

Research Article

## AERIAL FORAGERS IN THE PERIYAKULAM LAKE, TIRUCHIRRAPPALLI DISTRICT, TAMIL NADU, SOUTHERN INDIA

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**Article History:** Received 4<sup>th</sup> September 2015; Accepted 22<sup>nd</sup> September 2015; Published 25<sup>th</sup> September 2015

### ABSTRACT

Wetlands are the most preferred habitats for water birds. They support the birds by way of feeding, roosting, nesting and rearing young ones. The Periyakulam lake, Tiruchirappalli District, Tamil Nadu, India is one such habitat frequently used by waterbirds. Current status of the waterbirds and habitat was studied for the present investigation. Aerial foraging birds were estimated using total count method. Totally five species of aerial foragers were observed from January 2011 to December 2012. Densities of aerial foraging birds were at their maximum during the monsoon of both the study years. The density, diversity and species richness varied significantly between the years and among the seasons. The Periyakulam lake is an important habitat as it support aerial foragers throughout the year.

**Keywords:** Seasonality, Diversity, Population wetlands, Conservation, Tamil Nadu.

### INTRODUCTION

Wetland is an important for native and migratory birds for foraging, roosting and breeding purposes (Sivaperman and Jayson, 2000). Besides, it also harbours other faunal group such as invertebrates, fish, amphibians, reptiles and mammals (Buckton, 2007). Most of the wetlands in India are directly or indirectly linked with major river systems. India has totally 27403 wetlands of which 23444 are inland wetlands and remaining 3959 are coastal wetlands (Rajkumar, 2012). Nowadays, wetlands are one of the most threatened habitats because of their vulnerability of exploitation for development (Hollis *et al.*, 1988).

Birds are the important consumers in aquatic systems and are indicators of both water quality and biodiversity. Water birds are the most conspicuous and significant component of different wetland habitats and their presence or absence may indicate the ecological conditions of the particular area (Rajpar and Zakaria, 2011). Being an ecologically important with high nutritional value and productivity, the wetlands

support a good diversity of different species of water birds (Gibbs, 1993; Paracuellos, 2006). The presence of aerial foraging bird species in any lake depends on certain conditions such as habitat types, climatic conditions, and resource stability (Weller, 1999; Getzner, 2002). While studying avifauna of wetlands, parameters such as species richness, relative density and diversity of bird population are frequently used as indicators to determine the habitat quality (Nilsson and Nilsson, 1978; Weller, 1981; Pandiyan, 2002, Pandiyan and Asokan, 2008a and b, Pandiyan *et al.*, 2013). The present article deals with the seasonal variation of density, diversity and richness of aerial foragers in the Periyakulam wetland.

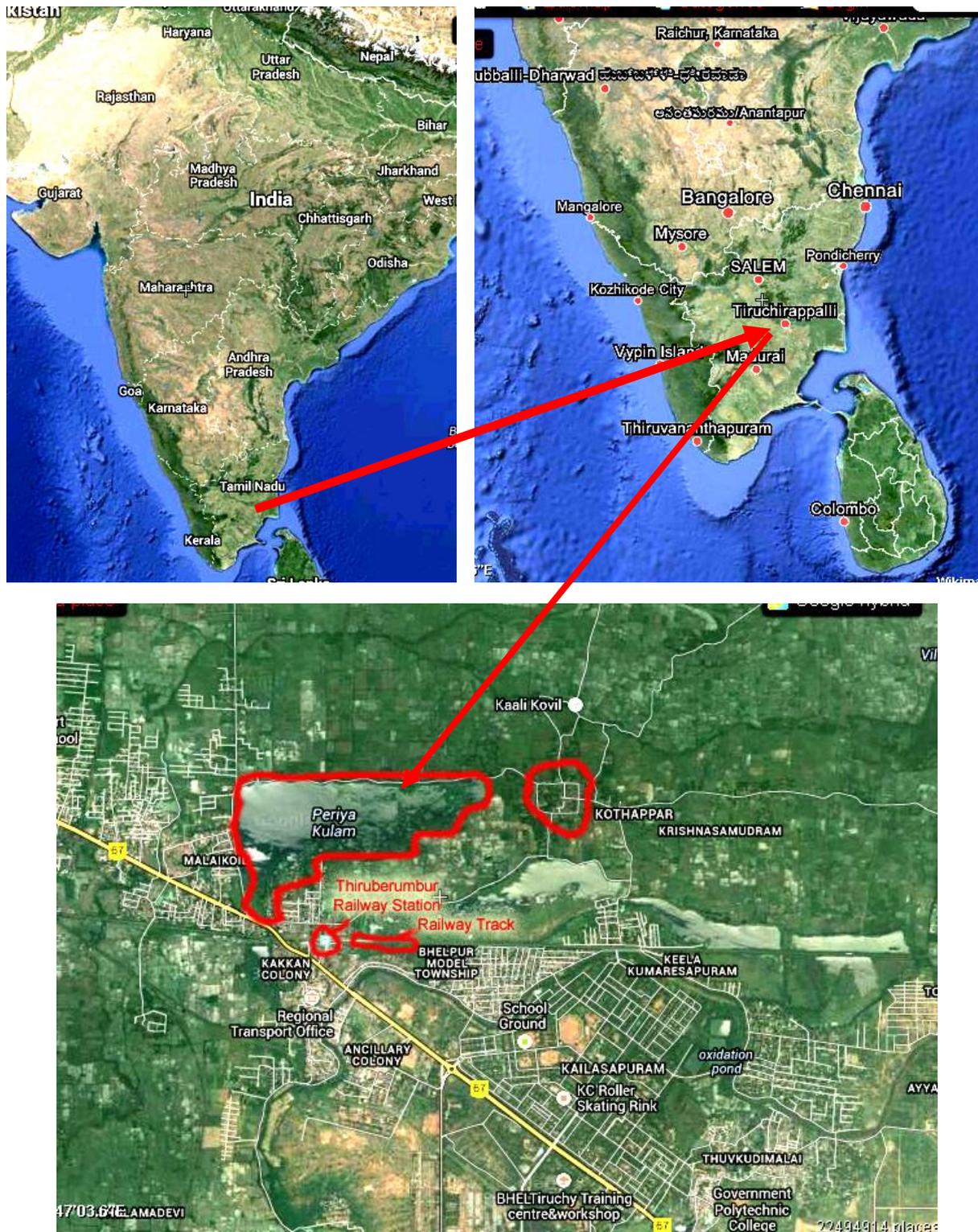
### MATERIALS AND METHODS

#### Study area

Periyakulam lake (10°.78 N; 78°.77 E) is located in the Kothappar village of Thiruvarampur, Tiruchirappalli district, Tamil Nadu, India (Figure 1). It covers an area of 74.085 ha. The major water source to this lake is Cauvery River via Uyyakondan canal. The water resource is

largely used for agriculture and inland aquaculture. About 629.84 ha agricultural land is irrigated from this lake. Besides, this wetland attracts thousands of water birds comprising of resident and migrant species. *Eichhornia crassipes*, *Phragmites karka*, *Zizania latifolia*,

*Cynodon* spp., *Limnophila* spp., *Sagittaria* spp., *Saccharum latifolium*, *Erianthus pucerus*, *Erianthus ravennae*, *Leersia hexandra*, and *Cyperus rotundus* are the dominant floral species found in this wetland.



**Figure 1.** The Map showing the Kothappari Periyakulam Wetland, Tiruchirappalli District.

## Bird counting

Water birds were counted using the 'direct count' (Yates and Goss-Custard, 1991). Birds were counted with 7 × 50 mm binocular and 20 x 60 mm spotting scope from vantage points on the lake. On each day, we carried out two counts of 3.00h duration and as far as possible, counts were undertaken on clear and sunny days to minimize bias arising from variation in weather. During the census, we were always aware of any arrival or departure of flocks of birds in the areas to be counted to avoid missing or duplicating records. Care was taken not to disturb any birds while counting birds.

## Seasons

The study period was divided into four different seasons based on the migration chronology of water birds. The Pre-Monsoon season (PrM) which includes the months of July, August and September when birds arrive or pass the lake for wintering. The Monsoon season (Mon) includes the months of October, November and December. The Post Monsoon season (PoM) which includes the months of January, February and March, and summer season (Sum) which includes the months of April, May and June (Pandiyan *et al.*, 2006)

## Data analysis

Density of aerial foraging bird was calculated as number per hectare. Species richness was calculated by the number of waterbird species recorded in the lake (Verner 1985), and species diversity was calculated by using the Shannon-Wiener Index (Shannon and Wiener 1949). The General Linear Model (GLM) was applied to understand the impact of bird characteristics features such as density, diversity and species richness between the years and among the seasons. All the statistics were run by using SPSS 16.0. Results of the analyses were interpreted using standard statistical procedures (Sokal and Rohlf 1981).

## RESULTS AND DISCUSSION

Water birds are one of the most significant levels in the biological community on the wetlands. The water bird species presence, as measured by different manners for examples composition, abundance, density, richness and diversity is a result of the extent of habitat and availability of food (Kingsford *et al.*, 1999). In an aquatic ecosystem the vegetation is the most significant factor for the survival of water birds especially aerial forager. The vegetation community may directly or indirectly affect the aerial forager (Deshkar, 2008). Water is a major driven factor that affected aquatic vegetation composition and food resources that influenced bird density, diversity and species richness (Colwell and Taft, 2000; Quinn 2002; Wilcox *et al.*, 2002). Among the most important parameters of the bird study, the species richness (Nilsson and Nilsson, 1978; Weller, 1978; Pandiyan and Kannan 2012) the density (Krebs, 1985), bird species diversity (Pandiyan *et al.*, 2006) are known to differ between locations (spatial) and seasons (temporal) (Austin and Tomoff, 1978; Rotenbery *et al.*, 1979; Benthke and Nudds, 1993).

Totally five different species of aerial foragers consisting of three different families and three orders were recorded during the Year I (2011) and year II (2012) (Table 1). The White breasted Kingfisher (*Halcyon smyrnensis*) was the maximum density during the monsoon season  $6.25 \pm 2.967/ha$ . and the Whiskered Tern (*Chidonias hybridus*) density was the minimum during the pre monsoon season  $5.36 \pm 2.539/ha$ . for the period of year I and year II respectively. But out of five species the Small Blue Kingfisher (*Alcedo atthis*) and Indian palm swift (*Cypsurus balasiensis*) not recorded during the year I. Whereas, during the second year the Indian palm swift was the highest density during monsoon season  $168.67 \pm 29.873/ha$ . The Lesser Pied kingfisher (*Ceryle rudis*) occurred maximum during monsoon season of year II  $10.7 \pm 2.470$  (Table 1). Besides, the overall density of aerial foragers was recorded of both the years in monsoon season ( $12.5 \pm 3.381/ha$ .) and ( $233.72 \pm 32.295/ha$ .). The density, diversity, and species varied significantly between the years and among the seasons ( $P < 0.05$ ).

Table: 1. Different species of aerial foragers recorded in the Periyakulam lake during January-2011 to December-2012 (Values are Mean  $\pm$  SE).

S. No.	Name of the aerial foragers	Year I (January –December 2011)				Year II (January –December 2012)			
		Seasons*				Seasons*			
		Prm	Mon	Pom	Sum	Prm	Mon	Pom	Sum
1	White breasted kingfisher ( <i>Halcyon smyrnensis</i> )	1.17 $\pm$ 0.441	6.25 $\pm$ 2.967	0.46 $\pm$ 0.332	5.67 $\pm$ 3.283	4.36 $\pm$ 0.992	4.33 $\pm$ 1.331	7.67 $\pm$ 4.557	4.42 $\pm$ 2.047
	Small blue kingfisher ( <i>Alcedo atthis</i> )	0	0	0	0	0.86 $\pm$ 0.533	0.89 $\pm$ 0.690	0	0
3	Lesser pied kingfisher ( <i>Ceryle rudis</i> )	2.58 $\pm$ 1.184	5.25 $\pm$ 0.871	0 $\pm$ 0	1.00 $\pm$ 0.537	5.86 $\pm$ 1.313	10.7 $\pm$ 2.470	7.50 $\pm$ 3.547	11.5 $\pm$ 4.967
	Indian palm swift ( <i>Cypsurus balasiensis</i> )	0	0	0	0	31.0 $\pm$ 9.854	168.67 $\pm$ 29.873	15.0 $\pm$ 0	8.346 $\pm$ 8.346
5	Whiskered tern ( <i>Chidonias hybridus</i> )	0	0	0.69 $\pm$ 0.692	0 $\pm$ 0	5.36 $\pm$ 2.539	47.0 $\pm$ 10.582	47.9 $\pm$ 17.267	37.8 $\pm$ 21.866
	Density (No./ha.)	4.75 $\pm$ 1.326	12.5 $\pm$ 3.381	2.15 $\pm$ 0.732	7.67 $\pm$ 3.180	49.4 $\pm$ 11.201	233.72 $\pm$ 32.295	61.0 $\pm$ 17.327	70.8 $\pm$ 23.049
7	Richness (No.of bird species)	0.83 $\pm$ 0.207	1.33 $\pm$ 0.188	0.23 $\pm$ 0.122	1.00 $\pm$ 0.123	2.93 $\pm$ 0.267	2.78 $\pm$ 0.319	1.33 $\pm$ 0.256	1.9 $\pm$ 0.229
	Diversity (H')	0.0020 $\pm$ 0.0006	0.0047 $\pm$ 0.0011	0.0009 $\pm$ 0.0003	0.0031 $\pm$ 0.0009	0.0146 $\pm$ 0.0026	0.0476 $\pm$ 0.0051	0.0166 $\pm$ 0.0040	0.0186 $\pm$ 0.0046

\*Prm= Premonsoon ; Mon= Monsoon; Pom= Post Monsoon; Sum= Summer.

The present study revealed that the overall bird density was highest during the monsoon season than the other seasons in the lake. During monsoon season the study area have been received maximum rainfall than the other seasons and subsequently water level will be elevated due to north east monsoon rainfall and they greatly pretentious by prey species distribution for the predators. Besides, during the monsoon season most of the lakes blooming variety of plant species which are the most important base or niche for the aerial foragers. Aerial foragers are a 'sit-and-wait' predator, so they spent majority of day time to searching the prey. Earlier, many investigators have been reported that scanning as a major diurnal activity in aerial foraging birds (Mahabal, 1991; Sivakumaran and Thiyagesan, 2003).

The aerial foragers such as White breasted Kingfisher (*Haleyon smyrnensis*), Small Blue Kingfisher (*Alcedo atthis*), Lesser Pied Kingfisher (*Ceryle rudis*), Indian Palm Swift (*Collocalia unicolor*) and Whiskered Tern (*Chidonias hybridus*) highly depend on wetland habitats since they are foraging on water bodies. Among the aerial foragers the White-breasted Kingfisher had a bimodal feeding patterns one during morning (06:00-09:00 hrs) and evening (15:00-18:00 hrs). Other birds are known to exhibit feeding maximum early in the morning and late in the evening (Ramachandran, 1998; Evers, 1994; Natarajan, 1991; Sivakumaran and Thiyagesan, 2003; Rodway, 1998). The present study recorded maximum number of bird species during morning hours and late evening hours.

The results showed that maximum density recorded during the monsoon and summer seasons than the other seasons studied during the period Year I and Year II. The main reason behind the results might have been due to the maximum water level in the lake during the monsoon season (PWD unpublished data). However, this lake is one of the important catchment areas for the agricultural lands for the in and around Tiruchirappalli District. During post monsoon season the lake have low level of water and the bird density, richness and diversity were lower range. On the other hand during summer season the lake was support maximum number of aerial foragers density, diversity and species richness, it is a significant type of results it might be due to neighboring areas could be dried and birds were used the lake as a viable feeding ground even during summer because during summer this lake have minimum water level (PWD unpublished data). The presence of birds indicates that the level of water is most significant for the survival of aerial foragers. Water is a major driven factor that affected aquatic vegetation composition and food resources that influenced bird density, diversity and distribution (Colwell and Taft 2000; Quinn 2002; Wilcox *et al.*, 2002).

The study indicated that this freshwater lake is extensively utilized by water birds to acquire their daily requirements such as food, shelter and other uses. The aerial foragers preferred emergent vegetation during the juvenile stages to complete their life cycle upto adults (Meyer *et al.*, 2010). The diversity of wetland habitats such as fresh waters, emergent vegetation patches, marsh edges and adjacent vegetated areas had attracted different water bird species especially aerial foraging birds. The inland wetland habitats offers viable foraging sites for aerial foragers such as White breasted Kingfisher, Small blue kingfisher, Pied kingfisher, Indian palm swift and Whiskered Terns.

## CONCLUSION

The occurrence of various species aerial foragers could be due to water level and vegetation (including trees, emergent and submerged vegetation, reeds and sedges, fens and herbs) that provide multiple microhabitats for the aerial foragers. The present study implied that the Periyakulam lake support significant number of water birds (Mohanraj and Pandiyan 2014)

especially aerial foragers during monsoon and summer seasons.

## ACKNOWLEDGEMENTS

We thank the Head of Department of Zoology and Wildlife Biology of AVC College (Autonomous) Mannampandal for providing necessary facilities and support during the study. We would like to express our gratitude to Tamil Nadu Forest Department (Triuchirappalli) for permitting to logistic support to carry out this work.

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