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RESEARCH ARTICLE

STUDIES ON THE ECOLOGY OF EGRETS AND HERONS AT PICHAVARAM MANGROVES, TAMIL NADU

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ABSTRACT

The present study is aimed to investigate the population and richness of egrets and herons in five areas of Pichavaram mangroves during the study period. Totally 10 species are identified in which 4 species are egrets and 6 species are herons. The diversity, breeding and behavior of egrets and herons are noticed in the present study. The herons species are moiré than the egrets in Pichavaram mangroves.

INTRODUCTION

Mangrove forests are among the world's most productive ecosystems. These are often called as 'tidal forests', 'coastal woodlands' or 'oceanic rainforest's. Mangroves are woody plants that grow in tropical and subtropical latitudes along the land-sea interface, bays, estuaries, lagoons, backwaters, and in the rivers, reaching upstream up to the point where the water still remains saline (Qasim, l998). These plants and their associated organisms (microbes, fungi, other plants and animals), constitute the 'mangrove forest community' or 'mangal'. The mangal and its associated abiotic factors constitute the mangrove ecosystem, as has been illustrated by Kathiresan and Bingham, 2001 (Fig. 1). Physical and biological components of mangrove ecosystems (From Kathiresan and Bingham, 2001). Mangroves are one of the most productive ecosystems of the world, providing shelter and feeding sites for many animal species (Kathiresan, 2000). Wetlands form a lifeline for resident and migratory waterfowl and waders. They are critical for biodiversity conservation and for the life cycles of many birds (Sharma *et al.,* 1993). Mangrove habitat play host to a moderate number of bird species around the globe. There is little knowledge about Indian mangrove avifauna, and most of the information about Neotropical mangrove birds comes from North America (Odum, 1982). The Pichavaram mangroves are considered among the healthiest mangrove occurrence in the world. Pichavaram consists of a number of islands interspersing a vast expanse of water covered with green trees. They are the only large area of mangroves, covering an area of 11,000 ha, with 51 islets separated by a complex network of creeks and channels (Fig. 1). The Pichavaram mangrove biotope, consisting of rare species like *Avicennia* and *Rhizophora*; presents a special attraction, with its peculiar topography and environmental condition. It supports the existence of many rare varieties of economically important shell and finfishes. Mangrove trees are the most prominent salt – tolerant forest trees of the intertidal areas. (Kathiresan, 2002). In a broad sense, the mangrove wetlands provide asylum to number of species, among them crustaceans, molluscs, fishes and birds are the important group. Birds and bats are known to pollinate mangrove representatives of the genus *Sonneratia* (Tomilson, 1986; Coupland *et al.,* 2006). While the huming bird Amazilia tzacatl De la llave is the sole polinator of Pelliciera rhizopharae Trians and Planch in Central America (prahl,1987). Onuf *et al* (1977) demonstrated that birds nesting in mangrove stands are significant nitrogen for Rhizophora trees. Macrophytes, such as mangroves, salt marshes and sea grasses constitute an important component of coastal domain (Kathiresan and Bingham, 200; Kathiresan, 2007). The Pichavaram mangroves are considered among the healthiest mangrove occurrence in the world. Pichavaram consists of a number of islands interspersing a vast expanse of water covered with green trees. They are the only large area of mangroves, covering an area of 11,000 ha, with 51 islets separated by a complex network of creeks and channels. The Pichavaram mangrove biotope, consisting of rare species like Avicenna and Rhizophora; presents a special attraction, with its peculiar topography and environmental condition. It supports the existence of many rare varieties of economically important shell and finfishes. Mangrove trees are the most prominent salt – tolerant forest trees of the intertidal areas.

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(Kathiresan, 2002). In a broad sense, the mangrove wetlands provide asylum to number of species, among them crustaceans, molluscs, fishes and birds are the important group. Birds are the remarkabably benefited from this highly productive ecosystem. They consumed fruits, seeds, and arthropods and the aerial insectivores species were the most common in these environment. Also a relative high percentage of generalist aquatic species also common. The Pichavaram mangroves attract an appreciable bird population of residents, local migrants and true migrants. Amongst others, one can view birds like Water snips, Cormorants, Egrets, Storks, Herons, Spoonbills and Pelicans. At the mangroves, so far, 177 species of birds belonging to 15 orders and 41 families have been recorded. The season for birds is from September to April every year. Peak population of birds could be seen from November to January. This is due to high productive nature (in terms of prey organisms) of the ecosystem and coincidence of the time of arrival of true migrants from foreign countries and local migrants from their breeding grounds across India. The availability of different habitat types such as channels, creeks, gullies, mud flats and sand flats and adjacent sea shore offers ideal habitat for difference species of birds.

Egrets are large sized long necked birds which wade in to the shallow water in search of prey. An egret is any of several herons, most of which are white or buff, and several of which develop fine plumes (usually milky white) during the breeding season. Many egrets are members of the genera *Egretta* or *Ardea* which contain other species named as herons rather than egrets. The distinction between a heron and an egret is rather vague, and depends more on appearance than biology. The word "egret" comes from the French word "aigrette" that means both "silver heron" and "brush," referring to the long filamentous feathers that seem to cascade down an egret's back during the breeding season. The herons are long-legged freshwater and coastal birds in the Ardeidae family. There are 64 recognized species in this family Some are called egrets or bitterns instead of herons. Within the family, all members of the genera *Botaurus* and *Ixobrychus* are referred to as bitterns, monophyletic group within the Ardeidae. However, egrets are not a biologically distinct group from the herons, and tend to be named differently because they are mainly white and/or have decorative plumes. Although egrets have the same build as the larger herons, they tend to be smaller. The classification of the individual heron/egret species is difficult , and there is still no clear consensus about the correct placement of many species into either of the two major genera Ardea and Egretta . Similarly, the relationship of the genera in the family is not completely resolved. Although herons resemble birds in some other families, such as the storks, ibises and spoonbills, they differ from these in flying with their necks retracted, not outstretched. Some members of this group nest colonially in trees; others, notably the bitterns, use reed beds. The herons are medium to large sized birds with long legs and necks. They exhibit very little sexual dimorphism in size. The smallest species is usually considered the little bittern The necks are able to kink in an s-shape, due to the modified shape of the sixth vertebrae. The neck is able to retract and extend, and is retracted during flight, unlike most other long-necked birds. The neck is longer in the day herons than the night herons and bitterns. The legs are long and strong and in almost every species are unfeathered from the lower part of the tibia in flight the legs and feet are held backward. The feet of herons have long thin toes, with three forward pointing ones and one going backward. The bill is generally long and harpoon like. It can vary from extremely fine, or to thick as in the Grey Heron The bill, as well as other bare parts of the body, is usually yellow, black or brown coloured, although this colour can vary during the breeding season. The feathers of the herons are soft. The plumage of the herons is usually blue, black, brown, grey or white, and can often be strikingly complex. Amongst the day herons there is little sexual dimorphism in plumage (except in the pond-herons); differences between the sexes are the rule for the night herons and smaller bitterns. Many species also have different colour morphs.

MATERIALS AND METHODS

Study area

The Pichavaram mangroves (11^0 25'N; 74^0 47'E) are situated about 190 km south of Madras at the mouth of the Vellar, Coleroon and Uppanar rivers on the south east coast, known as the Coramandal coast (Bay of Bengal), of India (Figure 1). The two area were selected for the present study Agricultural land (Station-1) and Mud flats (Station-2).They are the only large area of mangroves, covering an area of 11,000 ha, with 51 islets separated by'a complex network of creeks and channels (Figure 1). As Figure 1 shows, interspersed in this forest area, there are many types of wetland habitats such as swamps, marshy areas, estuaries, intertidal mudflats and open waters (Wolstencroft *et al.,* 1989), offering a wide variety of roosting and nesting places and foraging grounds for several migratory and resident bird species (Nagarajan and Thiyagesan 1996). It is situated at mouth of the Rivers Vellar, coleroon and Uppanar in Cuddalore district of Tamil Nadu, India. Further it is located in the Coramandal coast of the Bay of Bengal. Pichavaram, is the second largest mangrove of India, which covering an area of 1100 ha.and consisting 51 Islets in it. These Islets are ranging from 10 m^2 to 2 km^2, which are separated by intricate waterways, creeks and channels – all are connected with the three river's estuary.

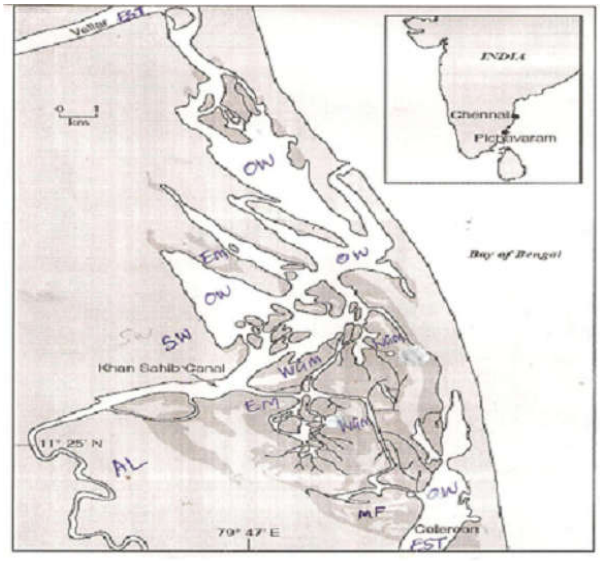

Fig. 1. Map of the study area

Table 1. The diversity of egrets and herons in the Pichavaram mangroves

S.No	Common Name	Species name	Order	Family	Ecological group
1	Black Crowned Night heron	Nycticorax nycticorax	Ciconiiformes	Ardeidae	Large Wader
2	Grey Heron	Ardea cinerea	Ciconiiformes	Ardeidae	Large Wader
3	Indian Pond heron	Ardeola grayii	Ciconiiformes	Ardeidae	Large Wader
4	Little Green Heron	Butorides striatus	Ciconiiformes	Ardeidae	Large Wader
5	Cattle Egret	Bubulcus ibis	Ciconiiformes	Ardeidae	Large Wader
6	Large Egret	Casmerodius albus	Ciconiiformes	Ardeidae	Large Wader
7	Little Egret	Egretta garzatta	Ciconiiformes	Ardeidae	Large Wader
8	Medium Egret	Mesophoyx intermeidia	Ciconiiformes	Ardeidae	Large Wader
9	Chesnut Bittern	Lxobrychus cinnamomeus	Ciconiiformes	Ardeidae	Large Wader
10	Great Bittern	Botaurus stellaris	Ciconiiformes	Ardeidae	Large Wader

Table 2. Bird Density perha, during different season – Cattle Egret

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Cattle Egret	2006	Post Mon	320	390	330	4940	100
		Summer	50	30	25	60	0
		Pre Mon	0	0	0	260	0
		Mon	4880	530	340	15300	235
	2007	Post Mon	180	115	90	205	410
		Summer	40	0	0	50	0
		Pre Mon	0	0	0	0	0
		Mon	150	85	55	230	180
	2008	Post Mon	200	340	310	760	2540
		Summer	0	20	0	60	400
		Pre Mon	0	0	0	0	0
		Mon	190	280	330	350	1040
	2009	Post Mon	550	1000	380	13500	3310
		Summer	0	40	0	780	110
		Pre Mon	0	0	0	0	0
		Mon	200	450	200	1680	490

Table 3. Bird Density perha, during different season – Large Egret

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Large Egret	2006	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	170	0	0
	2007	Post Mon	0	0	60	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	145	0	0
	2008	Post Mon	0	0	145	205	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	580	1025	0
	2009	Post Mon	0	0	35	220	0
		Summer	0	0	0	110	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	125	785	0

Study Period

Data collection were made from January 2006 to December 2009 – Four Years encompassing four seasons of a year, as described earlier in the Study area.

Data collection

Field surveys were made forthrightly, days with unfavorable climatic conditions such as heavy rains, cyclones, were avoided for the data collection. The data was collected in the four area; 1-Open Water (OW),2-Mud Flats (MF);3-well Grown Mangroves (WGM),4-Emerging Mangroves (EM),5-Agricultural Lands (AL).

Bird surveys

The Total count of birds were made throughout the study period on the micro habitat of the study area to estimate population density, species richness, Species diversity of the

Table 4. bird Density perha. During different season – Little Egret

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Little Egret	2006	Post Mon	0	0	80	155	460
		Summer	0	0	0	0	40
		Pre Mon	0	0	20	0	0
		Mon	0	0	150	145	230
	2007	Post Mon	260	0	230	340	1360
		Summer	30	0	0	40	150
		Pre Mon	0	0	80	370	360
		Mon	100	0	280	1070	930
	2008	Post Mon	260	60	100	530	340
		Summer	70	0	0	130	60
		Pre Mon	0	0	0	0	40
		Mon	130	60	40	450	165
	2009	Post Mon	700	90	150	1600	490
		Summer	180	0	60	600	30
		Pre Mon	0	0	0	0	0
		Mon	620	165	200	680	330

Table 5. Bird Density perha, during different season – Median Egret

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Median Egret	2006	Post Mon	0	0	110	600	250
		Summer	0	0	0	70	20
		Pre Mon	0	0	70	210	70
		Mon	0	0	410	830	410
	2007	Post Mon	0	190	430	840	140
		Summer	0	20	100	180	90
		Pre Mon	0	70	70	70	235
		Mon	0	960	1230	800	600
	2008	Post Mon	460	70	40	210	710
		Summer	0	0	0	0	60
		Pre Mon	30	0	0	160	110
		Mon	410	95	340	900	260
	2009	Post Mon	550	70	90	460	180
		Summer	120	0	0	20	70
		Pre Mon	195	0	0	0	190
		Mon	960	130	150	370	720

Table 6. Bird Density perha, during different season – Black crowned Night Heron

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Black crowned Night Heron	2006	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	0	0	0
	2007	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	0	0	0
	2008	Post Mon	0	0	290	410	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	1560	5200	0
	2009	Post Mon	0	0	1080	1810	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	1970	3370	0

Egrets The habitats were scanned systematically with binocular (7' x 50") and Minolta spitting Telescope. Total Counts of Each Egret species in each micro habitat were made as per Spinder *et al.* (1981). Surveys were conducted in the morning between 6.00 Hrs and 9.00 Hrs and again in the evening 15, 00 Hrs to 17.30 hrs. For Identifying the Water birds and the four egrets of the study in the wetland, the Field guide of Ali (2002) and Grimmetti *et al.* (1999) were used. All

Table 7. Bird Density perha, during different season – Grey Heron

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Grey Heron	2006	Post Mon	0	0	505	300	110
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	206	180	200
	2007	Post Mon	0	0	200	160	580
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	280	70	0
	2008	Post Mon	0	0	100	280	500
		Summer	0	0	120	120	0
		Pre Mon	0	0	0	40	0
		Mon	0	0	160	430	40
	2009	Post Mon	330	310	256	450	310
		Summer	0	30	220	420	210
		Pre Mon	0	30	0	0	0
		Mon	0	210	140	80	100

Table 8. bird Density perha. During different season – Pond Heron

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Pond Heron	2006	Post Mon	410	160	200	780	190
		Summer	60	80	45	80	0
		Pre Mon	0	0	0	0	20
		Mon	280	85	310	890	250
	2007	Post Mon	510	210	200	470	100
		Summer	80	0	0	40	0
		Pre Mon	0	40	0	0	0
		Mon	590	550	370	1180	380
	2008	Post Mon	510	135	410	580	190
		Summer	60	0	0	20	0
		Pre Mon	0	0	0	0	0
		Mon	480	280	440	570	185
	2009	Post Mon	670	150	210	350	125
		Summer	60	0	0	10	0
		Pre Mon	0	0	0	30	0
		Mon	460	195	510	950	360

Table 9, bird Density perha. During different season – Little green heron

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Little green heron	2006	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	`0	0	0
		Mon	0	0	0	0	0
	2007	Post Mon	0	0	3410	650	0
		Summer	0	0	210	80	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	470	200	0
	2008	Post Mon	0	0	9900	480	0
		Summer	0	0	600	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	1230	300	0
	2009	Post Mon	0	0	6500	510	0
		Summer	0	0	80	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	850	140	0

of the four egrets observed, i.e., forgoing, nesting, flying and in all other activities have been recorded. Birds were counted during both high tide and low tide. The Maximum number counted is taken in to the account. This methods was adopted for the following reason' Lack of conspicuous high tide roosts. During High Tide, some species flew away from the islands and come back only at Low Tide for feeding. A few species can be easily counted at High Tide congregation and their numbers is more at High Tide. The Bird occupied areas varied from time to time depending upon water conditions. During

flooding, the birds were confined to the periphery; but when the water receded they were seen along the limits of water forms. Care was taken to avoid duplication, by omitting the folks coming from the behind the enumeration. The total number of birds counted in the total area of 11.25 sq. km was taken for estimating population per Sq. Km/ Hectare. The major factor that has adhered during the study is the survey Time. The fluctuations in numbers may occur during different hours of the day, signifying local foraging or nest material collection flights. Boats are used to for the surveys in remote areas, open waters of fully developed mangrove areas with channels, waterways and on agricultural lands, emerging mangroves surveys are carried out with driving a motor car slowly in order to avoid the disturbances to birds. A Country boat has been used for the survey. With the help of this country boat, the remote areas of wetland have been accessed easily with fewer disturbances to birds.

Identification Technique

The bird species were identified based on the following characteristic features. Size and Shape of body (It is important to judge the relative size of the new bird species with the size of a common and familiar bird species). The size of the wetland birds varies from the smallest bird the Little Stint (15cm) to the tallest bird the Sarus Crane (156cm). Most species have a characteristic shape. The notable feature are Bill shape and relative size (long, medium, short, straight, down curved, curved upward, tapering, pointing, a flat spoon-shaped, thin and hooked); Tail shape (square, rounded, forked wedge-shaped, pointed, notched, long and pointed); Leg length (in relation to the body height and tail in flight); Wing shape (especially in flight the wings may have a characteristic shape); Plumage patterns (bars, bands, spots, streaks or patches on the various body parts of bird such as head, breast, belly, tail, rump, wings, face and head); Head shape (presence of distinctive crests or plumes on the head of birds); Feeding behavior (grazing, dabbling, diving, walking, probing, deep probing, filtering); Taking off (some bird species take off directly and some other species run on the water for some distance and take off latter); Flying (while flying birds hold their wings and legs in a different position. Some birds like Cranes keep the neck straight and extend the legs backward. Birds like egrets and herons position their neck like "S" shape in flight. In the case of members of Rallidae they dangle their legs when flying); Swimming (Birds like Moorhen while swimming sits high in the water, whereas the Cormorant swims with the body submerged in the water); Colour (All the species are brilliantly coloured, which helps in identification. White throated kingfisher has white colour on the throat region. Common redshank is named so as the colour of the shank is red); Habitat preference (some species of ducks prefer deep water and some swallow; whereas some species chooses open water areas. Likewise, many species of waders and shorebirds prefer intertidal sand and mudflats, sand beaches, exposed coral reefs, freshwater marshes, grasslands, and arid lands and offshore coastal waters); and Calls (Many wetland birds have distinctive calls, which can easily be heard in their habitats). Since, the present study is aimed to highlight the Ecology of egrets, the concentration has taken on Egrets only and the Data on Other species have recorded only for reference values

Field Key for Identification

Family: Ardeidae (Herons, Egrets)

Long – legged, lanky wading birds, with long slender flexible necks, which are retracted into a flat's' during flight. Bill long, sharp -pointed and dagger – like. Tarsi very long. Toes long and slender, the middle and outer toes united by a small web at their base, claw of middle toe pectinate. Most species have curious power-down patches on each side of rump and breast providing a sort of dry shampoo for degreasing soiled feathers. Plumage soft and loose-featured, usually white, grey, purple (or) brown. In many species filamentous ornamental plumes acquired during the breeding season.

Species Diversity analysis

The species diversity for Egrets was calculated by Shanon – wiener Index to illustrate the variation of Egret species occupying in different micro habitats during different months of the study period and year during the study period. Statistical analysis Statistical analysis was calculated by using ANOVA

RESULTS

In the present study the four species of egrets and six species of herons are identified in five areas of Pichavaram mangroves. Large Egret, *Casmerodius albus,* Median Egret, *Mesophoyx intermeidia,* Cattle Egret, *Bubulcus ibis* , Little Egret, *Egretta garzetta* , Black Crowned Night Heron, *Nycticorax nycticorax,* Grey Heron, *Ardea cinerea,* Indian Pond Heron, *Ardeola grayii,* Little Green Heron, *Butorides striatus,* Chestnut Bittern, *Lyxobrychis cinnamomeus,* Great Bittern, *Botaurus stellaris* during the study period (Table 1-11). The present study involved with regard to egrets and herons (10 Species), which forms the predominant group of birds in this mangrove ecosystem. The bird's species studies are generally observed during monsoon and post monsoon and they have not recorded during summer (Table 1-11). Systematic and taxonomy of Egrets and Herons. The Great Egret is a large bird with all-white plumage that can reach one meter in height, weigh up to 950 grams (2.1 lb) and a wingspan of 165 to 215 cm (65 to 85 in). It is thus only slightly smaller than the Grey heron (*A. cinerea*). Apart from size, the Great Egret can be distinguished from other white egrets by its yellow bill and black legs and feet, though the bill may become darker and the lower legs lighter in the breeding season. In breeding plumage, delicate ornamental feathers are borne on the back. Males and females are identical in appearance; juveniles look like non-breeding adults. It is a common species; usually easily seen. It has a slow flight, with its neck retracted. This is characteristic of herons and bitterns, and distinguishes them from storks, cranes, ibises and spoonbills which extend their necks in flight. The Great Egret is not normally a vocal bird; at breeding colonies, however, it often gives a loud croaking *cuk cuk cuk.* The Median Egret or Intermediate Egret or Yellow-billed Egret (*Mesophoyx intermedia*) is a medium-sized heron. It is a resident breeder from east Africa across tropical southern Asia to Australia. It often nests in colonies with other herons, usually on platforms of sticks in trees or shrubs. Two to five eggs are laid, the clutch size varying with region. This species, as its scientific name implies, is intermediate in size between the Great Egret

Table 10. Bird Density perha, during different season – Chesnut Bittern

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Chesnut Bittern	2006	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	0	0	0
	2007	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	0	0	0
	2008	Post Mon	0	260	0	0	0
		Summer	0	20	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	190	0	0	0
	2009	Post Mon	0	360	0	120	0
		Summer	0	20	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	450	0	70	0

Table 11. Bird Density perha, during different season – Great bittern

Bird Species	Year	Season	Habitat				
			AL	OW	EM	WGM	MF
Great bittern	2006	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	0	0	0
	2007	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	0	0	0
	2008	Post Mon	0	0	0	0	0
		Summer	0	0	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	0	0	0	0
	2009	Post Mon	0	480	0	0	0
		Summer	0	80	0	0	0
		Pre Mon	0	0	0	0	0
		Mon	0	150	0	0	0

and smaller white egrets like the Little egret and Cattle Egret, though nearer to Little than Great. It is about 90 cm tall with all-white plumage, generally dark legs and a thick yellow bill. Breeding birds may have a reddish or black bill, greenish yellow gape skin, loose filamentous plumes on their breast and back, and dull yellow or pink on their upper legs (regional variations). The sexes are similar. The Intermediate Egret stalks its prey methodically in shallow coastal or fresh water, including flooded fields. It eats fish, frogs, crustaceans and insects. The non-breeding colours are similar, but the Intermediate is smaller, with neck length a little less than body length, a slightly domed head, and a shorter, thicker bill. The Great Egret has a noticeable kink near the middle of its neck, and the top of its longer bill nearly aligns with the flat top of its head. Close up, the bare skin of the Great Egret's gape line extends in a dagger shape behind the eye, while the Intermediate's is less pointed and ends below the eye. The Intermediate tends to stalk upright with neck extended forward. The Great is more patient, often adopting a sideways-leaning "one-eyed" stance. The Cattle Egret (*Bubulcus ibis*) is a cosmopolitan species of heron (Family: Ardeidae) found in the tropics, subtropics and warm temperate zones. It is the only member of the monotypic genus *Bubulcus*, although some authorities regard its two subspecies as full species, the Western Cattle Egret and the Eastern Cattle Egret. Despite the similarities in plumage to the egrets of the genus Egretta, it is more closely related to the herons of Ardea. It has undergone a rapid expansion in its distribution and successfully colonized much of the rest of the world. It is a stocky white bird adorned with buff plumage in the breeding season which nests in colonies, usually near bodies of water and often with other wading birds. The nest is a platform of sticks in trees or shrubs. Unlike most other herons, it feeds in relatively dry grassy habitats, often accompanying cattle or other large mammals, since it catches insect and small vertebrate prey disturbed by these animals. Some populations of the Cattle Egret are migratory and others show post-breeding dispersal. The adult Cattle Egret has few predators, but birds or mammals may raid its nests, and chicks may be lost to starvation, calcium deficiency or disturbance from other large birds. This species removes ticks and flies from cattle, but it can be a safety hazard at airfields, and has been implicated in the spread of tick-borne animal diseases. The Cattle Egret was first described in 1758 by Linnaeus in his Systema naturae as *Ardea ibis*, but was moved to its current genus by Charles Lucien Bonaparte in 1855. Its genus name *Bubulcus* is Latin for herdsman, referring, like the English name, to this species' association with cattle *Ibis* is a Latin and Greek word which

originally referred to another white wading bird, the Sacred Ibis. Despite superficial similarities in appearance, the Cattle Egret is more closely related to the genus Ardea, which comprises the great or typical herons and the Great Egret (*A. alba*), than to the majority of species termed egrets in the genus Egretta. The Cattle Egret is a stocky heron with a 88–96 cm (35–38 in) wingspan; it is 46–56 centimeters (18–22 in) long and weighs 270–512 Grams (9.5–18.1 oz. It has a relatively short thick neck, sturdy bill, and a hunched posture. The non-breeding adult has mainly white plumage, a yellow bill and grayish-yellow legs. During the breeding season, adults of the nominate western subspecies develop orange-buff plumes on the back, breast and crown, and the bill, legs and irises become bright red for a brief period prior to pairing. The sexes are similar, but the male is marginally larger and has slightly longer breeding plumes than the female; juvenile birds lack coloured plumes and have a black bill. The positioning of the egret's eyes allows for binocular vision during feeding, and physiological studies suggest that the species may be capable of crepuscular or nocturnal activity. Adapted to foraging on land, they have lost the ability possessed by their wetland relatives to accurately correct for light refraction by water. This species gives a quiet, throaty "rick-rack" call at the breeding colony, but is otherwise largely silent. Little Egrets eat a wide variety of prey from fish, molluscs and worms to insects and even small mammals and birds. Little Egrets are the liveliest hunters among herons and egrets, with a wide variety of techniques. They may patiently stalk prey in shallow waters. Or stand on one leg and stir the mud with the other to scare up prey. Or better yet, stand on one leg and wave the other bright yellow foot over the water surface to lure aquatic prey into range. The adult Little Egret is 55–65 cm long with an 88–106 cm wingspan, and weighs 350–550 grams. Its plumage is all white. The subspecies *garzetta* has long black legs with yellow feet and a slim black bill. In the breeding season, the adult has two long nape plumes and gauzy plumes on the back and breast, and the bare skin between the bill and eyes becomes red or blue. Juveniles are similar to non-breeding adults but have greenish-black legs and duller yellow feet and have yellow feet and a bare patch of grey-green skin between the bill and eyes. Little Egrets are mostly silent but make various croaking and bubbling calls at their breeding colonies and produce a harsh alarm call when disturbed. Egrets are one of the most conspicuous bird group found in mangroves in Pichavaram mangrove.

The Black-crowned Night Heron (*Nycticorax nycticorax,* commonly abbreviated to just Night Heron, is a medium-sized heron found throughout a large part of the world, except in the coldest regions. They have a black crown and back with the remainder of the body white or grey, red eyes, and short yellow legs. Young birds are brown, flecked with white and grey. These are short-necked and stout herons. Adults are approximately 64 cm (25 in) long and weigh 800 g. The breeding habitat is fresh and salt-water wetlands throughout much of the world. The nominate race *N. nycticorax* in Asia, Africa and Europe. Night Herons nest in colonies on platforms of sticks in a group of trees, or on the ground in protected locations such as islands or reed beds. Three to eight eggs are laid. These birds stand still at the water's edge and wait to ambush prey, mainly at night or early morning. They primarily eat small fish, crustaceans frogs, , aquatic insects , small mammals, and small birds. During the day they rest in trees or bushes. The Grey Heron (*Ardea cinerea*), is a wading bird of the heron family Ardeidae, native throughout temperate Europe and Asia and also parts of Asia It is resident in the milder south and west, but many birds retreat in winter from the ice in colder regions. It has become common in summer even inside the Arctic Circle along the Norwegian coast. It is a large bird, standing 90–100 cm tall, with a 175–195 cm wingspan and a weight of 1–2 kg. Its plumage is largely grey above, and off-white below. Adults have a white head with a broad black supercium and slender crest, while immature have a dull grey head. It has a powerful, pinkish-yellow bill, which is brighter in breeding adults. It has a slow flight, with its long neck retracted (S-shaped). This is characteristic of herons and bitterns and distinguishes them from storks, cranes and spoon bills, which extend their necks. The call is a loud croaking "fraaank". There are four subspecies. It is closely related and similar to the American, Great Blue Heron, which differs in slightly larger size, and chestnut-brown flanks and thighs. It feeds in shallow water, catching fish, frogs and insects with its long bill. Herons will also take small mammals, reptiles and occasionally warbler nestlings, plovers, young and adult snipes, takes ducklings and tern chicks and other small birds. It will often wait motionless for prey, or slowly stalk its victim. This species breeds in Colonies in trees close to lakes, the seashore or other wetlands, although it will also nest in reed beds. It builds a bulky stick nest. The Indian Pond Heron or Paddy bird (*Ardeola grayii*) is a small heron. It is of Old World origins, breeding in Southern Iran and East to India, Burma, Bangladesh and Sri Lanka They are widespread and common but can be easily missed when they stalk prey at the edge of small water-bodies or even when they roost close to human habitations. They are however distinctive when put to flight, the bright white wings flashing in contrast to the cryptic streaked olive and brown colours of the body. The camouflage is so excellent that they will often allow humans to approach very close before taking to flight, and this has resulted in folk names and beliefs that the birds are short-sighted or blind. They appear stocky with a short neck, short thick bill and buff-brown back. In summer, adults have long neck feathers. Its appearance is transformed from their dull colours when they take to flight, when the white of the wings makes them very prominent. It is very similar to the Squacco Heron Ardeola *ralloides*, but is darker-backed. To the east of its range, it is replaced by the Chinese Pond Heron *Ardeola bacchus*.

During the breeding season, there are records of individuals with red legs. The numbers do not suggest that this is a normal change for adults during the breeding season and some have suggested the possibility of it being genetic variants. They are very common in India, and are usually solitary foragers but numbers of them may sometimes feed in close proximity during the dry seasons. When small wetlands have a high concentration of prey. They are semi-colonial breeders. They may also forage at garbage heaps. During dry seasons, they sometimes take to foraging on well watered lawns or even dry grassland. When foraging, they allow close approach and flush only at close range. They sometimes form communal roosts, often in avenue trees over busy urban areas. The Indian Pond Heron's feeding habitat is marshy wetlands. They usually feed at the edge of ponds but make extensive use of floating vegetation such as water hyacinth to access deeper water.

They may also on occasion swim on water or fish from the air and land in deeper waters. They have also been observed to fly and capture fishes leaping out of water. Sometimes, they fly low over water to drive frogs and fishes towards the shore before settling along the shoreline. The primary food of these birds includes crustaceans, aquatic insects, fishes, tadpoles and sometimes leeches (*Herpobdelloides* sp.). Outside wetlands, these herons feed on insects (including crickets, dragonflies and bees and amphibians. The breeding season is prior to the Monsoons. They nest in small colonies, often with other wading birds, usually on platforms of sticks in trees or shrubs. Most nests are built at a height of about 9 to 10 m and in large leafy trees. The nest material is collected by the male while the female builds the nest. 3-5 eggs are laid. The eggs hatch asynchronously, taking 18 to 24 days to hatch. Both parents feed the young.Fish are the main diet fed to young. Nest sites that are not disturbed may be reused year after year.Nocturnal movements of Pond Herons have been noted along the coast near Chennai (Santharam, 197).

Little Green Heron The Striated Heron, Butorides striata, also known as Mangrove Heron, Little Heron or a Green backed Heron, is a small heron – which are mostly non migratory and noted for some interesting behavioral traits. They breed in small wetlands. Adults have a blue-grey back and wings, white under parts, a black cap and short yellow legs. Juveniles are browner above and streaked below. These birds stand still at the water's edge and wait to ambush prey, but are easier to see than many small heron species. They mainly eat small l fish, frogs and aquatic insects. They sometimes use bait, dropping a feather or leaf carefully on the water surface and picking fish that come to investigate. They nest in a platform of sticks measuring between 20–40 cm long and 0.5–5 mm thick. The entire nest measures some 40–50 cm wide and 8–10 cm high outside, with an inner depression 20 cm wide and 4–5 cm deep. It is usually built in not too high off the ground in shrubs or trees but sometimes in sheltered locations on the ground, and often near water. The clutch is 2-5 eggs, which are pale blue and measure around 36 by 28 mm. An adult bird was once observed in a peculiar and mysterious behavior: while on the nest, it would grab a stick in its bill and make a rapid back-and-forth motion with the head, like s sewing machine's needle. The significance of this behavior is completely unknown: While such movements occur in many other nesting birds where they seem to compact the nest, move the eggs, or dislodge parasites, neither seems to have been the case in this particular Striated Heron. Young birds will give a display when they feel threatened, by stretching out their necks and pointing the bill skywards. In how far this would deter predators is not known. The Cinnamon Bittern or Chestnut Bittern (*Ixobrychus cinnamomeus*) is a small bittern. It is of old world origins, breeding in tropical Asia from Pakistan to Sri Lanka East to China and Indonesia. It is mainly non migrant; but some species migrate for short distances. This is a small species at 38 cm length, with a short neck and longish bill. The male is uniformly cinnamon above and buff below. The female's back and crown are brown, and the juvenile is like the female but heavily streaked brown below. When surprised on its nest or concerned, it assumes the characteristic attitude of bitterns. Aptly termed the *On-Guard*. The neck is stretched perpendicularly, bill pointing skyward, while the bird freezes, becoming astonishingly obliterated amongst its reedy environment. Their breeding habitat is reed beds. They nest on platforms of reeds in shrubs. 4-6 eggs are laid. They can be difficult to see, given their skulking lifestyle and reed bed habitat, but tend to emerge at dusk, when they can be seen creeping almost cat-like in search of frogs. They feed on insects, fish and amphibians. The Great Bittern (*Botaurus stellaris*) is a wading bird of heron family Ardeidae Bitterns are thickset herons with bright, pale, Buffy-brown plumage covered with dark streaks and bars, similar in appearance to the to the American Bittern, *Botaurus lentiginosa*. The Great Bittern is 69–81 cm (24"-34") in length, with a 100–130 cm wingspan. Their most distinctive feature is the males booming call in spring. Males are polygamous with each mating with up to five females. The nest is built in the previous year's standing reeds and consists of a platform some 30 cm across. Four or five eggs are laid in late March and April and incubated by the female bird. After hatching, the chicks spend about two weeks in the nest and then disperse amongst the reeds The Bittern is, usually well-hidden in reed beds usually solitary, and it walks stealthily seeking fish, frogs, small mammals and insects. If it senses that it has been seen, it becomes motionless, with its bill pointed upward, causing it to blend into the reeds. It is most active at dawn and dusk. Its folk names include "barrel-maker", "bog-bull", "bog hen", "bog-trotter", and "butter bump" mire drum, mostly refer to the mating call of the male, which is a deep fog-horn or bull-like *boom*, easily audible from a distance of 2 miles on a calm night. The Latin for bittern, *Botaurus*, also refers to the bull. The other part of its scientific name, *stellata* is the Latin for *starry*, in reference to its plumage. Water birds in the pichavaram wetlands followed by mudflats, swamps, abandoned fields, open waters and marshy areas, large mudflats with a waste expanse of foraging habits on the shore line are indicative of a relatively safe site for migratory shore birds. Well grown Mangroves are the most productive habitats with mud flats of intertidal habitats because of their substrate constituents that support a wide variety of benthic invertebrate of various size ranges and attract different species of share birds.

DISCUSSION

Birds are important components of our ecosystem and play a major role in maintaining the natural balance in the food chain in nature. The role played by birds in many habitats is still unexplored. According to Ali (1949), "to study the complete life histories of birds in relation to human interests is an attempt to strike an accurate balance sheet of their activities." An insight into details of bird activity elucidates the significance of their various roles in various situations. In India, region wise or crop wise losses caused by birds are not available. These are of vital significance for their management. The present study shows the population and richness of egrets and herons in Pichavaram mangroves during 2006-2009. The population of egrets and herons needed the favorable environment and habits which are available in the Pichavaram mangroves. Sampath and Krishnamoorthy (1990) stated that many of the water birds visiting the Indian Wetlands are migratory in nature; mostly they arrive from Northern Asia. Wiens and Dyer, (1977) stated that migratory birds requires a mosaic of habitats to fulfill their requirements and often they selected the area from the landscapes point of view. Earlier Sampath and Krishnamoorthy (1990) and Nagarajan and Thiyagesan (1996, 1998) also observed the

availability of various types of micro habitats in around Pichavaram mangrove. In the present study, Agri land, Open Water, Emerging Mangroves, Well Grown mangroves and Mud Flats have been studied based on their classification. These microhabitats provide suitable feeding ground for several water bird species. IWSG 2003 reported that Southern Asian Flyway water bird population is poorly known and the contemporary knowledge of the waders of this part is almost unknown. It further stated that the majority of the population of water birds is declining all around the world. In this context too, the results of the present study clearly established the pivotal role of the Pichavaram mangrove wetlands in water bird ecology, particularly that of migrants. Seasonal variations in water bird species abundance may be related to migratory patterns, food availability, reproductive behavior, latitude wher the water birds are located, general hydrological budget and regional and Global microclimatic events and erratic climate (Nagarajan and Thiyagesan, 1996). Sundarbans and Mohanty (1992) reported 166 species form Bhitarkanika. However, mangroves have been relatively less studied in our country except few works (Sampath, 1989; Basha, 1992; Sampath and Krishnamoorthi, 1993; Sandilyan *et al.,* 2010.

During the present study the peak density of small wadres occurred during monsoon and for large wadres during post monsoon was usually the period of peak density . The water bird population was peak during after monsoon, remained high in the post monsoon and then gradually decreased towards summer. Sampath and Krishnamoorthy (1990) reported that water birds arrival to Pichavaram starts from October and reach the peak during November which lasts till January of the next year. During February, and March they would start their emigration. The Data Collected during the four years clearly reflects the same patterns. Data recorded for a relatively long period (10 years and above) would provide an excellent opportunity to detect the effects of such medium to long-term changes on Water bird population in wetlands (Rao *et al.,* 1997).

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