

AVIAN DIVERSITY IN MANJAMALAI SACRED GROVE, MADURAI DISTRICT, TAMIL NADU, INDIA

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Abstract - Sacred groves are patches of vegetation preserved by the local people or communities for their deity. The sacred groves are considered as abode of ancestral spirits, gods and biodiversity. These small natural pockets acts as a refuge to large number of endemic, endangered and threatened species. The present study was made to explore the avian diversity and to assess the residential status, relative abundance and feeding guild of the birds in Manjamalai Sacred grove, Valayapatti Village, Madurai District, Tamil Nadu. The study revealed the supporting system of sacred grove in conservation of biodiversity. Line transect method was used for estimating the bird population in the study site. A total of 72 bird species were observed belonging to 38 families and 13 orders. The insectivorous bird population dominates over the omnivorous followed by frugivorous, as the post monsoon favours the insect population. The study site acts as a natural pocket for large number of resident birds comprising many forest birds and four raptor species Shikra *Accipiter badius*, Short toed snake eagle *Circaetus gallicus*, Black kite *Milvus migrans* and Oriental honey buzzard *Pernis ptilorhynchus*. During winter, the sacred grove attracts 10 species of winter migrants Pied cuckoo *Clamator jacobinus*, Indian golden oriole *Oriolus kundoo*, White bellied drongo *Dicrurus caerulescens*, Ashy drongo *Dicrurus leucophaeus*, Blue tailed bee-eater *Merops philippinus*, Brown shrike *Lanius cristatus*, Asian brown flycatcher *Muscicapa latirostris*, Greenish warbler *Phylloscopus trochiloides*, Blyth's reed warbler *Arcocephalus dumetorum*, Barn swallow *Hirundo rustica* and one passage visitor Black headed cuckooshrike *Coracina melanoptera*. This depicts the rich bird diversity of the sacred grove and its significant role in biodiversity conservation.

Keywords - Sacred grove, biodiversity, line transect method, forest birds, winter migrants.

1. Introduction

Birds represent one of the important segments of biodiversity. They are regarded as the bio-indicator reflecting richness of natural sites like reserved forest including sacred groves and green patches around the periphery of rural areas. Sacred natural sites, defined areas of natural landscape of spiritual significance to local people and communities are considered as the informal protected epicenters of biodiversity conservation in many eco regions of the world. India is exceptionally rich in sacred grove with around 13,720 sacred grove spread across 19 states.

Sirumalai hills have a typical biodiversity due to their proximity to Palani hills of Western Ghats, a biodiversity hotspot. The southern slopes of the Sirumalais and Alagar hills altogether host 323 species of birds.

The Manjamalai sacred grove is one of the sacred groves located on the southern slopes of the Sirumalai hills, an isolated range of hills in southern part of Tamil Nadu.

Sacred groves are age old luxuriant patches of vegetation preserved for ancestral deity, where the godly element was actively at work in places of natural beauty and any activities that disturb and destroys the ecosystem and harmony of sacred groves leads to the wrath of the deity. They are protected through ‘social fencing’ rather than any law imposed by government for the protection of forests. Sacred groves act as refuge to large number of endemic, endangered and threatened species. Many small sacred groves have been lost in recent years and no recent data are available to assess their status. Due to the socio-cultural beliefs of natives, such sites can serve as the participatory conservation centres. This study is carried out to explore and document the avian diversity of Manjamalai Sacred grove, Valayapatti Village, Madurai District, Tamil Nadu. The study also includes assessing the residential status, relative abundance and feeding guild of the birds in study site to know the supporting system of sacred grove in conservation of biodiversity.

2. Study Area

Sirumalais are the range hills in Southern Tamil Nadu. They are the outliers of the Western Ghats. The present study was carried out in Manjamalai Sacred grove, Valayapatti Village which lies in the southern slopes of Sirumalais situated at Northern part of Madurai, Tamil Nadu ($10^{\circ}09'45''$ N, $78^{\circ}05'50''$ E). The Elevation of the study site – Manjamalai sacred grove is 338 m. The study site hosts various varieties of indigenous trees such as Tamarind (*Tamarindus indica*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*), bamboo groves and thorny scrubs of *Euphorbia* and *Acacia* species are sparsely found. The transect path starts from the periphery of village and extend till the Manjamalaiyan temple in the center of Manjamalai Sacred grove (Fig. 1). Sirumalais receive less rainfall, which get 90-190cm being located toward side of the south-west monsoon winds.. The area holds a good vegetation and bird diversity during the monsoon and winter till early summer. It also consist more than 50% of seasonal agricultural landscape created by anthropogenic activities.

Figure 1. Manjamalai Sacred grove, Valayapatti Village, Madurai District, Tamil Nadu

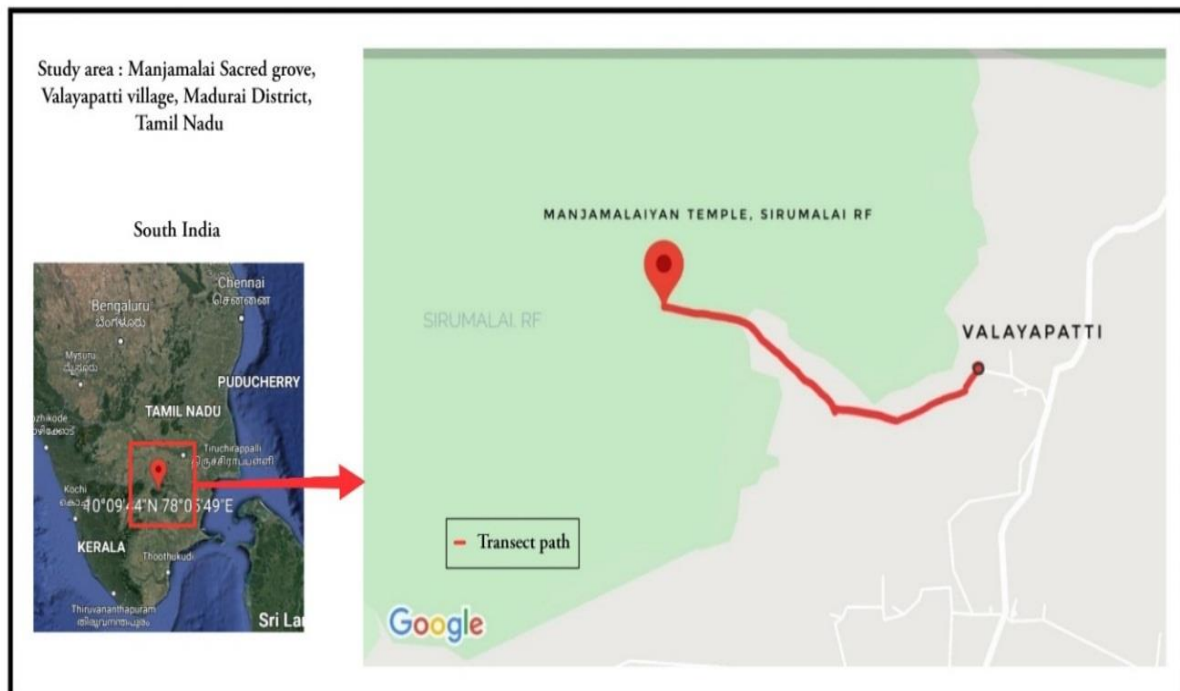
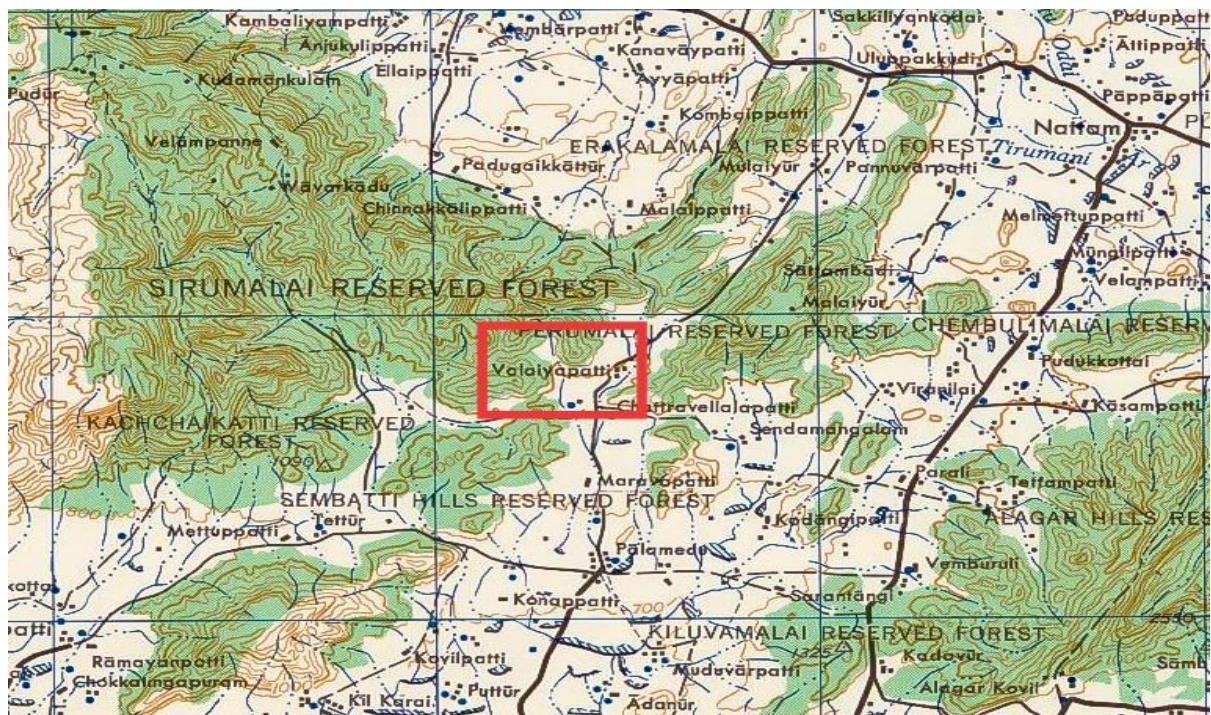


Figure 2. Map of Sirumalai Hills



[SOURCE: After University of Texas at Austin's 1:250,000 Map "NC43-8 Dindigul"]

3. Methods

The line transect method was used for estimating bird diversity and abundance which involves moving along a fixed length of 2 km and recording the bird species seen and voice heard on both sides of the transect path. The study was carried out during the year 2019-2020 from November 2019 to March 2020. Twice in every month survey was carried out from 7:00 am to 10:00 am, when birds are more active along the transect that covered most of the study area. The survey dates were selected with equal time intervals i.e., alternate week ends of the month. The two data of a month were compiled together and assessed. Birds were observed and identified up to species level and the observation of birds were made by using Olympus (8*40) binoculars. Photographic documentation was done using DSLR Camera (Canon 200D mark ii). Birds were identified by field guide Birds of Indian Subcontinent and The Book of Indian Birds.

The IUCN status was also used to compare the local status with the global status. The Species richness (Shannon index) and abundance (Simpson index) were calculated by using PAST software. The residential status of the birds was worked out, and different status categories were used; resident (R), winter migrant (W) and Passage visitor (PV) were assigned strictly with reference to the study area on the basis of the presence or absence method. The data recorded in each survey analysed for relative abundance on the basis of frequency of sighting; Birds sighted 41-60 times are very common (VC); 21-40 times are common (CO), 6-20 times are uncommon (UC) and 1-5 times are rare (R). Feeding guilds of birds were recorded, i.e. omnivorous (O), carnivorous (C), insectivorous (I) and nectarivorous (N).

4. Results

4.1 Species Diversity Analysis

As a result of 5 months (November 2019 to March 2020) observation, 72 bird species were recorded, belonging to 13 orders and 38 families. Bird species recorded in Manjamalai sacred grove, Sirumalai foothills, Madurai District, Tamil Nadu. During the study period of November 2019 to March 2020 Highest number of bird species were observed during December 2019 (65 species), followed by November 2019 (58 species), January 2020 (50 species), February 2020 (33 species and minimum in March 2020 (28 species).

The only water bird recorded is egrets and this mainly due to lack of wetland. The only water body found near the edge of village is a seasonal pond (checkumadai) which holds only water for 2 months in a year. All bird species recorded in the study area are categorized as Least Concern by IUCN Red List of Birds (Birdlife International 2016). Though all the species of the study site come under Least Concern category according to the IUCN Red List, there is a pressing need of prompt steps to conserve bird population in the Manjamalai Sacred grove (Table 2).

4.2 Diversity Indices

Bird species diversity was more in the month of December at Manjamalai Sacred grove having a Shannon index and Simpson index, 3.93 and 0.97 (Table 1). This shows the richness of the site during post monsoon. The Diverse vegetation and native trees facilitates the huge bird population which facilitates the insectivorous birds. While the bird species diversity was lower in the month of March at Manjamalai Sacred grove having a Shannon index and Simpson index, 3.09 and 0.94 respectively (Table 1).

4.3 Residential Status & Relative Abundance

The data on residential status revealed that among 72 bird species, 61 bird species were resident, whereas the remaining 11 bird species are seasonal visitors (Table 2). Altogether 10 bird species were identified as Winter migrant (W) and one bird species as Passage Visitor (PV) . Further analysis of relative abundance indicated that 4 bird species were VC(Very Common), 8 bird species were CO (Common), 32 bird species were UC (Uncommon) and 28 bird species were rare (Table 2).

4.4 Feeding guild structure

The observation on feeding guilds of bird species showed that the highest number of bird species belong to Insectivorous (36 bird species) followed by Omnivorous (13 bird species), Carnivorous (8 bird species), Granivorous, Frugivores (6 bird species each) and Nectarivorous (2 bird species). The Diverse feeding habit of various birds ease the high population in the study site. The post monsoon makes a hope for insect population which facilitates the insectivorous birds. This is reflected in the feeding guild data. The residential area along the periphery thorn forest a hope for high number of omnivorous birds like crows and mynas (Table 2).

Figure 3. The Feeding guild structure of birds in Manjamalai Sacred grove, Valayapatti Village, Madurai District, TamilNadu

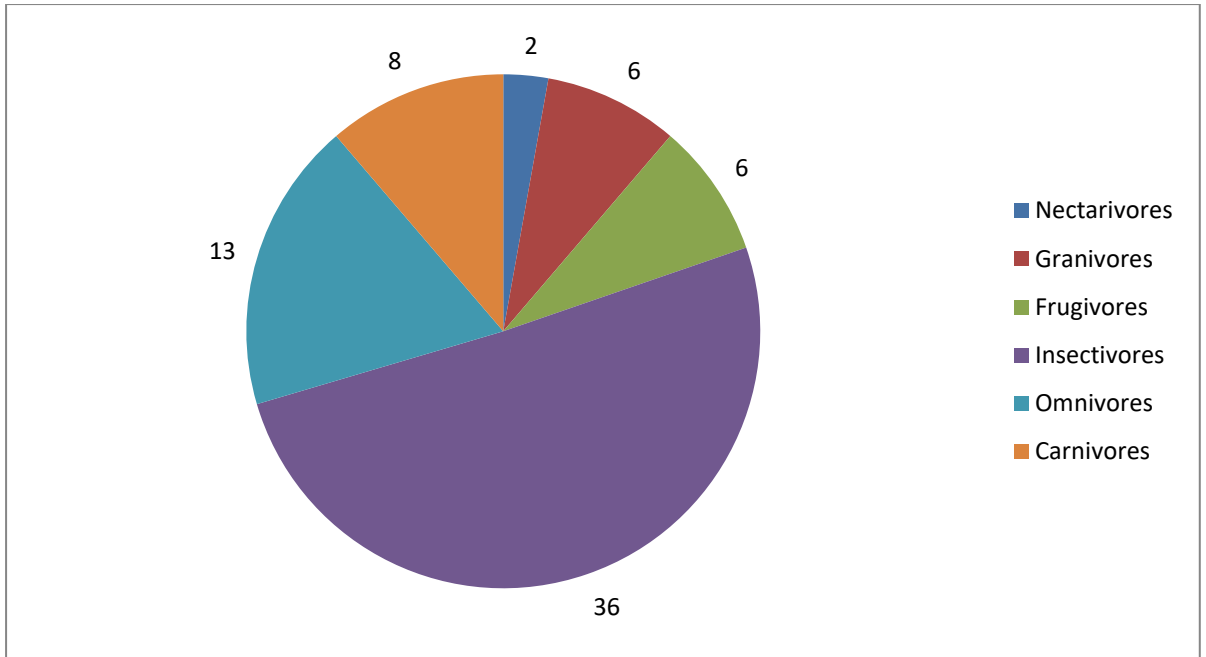


Table 1. Bird species richness and diversity in the Manjamalai Sacred grove, Madurai District, TamilNadu

Indices & No. of species	November	December	January	February	March
No. of species	58	65	50	33	28
Shannon_H	3.7	3.934	3.614	3.206	3.095
Simpson_1-D	0.965	0.9757	0.9651	0.9481	0.9477

Table 2. Systematic checklist, IUCN, Residential status, Abundance and Feeding guild of birds observed in Manjamalai Sacred grove, Madurai District,

TamilNadu

S. N.	Order	Family	Common name	Scientific name	IUCN status	Residential status	Abundance	Feeding guild
1	Galliformes	Phasianidae	Indian peafowl	<i>Pavo cristatus</i>	LC	R	UC	O
		Phasianidae	Gray junglefowl	<i>Gallus sonneratii</i>		R	UC	O
		Phasianidae	Gray francolin	<i>Francolinus pondicerianus</i>	LC	R	UC	O
2	Upupiformes	Upupidae	Eurasian hoopoe	<i>Upupa epops</i>	LC	R	UC	I
3	Cuculiformes	Cuculidae	Southern coucal	<i>Centropus sinensis</i>	LC	R	CO	I
		Cuculidae	Bluefacedmalkoha	<i>Phaenicophaeus viridirastris</i>	LC	R	UC	I
		Cuculidae	Sirkeermalkoha	<i>Phaenicophaeus leschenaultia</i>	LC	R	RA	I
		Cuculidae	Jacobin/Pied cuckoo	<i>Clamator jacobinus</i>	LC	W	RA	O
		Cuculidae	Common hawk cuckoo	<i>Hierococcyx varius</i>	LC	R	RA	I
		Cuculidae	Asian koel	<i>Eudynamys scolopaceus</i>	LC	R	UC	F
4	Psittaciformes	Psittaculidae	Rose ringed parakeet	<i>Psittacula krameri</i>	LC	R	VC	F
		Psittaculidae	Plum headed parakeet	<i>Psittacula cyanocephala</i>	LC	R	RA	F
5	Coraciiformes	Alcedinidae	White-throated kingfisher	<i>Halcyon smyrnensis</i>	LC	R	RA	C
		Meropidae	Green bee eater	<i>Merops orientalis</i>	LC	R	UC	I
		Meropidae	Blue tailed bee eater	<i>Merops philippinus</i>	LC	W	UC	I
		Coraciidae	Indian roller	<i>Coracias benghalensis</i>	LC	R	CO	I
6	Piciformes	Picidae	Lesser-goldenback woodpecker	<i>Dinopium benghalense</i>	LC	R	RA	I
		Megalaimidae	Coppersmith barbet	<i>Megalaima haemacephala</i>	LC	R	UC	F
		Megalaimidae	Brown headed barbet	<i>Megalaima zeylanica</i>	LC	R	VC	F

7	Apodiformes	Apodidae	Indian palm swift	<i>Cypsiurus balasiensis</i>	LC	R	CO	I
8	Caprimulgiformes	Caprimulgidae	Indian nightjar	<i>Caprimulgus asiaticus</i>	LC	R	RA	I
9	Pelecaniformes	Ardeidae	Cattle egret	<i>Bubulcus ibis</i>	LC	R	UC	C
		Ardeidae	Little egret	<i>Egretta garzetta</i>	LC	R	RA	C
10	Columbiformes	Columbidae	Laughing dove	<i>Spilopelia senegalensis</i>	LC	R	UC	G
		Columbidae	Eurasian collared dove	<i>Streptopelia decaocto</i>	LC	R	UC	G
		Columbidae	Spotted dove	<i>Spilopelia chinensis</i>	LC	R	UC	G
11	Strigiformes	Strigidae	Spotted owl	<i>Athene brama</i>	LC	R	RA	C
12	Accipitriformes	Accipitridae	Shikra	<i>Accipiter badius</i>	LC	R	RA	C
		Accipitridae	Short toed snake eagle	<i>Circaetus gallicus</i>	LC	R	RA	C
		Accipitridae	Black kite	<i>Milvus migrans</i>	LC	R	RA	C
		Accipitridae	Oriental honey buzzard	<i>Pernis ptilorhynchus</i>	LC	R	RA	C
13	Passeriformes	Passeridae	House sparrow	<i>Passer domesticus</i>	LC	R	UC	G
		Estrildidae	Scaly breasted munia	<i>Lonchura punctulata</i>	LC	R	UC	G
		Estrildidae	Indian silverbill	<i>Euodice malabarica</i>	LC	R	UC	G
		Monarchidae	Asian paradise flycatcher	<i>Terpsiphone paradise</i>	LC	R	UC	I
		Monarchidae	Tickel's blue flycatcher	<i>Cyornis tickelliae</i>	LC	R	RA	I
		Monarchidae	Asian brown flycatcher	<i>Muscicapa latirostris</i>	LC	W	RA	I
		Monarchidae	Black naped monarch	<i>Hypothymis azurea</i>	LC	R	RA	I
		Muscicapidae	Pied bush chat	<i>Saxicola caprata</i>	LC	R	RA	I
		Muscicapidae	Indian robin	<i>Saxicoloides fulicatus</i>	LC	R	CO	I
		Sturnidae	Common myna	<i>Acridotheres tristis</i>	LC	R	VC	O
		Sturnidae	Brahminy starling	<i>Sturnia pagodarum</i>	LC	R	UC	O
		Nectariniidae	Purple sunbird	<i>Cinnyris asiaticus</i>	LC	R	CO	N
		Nectariniidae	Purple rumped sunbird	<i>Leptocoma zeylonica</i>	LC	R	UC	N
		Dicaeidae	Pale billed flowerpecker	<i>Dicaeum erythrorhyncos</i>	LC	R	CO	I
		Alaudidae	Jerdon's bush lark	<i>Mirafra affinis</i>	LC	R	UC	I
		Pycnonotidae	Red vented bulbul	<i>Pycnonotus cafer</i>	LC	R	UC	O
		Pycnonotidae	White browed bulbul	<i>Pycnonotus luteolus</i>	LC	R	UC	I
Motacillidae	White browed wagtail	<i>Motacilla maderaspatensis</i>	LC	R	RA	I		
Motacillidae	Paddyfield pipit	<i>Anthus rufulus</i>	LC	R	RA	I		

	Acrocephalidae	Blyth's reed warbler	<i>Acrocephalus dumetorum</i>	LC	W	RA	I
	Phylloscopidae	Greenish warbler	<i>Phylloscopus trochiloides</i>	LC	W	RA	I
	Timaliidae	Tawny bellied babbler	<i>Dumetia hyperythra</i>	LC	R	UC	O
	Leiothrichidae	Yellow billed babbler	<i>Turdoides affinis</i>	LC	R	VC	O
	Hirundinidae	Barn swallow	<i>Hirundo rustica</i>	LC	W	CO	I
	Laniidae	Brown shrike	<i>Lanius cristatus</i>	LC	W	RA	I
	Laniidae	Bay backed shrike	<i>Lanius vittatus</i>	LC	R	RA	I
	Corvidae	Rufous treepie	<i>Dendrocitta vagabunda</i>	LC	R	UC	O
	Corvidae	Common house crow	<i>Corvus splendens</i>	LC	R	UC	O
	Corvidae	Large billed crow	<i>Corvus macrorhynchos</i>	LC	R	UC	O
	Aegithinidae	Common iora	<i>Aegithina tiphia</i>	LC	R	UC	F
	Dicruridae	Black drongo	<i>Dicrurus macrocercus</i>	LC	R	CO	I
	Dicruridae	Ashy drongo	<i>Dicrurus leucophaeus</i>	LC	W	RA	I
	Dicruridae	White bellied drongo	<i>Dicrurus caerulescens</i>	LC	W	RA	I
	Campephagidae	Small minivet	<i>Pericrocotus cinnamomeus</i>	LC	R	RA	I
	Campephagidae	Black-headed cuckooshrike	<i>Coracina melanoptera</i>	LC	PV	UC	I
	Oriolidae	Indian golden oriole	<i>Oriolus kundoo</i>	LC	W	RA	O
	Chloropseidae	Jerdon's leafbird	<i>Chloropsis jerdoni</i>	LC	R	UC	I
	Cisticolidae	Ashy prinia	<i>Prinia socialis</i>	LC	R	UC	I
	Cisticolidae	Jungle prinia	<i>Prinia sylvatica</i>	LC	R	RA	I
	Cisticolidae	Plain prinia	<i>Prinia inornata</i>	LC	R	UC	I
	Cisticolidae	Tailor bird	<i>Orthotomus sutorius</i>	LC	R	UC	I

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, PV-Passage visitor

Abundance- UC-Uncommon, CO-Common, RA- Rare, VC-Very common

Figure 4. Birds in Manjamalai Sacred grove, Valayapatti Village, Madurai District, Tamil Nadu



Pied cuckoo



Plum headed parakeet



Jungle prinia



Indian nightjar



Ashy drongo



Short toed snake eagle



Large billed crow



Oriental honey buzzard

5. Discussion

The Avian Diversity of the study site reaches its peak during November and December. Almost 72 bird species are recorded during the study in Manjamalai sacred grove. This shows the richness of the study site during post monsoon. The vegetation of the sacred grove represents thorny shrub forest and a portion of dry deciduous forest patch. The hill rejuvenates its greenery during post monsoon. The Diverse vegetation and native trees facilitates the huge bird population in the sacred grove.

The order Passeriformes dominates over the other orders with 41 bird species. The Diverse feeding habit of various birds ease the high bird population in the study site with limited resources. Insectivorous birds (36 bird species) dominates the others followed by Omnivorous, Carnivorous, Granivorous, Frugivores and Nectarivorous. After the post monsoon , the rich vegetation makes a hope for insect population which facilitates the insectivorous birds. The residential area along the periphery of thorn forest facilitates the living of omnivorous bird.

The Evergreen and Moist Deciduous forests of Sirumalai makes a suitable home for many resident bird species throughout the year. During, the post monsoon the study site acts a natural pocket for large number of resident bird species. Among 72 bird species observed in the study site, 61 bird species were resident, 10 bird species were winter migrants and one bird species is passage visitor. In winter, these birds migrated from the ghats to the plains or areas with lower elevations in search of favourable environmental condition and food. As Sirumalai hills are outliers of Western Ghats, one of the Biodiversity hotspots of the world, these birds migrate from the ghats to the slopes of Sirumalais. The only water bird recorded here is egret and this is mainly due to lack of waterholes nearby. The only water body found near the edge of village is a seasonal pond (checkumadai) which holds only water for 2 months in a year.

Though all the species of the study site come under Least Concern category according to the IUCN Red List there is a pressing need of prompt steps to conserve bird population in the Manjamalai Sacred grove. To maintain a rich population of birds, conservation measures are need there are several facts that influence change in bird population such as rainfall, vegetation and availability of food.

6. Conclusion

The avian diversity of the study site reaches its peak during November and December. This shows the richness of the site during post monsoon. The hill rejuvenates its greenery during post monsoon. The Diverse vegetation and native trees facilitates the huge bird population in the sacred grove. The post monsoon makes a hope for insect population which facilitates the insectivorous birds.

The Evergreen and Moist Deciduous forests of Sirumalai makes a suitable home for many resident bird species throughout the year. During, the post monsoon the study site acts a natural pocket for large number of resident bird species. The Manjamalai Sacred grove host more resident birds and few winter migrants as the Sirumalai hills lies very near to the Palani Hills, the nearest point of western ghats to the Sirumalais.

Social fencing of sacred groves provides excellent protection to the biodiversity of the locality; they help in supporting diverse species of birds and wildlife. The result of the present study depicts the rich bird diversity of the locality reflecting the significance of sacred groves in conservation. Steps should be taken to conserve existing biodiversity of the forest patches around the sacred groves by protecting these crucial island repositories of biodiversity for future.

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