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Studies on species diversity and abundance of ornithofauna in Thirunnavaya Wetland, Malappuram District, Kerala

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Abstract
An ecological investigation of the species diversity and abundance of avian community of wetlands in Thirunnavaya, Malappuram district, Kerala state was carried out during July 2014 to June 2015. Thirunnavaya wetlands were winter shelters for variety of migratory birds and suitable habitat for several resident and resident migratory birds. A total of 67 birds belong to 30 families and 16 orders were recorded during the study period. Out of these, 49 were Residents and 12 were Winter Visitors and 6 were Resident Migratory. The total number of birds in the area varied from 232 to 1460 individuals in a month with the lowest during July 2014 and highest being recorded during December 2014. The orders Ciconiiformes and Passeriformes showed maximum species diversity ((22.38%) followed by Charadriformes and Coraciformes (15&9%) respectively. The remaining orders showed a least diversity. The major threats noticed in the study area were destruction by clay mining, pollution, land mining, over fishing, introduction of invasive species and hunting of fauna. It is expected that this study would provide a preliminary account and importance of various water birds of this area and is useful for further research and assessment.

Keywords: thirunnavaya wetland, winter shelters, ciconiiformes, passeriformes, IUCN

Introduction
Wetlands are complex and productive ecosystem in the world. Wetlands providing crucial ecosystem services that are beneficial to human kind are also known as "Kidneys of landscape''. Wetlands are also known as "Biological super markets" because of the extensive food chains and rich bio diversity, they support, providing unique habitats for a wide range of flora and fauna. According to Ramsar convention a wetland is defined as "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water depth of at which low tide does not exceed six meters.

In India, the wetlands support varieties of avian fauna include rare species, local migrants, migrants and winter visitors. About 1340 bird species are found in India; around 310 species are known to be dependent on wetland (Manakandan and Pitti 2001) [2]. Wetland birds are an important component of wild life and their occurrence and distribution are an important phenomenon to understand the overall picture of wetland habitats. Birds are one of the best indicators of environmental changes.

Nammassivayan and Venugopalan (1989) [4] was given more contribution on the studies of wetlands in Kerala. A study conducted by Nameer (1993) of the birds of Kole Wetlands in Thrissur shows that the wetlands are attractive habitat for waterfowl. Ornithology in Kerala has developed during the extensive studies by Neelakandan and he reported many aspects of the wetland birds in Kerala over a span of 40 years. Forty five water birds are recorded on the preliminary survey on avifauna of Buxa Tiger Reserve by Sivakumar and Vibhu (2004) [6]. Biju prepared a check list of avifauna in Bharatha puzha river basin in the year 2006. A preliminary study on avian fauna of Krishna River basin was studied by Suresh and Abhijit (2013) [8]. The present investigation was an attempt to prepare a checklist, monthly or seasonal variation of species, migratory status and threats of avifauna of the Thirunnavaya wetland, Kerala.

Materials and Methods
Study area
The study area lying between Thirunnavaya and Kuttippuram with. Thirunnavaya is a large fresh water wetland in Kerala is located in Tirur taluk, Malappuram district, and it spreads approximately 80 acres. There are so many natural and artificial ponds, wells, canals, channels and shallow marshy areas in this wetland. Usually this wetland receives average annual rainfall of 170- 200 mm and average annual minimum and maximum temperature 24.8 & 36.3 C respectively. The dominant vegetation in this area includes *Nelumbo nucifera*, *Nymphaea nonchalli, Oryza species and Ipomea Carnea.*

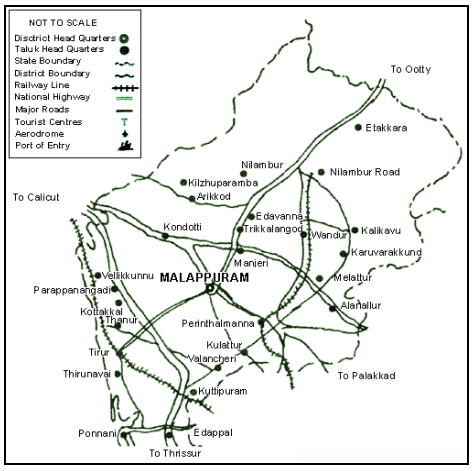

Fig 1: Map and Satellite View of Study Area

Methodology

The study was carried out from July 2014 to June 2015. For understanding the diversity of birds regular surveys were done in and around Thirunavaya wetlands. The survey was conducted from 7 to 10 am and from 3 to 6.30 pm with help of binocular (Olympus, 7x50). Total count method was adopted to conduct census of avian fauna and line transecting method is also used for counting birds for more accuracy of results. For conducting census I walked slowly along fixed pathways and stopped to observe birds. In each recording of the species encountered, the activities like feeding, flying, resting& etc. were also noted. For the further identification purpose birds were photographed at the field itself.

Each species observed on the study plot was categorized according to its status viz Resident (R), Resident Migrant (RM) and winter visitor (WV). For obtaining the population fluctuation of avifauna, they were categorized in to Winter, Winter and Summer (WS) and All; observed during 3 seasons.

Results and Discussion

The wetlands are closely related to birds for nesting, feeding, resting and breeding purposes. So wetland ecosystem is an important component in the biodiversity and the conservation and proper management of wetlands are important criteria for maintain biodiversity of the earth. Based on the survey, a total of 67 species birds belong to 30 families and 16 orders were present in Thirunnavaya wetlands. The orders Ciconiiformes and Passeriformes showed maximum species diversity (22.38%) followed by Charadriformes and Coraciformes (15 & 9%) respectively. The remaining orders showed a least diversity. The remaining orders showed a least diversity (Fig.2). Little cormorant, Indian Pond Heron, Cattle Egret, Common Myna, House Crow, Jungle Crow, White Breasted Kingfisher, Purple Moorhen, Bronze Winged Jacana and Lesser Whistling Teal were commonly observed from the study area. These species were appeared to be better adapted for exploiting the resources of these wetlands. Among the bird species recorded, Oriental White Ibis (*Threskiornis melanocephalus*) and Oriental Darter (*Anhingarufa melanogaster*) were listed as Near Threatened category on Red List by IUCN, it increases the importance of Thirunnavaya wetland in Kerala for providing suitable habitat for these birds.

Out of 67 birds recorded from study area, 49 (73%) were Resident, 12 (18%) were Winter Visitors and 6 (9%) were Resident Migratory (Fig.3). In India, the wetlands support varieties of avian fauna include rare species, Resident Migrants, Migrants and Winter Visitors. According to wetlands are habitat for hundreds of avian fauna, and around 1340 bird species were reported in India. Out of 1340 birds, around 310 birds were dependent on wetland areas (Manakandan and Pittie 2001) [2].

Migratory birds were mostly recorded on post monsoon and pre monsoon seasons. There was population fluctuation in the occurrence of birds in the study area as indicated by the occurrence of 43 species in all seasons, 12 species in both winter and summer (WS) and winter season only. The maximum number of individuals were recorded in winter seasons (67) followed by the species which were observed during summer seasons (55) and least species recorded on monsoon season (48). Species richness of bird community was directly proportional to the availability of food resources, suitable climate, optimum soil factors as well as water parameters. The total number of birds in the area varied from 232 to 1460 individuals in a month with the lowest during July 2014 and highest being recorded during December 2014. According to Sivaperuman and Jayson (2000) [7] the seasonal abundance of birds increased progressively with the onset of winter and remained high during the early summer. From mid-April the migratory species started leaving the area

The major threats were noticed in the study area was the destruction of wetland by clay mining, land mining, reclamation of wetland, pollution by pesticides, introduction and excessive growth of invasive species. Apart from these threats, over fishing and hunting of fauna for food in house and restaurants or hotels was common practice in local villagers. So it decrease the biodiversity and there by destroying the entire wetland ecosystem. There for it is the time for bring the people for the protection and conservation of wetlands from these threats for us and for the future generations also.

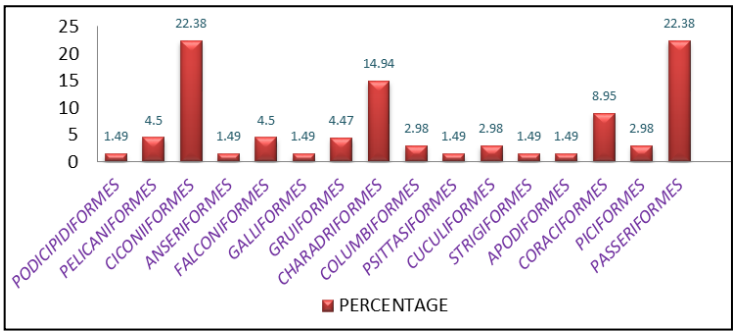

Fig 2: Order wise distribution of Bird Species in Thirunnavaya wetland.

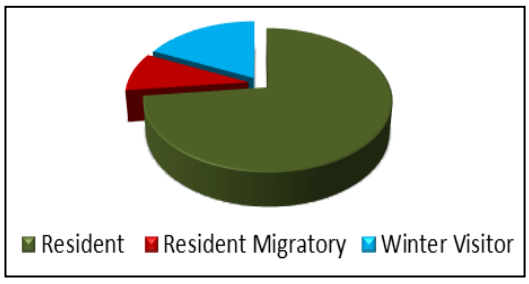

Fig 3: Categorization of Birds based on their Status.

Table 1: Taxonomic Position of Birds, along with Status and Season.

Order	Family	Scientific name	Common Name	Status	Season
Podicipidiformes	Podicipitidae	*Trachybaptus ruficollis*	Little grebe	R	All
Pelicaniformes	Phalacrocoracidae	*Phalacrocorax fuscicollis*	Indian shag	R	W
		Phalacrocorax niger	Little Cormorant	R	All
		Anhinga rufa melanogaster	Oriental Darter	RM	WS
Ciconiiformes	Ardeidae	*Ardea cineria*	Grey heron	WV	W
		Ardea purpurea	Purple Heron	R	All
		Casmerodius albus	Large Egret	RM	All
		Butorides striatus	Little green heron	R	WS
		Ardeola grayii	Indian Pond heron	R	All
		Bubulcus ibis	Cattle egret	R	All
		Egreta intermedia	Median egret	R	All
		Egreta garzetta	Little egret	R	All
		Nycticorax nycticorax	Black crowned Night Heron	R	W
		Ixobrychus sinensis	Yellow bittern	RM	All
	Ciconidae	*Anastomus oscitans*	Asian open bill stork	RM	All
		Ciconia episcopus	White necked stork	RM	All
		Ciconia ciconia	European white stork	WV	W
	Threskiornithdae	*Threskiornis melanocephalus*	Oriental white Ibis	R	All
		Plegadis falcinellus	Glossy Ibis	WV	W
Anseriformes	Anatidae	*Dendrocygna javanica*	Lesser whistling teal	R	All
Falconiformes	Accipitridae	*Milvus migrance*	Black kite	R	All
		Haliastur Indus	Brahminy kite	R	All
		Accipiter badius	Shikra	R	WS
Galliformes	Phasianidae	*Pavo cristatuss*	Indian Peafowl	R	All
Gruiformes	Rallidae	*Amaurornis phoenicurus*	White breasted water hen	R	All
		Gallinula chloropus	Common moor hen	RM	All
		Porphyrio porphyrio	Purple moor hen	R	All
Charadriformes	Jacanidae	*Hydrophasianus chirurgus*	Pheasant tailed Jacana	R	W
		Metopidius indicus	Bronze winged Jacana	R	All
	Charadridae	*Vanillus indicus*	Red wattled lapwing	R	All
		Tringa stagnatilis	Marsh sand piper	WV	WS
		Actitis hypoleucos	Common Green shank	WV	W
		Tringa nebularia	Common sand piper	WV	WS
		Tringa glareola	Wood Sandpiper	WV	W
		Calidris alpine	Little stint	WV	W
	Laridae	*Sterna aurantia*	River tern	R	W
		Chlidonias hybridus	Whiskered tern	WV	W
Columbiformes	Columbidae	*Columba livia*	Blue rock Pigeon	R	All
		Streptopelia chinensis	Spotted Dove	R	All
Psittasiformes	Psittacidae	*Psittacula krameri*	Rose ringed parakeet	R	All
Cuculiformes	Cuculidae	*Eudynamys scolopacea*	Asian koel	R	All
		Centropus sinensis	Greater coucal	R	All
Strigiformes	Strigidae	*Tyto alba*	Barn owl	R	WS
Apodiformes	Apodidae	*Cypsiurus balasiensis*	Asian palm swift	R	All
Coraciformes	Alcidinidae	*Ceryle rudis*	Lesser pied kingfisher	R	All
		Alcedo atthis	Small blue kingfisher	R	All
		Pelargopsis capensis	Stork billed kingfisher	R	All
		Halcyon smyrensis	White breasted kingfisher	R	All
	Meropidae	*Meropus orientalis*	Small Bee-eater	R	All
	Coracidae	*Coracias benghalensis*	Indian Roller	R	All
Piciformes	Capitonidae	*Megalaima viridis*	White cheeked barbet	R	All
	Picidae	*Dinopium benghalense*	Lesser golden-backed woodpecker	R	All
Passeriformes	Oriolidae	*Oriolus oriolus*	Eurasian Golden oriole	WV	WS
	Dicruridae	*Dicrurus smacrocerus*	Black Drongo	R	All
		Dicrurus paradiseus	Greater racket-tailed drongo	R	All
	Sturnidae	*Acridotheres tristis*	Common myna	R	All
	Corvidae	*Dendrocitta vagabunda*	Indian tree pie	R	All
		Corvus splendens	House crow	R	All
		Corvus macrorhynchos	Jungle crow	R	All
	Pycnonotidae	*Pycnonotus jocosus*	Red whiskered Bulbul	R	WS
	Muscicapidae	*Turdoides affinis*	Jungle Babbler	R	WS
		Acrocephalus dumetorum	Blyth's Reed warbler	WV	WS
		Acrocephalus Agricola	Paddy field Warbler	WV	W
		Copsychus saularis	Oriental magpie-robin	R	WS
	Motacillidae	*Motacilla maderaspatensis*	White browed wagtail	R	WS
	Nectarinidae	*Nectarinia zeylonica*	Purple-Rumped sunbird	R	All
		Nectarinia lotenia	Loten's Sunbird	R	All

Plate 1

Little Grebe

Oriental Darter

Purple Heron

Grey Heron

Pond Heron

Cattle Egret

Plate 2

White Necked Stork

Asian Open-bill Stork

Oriental White Ibis

Lesser Whistling Teal

Purple Moorhen

Bronze Winged Jacana

Red Wattled Lapwing

Common Sandpiper


Pied Kingfisher


Small Blue Kingfisher


Stork Billed Kingfisher


Black Drongo

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