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Lalitha HM
Department of Zoology,
University college of Science,
Tumkur University, Tumakuru,
Karnataka, India

Corresponding Author:
Lalitha HM
Department of Zoology,
University college of Science,
Tumkur University, Tumakuru,
Karnataka, India

A preliminary study of avifaunal diversity in the outskirts of Belagumba, Tumkur District, Karnataka

Lalitha HM

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Abstract
Biodiversity refers to the variety and abundance of species in different habitats. An ecosystem with rich iodiversity provides more alternatives for transferring energy. Birds are one of the most important components of any ecosystem and the best indicators of ecological changes. The objective of this study was to record and examine the avian diversity in the selected habitats of Belagumba village adjoining the Devarayana Durga state forest. The study was carried out during March-2023 to April-2024 in some of the selected agricultural habitats like arecanut plantation, coconut plantation, flower garden and vegetable croplands with sparse residential houses. The bird survey was done by following the point count method. Identification of birds was based on field guidelines and with the help of ornithologists. In the present study, 52 species of birds belonging to 13 orders and 26 families with an endangered species, Egyptian vulture have been recorded. Among these, order Passeriformes is represented by 17 species, Cuculiformes -04 species, Accipitriformes and Piciformes each by 03 species, Pelecaniformes, Columbiformes, Galliformes, Apodiformes, Coraciiformes, Bucerotiformes each by 02 species and Psittaciformes, Strigiformes and Charadriiforms' each by 01 species. As the study area is adjoining the forest ecosystem of Devarayana Durga state forest and with diversified croplands, plantations, it provides suitable and preferred habitat for birds.

Keywords: Biodiversity, arecanut plantation, Egyptian vulture, order passeriformes

Introduction
Quantitative recording of biodiversity is a significant component of ecology and has gained popularity in recent days. The Indian subcontinent, one of the vast Oriental biogeographic regions, has a high level of biodiversity. It is approximated that over 18,000 bird species are dispersed throughout this planet's diverse terrain (Sen *et al*.,2023) [18]. Research on avifaunal diversity is a significant ecological tool in the ecosystem for the qualitative and quantitative evaluation of different habitats. In addition to providing aesthetic value to our lives, bird species also contribute to seed distribution, agricultural crops pest control and ecological balance maintenance. As a result, they form the crucial parts of the natural ecosystem (Chethan, 2020) [8].

Birds are among the best indicators of ecological changes and have been employed to assess the environment throughout time as bio monitors. Hence, they are considered as the reliable indicators of the ecological status of any given environment and the bird studies aid in gathering baseline data. Changes in their population, behaviour patterns, and reproductive capacity have most frequently been utilized to analyse the long-term effects of habitat fragmentation. Studies examining the diversity of avifauna and their varied habitat conditions are growing in popularity as they show a variety of patterns in their habitat selection (Bilgrami, 1995; Harisha and Hosetti, 2009) [6, 11]. The distribution and abundance of birds are frequently investigated as indicators of biodiversity and ecosystem health because it is difficult to monitor every species that exists within an ecosystem or community. The distribution and diversity of birds reveal details about a forest's overall wellness. (Canterbury *et al*., 2000; Fraixedas *et al.*, 2020) [7, 9].

Forests attract a diverse range of bird species due to the adequacy of habitat for most of them. This particularly include the birds that are connected to the vegetation, and for the majority, trees are essential to their life cycle. The composition of bird species is closely linked to the

vegetation structure of the forest. There is a positive correlation between the growing structural complexity of the vegetation and the diversity of birds, especially native species. And birds' foraging habits also cause seasonal changes in the species diversity of birds in forests (Robertson and Hackwell, 1995) [17]. Usually, urbanization and the stresses resulting from human activities cause a loss of biodiversity. and can have a detrimental impact on the distribution and behaviour of species either directly or indirectly through habitat modification (Myczko *et al.*, 2014; Partecke *et al.*,2004) [15, 16]. Numerous bird species can be found among the varied forests. However, as it is isolated from other nearby forests due to its urban location, it may affect the distribution of faunal species (Sen *et al.*, 2023) [18]. The distribution and abundance of avian fauna in urban areas have been more significantly impacted by anthropogenic activities (Kushwaha and Kulkarni, 2013) [14]. Due to the important role that birds play in maintaining ecosystems and supporting biodiversity, many seek their protection to manage biological threats and efficiently protect the environment (Stevenson and Fanshawe 2002) [19].

Study area

The study was conducted in some selected agricultural habitats of Belagumba village like arecanut plantation, coconut plantation, flower garden and vegetable croplands with sparse residential houses. The study area lies at 13.3487° N latitude and 77.1341° E longitude. Belagumba is a rural area located 5km East Tumkur city adjoining the Devarayana Durga state forest. The east and south borders of the village are in continuation with Devarayana Durga state forest interrupted by agricultural lands and some residential areas. The satellite view of the study area is shown in Fig.1.

Fig 1: The satellite view of the study area, Belagumba.

Materials and methods

Bird survey was done using Point count method**.** Survey was conducted from March-2023 to April-2024 in the morning 6.30 a.m. to 9.30 a.m. and evening 5.00 p.m. to 6.30 p.m. Nikon Action 10x50 mm binocular was used to observe the birds. Field guides were used to identify birds (Ali and Ripley, 1987; Grimmett *et al.*,2010) [2, 10].

Birds observed during the survey were categorized based on their migratory nature into resident and migrant and based on their feeding habits also categorized as insectivore, nectarivore, omnivore, scavenger, frugivore, carnivore and granivore.

Results and Discussion

52 bird species belonging to 13 orders and 32 families were observed during the study period. Order Passeriformes was the most dominant family represented by 23 species comprising 44% of bird species, Accipitriformes by 05 species with 10% of bird species. Each of the orders Pelecaniformes, Columbiformes, Cuculiformes, Apodiformes, Coraciiformes were represented by 3 species, each with 6% of bird species, Orders Bucerotiformes, Galliformes, Piciformes each by 2 species with 4% of bird species and Psittaciformes, Strigiformes, Charadriiformes each by 01 species with 2% of the total reported bird species.

Table 1: Avifaunal diversity in Belagumba

Sl.No.	Order	Family	Scientific name	Common name	IUCN status	Population Trend	Migratory status	Feeding habit
1	Pelecaniformes	Ardeidae	*Egretta garzetta*	Little egret	LC	Increasing	Winter Migrant	Carnivorous
2			*Bubulcus ibis*	Cattle egret	LC	Increasing	Summer Migrant / Passage Migrant	Carnivorous
3			*Ardeola grayii*	Indian Pond eron	LC	Resident	Stable	Carnivorous
4	Bucerotiformes	Bucerotidae	*Ocyceros birostris*	Indian Grey Hornbill	LC	Resident	Stable	Omnivorous
5		Upupidae	*Upupa epops*	Eurasian Hoopoe	LC	Resident	Stable	Insectivorous
6	Accipitriformes	Accipitridae	*Milvus migrans*	Black kite	LC	Increasing	Summer Migrant / Passage Migrant	Carnivorous (Scavenger)
7			*Halliastur indus*	Bramhiney kite	LC	Stable	Resident and Partial Migrant	Carnivore, Scavenger
8			*Neophron percnopterus*	Egyptian Vulture	EN	Summer migrant	Decreasing	Scavenger
9			*Ictinaetus malaiensis*	Black Eagle	LC	Resident	Stable	Carnivorous
10			*Accipiter badius*	Shikra	LC	Resident	Stable	Carnivorous
11	Columbiformes	Columbidae	*Columba livia*	Blue rock pigeon	LC	Stable	Resident	Granivorous
12			*Spilopelia chinensis*	Spotted dove	LC	Stable	Resident	Granivorous
13			*Spilopelia senegalensis*	Laughing dove	LC	Stable	Resident	Granivorous
14	Psittaciformes	Psittaculidae	*Psittacula krameri*	Rose ringed parakeet	LC	Increasing	Resident	Herbivorous
15	Galliformes	Phasianidae	*Pavo cristatus*	Pea fowl	LC	Resident	Increasing	Omnivorous
16		Phasianidae	*Old world quail sp. Synoicus/Coturnix sp.*	Quail	LC	Resident	Stable	Omnivorous
17	Cuculiformes	Cuculidae	*Hierococcyx varius*	Common hawk-cuckoo	LC	Resident and Local Migrant	Stable	Insectivorous
18		Cuculidae	*Eudynamys scolopaceus*	Asian Koel	LC	Resident and Local Migrant	Stable	Omnivorous
19		Cuculidae	*Centropus sinensis*	Greater Coucal	LC	Resident	Stable	Omnivorous
20	Strigiformes	Strigidae	*Athene brama*	Indian Spotted Owlet	LC	Resident	Stable	Carnivorous
21	Apodiformes	Apodidae	*Apus affinis*	Little swift	LC	Resident and Partial Migrant	Stable	Insectivorous
22		Apodidae	*Tachymarptis melba*	Alpine Swift	LC	Summer migrant	Stable	Insectivorous (Aerial)
23		Apodidae	*Cypsiurus balasiensis*	Asian palm swift	LC	Resident and Partial Migrant	Stable	Insectivorous
24	Coraciiformes	Alcedinidae	*Halcyon smyrnensis*	White Throated king fisher	LC	Resident and Partial Migrant	Stable	Carnivorous
25		Coraciidae	*Coraceous benghalensis*	Indian roller bird	LC	Resident and Partial Migrant	Stable	Carnivorous
26		Meropidae	*Merops orientalis*	Green bee eater	LC	Resident and Partial Migrant	Stable	Insectivorous
27	Piciformes	Picidae	*Psilopogon viridis*	Small green barbet	LC	Resident	Stable	Omnivorous
28		Picidae	*Crysocolaptes festivus*	White naped woodpecker	LC	Resident	Stable	Omnivorous
29	Charadriiformes	Charadriidae	*Vanellus indicus*	Red wattled Lapwing	LC	Resident	Stable	Omnivorous
30	Passeriformes	Dicruridae	*Dicrurus macrocercus*	Black Drango	LC	Resident	Stable	Omnivorous
31		Passeridae	*Passer domesticus*	House Sparrow	LC	Resident and Partial Migrant	Decreasing	Omnivorous
32		Sturnidae	*Acridotheres tristis*	Indian Myna	LC	Resident and Partial Migrant	Stable	Omnivorous
33		Sturnidae	*Acridotheres fuscus*	Jungle Myna	LC	Resident	Stable	Omnivorous
34		Corvidae	*Corvus splendens*	House crow	LC	Resident	Increasing	Omnivorous
35		Corvidae	*Corvus macrorhynchos*	Jungle crow	LC	Resident	Stable	Omnivorous
36		Pycnonotidae	*Pycnonotus cafer*	Red vented bulbul	LC	Resident	Stable	Omnivorous
37		Pycnonotidae	*Pycnonotus jocosus*	Red whiskered bulbul	LC	Resident	Stable	Omnivorous
38		Leiothrichidae	*Argya affinis.*	Yellow billed babbler	LC	Resident	Stable	Omnivorous
39		Muscicapidae	*Saxicola caprata*	Pied bush chat	LC	Resident	Stable	Insectivorous
40		Muscicapidae	*Copsychus fulicatus*	Indian Robin	LC	Resident	Stable	Insectivorous
41		Paridae	*Parus cinereus*	Cinerous tit	LC	Resident	Stable	Omnivorous
42		Motacillidae	*Motacilla maderaspatensis*	Large pied wag tail	LC	Resident	Stable	Insectivorous
43		Nectariniidae	*Leptocoma zeylonica*	Purple rumped	LC	Resident	Stable	Nectarivorous

				sunbird				and insectivorous
44		Nectariniidae	*Cinnyris asiaticus*	Purple sun bird	LC	Resident	Stable	Nectarivorous and insectivorous
45		Zosteropidae	*Zosterops palpebrosus*	Indian White eye	LC	Resident	Stable	Omnivorous
46		Estrildidae	*Lonchura punctulata*	Scaly breasted Munia	LC	Resident	Stable	Granivorous
47		Sylviidae	*Orthotomus sutorius*	Common Tailor bird	LC	Resident	Stable	Insectivorous (Omnivorous)
48		Ploceida	*Ploceus philippinus*	Baya weaver	LC	Resident	Stable	Granivorous / Omnivorous
49		Irenidae	*Aegithina tiphia*	Common Iora	LC	Resident	Stable	Insectivorous/ Nectarivorous
50		Irenidae	*Jerdon's Leafbird*	Chloropsis jerdoni	LC	Resident	Stable	Insectivorous some frugivorous
51		Corvidae	*Dendrocitta vagabunda*	Rufous tree pie	LC	Resident	Stable	Omnivorous
52		Campephagidae	*Coracina macei*	Indian Cuckoo shrike	LC	Resident	Stable	Insectivorous

Avifaunal diversity in Belagumba, Tumakuru is shown in Table 1, Percentage occurrence of birds' orders in Fig.2, Percentage occurrence of migratory status of birds in Fig.3 and Percentage occurrence of birds' population trends in Fig.4.

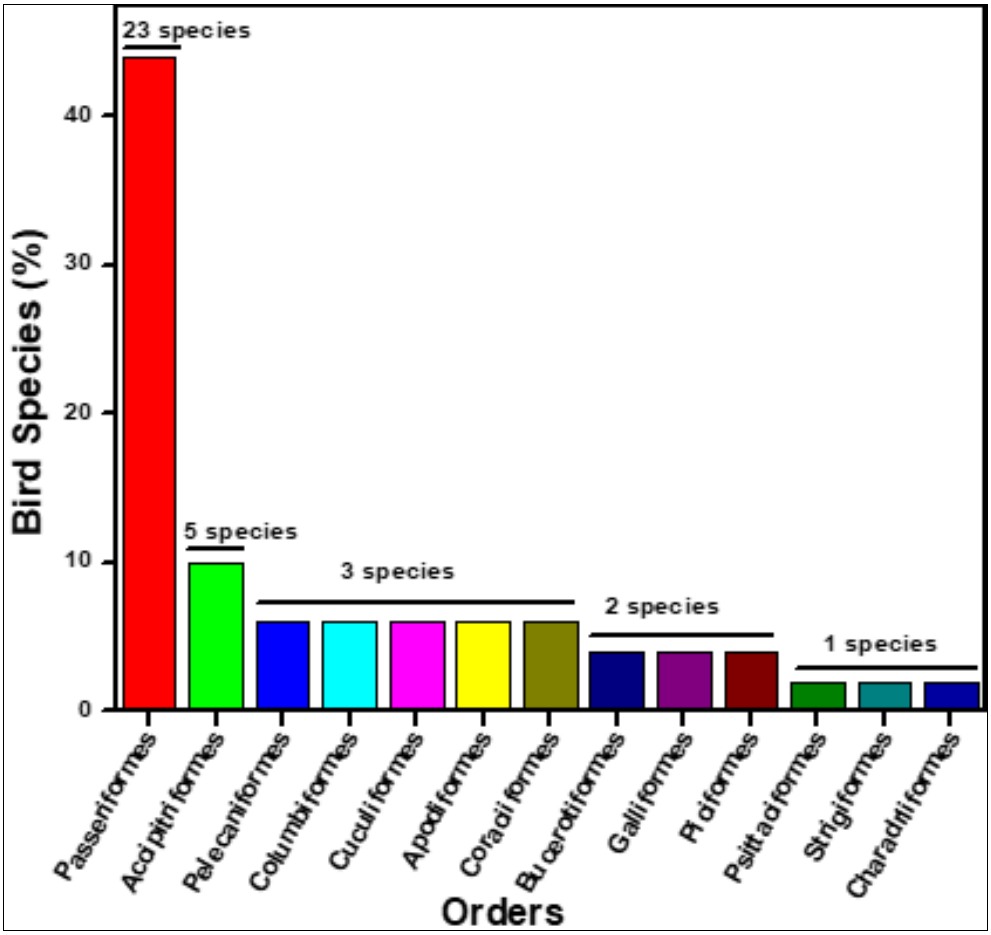

Fig 2: Percentage occurrence of Birds orders in Belagumba

Family Accipitridae contributed the highest number of species (05) followed by the family Ardeidae, Columbidae, Cuculidae, Apodidae with 03 species, 08 families with 2 species whereas 19 families were found to be represented by single bird species.

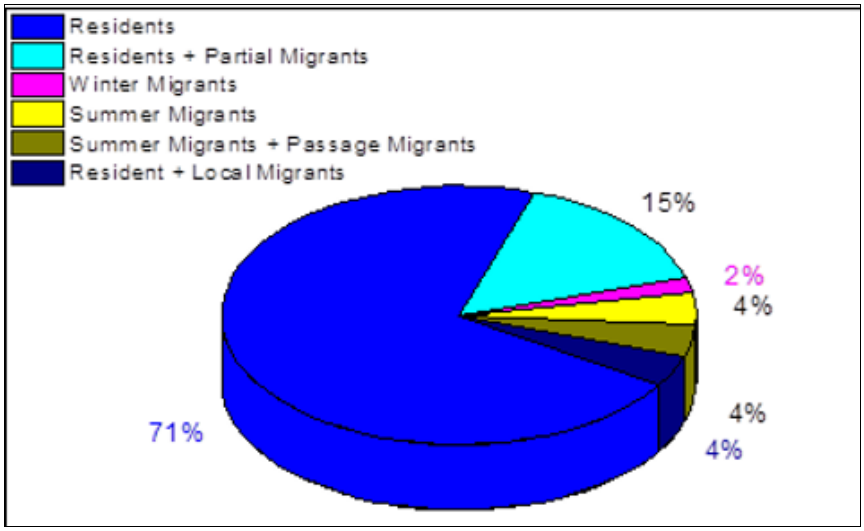

Fig 3: Percentage occurrence of migratory status of bird species in Belagumba.

Out of 52 bird species, 71% were Residents, 15% were Resident and Partial migrants, 02% were Winter migrants, 04% were summer migrants, 04% were summer migrants/ Passage migrants and 04% were Resident and Local migrants.

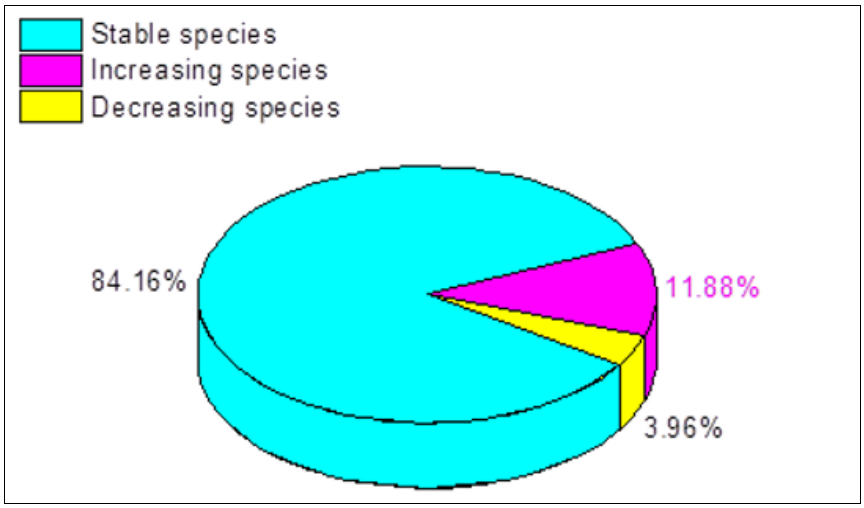

Fig 4: Percentage occurrence of bird population trends in Belagumba.

In the present study, 51 species of birds are listed as species of Least concern by the IUCN and one species i.e., Neophron percnopterus (Egyptian vulture) is listed as Endangered species.

Population of Egyptian vulture has declined significantly due to various threats. Feeding on poison carcasses, consuming veterinary drugs fed livestock carcasses, Power lines, Lead Poisoning, Disturbance at Nesting Sites are some of the causes for Egyptian vultures to become endangered.

Population trend of 85% of the species were showing stable, 12% were increasing and 4% were decreasing.

Stable or Increasing in the population trend of birds may be due to the conservation efforts like habitat restoration, their adaptability to human-dominated landscapes. Improvements in forestry, agriculture, and fishing practices have benefited birds to maintain their population.

Decrease in Population of bird species may be attributed to habitat loss due to urbanization, deforestation, and agricultural expansion. Changes in the Climate leads to rising temperatures, altered migration patterns, changes in food availability, thus impacting the decline in population of many bird species. Pesticides, plastics, and industrial pollution also affect the population of birds.

The present research work also documented 20 species of birds showing omnivorous feeding, 08 species carnivorous, 06 species insectivorous, 04 species granivorous, 02 species Nectarivorous and 01 species frugivorous which represents that the study area is supporting the various species of birds with different feeding pattern.

The present study which recorded 52 bird species reflects a moderately healthy overall biodiversity for the present study location. But it must be mentioned that the study area is facing anthropogenic disturbances in the forms of urbanization, deforestation and agricultural expansion.

Ali and Whistler (1943) [3] in historical landmark survey of Mysore state covered 343 species from Mysore state characterized by passerines and non-passerine avifauna. In the presented order Passeriformes is recorded with 23 species of birds.

Joshi *et al*., (2021) [12] encountered 231 species of birds belonging to 54 families during the avian survey at water streams, forest and agriculture habitats of Dehradun District. In the study area, one endangered species, namely Egyptian Vulture (*Neophron percnopterus*) has been recorded. In the present study also Neophron percnopterus (Egyptian vulture) is listed as Endangered species.

Asif and Gautam (2016) [4] recorded 59 species belonging to

14 families and 8 orders and observed 56% were winter migrants, 16 species (27%) were residents, and 10 species (17%) were local migrants and are of the opinion that difference in bird diversity across different habitats might be associated with the availability of food, roosting and nesting sites, predation pressure and disturbance.

In Durgapur Government College Campus, Adhurya *et al*., (2023) [1] recorded 106 bird species belonging to 47 families and family Sylviidae was found to be the most diverse family and 23 were winter migrants, 4 were summer migrants, 1 was passage migrant, 1 was vagrant and the rest 77 were residents. The global population trend showed that 52% of the species belonged to the stable category. They concluded that the study area is exposed to various anthropogenic disturbances which led to the decline of the bird populations and need special attention. Similar results were obtained in the present study where 71% were Residents, 15% were Resident and Partial migrants, 02% were Winter migrants, 04% were summer migrants, 04% were summer migrants/ Passage migrants and 04% were Resident and Local migrants.

Chethan (2020) [8] studied the abundance and distribution of bird species in Mysore city in different habitats, a total 3400 birds of 20 families have been recorded from the study areas and opined that semi-arid climate, freshwater lakes, several human planted vegetations provide an excellent habitat for several residential and migratory species of birds. He also noticed that occurrence of insectivorous (16 species) birds were dominant followed by frugivorous, carnivorous, piscivorous, omnivorous and granivorous birds respectively. These results were also similar to the present findings with the occurrence of birds with different types of feeding habits.

In addition, Insectivorous species and raptors control vectors like mosquitoes and rodents. Scavenger birds help in recycling of biomass and, to a certain extent, lower the amount of disposable waste. Frugivorous birds are crucial to the spread of fleshy fruit-producing plant seeds. Birds like sun birds participate in crossbreeding of flowering plants. (Judd *et al.*, 2008) [13].

Basavarajappa (2006) [5] documented 27 species of water birds belonging to 13 families in Channagiri Taluk of Davangere District. Of all, family Ardeidae (9 species) was relatively dominant (68.7%). The most common and abundant species of Ardeidae family were the Cattle Egret (*Bubulcus ibis*) and Little Egret (*Egretta garzetta*) followed by Indian Pond Heron (*Ardeola grayii*). Similar findings also reported in the present study showing the abundance of water birds in the agricultural lands on the banks of water canals.

Conclusion

The present study contributes to the knowledge of bird diversity in rural landscapes and provides the recent status of bird diversity in Belagumba. It is recommended that city land-use plans should prioritize biodiversity, especially in regions where villages and cities are situated close to protected areas or natural reserves. Finally, city planning should incorporate an understanding of biodiversity, particularly avian populations, as highlighted by our study.

Conflict of interest

The author has no conflict of interest.

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