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Studies on the Wetland Biodiversity and Conservation with reference to Habitat, Prey Abundance and Foraging by Two species of Herons

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Abstract

Kerala is the one of the green states of India and is well known for its wetlands. The present study is based on abundance of food and foraging by two species of herons (median egret and large egret) in different type of wetland habitats of Malappuram, Palakkad and Kozhikode districts, Kerala, India. Both the large egret and median egret are piscivorous. During non-breeding season the most preferred habitat of large egret (*Egretta alba*-37.44%) and median egret (*Egretta intermedia*-62.56%) are the coastal area and riverine habitats. During breeding season they prefer human habitation with close proximity of riverine habitats and lakes where they build their nests. Utilisation of different habitats, various foraging strategies employed by the species, threats to the wetland in the study area and need for their conservation are also highlighted.

Keywords: Abundance, Foraging, Egretta alba, Egretta intermedia, conservation, Wetland, Habitat use.

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1. Introduction

Herons are a large species of birds that inhabit wetland areas close to lake, ponds and rivers and have wading mode of adaptation. The members of this family are mostly associated with wetlands and water and feed on varieties of live aquatic prey. Wetlands are themselves diverse and changeable[1]. In Kerala state, India over the last 50 years , the drastic change in the environment including rapid urbanization and the alarming rate of population growth, industrialization, construction of roads and highways and many other factors have resulted in the fast depletion of the above natural habitat threatening our wetland rich biodiversity. The species focused on the present study, although considered to be a predominant piscivorous bird species once abundant is now relatively seen less. In this context, the present study is highly significant.

2. Methods

This observation on habitat use, habitat characteristics and abundance of two species of herons namely Median egret (*Egretta intermedia*) and large egret (*Egretta alba*) in four wetland habitats of Malappuram, Kozhikode and Palakkad districts, Kerala, India, was done as part of a "study on ecology and biology of wetland birds" during 2014-2016. Three methods were used for collection of data on abundance, habitat characteristics and food and feeding strategies of these wading birds which include 1) Direct visual observation walking along a fixed route every week a count of birds within 100x100m area was done using 10x45 binocular. Five counts were made during 0600 hrs to 1800 hrs per day. Habitat characteristics were quantified by monthly survey; 0.5x0.5m, 1x1m, and 10x10m quadrats were laid to examine herbs shrubs and trees respectively [2, 3]. Observations on foraging behaviour were carried out from 2014 to 2016 in four habitats for a total period of 12 hrs once in a week which was further divided it into three shifts of four hours each. The first shift began at 0600hrs and ended at 1000 hrs. The second shift began from 1000hrs to 1400hrs. The third shift

started from 1400 hrs to 1800hrs, using 10x42 binocular. The total time spent for each foraging techniques was calculated.

Aquatic organisms were assessed by sweeping a "D" frame nylon cloth net with 0.5 m diameter [4]. Data on aquatic organisms were identified following [5, 6] of four habitats, the abundance and percentage composition of birds in four jheels were pooled together (Tengalakkadavu and Azhingilam, Calicut) as one unit and the other habitats were studied as separate unit. Habitat loss also was estimated by travelling along the sides of the study areas splitting them into stretches of one kilometre distance.

2) Analysis of food content fall out during feeding-the characteristic behaviour of nestling, the characteristic of regurgitating when alarmed is also taken into consideration to draw information about the prey species in various studies [7] Samples were collected every week of each month during breeding season mostly from July to October of 2014, 2015 and 2016. The samples were stored in 40% formaldehyde solution for examination.

3. Result

The four types of habitats selected for the current study are given in table 1. All the habitats were vegetated mostly with plants that were aquatic and highly tolerant to flooding.

Habitat	Area	Major Flora	Major Fauna
Coastal area	Puthiyappa Beach, Kozhikkode $11^0194.9584N$ $75^044'49.488"E$	No flora except for certain trees.	*Trichiurus lepturus*(17%), *Stolephorus commersonii(18%), Sardinella longiceps(22%) Rastrelliger kanagurta(14%), Penaeus sp*(15%), *Perna viridis(7%), Arius sp(8%)*
Azhinji	Azhinjilam, Malappuram. $11^011'55.8N$ $75^052'04.5E$	*Salvinnia molesta* (36%), *Oryza sp* (22%), *Cynodon dactylon*(16%), *Nymphoides*	**Aquatic-***Macropodus cupanus*(29%), *Puntius vittatus*(24%), *Danio aequipinnatus*(14%), *Palaemon sp*(25%). *Dragon fly naiad* (8%)

lam Jheel		*hydrophylla*(15%), *Hydrillaverticillata* (11%)	**Terrestrial-** *Acrididae*(38%), *Tettigonidae*(21%) *Gryllidae Lestidae* (22%) *Cicadellidae*(15%, *Apidae* (4%)
Mavoor Jheel	Mavoor Jheel, Kozhikkode. $11^0$15'37.5372" N $75^0$56'20.7204" E	*Salvinnia molesta* (20%), *Hydrilla verticillata*(16%) *oryza sp*(14%) *Digitaria bicornis*(18%) *Nymphaea stellate*(15%), *Nymphoides indica*(12%)	**Aquatic-***Macropodus cupanus*(28%) *Belostomatidae, Palaemon sp.*(18%) *Puntius vittatus* (22%) *Planorbidae*(8%) *Naiads of Damselflies* (12%) *Niads of Dragon flies*(12%)
Riverine	Bharathappuzha Pattambi. $10^0$47'56.0976 N $76^0$11'0.078E	Fimbristylis mileacea (38%)Paspalum conjugatum (29%)Eragrostis unioloides (18%)Cynodon dactylon(15%)	**Aquatic-***Puntius amphibious*(29%) *Danio aequipinnatus* (12%) *Palaemon sp.*(13%) *Puntius parrah* (18%) *Etroplus maculatus* (16%) *Mystus montanus* (9%) *Corica soborna*(3%)
	Kadalundy Estuary, Kozhikkode. $11^0$7'37.1172" $75^0$49'52.92E	*Avicennia marina* (48%) *Entemorpha sp.* (28%) *Acanthus ilicifolius* (24%)	**Aquatic-***Penaeus sp* (49%) *Perna viridis (26%)* *Danio aequipinnatus* (14%) *Puntius amphibious*(7%) *Puntius parra*(4%)
Paddy Field	Paddy field, Muthanoor, Malappuram District $11^0$1024.978N $76^0$3'0.4608E	*Oryza sativa*(65%) *Cynodon dactylon*(4%) *Echinochloa colonum*(8%) *Ischaemum sp* (9%) *Eriocaulon quinquangulare*(9 %) *Hydrilla verticillata* (3%)*Salvinia mollusta* (2%)	**Aquatic-**Tadpoles (31%) *Pila globosa* (18%) *Puntius vittatus* (21%)*Macropus cupanus*(8%) naiad of Dragonfly (12%) *Puntius amphibious*(10%) **Terrestrial-***Formicidae* (29%)*Acrididae(24%)* *Pyraustidae(18%)* *Cicadellidae(11%)* *Tetrigidae*(18%)

	Paddy field, Vadakkumuri, Arecode, Malappuram District 11^{0}15'3.9132" N 76^{0}2'57.1704E	Oryza sativa (74%) *Cynodon dactylon*(6%) *Ischaemum sp* (7%) *Eriocaulon quinquangulare*(4 %) *Echinochloa colonum*(9%)	**Aquatic-**Tadpoles (38%) *Pila globosa* (14%)*Puntius vittatus* (18%)*Macropus cupanus*(8%) naiad of Dragonfly (18%)*Puntius amphibious*(4%) **Terrestrial-***Formicidae* (22%)*Acrididae(29%) Pyraustidae(14%) Cicadellidae(9%) Tetrigidae*(15%) Gryllidae(11%)

Table 1 The four types of habitats selected for the current study

4. Abundance

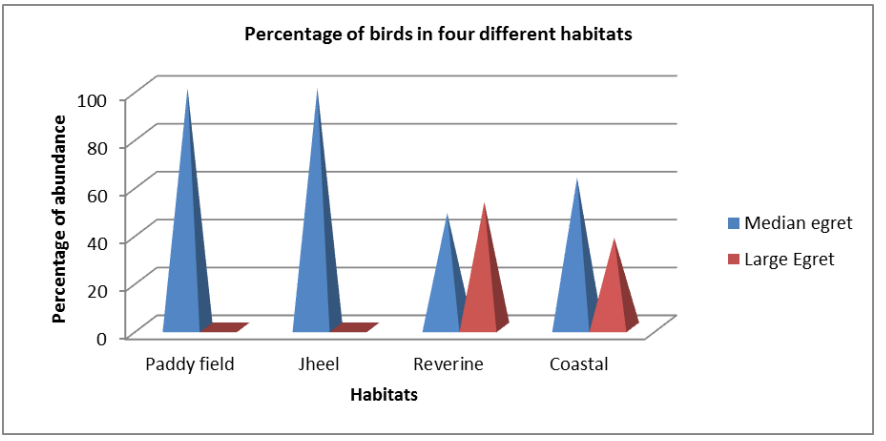

Fig 1Percentage of birds in four different habitats

Comparative abundance of both the egrets in different habitats is given in the figure-1. Median egret prefers almost all habitats although the most preferred habitats of median egret is riverine (47.65%) and coastal areas (62.56%). Large egret is totally absent in paddy fields and Jheel whereas their abundance is maximum in riverine habitat (52.35%) and Coastal areas (37.44%).

5. Foraging behaviour

Herons use different mode of feeding strategies in different habitats. [8]. Important behavioural techniques used by egret are in table 3. The total time devoted to all species was calculated (Table 2). Strategies used by the median and large egret vary depending upon their habitat. Some methods are common in both median and large egrets (Table-3.2). Median and large egret use less number of feeding techniques. Median as used to walk slowly, stand and wait, walk quickly, running, leapfrog feeding, peering over and diving whereas large egret use or walk slowly, stand and wait, running, peering over and diving in Puthiyappa beach, Calicut. It is noted that both egrets prefer a stand and wait strategy (Table-2). Both the median and large egret commonly use four types of feeding strategies. The most preferred techniques in the above herons are Stand and Wait whereas the least preferred technique is Running.

Feeding Techniques	Species	
	Median egret	Large egret
Stand and Wait (SW)	48.4	59.2
Walk Quickly (WQ)	2.8	7.2
Walk Slowly (WS)	34.7	19.7
Running (RU)	2.5	1.2
Diving (DI)	8.2	8.8
Leapfrog Feeding (LFF)	0	1.5
Peering Over (PO)	3.4	2.4

Table 2 Time taken for different foraging techniques by Median egret and Large egret in Puthiyappa beach (coastal area) 2014-2016

6. Prey abundance

Prey items were collected from the breeding ground of Pattambi includes *Corica Soborna* (5.19%), *Catla catla*(1.29%), *Puntius amphibious*(11.68%), *Puntius chola* (3.89%), *Puntius melanostigma* (5.19%), *Puntius parrah* (16.88%), *Puntius vittatus* (5.19%), *Salmostoma boopis*(1.29%), *Esomus danricus* (5.19%), *Lepidocephalus guntea* (3.89%), *Mystus montanus* (7.79%), *Etroplus maculates* (20.77%), *Etroplus suratensis* (2.59%) *and Amblypharyngodon microlepis* (6.49%), *Anabas testudineus* (2%).

1	Stand and Wait (SW) - A heron stands still in water or on land waiting for its prey to approach.
2	Walk Slowly (WS) - A heron moves slowly, walking towards the prey.
3	Running (RU) - Moves quickly after having a specific food item.
4	Diving (DI) - Dives head first into water from a perch.
5	Leapfrog Feeding (LFF)- Flies from the rear of feeding flock to the front
6	Peering Over (PO) - Extends neck and tip of its head so that its bill points straight down towards the ground.
7	Walk Quickly (WQ)- A heron walks relatively fast

Table 3 Foraging strategies used by herons

Species	Habitat	Methods
Median egret	Paddy field	SW, WS, WQ, RU, PO
Median egret	Jheel	SW, WS, WQ, RU, PO
Median egret	Riverine	SW, WS, PO, RU
Median egret	Coastal areas	SW, WS, WQ, RU, DI, LFF, PO
Large egret	Paddy field	Birds are totally absent
Large egret	Jheel	Birds are totally absent
Large egret	Riverine	SW, WS, RU, PO
Large egret	Coastal areas	SW, WS, WQ, RU, DI, PO

Table 3.1 Habitat wise foraging techniques in Median and Large egrets

Species	Methods
Median egret	SW, WS, RU, PO
Large egret	SW, WS, RU, PO

Table3.2 commonly used foraging techniques in egret

7. Discussion

Food is the decisive factor for the abundance of these birds in the habitat concerned [3]. The present study also confirms the same factor. During breading season the fishes that are dropped out from the nest were identified and confirmed as the food item of these

birds. Wetland birds adopted different types of feeding strategies [3].The median egret used "Stand and wait, walk slowly, peering over and Running. Of these four techniques, the most favoured technique is "Stand and wait". Large egret also used "stand and wait, walk slowly, peering over and running. Stand and wait strategy is the most preferred technique in large egret also. The least favoured technique in median egret is "walk quickly" where as in large egret it is "running".

Wetlands should be conserved since they acts as a feeding site for such birds. Abundance of these birds in wetlands indicates the prevalence of ecologically balanced wetland biodiversity since these birds are good ecological indicators and food spectrum of these species contain a variety of prey items from diverse habitats. These herons and their nestlings will no longer be here unless such habitats are conserved. Unfortunately these wetlands are being depleted due to anthropogenic pressures like habitat fragmentations and development of industrial units. These wetland habitats would be lost permanently depleting the population of herons unless appropriate steps are taken for conservation.

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