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Research Article

Avifaunal diversity in the tropical thorn forest of Kiluvamalai, Madurai district, Tamil Nadu, India

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ABSTRACT

Birds are good indicators of the state of our biodiversity since they are high up in the food chain. Avifauna density and diversity are affected by seasonal and climatic variations. Land use changes are one of the most important threats to biodiversity, yet data scarcity makes quantifying their ecological impact challenging in many regions of the world. A variety of bush birds and raptors live in the thorny shrub woodlands. From June 2014 to May 2015, researchers investigated the variety and status of avifauna in the Kiluvamalai Reserve Forest, Madurai District, Tamil Nadu, India. The study area's avian variety was observed using the line transect method. The Shannon Wiener index was used to calculate the species richness. The data analysis included 30 species from eight orders and 22 families. During the monsoon months, the avian diversity was at its highest, while during the pre-monsoon and post-monsoon months, it was at its lowest. Passeriformes dominated with 19 species of overall avifaunal species richness, according to the findings. The current study will serve as a foundation for future studies on the management and conservation of bird species in thorny forest area.

Key words: Avian diversity, Kiluvamalai, Line transect method, Species richness, monsoon season, Thorny Forest

INTRODUCTION

Birds contribute significantly to the diversity of terrestrial vertebrates, and they play vital role in the ecosystem. They're the crucial element of the forestland ecosystem; they play major roles as consumers, pollinators, predators, dispersers, and pointers. Birds are good pointers of environmental quality and are used to monitor environmental and ecosystem fitness (Canterbury *et al.,* 2000). Birds are a structural part of entire earth, crucial species in sustaining ecological equilibrium and are demanded for mortal food analogous to other biotic factors (State of India's Birds, 2020). The Indian subcontinent, a region of the vast Oriental bio-geographical regions, is extremely rich in biodiversity. Out of the quite 9,000 birds of the globe, the Indian subcontinent contains about1, 300 species, or over 13% of the world's birds (Bird Life International, 2012). With quite 1335 bird species, India shares 12.5% of the entire avifaunal richness of the globe (Grimmett *et al.,* 2011; Praveen *et al.,* 2020c).The natural life process can be disrupted by lost or damaged habitat (Balen and Prentice, 1997). Habitat change occurs as a result of human management. The diversity of local birds demonstrates this, and birds can thus be employed as a bio-indicator in detecting damaged levels in specific ecosystems. The diversity of birds is impacted by the diversity of habitat types. In some habitats, vegetation shape and feed availability are the key factors that influence species diversity (Rika, 2007).

The dry and rocky terrain of the southern tropical umbrella thorn shrub forests is covered with prickly shrubs and trees. Thorn forests are generally fragmented, yet they nonetheless have a rich diversity of vegetation and wildlife. These types of forests are crucial for local biodiversity conservation because they provide important food sources, nesting sites, and habitat for a range of animal species (especially birds), as well as functioning as corridors for animal mobility and survival (Forest Management in Tamil Nadu, 2015). Because there has been no comprehensive study of umbrella thorn forest birds, this study was done to identify the variety of the species. Land use changes can result in habitat loss or fragmentation, resource availability changes, and disturbance of biotic interactions or dispersal pathways for birds. As a result of urbanization, agricultural intensification, and land abandonment around the world, bird population levels and assemblage variety are declining (Johanna Fusco *et al.,* 2021).

The Kiluvamalai RF protected forest area serves as a diversity source cover for fauna and flora, as well as an economic purpose for the residents. The presence of birds (species diversity) and their habitat in this Protected Forest as a source of bird variety have yet to be discovered. Based on the foregoing, the goal of this research is to determine the diversity of birds based on altitude, as well as the habitat conditions (vegetation) that influence bird diversity in the Protected Forest area. The findings of this study could be useful as baseline data in the management of protected forest areas, particularly for bird management.

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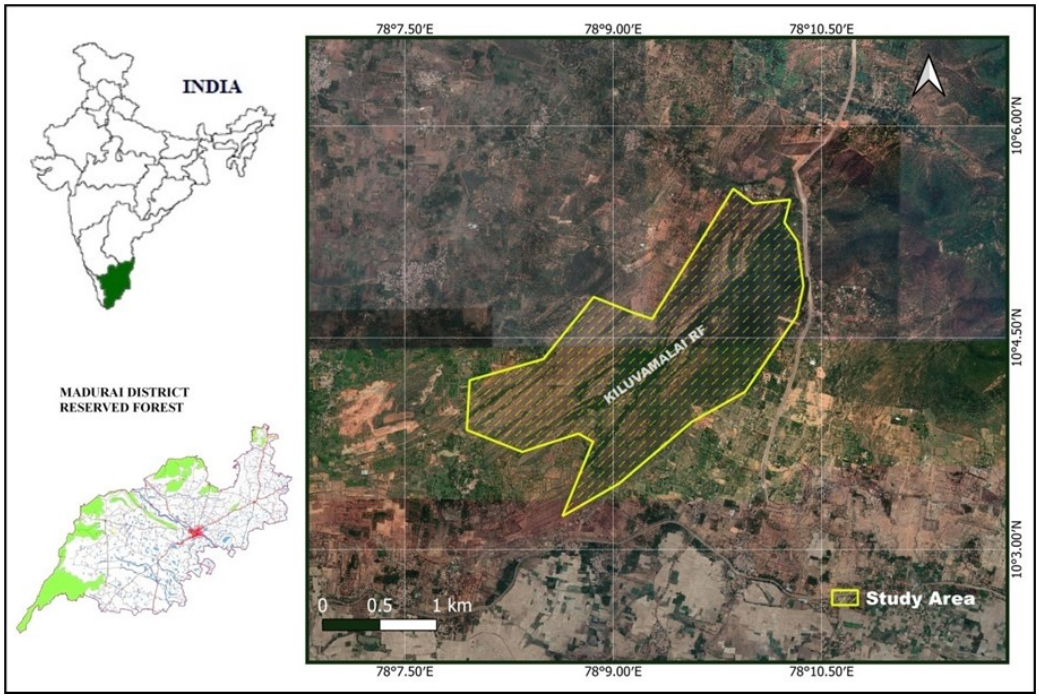

Figure 1. Study Area - Kiluvamalai RF.

MATERIALS AND METHODS

Study Area

Kiluvamalai RF is placed in Madurai Reserve Forest Block of Madurai district, Tamil Nadu. Kiluvamalai has ecological features and topography very similar to Sanamalai RF and the lower slopes of the Alagarmalai RF (Fig 1). Kiluvamalai is located at 10º 04' 23" N 78º 09' 22" E an elevation of approximately 350 meters. The Alagar Hills, around 15 kilometres from Sirumalai, are one of the Tamil Nadu's largest and highest hill ranges outside of the Western Ghats (Santharam *et al.,* 2014). Along with Sirumalai, Perumalai, Karandhamalai, and the Natham Hills in southern Tamil Nadu, Kiluvamalai is one of the numerous series of discontinuous low hills that make up the southernmost Eastern Ghats. It consists of vegetation like *Acacia latronum*, *Acacia sundra, Balsamodendron berryi, Bauhinia racemosa, Dichrostachys cinerea, Erythroxylon monogynum, Wrightia tinctoria* and shrubs like *Calotropis procera, Capparis sepiaria, Carissa carandas, Cassia auriculata*.

The present study was carried out fromJune 2014 to May 2015.The Line transect method as described by Burnham *et al.* (1980) was adopted for estimating the abundance and population of avifauna in the study spots of Kiluvamalai RF (Figure 1). The survey was conducted monthly twice during early morning 6:00 am to 10:00 am and evening from 3:30 pm to 6.30 pm. During the walk of transect, the data were collected based on the visual Encounter on a bird with the details such as species and number of individuals. Binocular, digital camera and field books were used during the survey. Identification of birds was done by referring the key book, "The book of Indian Birds – Salim Ali" (Ali, 2002).

The relative abundance of bird species per habitat was determined using: Relative abundance=n/N

Where, n is the total number of birds of a particular species and N is the total number of birds of all species.

Index of Dominance and Diversity

Shannon-Weinner Index (H′) was calculated in order to know the species diversity (Hutcheson, 1970) based on species abundance using the Shannon and Weinner (1949) formula:

$$H=\sum[(pi)\times Ln(pi)]$$

Where, 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.

RESULTS AND DISCUSSION

Bird Species diversity and richness

Kiluvamalai RF comprises of rocky plateau with dry thorn forests along the foot hills and dry deciduous forests confided to upper elevations. Dry periods extend up to 8 months in this region. Most of the reserve forests are tropical dry deciduous, tropical thorn forests (Bala Subramanyam 2018). As a result of one year (June 2014 to May 2015) study in the Kiluvamalai RF, a total of 30 bird species were recorded belonging to 8 orders and 22 families (Table 1). Figure 2 shows the 8 orders of birds observed in Kiluvamalai RF, Madurai district, Tamil Nadu. Order Passeriformes was represented with 19 bird species while Cuculiformes, Accipitriformes, Columbiformes and Coraciiformes with 2 bird species followed by Psittaciformes, Apodiformes and Galliformes with one bird species in Kiluvamalai RF, Madurai district, Tamil Nadu.

The occurrence of these birds in the area suggests that the area provides a favourable condition for birds as a green pocket. Local species richness is heavily influenced by the landscape and regional species pools, according to empirical and theoretical data (Gaston, 2000), and structurally complex landscapes support more species than simple landscapes. The clade Passeriformes is the largest and most diverse of all the bird families, with representatives on all continents except Antarctica with the greatest diversity in the tropics (Edwards and Harshman, 2013).

Table 1. Bird species in Kiluvamalai RF, Madurai from June 2014 to May 2015

S.No	Order	Family	Scientific Name	Common Name	IUCN Status	Resi-dential status	Feed-ing guild
1	Accipitriformes	Accipitridae	*Pernis ptilorhynchus*	Oriental Honey Buzzard	LC	R	C
		Accipitridae	*Circaetus gallicus*	Short-toed snake eagle	LC	R	C
2	Apodidae	Apodiformes	*Apus nipalensis*	Asian palm swift	LC	R	I
3	Columbiformes	Columbidae	*Columba livia*	Rock Pigeon	LC	R	G
		Columbidae	*Spilopelia chinensis*	Spotted dove	LC	R	G
4	Cuculiformes	Cuculidae	*Centropus senega-lensis*	Southern Coucal	LC	R	I
		Cuculidae	*Eudynamys scolo-paces*	Asian Koel	LC	R	F
5	Galliformes	Pharianidae	*Pavo cristatus*	Indian peafowl	LC	R	O
6	Passeriformes	Alaudidae	*Alaudala raytal*	Jerdon's Bushlark	LC	R	I
		Corvidae	*Dendrocitta vagabun-da*	Large billed crow	LC	R	O
		Corvidae	*Corvus splendens*	House crow	LC	R	O
		Cisticolidae	*Orthotomus sutorius*	Tailor Bird	LC	R	I
		Cisticolidae	*Prinia socialis*	Ashy prinia	LC	R	I
		Cisticolidae	*Prinia inornata*	Plain prinia	LC	R	I
		Dicruridae	*Dicrurus macrocer-cus*	Black Drongo	LC	R	I
		Leiothrichidae	*Argya caudate*	Yellow billed Babbler	LC	R	O
		Motacillidae	*Dendronanthus indi-cus*	Forest wagtail	LC	R	I
		Muscicapidae	*Copsychus saularis*	Oriental Magpie robin	LC	R	I
		Nectariniidae	*Cinnyris asiaticus*	Purple sunbird	LC	R	N
		Nectariniidae	*Leptocoma zeylonica*	Purple rumped sunbird	LC	R	N
		Phylloscopidae	*Phylloscopus trochi-loides*	Blyth's reed war-bler	LC	W	I
		Sturbidae	*Acridotheres tirstis*	Indian Myna	LC	R	O
		Pycnonotidae	*Pycnonotus cafer*	Red vented bulbul	LC	R	I
		Pycnonotidae	*Pycnonotus luteolus*	White browed bulbul	LC	R	I
		Picidae	*Dinopium bengha-lense*	Lesser Golden-back Woodpecker	LC	R	I
		Megalaimidae	*Megalaima haema-cephala*	Coppersmith bar-bet	LC	R	F
		Laniidae	*Lanius cristatus*	Brown shrike	LC	W	I
7	Coraciiformes	Coraciidae	*Coracias bengha-lensis*	Indian roller	LC	R	I
		Meropidae	*Merops philippinus*	Blue tailed Bee eater	LC	W	I
8.	Psittaciformes	Psittaculidae	*Psittacula krameri*	Rose-ringed para-keet	LC	R	F

Note: IUCN Status – LC – Least Concern
Feeding guild: omnivorous (O), carnivorous (C), insectivorous (I), granivorous (G), frugivorous (F) , nectarivorous (N)
Residential Status – R-Resident, W-Winter migrant

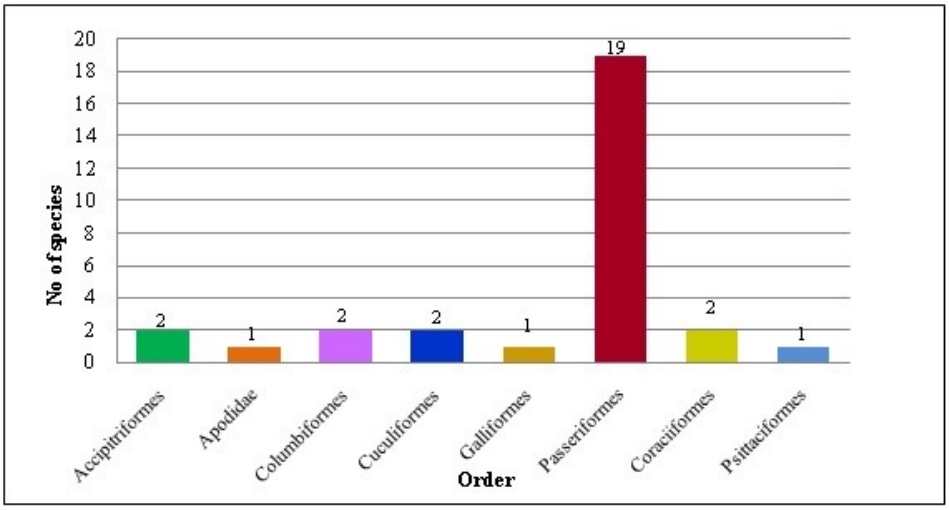

Figure 2. Number of Bird species observed based on order in Kiluvamalai RF.

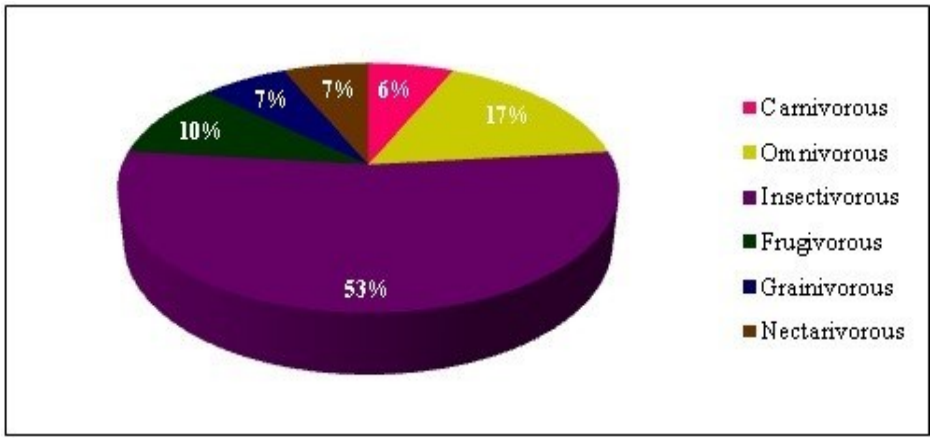

Figure 3. Feeding Guild of bird species in Kiluvamalai RF

Bird species diversity and habitat

Many types of avian species are attracted to forest settings, and around 23% of bird species use river and forest habitat as part of their life cycle (Sinha *et al.,* 2019). We found the most insectivorous species, indicating that the research area contains a diverse insect population. Different types of habitats also contribute to increased bug diversity, which in turn improves avian diversity and population in specific places (Joshi *et al.,* 2021). However, in the present study investigated the analysis of feeding habits showed that a maximum number of species (53%) were insectivorous, followed by omnivorous (17%), frugivorous (10%), graminivorous (7%), nectivrous (7%) and (6%) carnivorous in Kiluvamalai RF (Figure 4).

During the study period, there was a variation in the number of birds in different months. This could be due to the effect of the season. Aside from that, various research has verified that seasonal fluctuation, local migration patterns, reproductive behaviour, latitude,

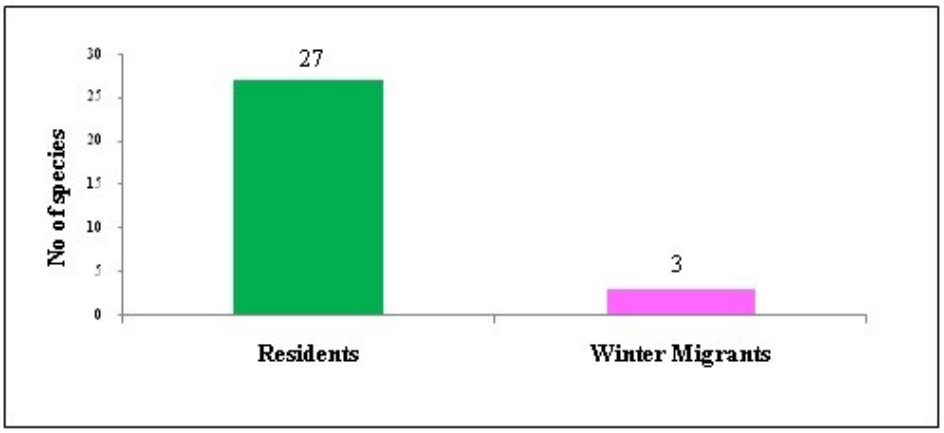

Figure 4. Residential status of bird species in Kiluvamalai RF

Figure 5. Shannon Weinner Diversity Index

Spilopelia senegalensis [Laughing Dove]

Psilopogon haemacephalus [Copper smith Barbet]

Merops orientalis [Little Green Bee eater]

Dicaeum erythrorhynchos [Pale billed Flower Pecker]

Accipiter badius [Shikra]

Camprimulgus asiaticus [Indian Night Jar]

Circaetus gallicus [Short toed snake eagle]

Vanellus indicus [Red Wattled Lapwing]

Figure 6. Aves in Kiluvamalai RF

regional and global microclimatic events, and irregular climate can all affect the number of birds in any area (Romano *et al.,* 2005).These findings back with Narayanan's (2016) findings that migrants made up just approximately 20% of the total number of species recorded in the Alagarkovil Range throughout the winter (September–April). Winter migrants in Kiluvamalai RF have inadequate properties, according to the current investigation.

Indices of Dominance and Diversity

The number of species and their abundance in a given area is referred to as species diversity. As a result, the Diversity Index is regarded as a variety computation, which is a valuable tool for determining the profile of biodiversity across the studied area (Bibi and Ali, 2013). Using diversity indices, the current study indicated the abundance of avian diversity. The Shannon diversity index of bird species changes throughout the year. The Shannon index value peaks in October with H= 2.295, followed by rich index values in December, January, February, and November. Because it is the monsoon and post-monsoon season, these months have a lot of bird diversity.

Shannon-Weiner Diversity Index values typically vary between 1.5 to 3.5, according to Bibi and Ali (2013). The findings of this study backed up the prior assertion (Fig 5). In contrast to the higher dominance reported in Kiluvamalai RF, which suggests that species dominant in some months, the highest species diversity indicates a dynamic community in which a high degree of species interaction is feasible.

There was a variation in number of birds during the study period. This may be due to fluctuation of season in this area. According to Kiros *et al.,* (2018), variations in bird species variety, richness, and abundance are linked to vegetation composition, which affects food supplies, nesting, and protection based on bird habitat preference and feeding.

CONCLUSION

Various researches have been conducted in India, but only a few have focused on the importance of thorny shrub forest for shrub and bird species (Jeganathan *et al.,* 2008). The conservation value of shrub has been largely unnoticed as key center is habitually specified to forests. This is despite the fact that shrub habitat is important for many species. The abundance of shrubs gives shelter to the birds if danger threatens. In addition, scattered shrub in open sites is often very significant for nest sites and song-posts (Malcome, 2007). Anthropogenic activities such as firewood collection, wood and cattle grazing are common in the current study area. Local people and concerned authorities should be educated on the importance of an ecosystem through public awareness campaigns. Tropical thorn forests receive the least attention from conservationists due to a lack of biodiversity analyses and exploration. Our research emphasizes the critical necessity to protect all of these ecosystems to exist in the future.

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