Research Article

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Diversity of Aquatic Insects and Insectivore Birds in Kurichi Wetland, Coimbatore

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ABSTRACT

Aquatic biodiversity is largely responsible for maintaining and supporting overall environmental health. Birds and insects are a very important part of aquatic biodiversity. While birds are best indicators of wetland function, aquatic insects can give insight into many different areas of ecology. Insects are a critical source of protein for many insectivore birds and growing nestlings of majority of birds. A survey was carried out to study the species diversity of aquatic entomo-fauna and insectivorous birds in the Kurichi wetland of Coimbatore district for a period of one year from September 2014 to August 2015. A total of 1721 aquatic/semi aquatic insects belonging to 11 orders, 19 families and 19 species were recorded. Higher species numbers were of insects belonging to the orders Hemiptera, Diptera, Odonata, Plecoptera, Trichoptera, Coleoptera, Ephemeroptera and Orthopetra followed by those belonging to Neuroptera, Hymenopthera and Lepidopthera respectively. The insectivore birds belonging to 7 orders, 22 families and 55 species were recorded. Higher species diversity was of birds belonging to the order Passeriformes followed by Apodiformes and Gruiformes. The birds were classified as resident/migrant/residentmigrant based on migration status. Majority of the birds were found to be resident birds. Most of the birds were sighted throughout the year. This study re-emphasized the potential of the Kurichi wetland as an important area of biological diversity.

Keywords: Aquatic biodiversity; Conservation; Insectivore birds; Kurichi wetland; Tamilnadu.

1. INTRODUCTION

Biodiversity is a sum of all the different species of animals, plants, fungi, and microbial organisms living on Earth and their habitats. Decrease in diversity and composition of a community causes a loss in ecosystem function such as productivity or nutrient retention in the soil (e.g. Loreau *et al*. 2001; 2002). Aquatic biodiversity encompasses freshwater ecosystems, including lakes, ponds, reservoirs, rivers, streams, groundwater, and wetlands. It consists of phytoplankton, zooplankton, aquatic plants, insects, fish, birds, mammals, and others.

Aquatic insects are those that spend some part of their life-cycle closely associated with water, either living beneath the surface or skimming along on top of the water (Resh and Rosenberg, 1984). Aquatic insects process wood and leaf waste in water and also form the primary source of food for insectivore birds, fishes and amphibians. Aquatic insects can influence the distribution and abundance of insectivores because theadults of aquatic insects often represent an important food resource (Jackson and Fisher, 1986).

Birds need protein as an integral part of their diet. Insectivorous diet describes a diet that consists primarily of insects, including aquatic insects, flying insects, ants, spiders, grasshoppers, caterpillars, dragonflies, butterflies or any combination of similar prey. Many birds have at least a partially insectivorous diet, and insects are a critical source of protein for many growing nestlings. While young birds are still dependent on their parents for food, they may be fed mostly insects, even if their mature diet will be much different.

To be considered insectivorous, a bird does not necessarily need a diet of exclusively insects, but the insect proportion is quite significant. Birds may also change their diet throughout the year. For example, many thrushes are primarily insectivorous during the breeding season when chicks need greater amounts of protein and insects are abundant. This protein is also essential for molting adults in order for new feathers to develop properly. In fall and winter, however, these birds may switch to more of a frugivorous diet when insects are scarce but autumn fruits are still plentiful.

Insectivorous birds forage in different ways. They may catch insects in flight or pick them from plants, leaves, water or leaf litter. Small birds are often seen hawking or sallying, foraging methods that involve small, hovering flights to pluck insects before returning to a nearby perch. Birds that are agile climbers, such as woodpeckers, nuthatches and creepers, will glean insects from bark and branches. Many shorebirds and wading birds will probe through mud or sand in search of insects,

while ducks may dabble or dive to find insects. Small birds of prey, such as the American kestrel, will hover or soar to find large insects in open fields, or may perch far above the ground to watch for insect prey with their keen eyesight.

Wetlands are among the most threatened habitats and the species they support are among the most endangered taxa. These aquatic ecosystems are considered one of the most important to protect, due to the ecosystem services they provide and the threats they face (Costanza *et al.* 1997; Junk *et al.* 2013). Birds are commonly used as surrogates of biodiversity owing to the wide availability of relevant data on their distribution and status and their broad popular appeal (e.g. Gregory *et al.* 2003, Gregory 2006; Eglington *et al.* 2012). 1.08% of Coimbatore district geographic area is wetland. The city is traversed in the middle by river Noyyal. The area of the water body is 288 acres with maximum depth of 13.95 feet and storage capacity of 52.27 M.cft.

The Kurichi wetland is the urban wetland famously known as KurichiKulam (in Tamil). It is located in Kurichi village at a distance of 1.5 km from Ukkadam bus stand, one of the satellite bus-terminus of Coimbatore district. Kurichi Wetland is one among the biggest wetland in Noyyal Basin. The area map is shown in fig. 1.

Kurichi wetland plays major role in holding water, recharging ground water, cleaning the water by removing excess nutrient and harmful substances. The native flora and fauna in wetlands break them and absorb them. Kurichi wetland is excellent habitat for birds and many bird watchers and researchers visit this place. About 50-70% of birds found in Coimbatore Wetlands habitat this wetland. Some birds are found throughout the year and migratory birds also arrive annually. This wetland acts as a roosting site for wetland birds. At Kurichi wetland, fishermen and those into bird hunting spread fishing net into the water, into which the birds get caught while hunting fish. As the birds attempt to wriggle out of the net, the hunters grab and kill the birds. Sometimes the hunters also sell the birds to sellers in Ukkadam. Some young boys hunt for fun as well.

Although study on insects and birds are being conducted in many wetlands of Coimbatore, Tamilnadu, no systematic surveys were conducted on Kurichi wetlands of Coimbatore, Tamil Nadu. Due to the importance of aquatic insects and wetland birds in environmental impact studies and biomonitoring of freshwater habitats, there is an urgent need for comprehensive study of the biodiversity of aquatic insects and insectivorous birds in Kurichi wetland in Coimbatore. Therefore the present study was carried out to investigate the aquatic insect assembly and insectivorous birds in Kurichi wetland, Coimbatore.

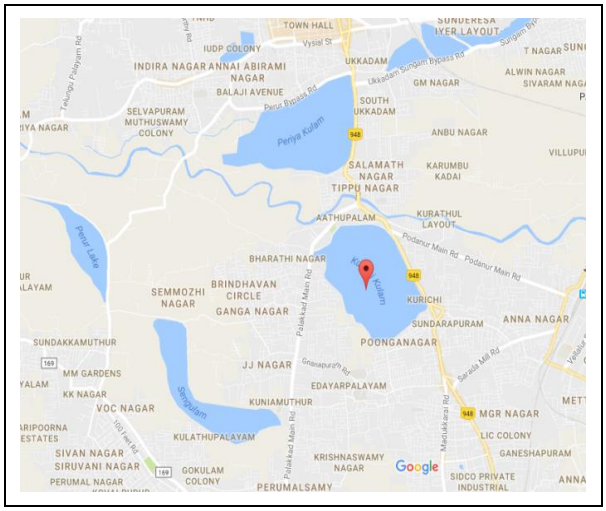

Fig. 1: Kurichi wetland map

2. MATERIALS & METHODS

This study was carried out with the objective of accessing the diversity of aquatic insects and insectivorous birds in the Kurichi wetland of Coimbatore district for a period of one year from September 2014 to August 2015.

For the study of aquatic insects, the following two types of sampling strategies were adopted.

2.1. Systematic Sampling

Systematic sampling is a type of probability sampling method in which sample members from a larger population are selected according to a random starting point and a fixed sampling interval. In the study, the kurichi wetland area was divided into five sites and insects were collected using D frame aquatic nets from each of the site.

2.2. Random Survey

Random survey is the purest form of probability sampling. Each member of the population has an equal and known chance of being selected. In the study, selected habitats best suited for collecting insects were identified from the vast Kurichi wetland and insects were collected. The specimens were observed and identified up to the best possible taxonomic level in the field using appropriated keys (Thirumalai, 1999).

For insectivore bird survey, following three methods were used (Bibby *et al.* 2000).

2.3 Direct Count Method

In this method, a suitable vantage point was selected and all visible birds were counted.

2.4 Total Count Method

In this method, all the birds seen and heard from a point count station for a set period of time are recorded. A series of point counts completed over a fixed route can then be compared to the results of the same point counts in other seasons or years. In the study, the area around kurichi wetland was covered by walk and from specific vantage points, birds were counted.

2.5 Block Count

An easy and accurate method for estimating numbers of birds present is the 'Block count' method. This can be used for large flocks, densely packed flocks or distant flocks. This method involves counting or estimating a 'block' of birds within a flock. The 'block' is then used as a model to measure the remainder of the flock.

During counts, the site was divided into many sections and each section was counted. Birds flying from behind the observer were not counted. During the study the birds found were classified according to the guild and migratory status. Birds study was systematically conducted from morning 6:00 hr to 10:00 hr and using Bushnell binocular (8x42) and birds were identified.

3. RESULTS & DISCUSSION

As a result of this study, a total of 1721 aquatic/semi aquatic insects were collected, identified and classified. The insects collected belong to 11 orders, 19 families and 19 species. The insect listing with classification is specified in Table 1.

Table 1. Number of insects collected from Kurichi wetland, Coimbatore from September 2014 to August 2015

Order	Family	Insects	Total
Coleoptera	Dytiscidae Hydrophilidae	Water Beetle Water Scavenger Beetle	95 71
Diptera	Chironomidae	Midges	270
Ephemeroptera	Baetidae	Mayfly	145
Hemiptera	Belostomatidae	Giant Water Bug	95
	Corixidae	Water Boatman	45
	Gerridae	Water Strider	85
	Nepidae	Water Scorpion	43
	Notonectidae	Backswimmer	75
Hymenopthera	Pompilidae	Spider Wasps	37
Lepidopthera	Pyralidae	Aquatic Moths	24
Neuroptera	Chrysopidae	Lacewings	42
Odonata	Anisoptera	Dragonfly	75
	Noteridae	Burrowing Water Beetle	82
	Zygoptera	Damselfly	81
Orthopetra	Acrididae	Grasshopper	74
	Gryllidae	Cricket	28
Plecoptera	Perlidae	Stoneflies	184
Trichoptera	Lepidostomatidae	Caddisfly	170
		Total	**1721**

Higher species numbers were of insects belonging to the orders Hemiptera, Diptera, Odonata, Plecoptera, Trichoptera, Coleoptera, Ephemeroptera and Orthopetra followed by those belonging to Neuroptera, Hymenopthera and Lepidopthera.

Of this, larvae of species of mayflies, dragonflies and damselflies, stoneflies, lacewings, caddiesflies, moths and wasps are aquatic with terrestrial adults. Larval or nymphal and adult stages of aquatic beetles and bugs are fully aquatic. The fig. 2 shows the relative insect counts of the observed insects orders. The species midges, mayflies, stoneflies and caddisflies were found in abundance. Aquatic moths and crickets were found in the least numbers. The fig. 3 shows the number of insects recorded by species name.

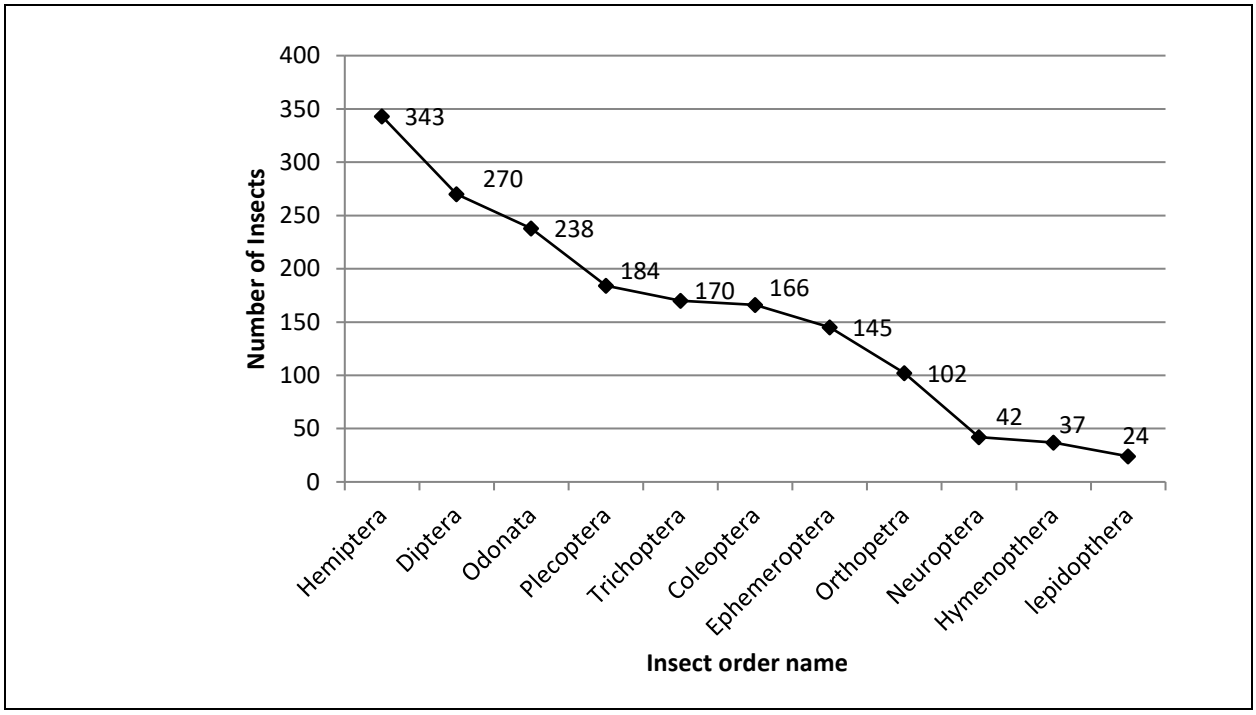

Fig. 2: Number of aquatic insects in observed orders

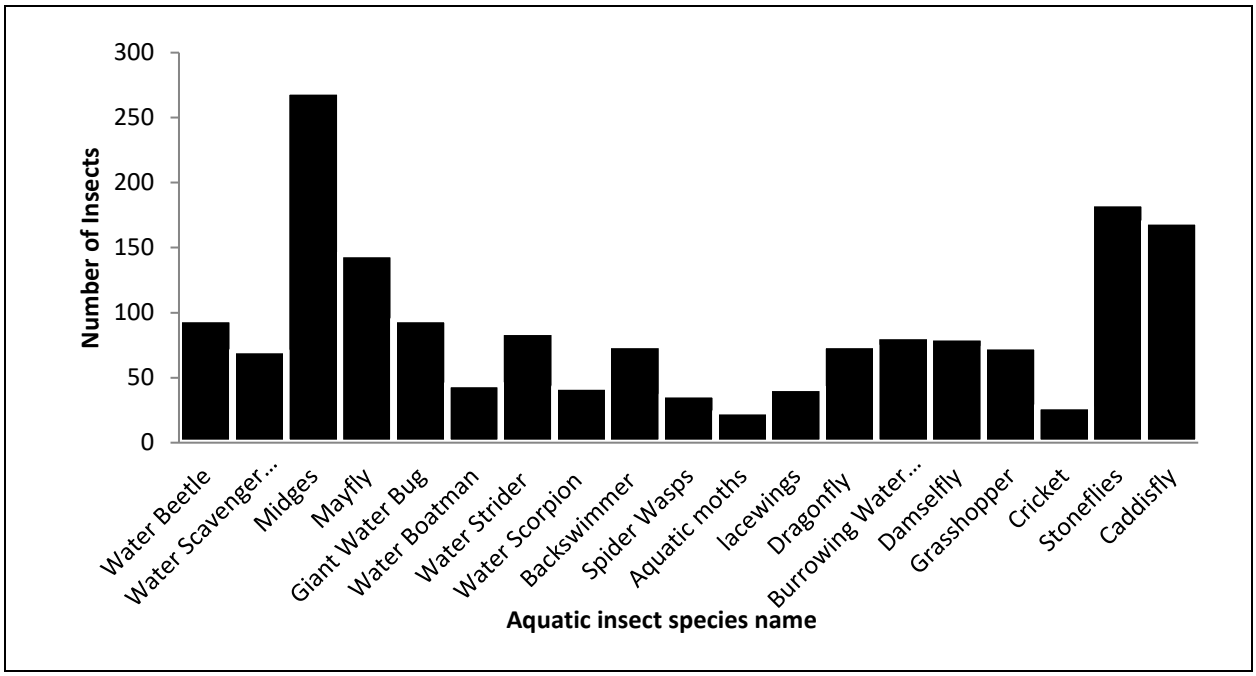

Fig. 3: Number of aquatic insects recorded by species

Table 2. List of insectivore birds recorded at Kurichi wetland, Coimbatore from September 2014 to August 2015

S. No.	Birds	Status	S. No.	Birds	Status
	Order: Ciconiiformes			**Order**: Turniciformes	
	Family: Ardeidae			**Family:** Turnicidae	
1	Little Egret	R	28	Common Button Quail	R
2	Cattle Egret	RM			
3	Indian Pond Heron	R			
	Order: Galliformes			**Order**: Passeriformes	
	Family: Phasianidae			**Family:** Alaudidae	
4	Grey Francolin	R	29	Red-winged Bush-Lark	R
	Order: Cuculiformes		30	Eastern Skylark	R
	Family: Cuculidae			**Family:** Hirundinidae	
5	Pied Crested Cuckoo	RM	31	Common Swallow	RM
	Order: Gruiformes		32	Red-rumped Swallow	RM
	Family: Rallidae			**Family:** Motacillidae	
6	White-breasted Waterhen	R	33	White Wagtail	RM
7	Little Crake	M	34	Large Pied Wagtail	R
8	Ruddy-breasted Crake	R	35	Yellow Wagtail	RM
9	Water Cock	M	36	Grey Wagtail	M
10	Purple Moorhen	R	37	Paddyfield Pipit	R
11	Common Moorhen	RM		**Family:** Campephagidae	
	Family: Charadriidae		38	Common Woodshrike	R
12	Little-ringed Plover	RM		**Family:** Laniidae	
13	Yellow-wattled Lapwing	R	39	Brown Shrike	M
14	Red-wattled Lapwing	R	40	Rufous-backed Shrike	R
	Family: Scolopacidae			**Family:** Muscicapidae	
15	Black-tailed Godwit	M	41	Indian Robin	R
16	Marsh Sandpiper	M	42	Common Stonechat	RM
17	Wood Sandpiper	M	43	Pied Bushchat	R
18	Common Sandpiper	RM		**Family:** Timaliinae	
	Order: Apodiformes		44	White-headed Babbler	R
	Family: Apodidae			**Family:** Sylviinae	
20	Asian Palm Swift	R	45	Streaked Fantail-Warbler	R
21	House Swift	RM	46	Ashy Prinia	R
	Family: Meropidae		47	Paddyfield Warbler	RM
22	Small Bee Eater	R	48	Blyth's Reed Warbler	RM
23	Blue-tailed Bee Eater	RM	49	Indian Great Reed Warbler	R
24	Chestnut-headed Bee Eater	R	50	Common Tailor Bird	R
	Family: Coraciidae		51	Greenish Leaf Warbler	M
25	Common Hoopoe	R	52	OrpheanWarbler	M
	Family: Upupidae			**Family:** Monarchinae	
26	Indian Roller	RM	53	Asian Paradise Flycatcher	RM
	Family: Picidae			**Family:** Nectariniidae	
27	Lesser Golden-backed Woodpecker	R	54	Purple-rumped Sunbird	R
			55	Purple Sunbird	R

Note: Status: R-Resident; M-Migrant; RM-ResidentMigrant;

Higher species diversity was of birds belonging to the order Passeriformes followed by Apodiformes, Gruiformes, Ciconiiformes, Galliformes, Turniciformes and Cuculiformes. The birds were classified as resident/ migrant/ residentmigrant based on migration status. Majority of the birds belonging to 29 species were found to be resident birds, while birds belonging to 17 species were found to be residentmigratory birds and birds belonging to 9 species were found to be migratory birds. The migratory birds were sighted between june to january months.

3.1 Conservation

Biological monitoring or biomonitoring is the systematic use of living organism or their responses to determine the health of aquatic ecosystem. As a wetland ecosystem, the kurichi wetland area of coimbatore is important for the breeding and roosting birds and several other taxa of fauna and flora. This region is one of the biggest water bodies in coimbatore and is home for many wetland birds and insects. Recent threats to the kurichi wetlands like Migratory Birds Pouching, Open-air Bar and Play ground, Washing vehicles, Washing cloths and bathing, Religious Activity, Electric Poles and Cables, Roads and Transport, Shops and Establishments, Crematorium and Dumping Waste, have increased and are a threat to the biodiversity that exists.

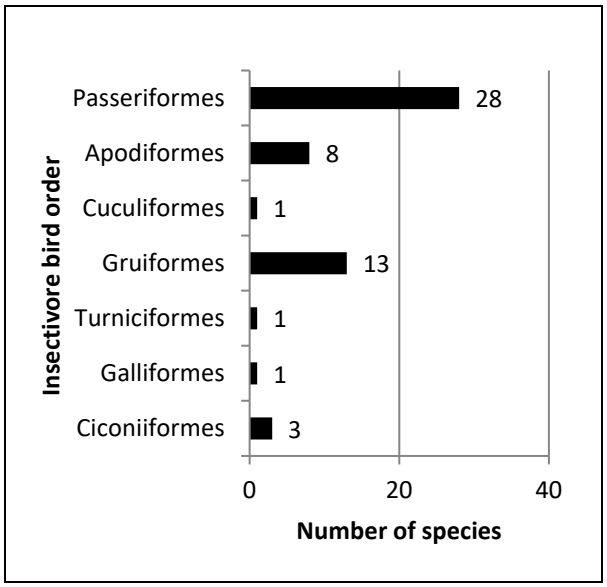

Fig. 4: Number of insectivore bird species in observed orders

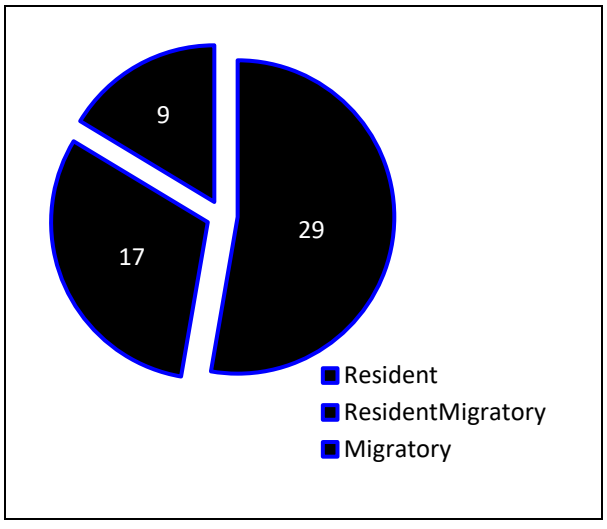

Fig. 5: Number of insectivore bird species in observed orders

4. CONCLUSION

The substrate, an important physical component of a habitat is very complex. The water current and the nature of the available parental material determine the physical nature of the substrate. Sand is a relatively poor habitat. The presence of sand and silt reduces and changes fauna. At least in stony substrata it is known that the space available for colonization determines species abundance. In general, diversity and abundance increase with substrate stability and the presence of organic detritus.

This study concludes that the kurichi wetland area of coimbatore is home to several insectivore birds and aquatic insects and is very essential in maintaining the bio diversity of coimbatore, and hence needs to be conserved.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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