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Avifaunal diversity of sugarcane research station, Sirugamani, Tiruchirappalli, Tamil Nadu

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Abstract
A total of 34 species of birds belonging to 26 families and 12 orders has been recorded in the survey carried out from January 2021 to March 2021. The maximum number of birds was observed of the Passeriformes order (13 species) followed by Coraciiformes, Charadriiformes, Cuculiformes (3 species) and Piciformes, Galliformes, Ciconiiformes, Strigiformes (2 species**).** All the birds recorded in the study area were categorized into 6 ecological groups based on their feeding habits Insectivorous (38.2%), Omnivorous (20.6%), Carnivorous (20.6%), Granivorous (8.8%), Nectarivorous (2.9%) and Frugivorous (8.8%). This study provides useful information on bird diversity in the study region which serves as a baseline data for future monitoring programs.

Keywords: Carnivorous**,** birds, ecosystem, omnivorous, passeriformes, sirugamani

Introduction
Birds form an important component of any natural ecosystem (Rahul *et al*. 2014) [16]. Avifauna play significant role in the ecosystem by being as a part of the food web, act as scavenger, predator of insect pests, seed dispersal agent, potential pollinators and bio-indicators (Pradhan *et al*. 2013) [15]. Study of avifaunal diversity is a necessary ecological means which acts as an important indicator to evaluate different habitats both qualitatively and quantitatively (Canterbury *et al*. 2000) [6]. According to an estimate total 1,369 bird species found in Indian sub-continent, out of the more than 11,162 bird species of the world, over 15% of the world's bird fauna are found in India. Out of 1,369 species of birds, 83 species are endemic, 3 species are breeding endemic and 105 species are globally threatened (Birdlife International, 2022) [4]. Population of bird is a very sensitive indicator of degree of pollution in both terrestrial and aquatic ecosystem (Gaston, 1975) [20]. Unfortunately global diversity of birds is decreasing due to anthropogenic activities and climate changes (Sekercioglu *et al*. 2012) [17]. In the assessment of International Union for Conservation of Nature (IUCN) red list several species of birds are considered to be threatened globally out of which 93 are from India. To safeguard global species diversity has emerged out as one of the significant issues today (Hu *et al*. 2011) [12]. Therefore this study aims at preparing a checklist of birds and their distribution and activity within the sugarcane research station, Sirugamani, Tiruchirappalli district for future studies.

Materials and Methods
Study area
The present study deals with the bird's diversity of the Sugarcane Research Station, Sirugamani, Tiruchirappalli district, Tamil Nadu (Figure 1). The research station is situated at elevation of 78.18 m MSL and between $10^0$56'N latitude and $78^0$26'E longitude with the average rainfall of 1.0 mm and average temperature of 33.2° C from January 2021 to March 2021.

Methodology
For the purpose of birding, the station was mapped into two blocks *i.e*., southern block include wet land, farm area and northern block include orchard. Farm area is meant for sugarcane, paddy, banana, betel vine and sun hemp cultivation and so irrigation (Periyavaikal and Kalluvaikal river sub channel) canals utilizing farm operations both in southern and northern

block, standing water in sugarcane and paddy field, fish ponds are its specialties. The total area is 60.57 ac. Northern block is spread over 10.3 ac and is more or less a wild habitat with trees and shrubs. Orchard is meant for the cultivation of fruiting plants and vegetables. Southern block is meant for the cultivation of sugarcane, paddy, banana, betel vine and sun hemp cultivation and with minimum anthropogenic disturbances and it is about 50.1 ac and between southern and northern block it contain coconut field is about 0.17 ac and divided these two block by railway track from Trichy to Coimbatore via Karur. Birds were counted by using total count method which involves searching throughout a fixed area for a set amount of time and recording the number of birds seen and heard (Bibby *et al*. 2000; Urfi, 2005) [5, 18]. Birds systematically counted from 6:30 am to 10:00 am in morning and 4:00 pm to 6:30 pm in evening. Bird observations were carried out by using Binocular and Photographs of birds were taken by using Camera (Nikon Coolpix B500 and Sony DSC-H400). In addition to these fixed timings of surveys, some irregular visits were also planned and made during other hours of the day. Birds were identified with the help of different field guides. Feeding guilds were classified as per direct observations and available literatures. The feeding guilds were determined according to the primary and predominant food type (Ali, 2012; Grimmet *et al*. 2013) [1, 9]. The birds were categorized based on the migratory status into Resident (R), Winter Migrant (WM), Resident (Local) Migrant (R/M). Based on the feeding guild the birds were categorized into Herbivore (HR), Piscivore (PI), Omnivore (OM), Insectivore (IN), Frugivore (FR) and Carnivore (CA) following Ali and Ripley (1987). The following formula was used for determining percentage of occurrence of Families (Wells, 2007) [19]. Per centage of occurrence is also stated as Relative diversity.

$$\text{Per centage occurrence} = \frac{\text{No. of species of each family}}{\text{Total no. of different species seen}} \times 100$$

The statistical analyses were calculated by using MS-Excel 2007.

Results and Discussion

The results revealed that, so far 34 bird species belonging to 12 orders and 26 families were recorded during three month study period during January 2021 to March 2021 in Sugarcane Research Station, Sirugamani, Tiruchirappalli district. Out of these Passeriformes consists of maximum representation with 13 species under 11 families (Figure 2). Another 3 dominant orders are Coraciiformes, Charadriiformes, Cuculiformes consists of three species followed by Galliformes, Pelecaniformes, Piciformes and Strigiformes consists of two species and the least represented orders are Psittaciformes, Pelecaniformes, Gruiformes and Columbiformes with minimum of one species each. Carlton *et al*. (2020) [7] reported that totally 34 bird species documented on the banks of river cauvery area of Tiruchirappalli district, Tamil Nadu. Birds are key species are maintaining the ecological balance (Haslem and Bennett, 2008) [11]. The birds are friends of human as they providing important ecosystem service such as pollination and seed dispersal destroy lot of harmful insects, mosquitoes and from the environment (Sekercioglu, 2012) [17]. The reasons for recording lesser diversity of birds in Sugarcane Research Station, Sirugamani, may be due to the short study period and the location of this station in a tropical semi-arid zone. The Rich bird diversity is due to more plant diversity which is more provided food as well as nesting and breeding sites. The considerable number of trees in fallow land and boundary of agricultural fields accommodates large number of bird population (Mariappan *et al*. 2013) [14]. There are several factors that influence changes in bird populations such as availability of food, location of nesting sites, availability of nesting materials, introduced diseases, introduced and invasive flora, predators, competitors (Margules *et al*. 2000) [13] and environmental changes (Anula, 2015) [3]. However habitat loss is considered atop among the others. At this stage educational institution like Sugarcane Research Station, Sirugamani with natural vegetation's serves as a good habitat for the bird community.

The paddy fields which are cultivated with well waters attract birds considerably. The bird composition of a site depends on the vegetation structure. Existences of trees, bushes, creepers are very important to them (Harisha and Hosetti, 2009) [10]. The list of bird species are presented in Plate 1. Among the 26 families 19 families are represented by one species *i.e*. Cisticolidae, Dicruridae, Timaliidae, Pycnonotidae, Nectariniidae, Sturnidae, Monarchidae, Oriolidae, Motacillidae, Alcedinidae, Coraciidae, Meropidae, Scolopacidae, Picidae, Megalaimidae, Psittaculidae, Ciconiidae, Rallidae, Columbidae (RD Index value=2.9) and 6 families are represented by two species *i.e*., Corvidae, Estrildidae, Charadriidae, Phasianidae, Ardeidae, Strigidae (RD Index value=5.9) and three species were found in only one family *i.e*., Cuculidae and so it was found to be the most dominant family in the research station with a RD Index value of =8.8 (Table 1.). The species distribution in the other study areas will also be higher, unless the area is not disturbed due to anthropogenic activities.

Based on the migratory status among the 34 bird species where 27 species belong to resident (R), 6 species belong to resident (local) migrant (RM) and 1 species belong to migrant (M) (Figure 3.). Little ringed plover, Asian open bill stork, Asian Koel, Asian paradise flycatcher, Eurasian Golden Oriole and Cattle Egret were the local migrant species and remaining all the 27 species were resident except wood sandpiper which is a migratory species.

Based on the abundance (frequency of sightings) 14 species were very common (41.2%), 13 species were common (38.2%), 2 species were occasional (5.9%) and 5 species were rare (14.8%) (Figure 4). More complex vegetation structure is associated with greater diversity. The agricultural fields surrounding orchard, garden, probably provided shelter and suitable foraging grounds for the land birds (Mariappan *et al*. 2013) [14]. Irrigation canals, fish ponds and paddy fields provided different food sources like fish, crustaceans, invertebrates, water plants which further added to the diversity of wet land birds. According to IUCN Red list all the species recorded in the present study come under least concern category (Table 1). Based on the feeding guilds 13 species were Insectivorous (38.2%), 7 species were Carnivorous, Omnivorous (20.6%), 3 species were Granivorous, Frugivorous (8.8%) and 1 species were Nectarivorous (2.9%) in the study area (Figure 5.). It is evident from this study, that insectivorous and omnivorous birds constitute majority of the bird community in the study area.

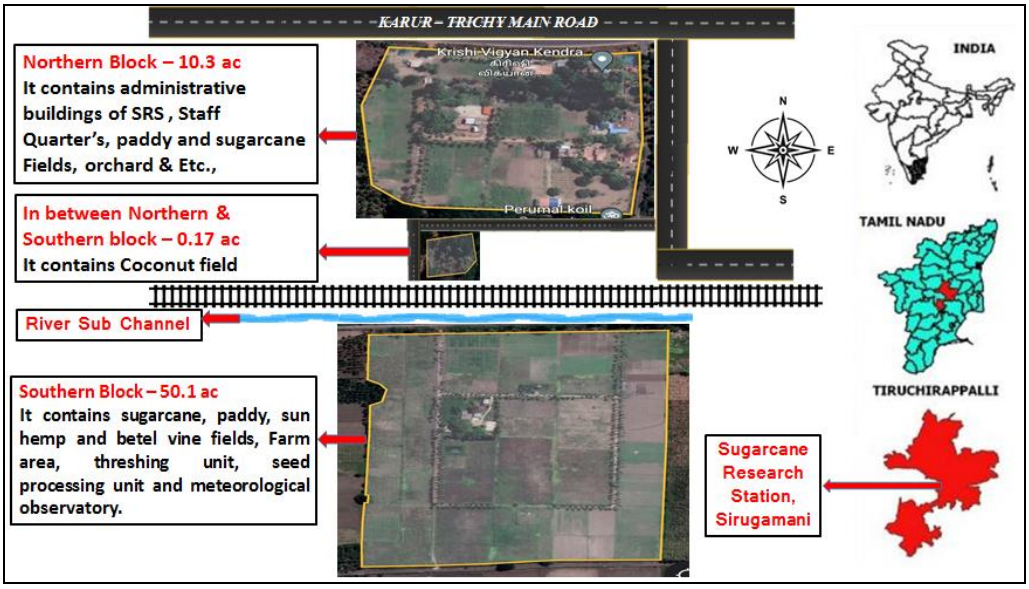


Fig 1: Satellite view of Sugarcane Research Station, Sirugamani, Tiruchirapalli district, Tamil Nadu

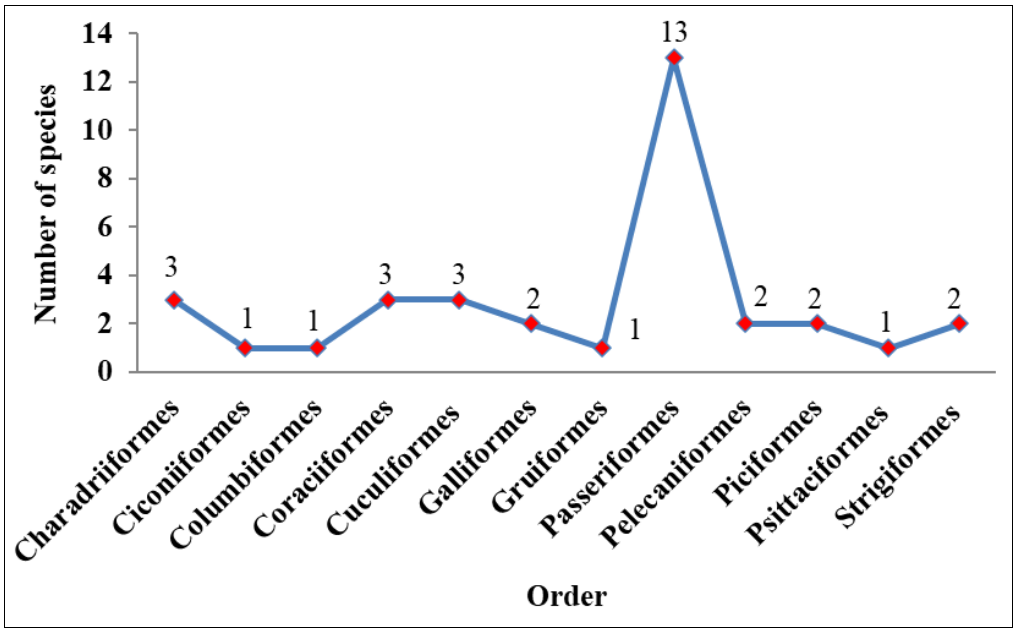


Fig 2: Order wise distribution of avifauna in Sugarcane Research Station, Sirugamani

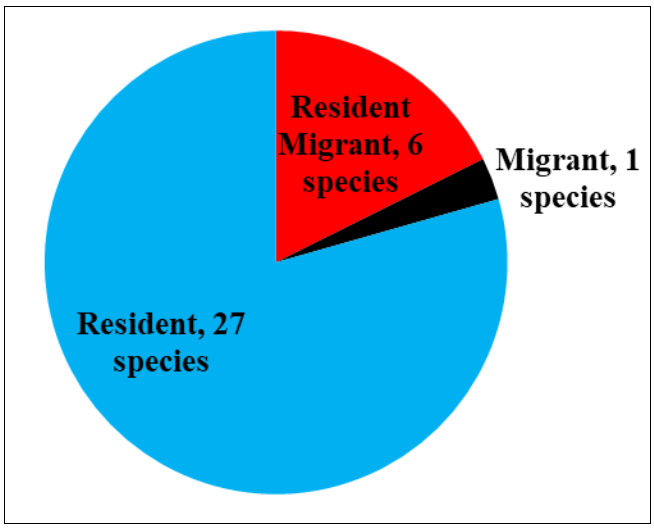


Fig 3: Migratory Status of Avifauna in Sugarcane Research Station, Sirugamani

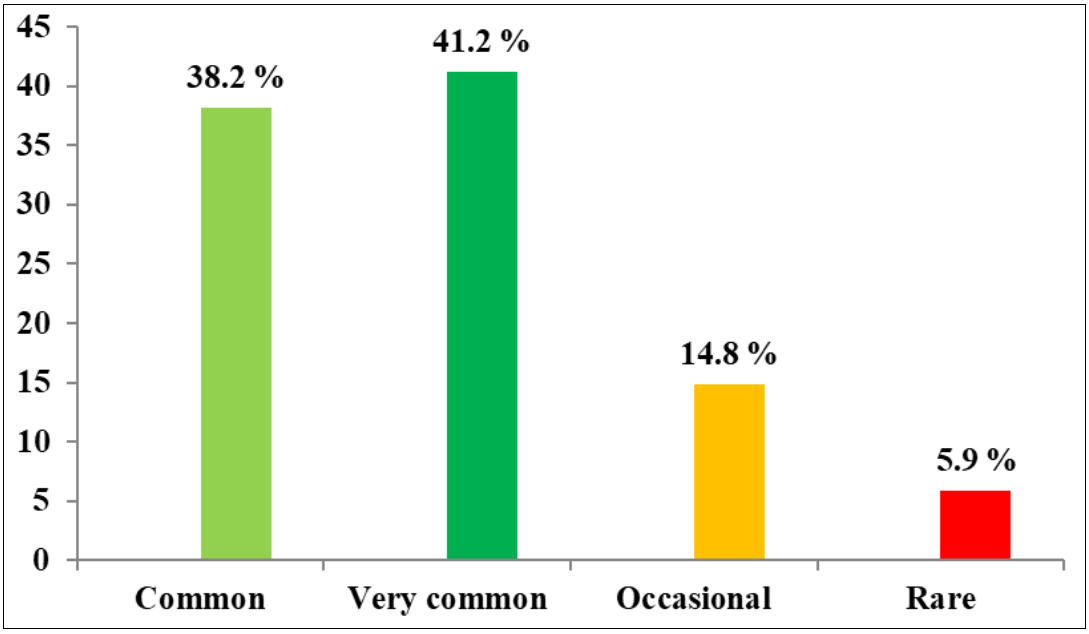


Fig 4: Abundant category of bird species in Sugarcane Research Station, Sirugamani

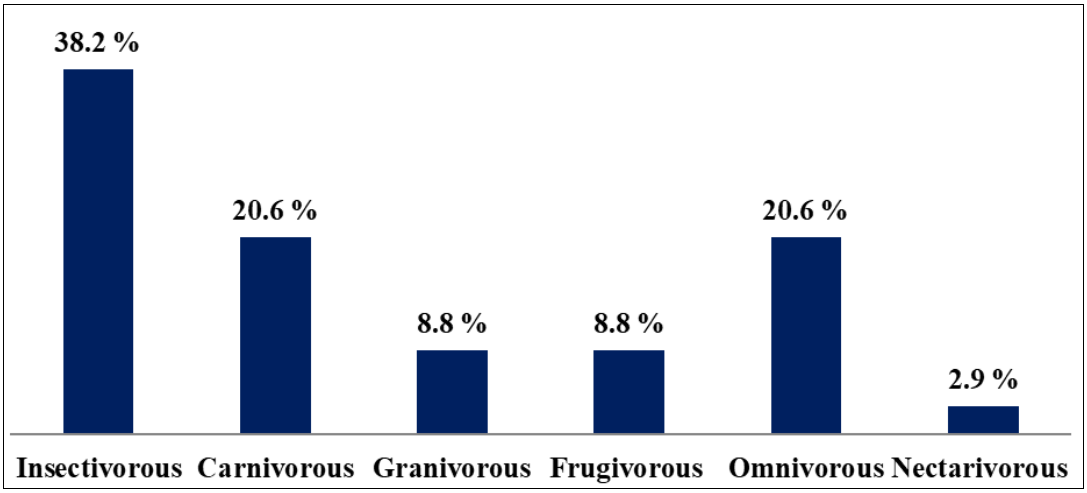
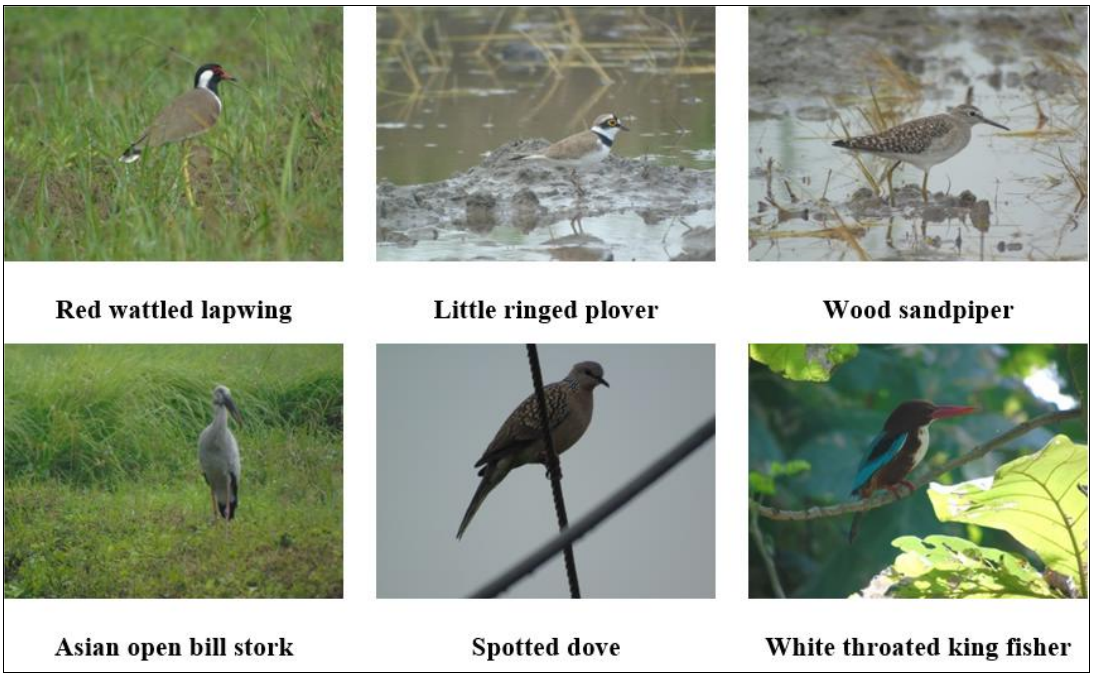


Fig 5: Feeding Guild of Avifauna in Sugarcane Research Station, Sirugamani




Indian roller
Blue tailed bee eater
Asian Koel
Greater coucal
Blue-faced malkoha
Indian peafowl
Grey francolin
White breasted waterhen
House crow

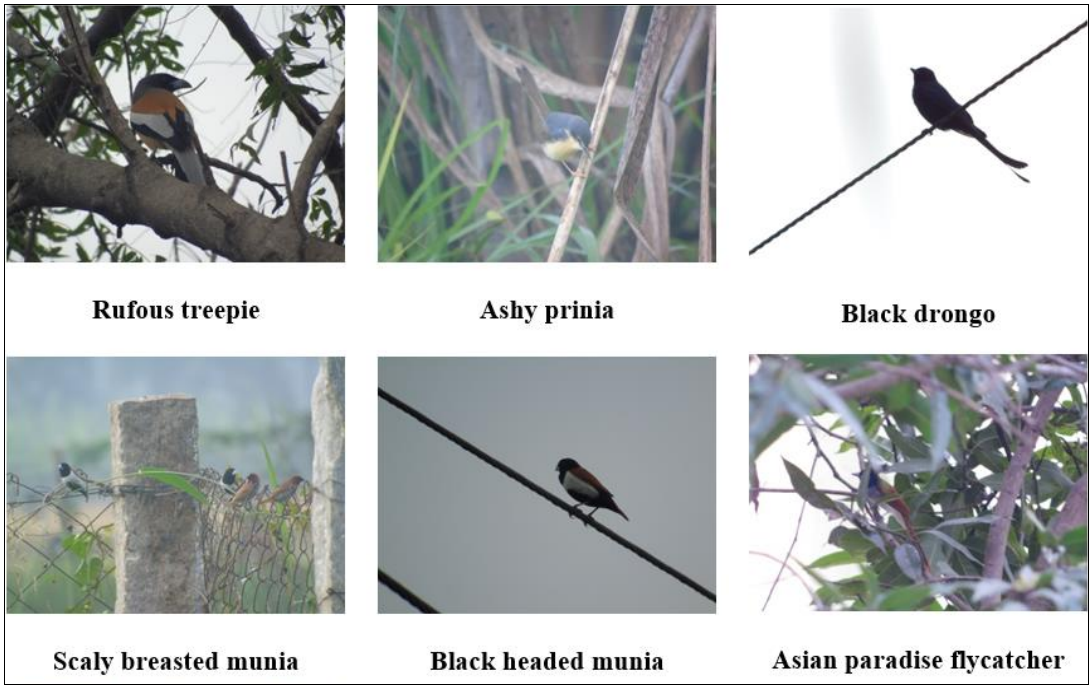

Rufous treepie
Ashy prinia
Black drongo
Scaly breasted munia
Black headed munia
Asian paradise flycatcher

Plate 1: Birds observed in Sugarcane Research Station, Sirugamani, Tiruchirapalli district, Tamil Nadu

Table 1: Systematic checklist, IUCN, Residential status, Abundance and Feeding guild of birds observed in Sugarcane Research Station, Tiruchirapalli District, Tamil Nadu

No	Order	Family	Common Name	Scientific Name	RD%	IUCN	Residential Status	Abundance	Feeding guild
1	Charadriiformes	Charadriidae	Red wattled lapwing	*Vanellus indicus*	5.9	LC	R	VC	IV
			Little ringed plover	*Charadrius dubius*		LC	RM	R	IV
		Scolopacidae	Wood sandpiper	*Tringa glareola*	2.9	LC	M	O	IV
2	Ciconiiformes	Ciconiidae	Asian open bill stork	*Anastomus oscitans*	2.9	LC	RM	R	CV
3	Columbiformes	Columbidae	Spotted dove	*Streptopelia chinensis*	2.9	LC	R	C	GV
4	Coraciiformes	Alcedinidae	White throated king fisher	*Halcyon smyrnensis*	2.9	LC	R	C	CV
		Coraciidae	Indian roller	*Coracias benghalensis*	2.9	LC	R	VC	IV
		Meropidae	Blue tailed beef eater	*Merops philippinus*	2.9	LC	RM	C	IV
5	Cuculiformes	Cuculidae	Asian Koel	*Eudynamys scolopacea*	8.8	LC	R	VC	FV
			Greater coucal	*Centropus sinensis*		LC	R	VC	CV
			Blue-faced malkoha	*Phaenicophaeus viridirostris*		LC	R	R	IV
6	Galliformes	Phasianidae	Indian peafowl	*Pavo cristatus*	5.9	LC	R	VC	OV
			Grey francolin	*Francolinus pondicerianus*		LC	R	VC	IV
7	Gruiformes	Rallidae	White breasted waterhen	*Amaurornis phoenicurus*	2.9	LC	R	O	OV
8	Passeriformes	Corvidae	House crow	*Corvus splendens*	5.9	LC	R	VC	OV
			Rufous treepie	*Dendrocitta vagabunda*		LC	R	C	OV
		Cisticolidae	Ashy prinia	*Prinia socialis*	2.9	LC	R	C	IV
		Dicruridae	Black drongo	*Dicrurus macrocercus*	2.9	LC	R	VC	IV
		Estrildidae	Scaly breasted munia	*Lonchura punctulata*	5.9	LC	R	C	GV
			Black headed munia	*Lonchura malacca*		LC	R	C	GV
		Monarchidae	Asian paradise flycatcher	*Terpsiphone paradise*	2.9	LC	RM	R	IV
		Motacillidae	Paddyfield pipit	*Anthus rufulus*	2.9	LC	R	C	IV
		Nectariniidae	Purple rumped sunbird	*Leptocoma zeylonica*	2.9	LC	R	VC	NV
		Oriolidae	Eurasian Golden Oriole	*Oriolus kundoo*	2.9	LC	RM	VC	IV
		Pycnonotidae	Red vented bulbul	*Pycnonotus cafer*	2.9	LC	R	C	OV
		Sturnidae	Common myna	*Acridotheres tristis*	2.9	LC	R	VC	OV
		Timaliidae	Yellow billed babbler	*Argya affinis*	2.9	LC	R	VC	OV
9	Pelecaniformes	Ardeidae	Cattle Egret	*Bubulcus ibis*	5.9	LC	RM	C	CV
			Indian pond heron	*Ardeola grayii*		LC	R	VC	CV
10	Piciformes	Megalaimidae	Coppersmith barbet	*Megalaima haemacephala*	2.9	LC	R	R	FV
		Picidae	Black rumped flameback	*Dinopium benghalense*	2.9	LC	R	C	IV
11	Psittaciformes	Psittaculidae	Rose ringed parakeet	*Psittacula krameri*	2.9	LC	R	C	FV
12	Strigiformes	Strigidae	Spotted owlet	*Athene brama*	5.9	LC	R	VC	CV
			Indian scops owl	*Otus bakkamoena*		LC	R	C	CV

NOTE: IUCN Status – LC – Least Concern
Feeding guild: Omnivorous (OV), Carnivorous (CV), Insectivorous (IV), Granivorous (GV), Frugivorous (FV), Nectarivorous (NV)
Residential Status – R-Resident, M-Migrant, RM- Resident Migrant
Abundance- C-Common, VC-Very common, O-Occasional, R- Rare

Conclusion

This study concluded that totally 34 species in 12 orders from 26 families were recorded in Sugarcane Research Station, Sirugamani, Tamil Nadu. The present study provides baseline data for monitoring bird's diversity in the station. This study creates awareness on documenting birds in other educational institutions. This information will be help in future for species specific work on avifauna and for launching conservation strategies. Although there are natural vegetation and cultivated crops in the station as habitat for birds of this region, conservation measures are immense need for their future survival.

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