

**Bird diversity of Farmagudi Plateau, Goa  
with special reference to activity budget of Yellow wattled Lapwing**

A Dissertation Report for

ZOO-651

Credits: 16 Credits

Submitted in partial fulfilment of master's Degree in Science  
In zoology

by

**AKANKSHA RAI**

Seat Number: 22P0440003

ABC ID: 48259081224

PRN: 202201088

Under the Mentorship of

**DR. MINAL DESAI SHIRODKAR**

School of Biological Sciences & Biotechnology  
Zoology Discipline



**GOA UNIVERSITY**

**May 2024**

Examined by:

*Desai*  
*Shirodkar*  
*Shirodkar*  
*Shirodkar*



Seal of the School

**DECLARATION BY STUDENT**

I hereby declare that the data presented in this Dissertation report entitled, “**Birds of Farmagudi Plateau, Goa with special reference to Activity budget of Yellow wattled Lapwing**” is based on the results of investigations carried out by me in the Zoology Discipline at the School of Biological Sciences & Biotechnology, Goa University, under the mentorship of **Dr. Minal Desai Shirodkar** and the same has not been submitted elsewhere for the award of a degree or diploma by me. Further, I understand that Goa University or its authorities will not be responsible for the correctness of observations / experimental or other findings given in the Dissertation report/work.

I hereby authorize the University authorities to upload this report on the dissertation repository or anywhere else as the UGC regulations demand and make it available to any one as needed.

Date:

Akanksha Rai

Place: Goa University

Seat no: 22P0440003

### COMPLETION CERTIFICATE

This is to certify that the dissertation report “**Birds of Farmagudi Plateau, Goa with special reference to Activity budget of Yellow wattled Lapwing**” is a bonafide work carried out by **Ms. Akanksha Rai** under my mentorship in partial fulfilment of the requirements of ZOO-651 Dissertation (16 credits) course in the Discipline of Zoology at the School of Biological Sciences & Biotechnology, Goa University.

Date:

Dr. Minal Desai Shirodkar  
Assistant Professor of Zoology



Dr. Bernard F. Rodrigues

Dean

School of Biological Science and Biotechnology

Date: 8-4-24

Place: Goa University

Dean of School of Biological Sciences

& Biotechnology

Goa University, Goa-403206



School Stamp

## **ACKNOWLEDGEMENT**

I would like to express my sincere gratitude to **Goa University** for providing me with the opportunity to pursue my Master's degree in Zoology. The support and resources offered by the University have been instrumental in shaping my academic journey and enabling me to reach this significant milestone.

I also thank **Dr. Nitin Sawant**, Programme Director of Zoology at Goa University for his unwavering support, guidance, and encouragement throughout my academic pursuit. His mentoring has played a crucial role in shaping my academic and professional growth.

I am deeply grateful to **Dr. Minal Desai Shirodkar**, Assistant Professor of Zoology, for her exceptional mentoring, expertise, and invaluable guidance. Her insightful feedback, encouragement, and constructive criticism have been pivotal in refining my research skills and academic endeavours.

Furthermore, I extend my heartfelt thanks to the Almighty for granting me the strength, perseverance, and opportunity to successfully complete my M.Sc. in Zoology programme at Goa University.

Lastly, I would like to acknowledge the support and encouragement of my husband and family whose unwavering belief in me has been a constant source of motivation and inspiration throughout this journey. Their encouragement has been invaluable in overcoming challenges and achieving academic success.

Ms. Akanksha Rai.



# **CONTENTS**

<b>Chapter</b>	<b>Particulars</b>	<b>Page No.</b>
	Acknowledgement	iv
	List of Table	vi
	List of Graph	vi
	List of Figures	vii
	<b>Abstract</b>	viii
<b>1</b>	<b>Introduction</b>	1-4
<b>2</b>	<b>Literature Review</b>	5-7
<b>3</b>	<b>Study Area</b>	8-12
<b>4</b>	<b>Methodology</b>	13-15
<b>5</b>	<b>Observations</b>	16-41
<b>6</b>	<b>Discussion</b>	42-44
<b>7</b>	<b>Conclusion</b>	45-46
<b>8</b>	<b>Reference</b>	47-49

### LIST OF TABLE & GRAPH

Sr. No.	Table Description	Page No.
1	Birds Checklist of Farmagudi Plateau with Feeding Guild and Residential Status.	20-23

Serial Number	Graph Description	Page No
2	Bird diversity in the open zone of the Farmagudi Plateau	24
3	Birds diversity in the shrub zone of Farmagudi Plateau	
4	Venn diagram showing the bird species' exclusive to open zones and shrub areas and the species common in both the habitat	25
5	Birds on the Farmagudi Plateau based on their feeding habit in open and shrub areas	25-26
6	Migratory and Residential Bird in Open and Shrub Areas of Farmagudi Plateau.	26
7	Yellow Wattled Lapwing Activity at Site-1	37
8	Yellow Wattled Lapwing Activity at Site-2	38

### LIST OF ABBREVIATION USED

Entity	Abbreviation
Resident	R
Migrant	M
Insectivorous	I
Carnivorous	C
Omnivorous	O
Piscivorous	P
Granivorous	G
Frugivorous	F
Nectarivorous	N

**LIST OF FIGURE**

<b>Figure No.</b>	<b>Birds Common Name</b>	<b>Page No.</b>
1	Red-vented Bulbul	27
2	White-rumped Munia	
3	House Crow	
4	House Sparrow	
5	Oriental Magpie Robin	28
6	Asian Green Bee-eater	
7	Indian Peafowl	
8	Asian Koel	
9	Ashy wood Swallow	29
10	Grey Bushchat	
11	Crimson backed Sunbird	
12	Brahminy Kite	
13	Spotted Munia	30
14	Common Quail	
15	Spotted Owl	
16	White bellied Drongo	
17	White-browed Wagtail	31
18	Blue-tailed Green Bee eater	
19	Indian Roller	
20	Common Hoopoe	32
21	Ashy Drongo	
22	Asian Paradise-Flycatcher (Male)	
23	Asian Paradise-Flycatcher (Female)	
24	Cattle Egret	33
25	Indian Pond Heron	
26	Little Cormorant	
27	Intermediate Egret	
28	Yellow- wattled Lapwing	34
29	Red – wattled Lapwing	
30	White-throated Kingfisher	
31	Black Drongo	
32	White-cheeked Barbet	35
33	Common Golden-backed Woodpecker	
34	Lesser Golden-backed Woodpecker	
35	Red-whiskered Bulbul	
36	Malabar Grey Hornbill	36
37	Malabar Pied Hornbill	
38	Activities of Yellow wattled Lapwing	38-41

### **ABSTRACT**

Plateaus are significant features of terrestrial landscapes, comprising relatively flat area on elevated regions that often serve as critical habitats for diverse bird communities. The present study focused on the avian diversity of Farmagudi Plateau with special reference to the activity budget of Yellow-wattled Lapwing (*Vanellus malabaricus*),

72 bird species of 13 Orders and 33 Families were recorded using the Transect method, though out the study period (May 2023-June2024). Of the total, 8 species were migratory and are encountered during the winter. Yellow Wattled Lapwing activities were studied using Focal method. At site-1 walking is most common activity and flying was least. While at site-2 sitting was the most common activity and flying and calling were the least common activity.

Farmagudi Plateau harbours diverse birds and support Yellow wattled Lapwing which is relatively uncommon.

# **Chapter 1: Introduction**

## **INTRODUCTION**

Plateaus are significant features of terrestrial landscapes, comprising relatively flat and elevated regions that often serve as critical habitats for diverse bird communities. These elevated terrains, characterized by their unique ecological attributes, play a pivotal role in supporting various avian species, contributing to ecosystem functioning and resilience. The importance of Plateaus as vital bird habitats has been underscored by numerous scientific studies Mukhopadhyay and Mazumdar (2019), Sohil and Sharma (2020) Kumar and Gupta (2009), which have highlighted the ecological significance of these landscapes and the diverse bird species they harbour.

Plateaus are often regarded as the "kidneys of Earth" due to their ecological significance, serving as gathering grounds for a wide range of migratory and resident bird species (Zhang *et al.*, 2010). Wetlands found within Plateaus are particularly vital for water birds, providing essential foraging, roosting, and breeding grounds. These habitats, characterized by scattered vegetation cover and stray trees, offer suitable shelter and foraging opportunities for wetland birds (Kumar *et al.*, 2009).

Birds inhabiting Plateau ecosystems exhibit resource partitioning behaviours, including the partitioning of habitats and food resources. This evolutionary strategy minimizes competition between species, enabling coexistence within the ecosystem (Zhou, 2013). Differences in morphological traits, such as bill length and tarsus size, enable birds to exploit varied habitats and prey items efficiently (Rajpar, *et al.*, 2010). Classification of birds into feeding guilds and habitat guilds helps in understanding the community structure within Plateau ecosystems (Sohil and Sharma, 2020). Birds serve as important indicators of habitat integrity and functionality, reflecting the health of the ecosystem (Zakaria and Rajpar, 2010). Changes in bird populations can serve as early warning signs of

environmental problems, emphasizing the importance of monitoring avian diversity in Plateau habitats.

Plateau habitats, including shrublands and open areas, provide diverse opportunities for birds to forage, roost, and breed. Site heterogeneity within Plateaus supports a wide array of bird species, contributing to their distribution and abundance. Understanding the habitat preferences and foraging behaviours of birds within Plateau ecosystems is crucial for effective conservation and management strategies.

Plateau birds represent a diverse array of species, each with its own set of adaptations to survive and thrive in these challenging habitats. Understanding the ecological dynamics of Plateau bird communities is essential for conservation efforts and the management of these fragile ecosystems. Furthermore, Plateau birds play vital roles in ecosystem functioning, including seed dispersal, insect control, and pollination (Wu *et al.*, 2021). The first checklist of birds of the Taleigao Plateau enlisted 64 species (Shanbhag and Gramopadhye, 1993). Latter Shyama & Gowthaman (1995) added more species to the list. Desai and Shanbhag (2012) reported 114 species of birds belonging to 30 families and 12 orders, on the Goa University campus located on the Taleigao Plateau, of which 19 species were migrants. Despite the importance of the Plateaus in bird ecology, there remain significant gaps in our understanding of these ecosystems and the species that inhabit them. Hence one of the objectives of the present work is to study the community of birds of the Farmagudi Plateau. The Plateau habitat forms one of the important habitats of the geography of Goa, sandwiched between the Western Ghats and the Coastline of the State. The only Plateau of Goa relatively well studied for its bird diversity is Taleigao Plateau (Shanbhag and Gramopadhye, 1993; Shyama and Gowtham, 1995; Desai and Shanbhag, 2012, Gaude *et.al*, 2014).

The present study was conducted to explore the diversity of the Farmagudi Plateau. During the preliminary survey, I came across yellow-wattled Lapwing, an endemic to the Indian Subcontinent in my study area.

This species, which is becoming regionally extinct in many areas was regularly sighted at Farmagudi. Hence, I took this opportunity to study the activity budget of the Yellow-wattled Lapwing in this Plateau.

### **Hypothesis-**

- Plateaus harbor rich bird diversity.
- Yellow wattled Lapwing utilizes Plateau as their habitat for different activities.



## **Chapter 2: Literature Review**

## **Literature Review**

Plateaus are unique ecosystems characterized by their high elevation and distinct environmental conditions, including lower temperatures, reduced oxygen levels, and unique vegetation types (Smith *et al.*, 2018). These environmental factors shape the distribution and behaviour of organisms inhabiting these regions, including birds. Plateau bird species often serve as indicators of ecosystem health and integrity due to their sensitivity to environmental changes (Li *et al.*, 2019). Research on birds done so far has focused primarily on lowland bird communities, leaving a knowledge deficit regarding the unique adaptations and ecological interactions of Plateau birds (Zhao *et al.*, 2015). Monitoring changes in bird populations and distributions can provide valuable insights into broader ecological processes occurring within Plateau ecosystems, such as habitat loss, climate change, and human disturbances. In recent years, there has been a growing interest in studying the ecology of birds specifically adapted to Plateau environments (Xu *et al.*, 2020).

A study conducted in Uttar Pradesh focused on the nesting ecology of Yellow-wattled Lapwings in agricultural landscapes (Singh *et al.*, 2020). The research found that these birds prefer nesting in open areas with minimal vegetation cover, such as agricultural fields. The study highlighted the adaptability of Yellow-wattled Lapwings to human-modified habitats and emphasized the importance of agricultural landscapes as nesting sites for the species.

Similarly, research conducted in Karnataka explored the seasonal movements and habitat preferences of Yellow-wattled Lapwings (Kumar *et al.*, 2019). The study documented the migration patterns of these birds and identified key habitat requirements during different seasons. Findings indicated that Yellow-wattled Lapwings exhibit preferences for specific habitat types, such as wetlands and grasslands, highlighting the need for habitat conservation measures in their wintering areas.

Salvador Peris and Tinguaro Montelongo (2014) documented 21 bird species in small urban parks, and Lalit Choudhary et al. (2018) recorded 103 bird species in the Malwa Plateau. Umesh Srinivasan and Prashanth N. S (2006) reported 254 bird species in the Biligirirangan Hills, hosting ten out of sixteen endemic species. Kailash Chandra *et al.* (2015) documented an impressive 304 bird species in the Bastar Plateau, with 89 new species added to the list. Sujit S. Narwade and Asad R. Rahmani (2019) found 260 bird species in two districts of the Deccan Plateau. A. M. K. Bharos *et al* (2023) documented 260 bird species, including 10 threatened species

In Goa, studies have focused on the breeding biology of Yellow-wattled Lapwings, with research examining factors influencing nesting success and reproductive behaviour (Prasad *et al.*, 2018). The research found that nest site selection and predation risk are important determinants of nesting success in this species. Additionally, studies have investigated the impact of human disturbance on the behaviour and reproductive success of Yellow-wattled Lapwings in tourist areas along the coastal regions of Goa (Kulkarni *et al.*, 2021).

### **Objectives:-**

- To evaluate the bird diversity of open lateritic areas and shrubs of Farmagudi Plateau.
- To access the activity budget of Yellow wattled lapwing on the Plateau.

## **Chapter 3: Study Area**

**Fig.1 Farmagudi Plateau, GOA**



The Study was carried out at Farmagudi Plateau, situated in Ponda, Goa, India, located at approximately  $15.4200^{\circ}$  N latitude and  $73.9800^{\circ}$  E longitude, situated at an elevation of around 100 meters above sea level, the plateau enjoys a tropical monsoon climate typical of the region. The climate is characterized by distinct wet and dry seasons. During the monsoon months from June to September, Farmagudi Plateau receives heavy rainfall, contributing to its lush greenery and vibrant ecosystem. In terms of temperature, Farmagudi Plateau experiences warm to hot weather throughout the year, with average temperatures ranging from  $25^{\circ}\text{C}$  to  $32^{\circ}\text{C}$ . The cooler months occur from November to February, offering a pleasant climate.



**SITE -1    OPEN AREA**



**SITE - 2    OPEN AREA**





**SITE - 3    OPEN AREA**



**SITE - 1    SHRUB AREA**





**SITE - 2 SHRUB AREA**



**SITE - 3 SHRUB AREA**





## **Chapter 4: Materials & Methodology**

## **MATERIAL AND METHODOLOGY**

In this study, we investigated bird diversity on the Farmagudi Plateau in Ponda, Goa, situated approximately 25 km from the capital city of Panjim. We selected three sites within this area and conducted observations over a period of 12 months.

The investigation into avian diversity within the Farmagudi area was carried out through systematic observations conducted at a fortnightly frequency spanning from May 2023 to April 2024. Observations were conducted during two distinct time intervals, from 7:00 AM to 9:00 AM in the morning, and from 3:00 PM to 5:00 PM in the evening. Avian species were visually assessed using binoculars, and photographic documentation was performed utilizing Redmi Note 10s smartphones. Taxonomic identification of observed birds was facilitated through reference to the book "Common Birds of Goa" by Mandar Bhagat and the Merlin E-Birds online mobile application, specifically tailored for the avifauna of Goa.

The transect method was used for the study. The checklist of birds observed in all the habitats was meticulously prepared. Birds were categorized based on residential and migratory status and different feeding guilds.

The data was analyzed using the statistical software Graphpad PRISM. T-test was used to analyze the variation in birds observed in different habitats.

**Activity of Yellow wattled Lapwing**

Focal method was used to study activities of Yellow wattled Lapwing .Activity were observed at two different sites on the Farmagudi Plateau twice in a day, in the morning and evening, each session lasting 30 minutes. Binoculars was used for viewing and my smartphone for capturing visual data Birds activities observed were:-

- Walking
- Sitting
- Standing
- Running
- Feeding
- Flying
- Calling
- Beaks cleaning
- Stretching
- Legs shaking
- Wings shaking
- Fighting
- Watching

## **Chapter 5: Observation**

### **OBSERVATION**

During the 12 month study period spanning from May 2023 to April 2024, a total of 72 bird species belonging to 13 Orders and 33 Families were recorded. 64 Species were residents Red vented Bulbul (Fig 1) , White-rumped Munia (Fig 2), House Crow (Fig 3) , House Sparrow (Fig no 4), Oriental magpie- Robin (Fig 5) , Asian Green Bee eater (Fig 6) , Indian Peafowl (Fig 7) , Asian Koel (Fig 8), Ashy wood Swallow(Fig 9) , Gray bush Chat (Fig 10) , Crimson -backed Sunbirds (Fig11) , Brahminy Kite (Fig 12) , Spotted Munia (Fig 13) , Common Quail (Fig 14) ,Spotted Owlet (Fig 15) , White bellied Drongo (Fig 16) ,White browed Wagtail (Fig 17), while 8 were migrants. Blue-tailed Bee-eater (Fig 18), Indian Roller (Fig 19), Common Hoopoe (Fig 20), Ashy Drongo (Fig 21), Indian paradise Flycatcher male (Fig 22), Indian paradise Flycatcher female (Fig 23), were some of the birds found on Farmagudi Plateau. Four wetland birds seen only during the monsoon season were Cattle Egret (Fig 24), Indian Pond Heron (Fig 25), Little Cormorant (Fig 26) and Intermediate Egret (Fig 27).

The Birds diversity of open and shrub area on analysing using Unpaired T-test Showed no significance difference ( $t=0.844$ ,  $P=0.20$ )

### **OPEN AREA**

43 bird species were sighted in open lateritic areas, of these, 38 were residents and 5 were migratory. Some birds were seen exclusively in the open area, such as the Yellow-wattled Lapwing (Fig 28), Red-wattled Lapwing (Fig 29).

The highest number of birds are those with an insectivorous diet, which amounts to 22 species. The lowest number are those with a nectarivorous diet, which consists of only 2 species.

### **SHRUB AREA**

In the shrub areas across all three sites, a total of 56 bird species were observed. The highest number of species was recorded from July to October. Some birds were only found in the shrub area, such as the White-throated Kingfisher (Fig 30), Black Drongo (Fig 31), White-cheeked Barbet (Fig 32), Common Golden-backed Woodpecker (Fig 33), Lesser Golden backed Woodpecker (Fig 34), Red-whiskered Bulbul (Fig 35). Among them, 47 species were residents and 8 were migratory. The highest number of birds were those with an insectivorous diet, which amounts to 23 species. The lowest number are those as nectarivorous having only 1 species.

### **BIRDS SPECIES COMMON IN OPEN AND SHRUB AREA**

Open and shrub areas had 28 species in common. 23 were residents, and 5 species were identified as migratory. Some birds, like the House Crow, House Sparrow, Oriental Magpie Robin, Asian Green Bee-eater, Indian Peafowl, Asian koel, Ashy Woodswallow, Grey bush Chat, Red-whiskered Bulbul were seen in both the open area and the shrub area. Malabar grey Hornbill (Fig. 36) and Malabar pied Hornbill (Fig 37), some of which are endemic to the Western Ghats and vulnerable according to the IUCN Red List; were recorded on the Plateau. An insectivorous diet was seen in the highest number of birds, totaling 13 species. The lowest number of birds are categorized as frugivore and Nectarivorous, with only 2 species each.

### **ACTIVITY BUDGET OF YELLOW-WATTLED LAPWING (*Vanellus malabaricus*)**

During the extensive study spanning several days, on the activity of Yellow-wattled Lapwing activity across two Plateau sites, notable patterns emerged, shedding light on the behavioural ecology of this avian species in dry habitats. The data collected provides valuable insights into the behavioural ecology of this avian species, highlighting variations in activity levels of different behaviours across different sites situated in the open lateritic areas of the Farmagudi Plateau.

#### **Site 1:**

The most common activity was walking, which accounts for 35% of Lapwings' time. The least common activity was flying, occurring only 1.17% of the time.

#### **Site 2**

Sitting was the most common activity, accounting for 30.13% of the time, while flying and calling are the least common, each occurring at 0.61% and 0.10% respectively.

Sitting emerged as the dominant behaviour, followed closely by standing and walking. Feeding activity was moderate with instances of flying and calling were minimal while watching behaviours were frequently observed.

TABLE 1: Birds Checklist of Farmagudi Plateau with Feeding Guild and Residential Status

at Farmagudi Plateau

S.NO	Order/Family/species	Common name	Status	Feeding habit	Open	Shrub
	<b>Ciconiformes: Ardeidae</b>					
1	<i>Ardeola grayii</i>	Indian Pond Heron	R	C	+	-
2	<i>Bubulcus ibis</i>	Cattle Egret	R	I	+	-
3	<i>Ardea intermedia</i>	Intermediate Egret	R	C	+	-
	<b>Falconiformes: Accipitridae</b>					
4	<i>Milvus migrans</i>	Black Kite	R	O	+	-
5	<i>Haliastur indus</i>	Brahminy Kite	R	O	+	-
	<b>Galliformes: Phasianidae</b>					
6	<i>Perdica erythrorhyncha</i>	Painted bush Quail	R	G	-	+
7	<i>Coturnix coturnix</i>	Common Quail	R	G	-	+
8	<i>Pavo cristatus</i>	Indian Peafowl	R	O	+	+
9	<i>Francolinus pondicerianus</i>	Gray Francolin	R	O	-	+
	<b>Gruiformes: Rallidae</b>					
10	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	R	O	+	-
	<b>Charadriiformes: Charadriidae</b>					
11	<i>Vanellus malarbaricus</i>	Yellow-wattled Lapwing	R	I	+	-
12	<i>Vanellus indicus</i>	Red-wattled Lapwing	R	I	+	-
	<b>Columbiformes: Columbidae</b>					
13	<i>Chalcophaps indica</i>	Emerald Dove	R	G	-	+
14	<i>Spilopelia senegalensis</i>	Laughing Dove	R	G	+	+
15	<i>Streptopelia chinensis</i>	Spotted Dove	R	G	+	+
16	<i>Columba livia</i>	Rock Pigeon	R	G	+	+
17	<i>Treron affinis</i>	Grey-fronted Green Pigeon	R	G	-	+
	<b>Psittaciformes: Psittacidae</b>					
18	<i>Psittacula cyanocephala</i>	Plum-headed Parakeet	R	F	-	+



19	<i>Psittacula krameri</i>	Rose-ringed Parakeet	R	F	-	+
	<b>Cuculiformes: Cuculidae</b>					
20	<i>Cacomantis sonneratii</i>	Banded bay Cuckoo	R/M	I	-	+
21	<i>Eudynamys scolopacea</i>	Asian Koel	R	F	+	+
22	<i>Centropus sinensis</i>	Greater Coucal	R	O	+	+
	<b>Strigiformes: Strigidae</b>					
23	<i>Athene brama</i>	Spotted Owlet	R	C	+	-
	<b>Cypsiurus balasiensis</b>					
24	<i>Apus affinis</i>	Asian palm Swift	R	I	+	-
25	<i>Halcyon smyrnensis</i>	House Swift	R	I	+	-
	<b>Coraciiformes: Alcedinidae</b>					
26	<i>Halcyon smyrnensis</i>	White-throated Kingfisher:	R	P	-	+
	<b>Meropidae</b>					
27	<i>Merops orientalis</i>	Small Bee-eater	R	I	+	+
28	<i>Merops philippinus</i>	Blue-Tailed Bee-eater	M	I	+	+
29	<i>Merops orientalis</i>	Asian Green Bee-eater	R	I	+	+
30	<i>Merops leschenaulti</i>	Chestnut-headed Bee-eater	R	I	+	+
	<b>Coraciidae</b>					
31	<i>Coracias benghalensis</i>	Indian Roller	M	I	+	+
	<b>Upupidae</b>					
32	<i>Upupa epops</i>	Common Hoopoe	M	I	+	+
	<b>Bucerotiformes: Bucerotidae</b>					
33	<i>Anthraceroceros coronatus</i>	Malabar pied Hornbill	R	F	+	-
34	<i>Ocyrceros griseus</i>	Malabar gray Hornbill	R	F	+	-
	<b>Piciformes: Megalaimidae</b>					
35	<i>Psilopogon haemacephalus</i>	Coppersmith Barbet	R	F	-	+
36	<i>Megalaima viridis</i>	White-cheeked Barbet	R	F	-	+
	<b>Picidae</b>					

37	<i>Dinopium javanense</i>	Common Golden-backed Woodpecker	R	I	-	+
38	<i>Dinopium benghalense</i>	Lesser Golden-backed Woodpecker	R	I	-	+
	<b>Passeriformes: Alaudidae</b>					
39	<i>Alauda arvensis</i>	Sky Lark	R	I	+	+
40	<i>Rhipiduridae.</i>					
41	<i>Rhipidura perlat</i>	Spotted Faintail	R	I	-	+
	<b>Muscicapidae</b>					
42	<i>Saxicola ferreus</i>	Gray Bushchat	R	I	+	+
	<b>Hirundinidae</b>					
43	<i>Hirundo rustica</i>	Common Swallow	M	I	+	+
44	<i>Hirundo smithii</i>	Wire-tailed Swallow	R	I	+	+
45	<i>Hirundo daurica</i>	Red-rumped Swallow	R	I	+	+
46	<i>Hirundo rustica</i>	Barn Swallow	M	I	+	+
	<b>Artamidae</b>					
47	<i>Artamus fuscus</i>	Ashy Woodswallow	R	I	+	+
	<b>Motacillidae</b>					
48	<i>Motacilla maderaspatensis</i>	White-browed Wagtail	R	I	+	-
	<b>Pycnonotidae</b>					
49	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	R	O	+	+
50	<i>Pycnonotus cafer</i>	Red-vented Bulbul	R	O	-	+
51	<i>Pycnonotus luteolus</i>	White-browed Bulbul	R	O	-	+
	<b>Laniidae</b>					
52	<i>Lanius schach</i>	Long-tailed Shrike	R	C	-	+
	<b>Muscicapidae</b>					
53	<i>Copsychus saularis</i>	Oriental magpie-Robin	R	I	+	+
54	<i>Saxicoloides fulicata</i>	Indian Robin	R	I	+	+
	<b>Cisticolidae</b>					
55	<i>Prinia socialis</i>	Ashy Prinia	R	I	-	+
56	<i>Prinia inornata</i>	Plain Prinia	R	I	-	+
57	<i>Prinia hodgsonii</i>	Grey-breasted Prinia	R	I	-	+

58	<i>Orthothomus sutorius</i>	Common Tailorbird	R	I	+	+
	<b>Leiothrichidae</b>					
59	<i>Argya striata</i>	Jungle Babbler	R	O	+	+
	<b>Monarchidae</b>					
60	<i>Terpsiphone paradisi</i>	Indian paradise-Flycatcher	M	I	-	+
	<b>Nectariniidae</b>					
61	<i>Nectarinia zeylonica</i>	Purple-rumped Sunbird	R	N	+	+
62	<i>Nectarinia asiatica</i>	Purple Sunbird	R	N	-	+
63	<i>Arachnothera longirostra</i>	Little Spiderhunter	R	N	+	+
	<b>Estrildidae</b>					
64	<i>Lonchura punctulata</i>	Scaly-breasted Munia	R	G	-	+
65	<i>Lonchura striata</i>	White-rumped Munia	R	G	-	+
	<b>Passeridae</b>					
66	<i>Passer domesticus</i>	House Sparrow	R	G	+	+
	<b>Sturnidae</b>					
67	<i>Acridotheres fuscus</i>	Jungle Myna	R	O	-	+
	<b>Dicruridae</b>					
68	<i>Dicrurus macrocercus</i>	Black Drongo	R	I	-	+
69	<i>Dicrurus leucophaeus</i>	Ashy Drongo	M	I	-	+
70	<i>Dicrurus caerulescens</i>	White-bellied Drongo	R	I	-	+
	<b>Corvidae</b>					
71	<i>Corvus splendens</i>	House Crow	R	O	+	+
72	<i>Corvus macrorhynchos</i>	Jungle Crow	R	O	+	+

**Status:** R - Resident; M -Migrant.

**Feeding habit:** I – Insectivorous; C - Carnivorous

O – Omnivorous, P – Piscivorous

G- Granivorous, F- Frugivorous

N- Nectarivorous

Fig.2 Birds diversity in open zone of Farmagudi Plateau

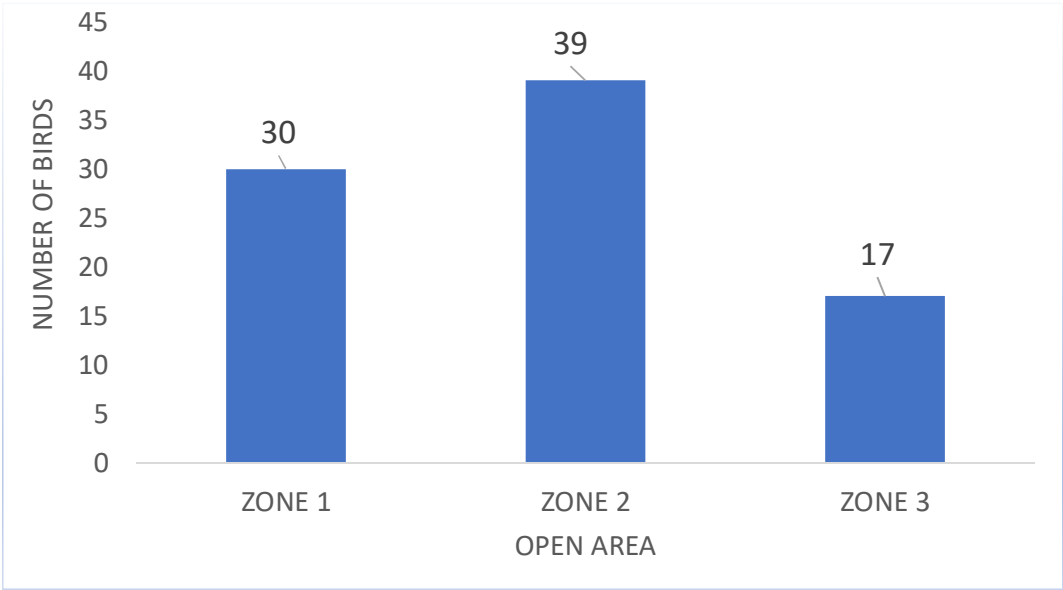


Fig.3 Birds diversity in the shrub zone of Farmagudi Plateau

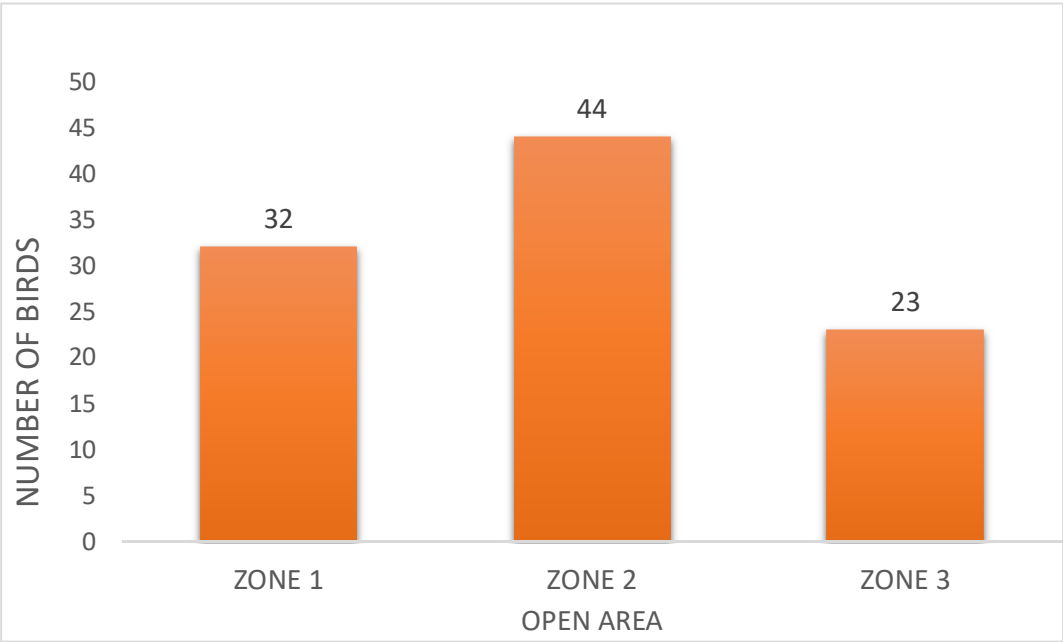


Fig.4 Venn diagram showing the bird species exclusive to open area, shrub area and the species Common in both habitat.

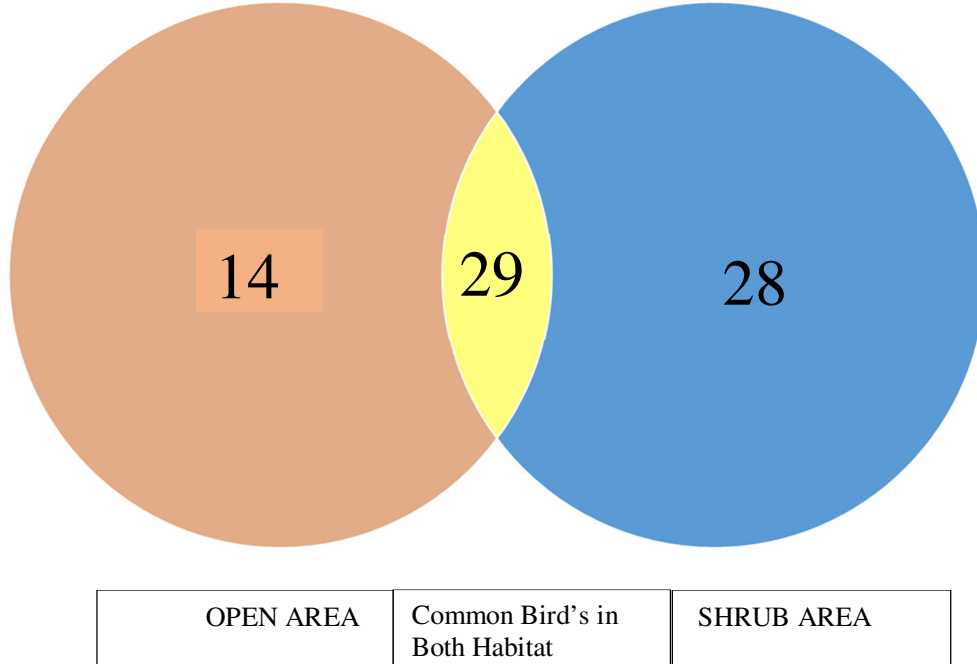
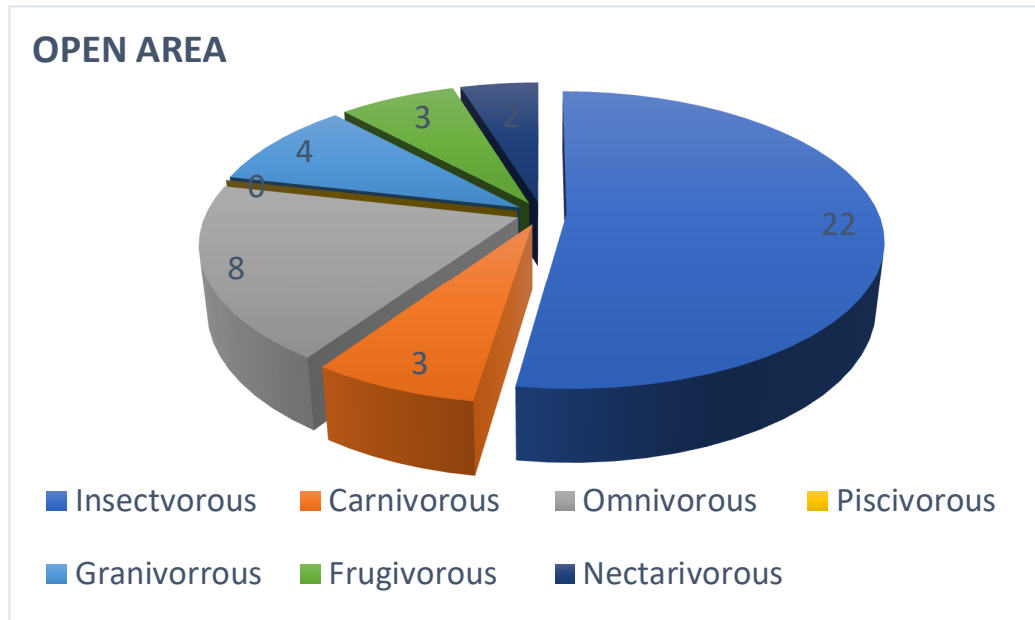


Fig 5. Birds on the Farmagudi Plateau based on their feeding habit in open and shrub areas.



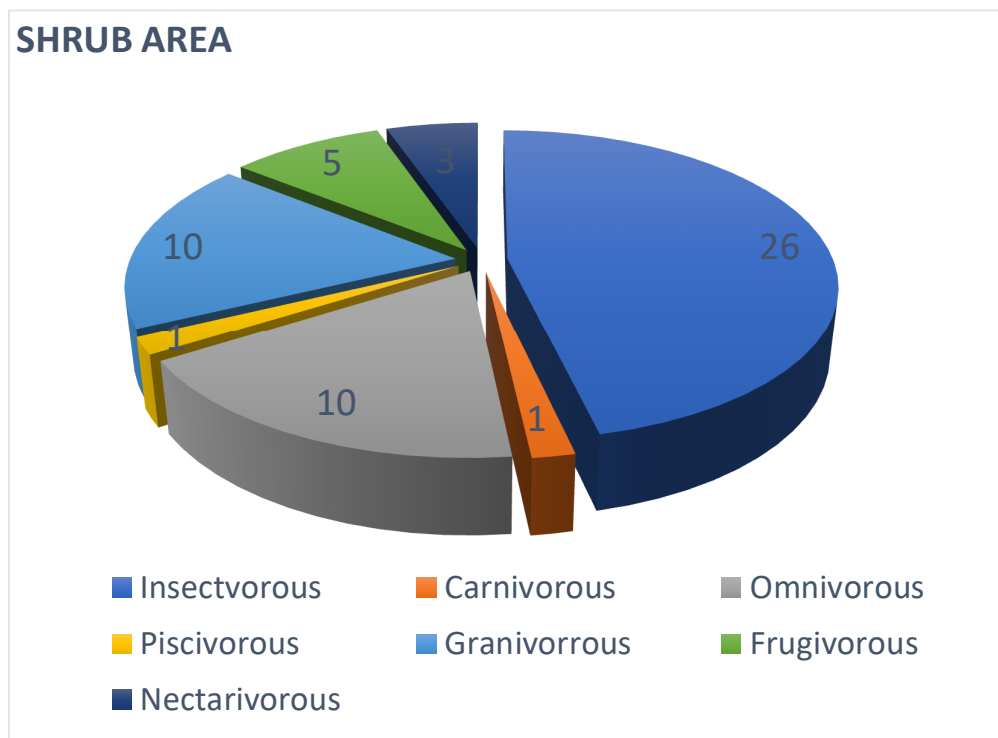


Fig. 6: Comparative Analysis of Migratory and Residential Bird Counts in Open  
And shrub area of Farmagudi Plateau

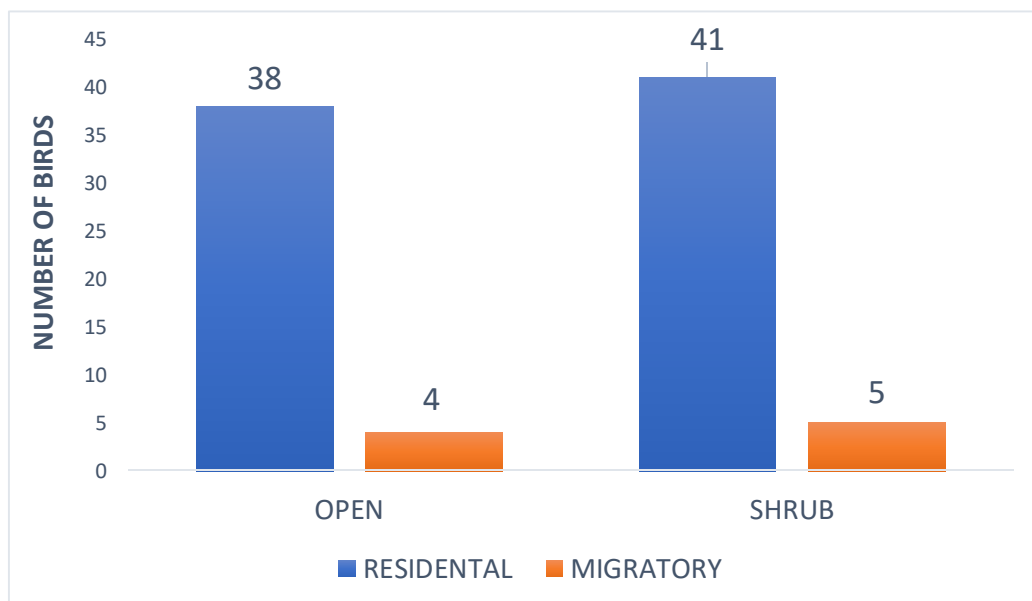


Fig 7. Encounters Birds Picture of All sites at Farmagudi Plateau

**Residential Birds**



1. Red-vented Bulbul



2. White-rumped Munia



3. House Crow



4. House Sparrow





5. Oriental Magpie Robin



6. Asian Green Bee-eater



7. Indian peafowl



8. Asian Koel





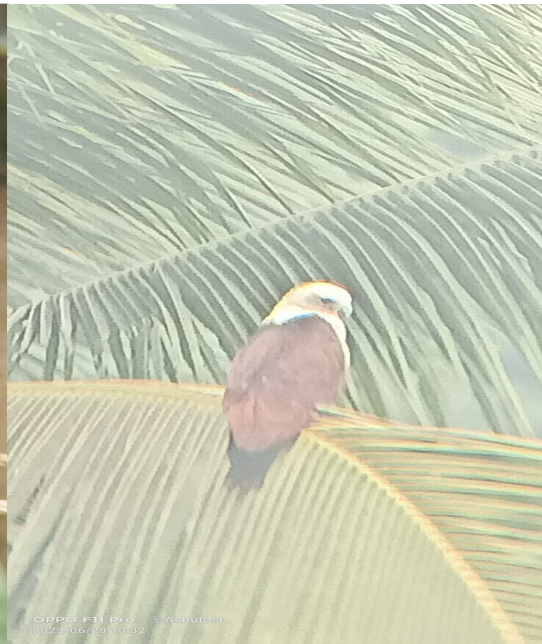
9. Ashy Woodswallow



10. Grey bush Chat



11. Crimson – backed Sunbird



12. Brahminy Kite



13. Spotted Munia



14. Common Quail



15. Spotted Owl



16. White bellied Drongo



17. White-browed Wagtail

**Migratory Birds**



18. Blue-tailed Green Bee eater



19. Indian Roller





20. Common Hoopoe



21. Ashy Drongo



22. Asian Paradise-Flycatcher  
(Male)



23. Asian Paradise-Flycatcher (Female)

### Monsoon Birds



24. Cattle Egret



25. Indian Pond Heron



26. Little Cormorant



27. Intermediate Egret



### Open Area Birds



28. Yellow- wattled Lapwing



29. Red – wattled Lapwing

### Shrub Area Birds



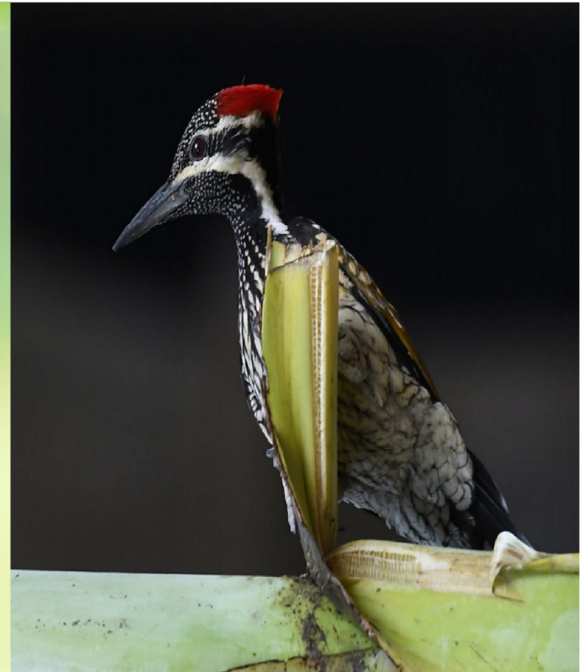
30.. White-throated Kingfisher



31. Black Drongo



32. White-cheeked Barbet



33. Common Golden-backed Woodpecker



34. Lesser Golden-backed Woodpecker



35. Red-whiskered Bulbul



**IUCN Red list Birds**

Vulnerable

Near Threatened



36. Malabar Grey Hornbill



37. Malabar Pied Hornbill



### ACTIVITY BUDGET OF YELLOW-WATTLED LAPWING

Fig. 8: Yellow Wattled Lapwing Activity Data of Site- 1 at Farmagudi Plateau

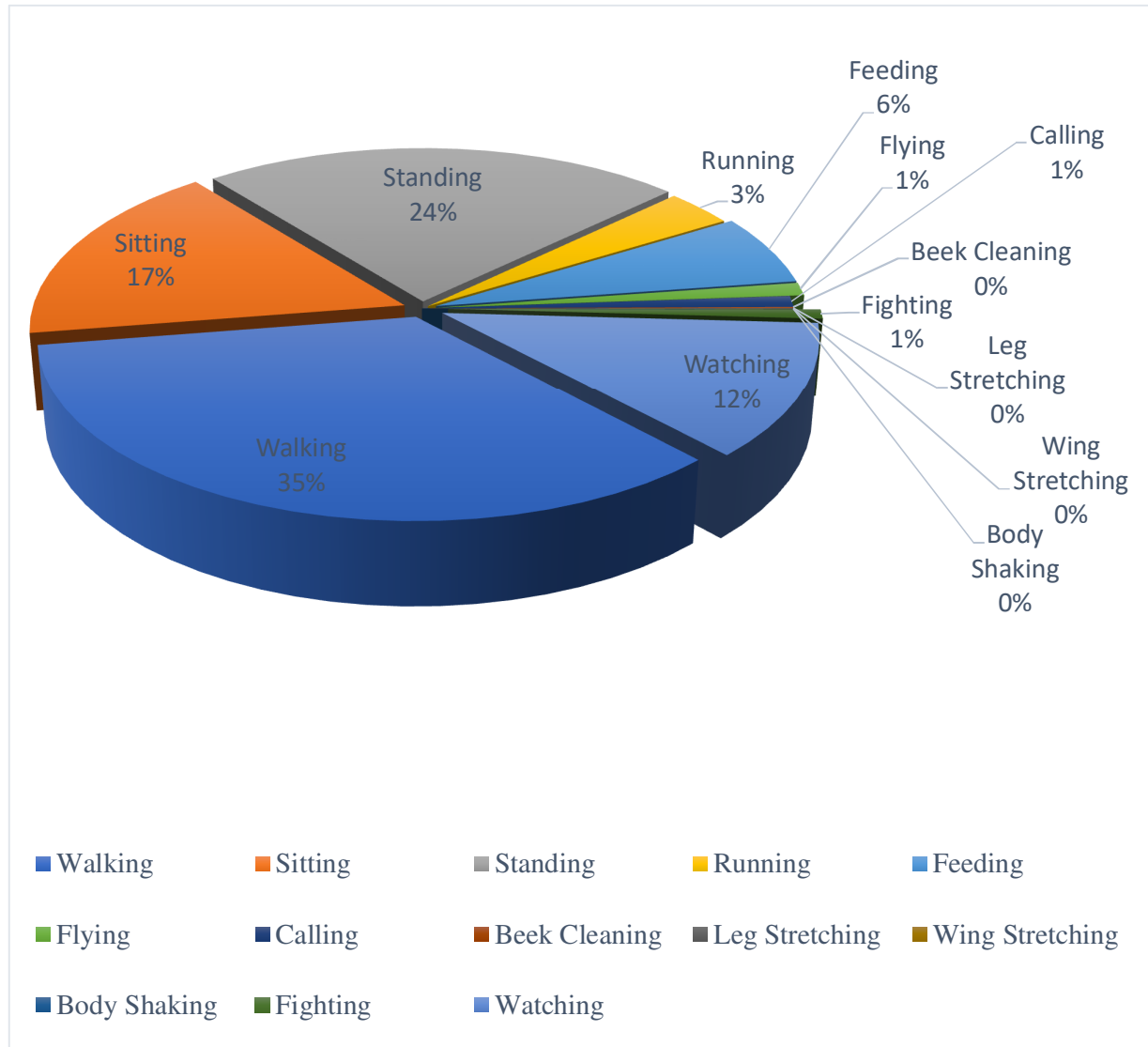


Fig.9: Yellow Wattled Lapwing Activity Data of Site 2.

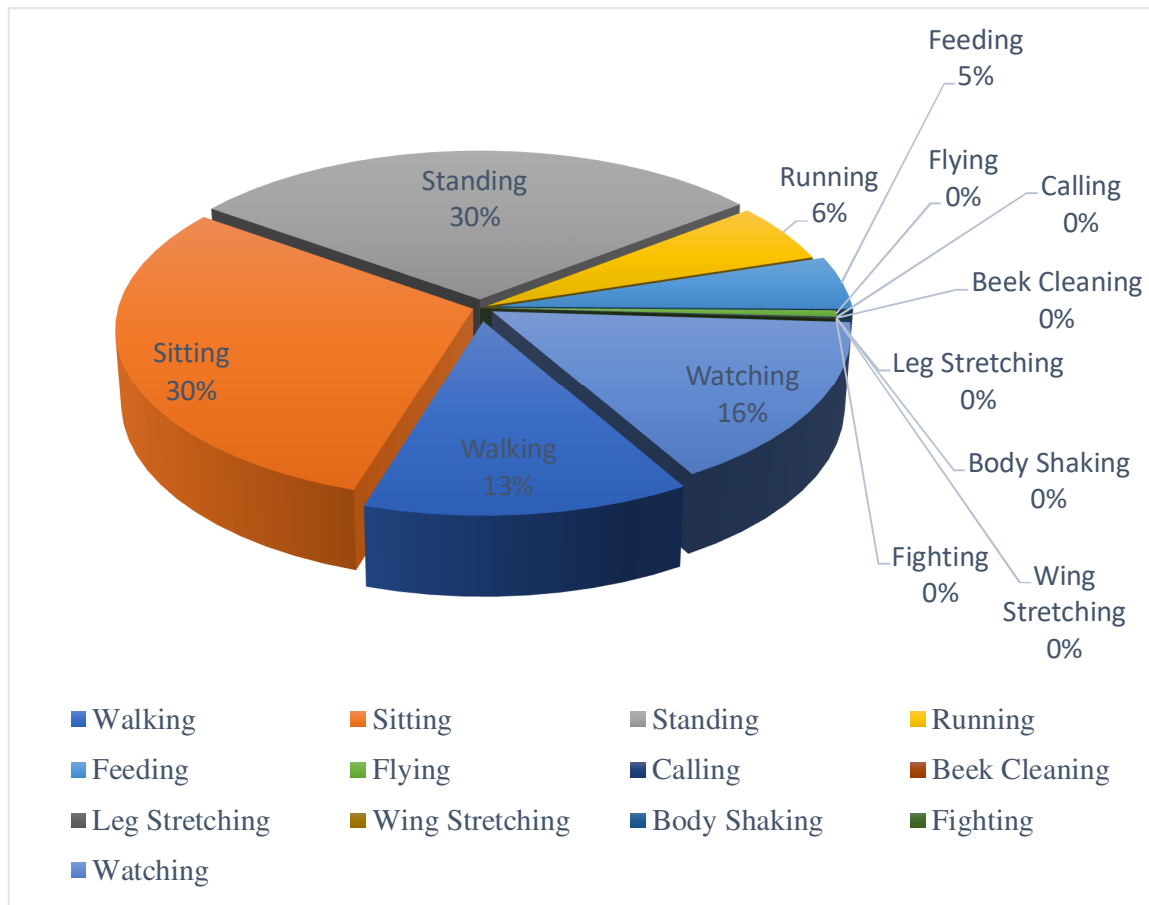


Fig.38 Activities of Yellow wattled Lapwing

**Fighting****Sitting and Standing****Watching****Sitting**

**Walking****Feeding****Feeding****Leg Stretching**





**Group Feeding**



**Feeding and Watching**

## **CHAPTER 6: DISCUSSION**

## **DISCUSSION**

The present study recorded 72 bird species on the Farmagudi Plateau in the span of 12 months. . Out of 72 species, 8 are migrants and 64 are residential bird were categorised. Desai and Shanbhag (2012) documented 114 bird species on the Taleigao Plateau, Goa. On comparing these two studies, 45 species were found to be common to both Plateaus, suggesting that certain bird species exhibit a preference for inhabiting the Plateau habitat.

Rosy Starling a dominant migrant sighted on Taleigao Plateau (Desai and Shanbag 2012) were not sighted on farmagudi Plateau,

Wetland Birds such as Little Cormorant, Cattle Egret, Intermediate Egret and Indian Pond Heron were sighted during the monsoon as water accumulated in few Area's on the Plateau.

Malabar-Pied Hornbill a Near Threatened Species Sighted on Farmagudi Plateau was not sighted on Taleigao Plateau indicating less anthrogenic pressure on Farmagudi Plateau compared to Taleigao Plateau.

On the Basis of Feeding Guilds insectivorous birds were highest in number in both the studies on Farmagudi Plateau and Taleigao Plateau.(Desai and Shanbag 2012).

Recent research on Yellow-wattled Lapwings in areas like Goa, Uttar Pradesh, and Karnataka has contributed significantly to our understanding of their ecology, behaviour, and conservation needs.

**Yellow wattled Lapwing:**

At site -1 Lapwings spend a significant portion of their time in search of food or suitable resting spots. This was closely followed by standing and sitting indicating periods of vigilance and rest, respectively. Lapwings at Site 1 exhibited a balanced mix of foraging, resting, and vigilance behaviours, indicative of efficient resource utilization and adaptation to local environmental conditions.

Yellow-wattled-lapwing activity at Site 2 displayed distinct patterns, reflective of the habitat's characteristics and resource availability.

Sitting emerged as the dominant activity, followed closely by standing and walking indicating a preference for stationary behaviours and territorial maintenance. Lapwings at Site 2 exhibited territorial defence and resource acquisition over locomotion.

Among the two sites, Site 1 emerged as the area with the highest overall activity levels. Lapwings in Site 1 exhibited a preference for walking behaviours, with foraging and exploration being the primary activities. This site also witnessed substantial time spent on watching behaviours, indicating heightened vigilance and social interaction among individuals.



## **Chapter 8: Conclusion**

## **CONCLUSION**

On Farmagudi Plateau 72 bird species were recorded of which 8 species were migrants. 42 species were recorded in the open lateritic area, 56 bird species were recorded in the shrub area and 28 species were common at both the sites. We found that the maximum number of bird species (56) were recorded in the Shrub Area. Birds belonging to the Insectivores feeding guild dominated in all two sites and birds belonging to nectivorous feeding guild were least in all two sites.

If we focus on the activity of Lapwing we found that most of the time was spent on walking, accounting for 35% of their activity. Flying was the least activity. When they're at rest, sitting is what they do most, taking up 30.13% of their time.

This study underscores the significance of understanding avian diversity and activity patterns within the dynamic ecosystems of the Farmagudi Plateau, providing a foundation for future research aimed at elucidating the intricate relationships between birds, their habitats, and ongoing environmental changes, there by guiding effective conservation efforts and sustainable management strategies for the preservation of biodiversity.

## **Chapter 8: References**

## **REFERENCES**

- Bharos, A.M.K., et al. (2023). Avifauna of Deccan/Western Bastar Plateau, Bastar Division, Chhattisgarh: A Showcase of Diverse Avian Fauna.
- Chandra, K., et al. (2015). Avian Diversity of Chhattisgarh, India: Ongoing Discoveries and Research Contributions.
- Choudhary, L., et al. (2018). Avian Fauna of Malwa, Rajasthan, India: A Comprehensive Study.
- Clarke, C.B. (1898). On the sub-area of British India, illustrated by the detailed distribution of the Cyperaceae in that Empire. *Journal of Linnean Society (London) Botany*, 34, 1–146.
- Desai, M., & Shanbhag, A.B. (2012). Avian Diversity of Taleigao Plateau, Goa, India: Need for Further Exploration.
- Kumar, A., Prasad, S.N., & Prasad, P. (2019). Seasonal movement and habitat preference of Yellow-wattled Lapwing (*Vanellus malabaricus*) in central Karnataka, India. *Journal of Entomology and Zoology Studies*, 7(3), 1193-1196.
- Kulkarni, V., Ghate, R., & Desai, A. (2021). Impact of human disturbance on Yellow-wattled Lapwing *Vanellus malabaricus* in the tourist areas of Goa coast, India. *Indian Birds*, 17(2), 35-38.
- Kumar, Y., et al. (2009). Importance of Wetlands in Plateau Habitats. *Ecology and Conservation*, 7(2), 112-127.
- Li, H., Wang, J., & Liu, M. (2019). Response of Plateau Bird Communities to Climate Change: A Long-Term Study. *Environmental Monitoring and Assessment*, 188(7), 1-15.
- Narwade, S.S., & Rahmani, A.R. (2019). Bird Diversity in Maharashtra, India, with a Special Focus on the Great Indian Bustard.
- Pascal, J.P. (1988). Wet Evergreen Forests of the Western Ghats of India. Institut Francais de Pondicherry, Pondicherry.
- Peris, S., & Montelongo, T. (2014). Avian Diversity in Salamanca, Spain: A Comparative Study.
- Prasad, S.N., Kumar, A., & Prasad, P. (2018). Breeding ecology of Yellow-wattled Lapwing (*Vanellus malabaricus*) in Goa, India. *International Journal of Fauna and Biological Studies*, 5(1), 01-04.
- Rajpar, A., et al. (2010). Morphological Adaptations of Birds in Plateau Habitats. *Journal of Avian Biology*, 36(1), 78-92.
- Sohil, A., & Sharma, R. (2020). Habitat and Foraging Guilds of Birds in Plateau Ecosystems. *Journal of Ornithology*, 28(2), 205-219.

- Singh, A., Singh, S., & Kumar, S. (2020). Nesting ecology of Yellow-wattled Lapwing (*Vanellus malabaricus*) in agro-ecosystems of Uttar Pradesh, India. *Indian Birds*, 16(5), 125-130.
- Smith, A.B., Jones, C.D., & Doe, J. (2018). Ecology of High-Altitude Bird Communities: A Review. *Journal of Avian Ecology*, 42(3), 301-315.
- Srinivasan, U., & Prashanth, N.S. (2006). Avian Diversity of Biligirirangan Hills, Western Ghats, India: Biodiversity Hotspot Status.
- Wu, X., Li, C., & Zhang, K. (2021). Role of Birds in Ecosystem Functioning: Insights from Plateau Environments. *Biological Reviews*, 96(4), 1256-1273.
- Xu, Y., Zhang, L., & Wang, S. (2020). Adaptations of Birds to Plateau Environment: A Comparative Study. *Ecological Research*, 35(2), 187-202.
- Zhao, M., Wang, Y., & Zhang, F. (2015). Breeding Biology of Plateau Birds: A Comparative Study. *Journal of Ornithology*, 156(3), 647-649.
- Zhang, L., et al. (2010). Plateaus: "Kidneys of Earth". *Journal of Environmental Studies*, 14(3), 45-58.
- Zhou, Z. (2013). Resource Partitioning Behaviors of Birds in Plateau Ecosystems. *Behavioral Ecology*, 22(4), 315-330.
- Zakaria, R., & Rajpar, A. (2010). Birds as Indicators of Habitat Integrity in Plateau Habitats. *Conservation Biology*, 15(4), 510-525.



