulbul	LC	R	Omn
		<i>Pycnonotus jocosus</i> (Linnaeus, 1758) ¹	Red-whiskered Bulbul	LC	R	Omn
	Pellorneidae	<i>Pellorneum ruficeps</i> (Swainson, 1832) ¹	Puff-throated Babbler	LC	R	Ins
	Timaliidae	<i>Dumetia hypertythra</i> (Franklin, 1831) ¹	Tawny-bellied Babbler	LC	R	Omn
		<i>Pomatorhinus horsfieldii</i> (Sykes, 1832) ^{1*}	Indian Scimitar- Babbler	LC	R	Omn
	Leiothrichidae	<i>Alcippe poioicephala</i> (Jerdon, 1841) ¹	Brown-cheeked Fulvetta	LC	R	Ins
		<i>Argya striata</i> (Dumont, 1823) ¹	Jungle Babbler	LC	R	Omn
	Muscicapidae	<i>Muscicapa muttui</i> (Layard, 1854) ¹	Brown-breasted Flycatcher	LC	R	Ins
		<i>Ficedula parva</i> (Bechstein, 1792) ¹	Red-breasted Flycatcher	LC	WM	Ins
		<i>Ficedula supercilialis</i> (Jerdon, 1840) ¹	Ultramarine Flycatcher	LC	WM	Ins
		<i>Cyornis tickelliae</i> (Blyth, 1843) ¹	Tickell's Blue Flycatcher	LC	R	Ins
		<i>Luscinia svecica</i> (Linnaeus, 1758) ¹	Bluethroat	LC	WM	Ins
		<i>Copsychus fulvatus</i> (Linnaeus, 1766) ¹	Indian Robin	LC	R	Ins
		<i>Myophonus horsfieldii</i> (Vigors, 1831) ^{1*}	Malabar Whistling Thrush	LC	R	Ins
		<i>Copsychus saularis</i> (Linnaeus, 1758) ¹	Oriental Magpie Robin	LC	R	Ins
	Monarchidae	<i>Terpsiphone paradisi</i> (Linnaeus, 1758) ¹	Indian Paradise-flycatcher	LC	R	Ins
		<i>Hypothymis azurea</i> (Boddaert, 1783) ¹	Black-naped Monarch	LC	R	Ins
	Rhipiduridae	<i>Rhipidura albogularis</i> (Lesson, 1831) ^{1*}	Spot-breasted Fantail	LC	R	Ins
	Cisticolidae	<i>Prinia buchanani</i> (Blyth, 1844) ¹	Rufous-fronted Prinia	LC	R	Ins
		<i>Prinia inornata</i> (Sykes, 1832) ¹	Plain Prinia	LC	R	Ins
		<i>Prinia socialis</i> (Sykes, 1832) ¹	Ashy Prinia	LC	R	Ins
		<i>Orthotomus sutorius</i> (Pennant, 1769) ¹	Common Tailorbird	LC	R	Ins
	Turdidae	<i>Turdus simillimus</i> (Jerdon, 1839) ¹	Indian Blackbird	LC	R	Ins
		<i>Geokichla citrina</i> (Latham, 1790) ¹	Orange-headed Thrush	LC	R	Ins
	Paridae	<i>Parus cinereus</i> (Vieillot, 1818) ¹	Cinereous Tit	LC	R	Ins
		<i>Macholophus aplonotus</i> (Blyth, 1847) ^{1*}	Indian Yellow Tit	LC	R	Ins
		<i>Dicaeum erythrorhynchos</i> (Latham, 1790) ^{[2] 1}	Pale-billed Flowerpecker	LC	R	Nect
	Motacillidae	<i>Motacilla cinerea</i> (Tunstall, 1771) ¹	Grey Wagtail	LC	WM	Car
		<i>Motacilla maderaspatensis</i> (Gmelin, JF, 1789) ¹	White-browed Wagtail	LC	R	Car
	Nectariniidae	<i>Leptocoma zeylonica</i> (Linnaeus, 1766) ¹	Purple-rumped Sunbird	LC	R	Nect
		<i>Cinnyris asiaticus</i> (Linnaeus, 1766) ¹	Purple Sunbird	LC	R	Nect
	Zosteropidae	<i>Zosterops palpebrosus</i> (Temminck, 1824) ¹	Indian White-eye	LC	R	Ins
	Passeridae	<i>Gymnoris xanthocollis</i> (Burton, 1838) ¹	Yellow-throated Sparrow	LC	R	Omn
		<i>Passer domesticus</i> (Linnaeus, 1758) ¹	House Sparrow	LC	R	Omn
	Ploceidae	<i>Ploceus philippinus</i> (Linnaeus, 1766) ¹	Baya Weaver	LC	R	Gran
	Emberizidae	<i>Emberiza lathami</i> (Gray JE, 1831) ¹	Crested Bunting	LC	R	Gran
	Estrildidae	<i>Amandava amandava</i> (Linnaeus, 1758) ¹	Red Avadavat	LC	R	Gran
		<i>Lonchura punctulata</i> (Linnaeus, 1758) ¹	Scaly-breasted Munia	LC	R	Gran

IUCN—International Union for Conservation of Nature | LC—Least Concern | NT—Near Threatened | VU—Vulnerable | R—Resident | Local Migratory—LM | Winter Migratory—WM | Car—Carnivore | Omn—Omnivore | Ins—Insectivore | Frug—Frugivore | Gran—Granivore | Nect—Nectivore | *—Endemic to India | Wildlife Protection (Amendment) Act, 2022: ¹—Schedule I | ¹—Schedule II.

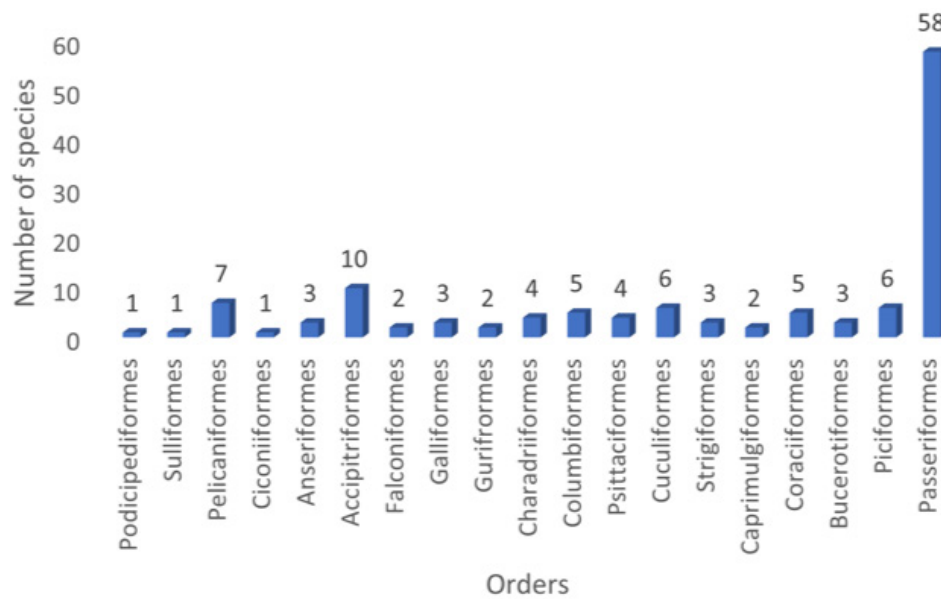


Image 2. Order-wise composition of avian species at Mahadare Conservation Reserve.

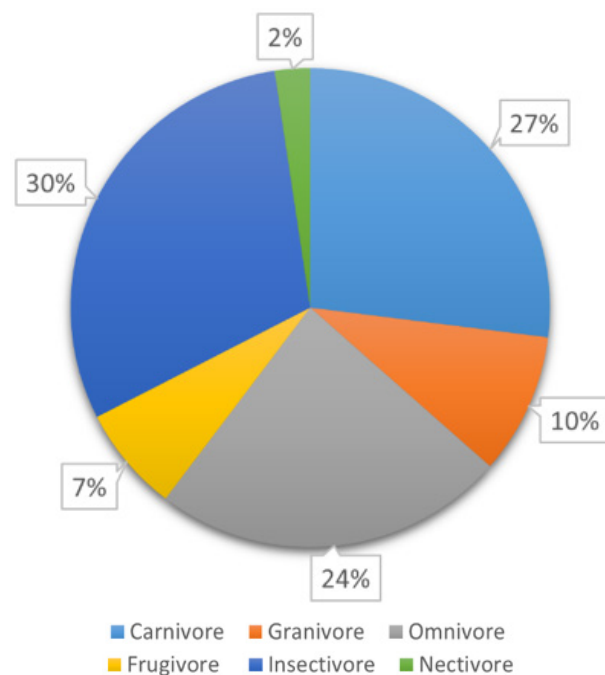


Image 3. Percentage of avian species based on feeding guilds at Mahadare Conservation Reserve.

(Mehta 2012), recorded 269 species of birds (Sreekumar & Bhatnagar 2021). The present study documented 96 (76%) birds resident to the Indian subcontinent, 23 (18%) Local Migratory, and seven (5%) Winter Migratory species.

Birds observed during the study are placed under

six different categories according to their dietary preferences as Insectivore, Carnivore, Nectivore, Omnivore, Granivore, and Frugivore. MCR consists of a mosaic of different habitats (Image 3). These include two freshwater bodies and small seasonal streams. Surrounding these water bodies are patches of dry deciduous forest characterized by an open canopy and seasonal leaf shedding. The landscape also features patches of semi-evergreen and evergreen forest. In addition, grasslands and cultivated paddy fields add to the habitat heterogeneity. The diverse habitat structures within the study area influence the coexistence of avian species (Panda et al. 2021; Byju et al. 2025; Kumar et al. 2025). It was seen that the Insectivore guild (38) comprised the highest number of bird species, followed by Carnivores (34), Omnivores (30), Granivores (12), Frugivores (9), whereas the Nectivore Guild (3) made up the least number of species (Image 4). The feeding guild diversity index ($H'_{FD} = 2.25$) and the evenness index ($J_{FD} = 0.87$) show high feeding diversity with a slightly uneven distribution, as Insectivorous and Carnivorous guilds dominate (Ghosh et al. 2022).

The feeding behaviour in birds varies in accordance with resource availability and niche partitioning, eventually providing insights into the habitat. Mahadare, with its diverse habitats, comprises 51 reptile and nine amphibian species (Dhale et al. 2024). These species serve as an important food source for carnivorous avian species, especially for migratory raptors such as the Peregrine Falcon *Falco peregrinus* (R. Patil per. obs.

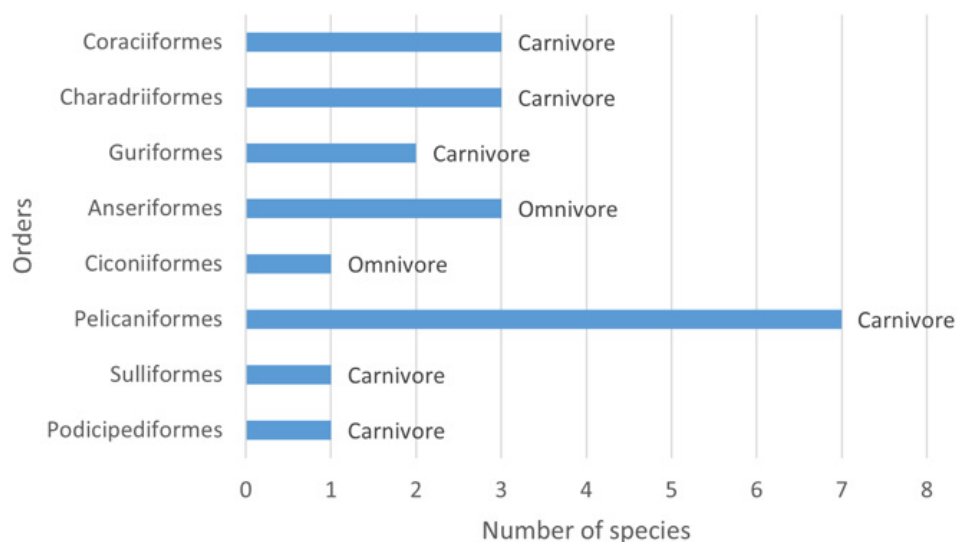


Image 4. Guild separation in aquatic feeders at Mahadare Conservation Reserve.

2022). Takahashi & Ohkawara (2007) and Wood et al. (2010) stated that paddy fields are suitable habitats for breeding and foraging of aquatic and terrestrial birds. We have observed that the ploughed soil of paddy fields attracts birds such as Blue-cheeked Bee-eater *Merops orientalis*, Tickell's Blue Flycatcher *Cyornis tickelliae*, Red-vented Bulbul *Pycnonotus cafer*, Indian Paradise Flycatcher *Terpsiphone paradisi*, and Black-naped Monarch *Hypothymis azurea* that feed on the insect diversity of paddy fields. MCR consists of multiple small streams, a natural reservoir, and an irrigation tank. These waterbodies support rich aquatic biodiversity with 22 species of fish, which serve as a food source for the fish-eating birds (Mohite et al. 2020). The waterbodies host 21 species of aquatic birds from two feeding guilds: Carnivore (16) and Omnivore (5). Species from the Carnivorous guild are mainly dependent on fishes and amphibians as their primary source of food, along with invertebrates such as snails, worms, and crustaceans. Aquatic birds such as Indian Spot-billed Duck *Anas poecilorhyncha*, Ruddy Shelduck *Tadorna ferruginea*, and Green-winged Teal *Anas crecca* of the Omnivorous guild feed on young shoots and seeds of grasses of the aquatic vegetation, along with molluscs and other invertebrates (Image 4).

Butterflies act as a prey base for many avifaunal species. Resendiz-Infante & Gauthier (2020) mentioned observations referring to the seasonal diversity of birds, which often reflects the timing of breeding in accordance with the abundance of caterpillars. Sutar et al. (2025) recorded 184 butterfly species from MCR, which supports the observation of rich insect

availability. Similarly, the present study showed bird count at its peak during winter months (Oct-Jan), coinciding with high butterfly activity (Seress et al. 2018). Several insectivorous winter migrants, such as the Bluethroat *Luscinia svecica*, Ultramarine Flycatcher *Ficedula superciliaris*, and Red-breasted Flycatcher *Ficedula parva*, were also recorded during this period. Colour, seed size, and fruiting arrangement influence fruit selection in frugivorous birds (Azman et al. 2011), and Mahadare comprises 392 plant species, which include a diversity of fruiting and flowering trees such as Black Clutch *Senegalia catechu*, Golden Shower *Cassia fistula*, and Indian Beech *Pongamia pinnata*. The region also reported 72 flowering plants, which serve as host plants for butterflies (Bhoite et al. 2025). This indirectly supports avian diversity by hosting their prey base. The floral diversity of the area supports the avian population in numerous ways, including nesting and feeding on those trees or shrubs. During summer, it was observed that birds such as Small Minivet *Pericrocotus cinnamomeus*, Coppersmith Barbet *Psilopogon haemacephalus*, Brown-headed Barbet *Psilopogon zeylanicus*, and Pale-Billed Flowerpecker *Dicaeum erythrorhynchos* were mostly seen feeding on Cluster Fig *Ficus racemosa*. Coppersmith Barbet was also seen nesting in the crevices of this tree. Trees such as Red Silk Cotton *Bombax ceiba* and Indian Mango *Mangifera indica* are a few important species that are directly beneficial to the avian populations of the region, fulfilling the guild structure. Species such as the Puff-throated Babbler *Pellorneum ruficeps* were mainly observed foraging in the leaf litter of Teak *Tectona grandis* by turning over leaves.

CONCLUSION

MCR is an ecotone region that acts as a transition zone between diverse habitats. The presence of multiple feeding guilds highlights the functional diversity of the region, not just taxonomic richness. Studying the feeding guild distribution in a region can also help in understanding the various nuances of community assemblages, along with the structural complexity of a given area. Since feeding guilds provide insights into ecosystem functioning, the loss of specific guilds can potentially disrupt activities such as pest regulation, pollination, and seed dispersal, which could severely alter ecosystems. In order to gain in-depth knowledge about the effects of change in feeding guild diversity, it is important to assess the long-term impacts of climate change and land-use change, along with their functional redundancy and resilience.

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