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Study on Breeding Biology of Large egret (*Egretta alba*) and Median egret (*Egretta intermedia*) in Kerala, South India

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ABSTRACT

Breeding in *Egretta alba* and *Egretta intermedia* coincide with the onset of south west monsoon. The present study is conducted in a temple yard in Pattambi, where the heronry initiates on the last week of May. Arrival of large egret triggers the building of nest by the other herons like median egret, little egret as well as little cormorant in the breeding site. They are colonial nesting species which build platform type of nests. Clutch size of large egret varies from 1-3 whereas in median egret it is 1-4. The mean incubation period *Egretta alba* and *Egretta intermedia* are 23.57 ±1.05 days and 24.88±0.73 days respectively. Hatching success of *Egretta alba* and *Egretta intermedia* was 84.09± 1.2 and 81.7± 1.3 respectively. Mean fledging success of *Egretta alba* and *Egretta intermedia was* 90.6± 0.72 and 91.4 ± 1.9 respectively. In large egret the last batch of fledgling left the nest by the first week of October whereas median egrets start nesting from July to last week of September. Offensive smell of rotten fish and excrement were the major causes for felling the nesting tree from their colony.

1. Introduction

Large egret and median egret, (Order: Ciconiformes, Family: Ardeidae) are species showing colonial nesting and frequenting a variety of habitats like paddy field , rivers, ponds, lakes and other natural wetland habitats (Ali and Ripley 1987, Kreb 1978, Burger 1981). They are chiefly piscivorous and feed on a range of aquatic organisms (Ali and Ripley 1987). The detailed studies of breeding and nesting aspects of large egret, *Egretta alba* and median egret, *Egretta intermedia* are conducted globally (Palmer 1962, Teal 1965, Pratt 1972, Wiese 1975, Maxwell and kale 1977, Mock 1985, Naile 1988, Dwyer 1988, Marchant and Higgins 1990, Mc Killigan 1991, Ando 1993 and Mc Crimmon 2001). A few aspects on breeding biology of some herons are conducted in India (Dusi 1966, Parasharya 1988, Seedikkoya 2004). However there is no detailed study on the breeding biology of large and median egrets in Kerala except for a few short communications. In this context, this study has much significance.

2. Study Areas

Nesting sites of large egrets and Median egrets were studied in Pattambi, Vadanakurishi and Shoranur Railway station of Palakkad district of Kerala. Intensive study on breeding was conducted in Pattambi temple area and Shoranur Railway station. Guruvayoorappan Temple in Pattambi is situated in geographical coordinates 100.49'00" N 76^0.12'00" E and located in Palakkad (Palghat), Kerala. The above temple is located on the bank of Bharathapuzha River. The nesting site is located approximately 100 metres away from Pattambi Railaway Station. There are four trees namely Neem (*Azardirachta indica*), Banyan tree (*Ficus bengalensis*), Mango tree (*Mangifera indica*) and bael tree (*Aegle marmelos*) upon which the large egret and median egret made their platform type of nest. (Table 1)

Shoranur railway station area (10^0.455'33" N 76^0.16'12" E) and Vadanamkurussi breeding site (10^0.47'12" N 76^0.15'9" E) are situated in Palakkad district of Kerala. Both study sites are clubbed as one for the convenience.

3. Methods

Regular and intensive study to locate nesting colonies of the species was conducted during early monsoon of 2016-2017. In the breeding colonies the nesting trees were numbered with metallic plates, concealed to the best, individually marked several nests. The freshly laid eggs were numbered with a felt tipped pen.

The nests were checked every day during egg laying period and at four or five day gaps during incubation and hatching periods and at weekly duration from the time chicks hatched , until they reached 24 days old. Hatching success was estimated by a number of consecutive visits in every week by checking the number of chicks in the nest. Data on breeding of large egrets were collected for a period of three years starting from June 2014 to October 2016. Weekly observations were made to examine the nestling, hatching and fledglings. Observations were made from the roof of the building, which was located adjacent and parallel to the nesting trees and provided vantage point overlooking good many nests. Observations were done by direct visual method and using binoculars (10 x 42).

4. Results and Discussion

4.1 Nesting season

Breeding in large egret, median egret and most herons occurs mostly during the heavy downpour and the rainy season may vary according to differences in geographical status (Irwin 1981, Ginn et al. 1989, Mc Clean 1993 b, Seedikkoya 2003).

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The present study also indicates that breeding in large egret as well as median egrets occur mostly during the south west monsoon. Nesting of large egrets starts by June and it reached the peak in July and August. The last batch of fledglings of large egret left the nests by the first week of October.

Median egret also breeds during wet season like large egret. Breeding starts from July –September. They prefer colonial nesting together with large egret, little egret and little cormorants. The study conducted (Ando 1993) reported that the nests were placed 1.5-20m above the water or water logged ground but still there is a chance to increase the nest heights. Present study indicates that the average nest height on trees varies from 7-15m.

4.2 Nesting colony

In a colony containing varieties of egrets, large egrets are often the first species to report and their presence may trigger nesting among other species (Bancroft et. al. 2001). The present study also agrees with the above result. The early arrival of large egrets initiates the nesting of other herons like median egret, little egret as well as little cormorant in most of the trees where colonial nesting occur. In contrast, some trees were occupied by large egrets alone. The choice of selection of a specific nesting site based mostly on availability of suitable feeding conditions (Bancroft et al. 1988, Carrascal et al 1993, Gibbs et al.1987, Venkettaraman and Muthukrishnan 1993) and protection. The present study also attests the above observation since temple yard given maximum safety to the breeding birds. Top of the colony is occupied by large egret followed by little egret and little cormorant except for one neem tree where it is occupied by large egret, median egret, little egret and little cormorant. Large egrets prefer different nesting height in order to reduce the disturbances from predators (Mc Crimmon.et.al 2001).

4.3 Shape and size of nests

The platform type of nests usually built on the tertiary and quaternary cross branches of the tree crown. The number and size of the nests depend on the availability of cross forks on the tertiary and quaternary branches. Nesting height depends on the nesting area and location. Nest height is maximum, where the chances of disturbances are high whereas height is minimal where the chances of disturbance are low. The nest of large egret is made of a large network of twigs being compact at the base and loose at periphery. The twigs can be seen coming out of from the base and the middle while the upper part of the nest comprises light and long twigs. Both males and females are involved in nest building. There is no special preference for nest material as it is made of all available twigs and rarely certain artificial materials like plastic wires were observed in nests from Pattambi, Vadanamkurissi and Shoranur nesting sites. Usually materials are collected from the available adjacent trees.

Table 1 Nesting trees of large egret located in two study areas during 2015-2016

Sl No	Nesting trees	Nests 2015		Nests 2016		Height (m) 2015		Height(m) 2016	
		PT	SH	PT	SH	PT	SH	PT	SH
1	*Azardirachta indica*	28+	0	24+	0	7 – 12	0	8 – 12	0
2	*Ficus bengalensis*	43+	54+	38+	48+	10 -17	17 - 19	11 - 17	17 – 19
3	*Mangifera indica*	35+	25+	41+	28+	18 – 24	25 – 28	18 - 25	24 – 27
4	*Aegle marmelos*	62+	0	58+	0	14 – 18	0	14 - 18	0
5	*Tamarindus indica*	0	15+	0	12+	0	30 - 35	0	31 – 34
6	*Tectona grandis*	0	6	0	0	0	18 - 19	0	0
PT= Pattambi SH= Shoranur									

Selection of nesting site is most important for starting their courtship behavior (Mc Crimmon 2001). They court each other and copulate on the nesting trees. As a prelude to the copulation males and females raise their upper plumes for attracting each other (Mc Crimmon 2001). The above courtship behavior is observed in this study also. Copulation lasts for 10-15 sec. After few minutes the male flew off to collect nesting material for nest modification. Their copulation repeats even after making the nest. Occasionally after bringing the nest materials both male and female lay down the above the nest materials on the cross branches of the nesting tree. Most of the nest materials are collected from the adjacent areas of nesting site. Twigs from recently evacuated nests are also used for nest modification. Very rarely twigs from trees upon which the nests are being built also used for nest modification.

4.4 Nest and Nest materials

In Large egret nests are made of twigs of different plants. It includes twigs of banyan, neem, mango and tamarind tree. Nests are built on the fine cross branches of tertiary and quaternary branches. Partial damage of the nest is observed during heavy rain and wind in which twigs from the nest at various points were noticed falling down. The same is repaired with the cooperation of both the members. Number of twigs used for nest building is counted and also measured for the length and depth of nests (N=8)(Table.2).

In median egrets, the nests are made using twigs of *Azardirachta indica, Ficus bengalensis, Mangifera indica, Aegle marmelos* and *Tamarindus indica*. The modification of nests is carried out by using twigs from the same nesting trees as well as twigs from adjacent plants. Nests are built mainly in the fine cross branches of tertiary and very rarely on quaternary branches. Nests and young ones are attended by parents who safeguard the eggs and young ones from crows and hawks (Mc Killgan 1991).The defending parents threaten the predators by raising plumes and pointing bill to predator (Marchant and Higgins 1990). The same is observed in the present study too. Partial damage to the nest is seen because of the unfavourable climatic condition. Such nests were seen

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modified together with male partner. They built the nest at different heights (Table 3). Nests of large egrets are put on topmost position of the tree.

Table.2 Characteristics of nest materials in Large egret (*Egretta alba*)

Nest No	Total material	Maximum size (cm)	Minimum size (cm)
Nest- 1	45	52.2	28
Nest- 2	60	63	31.2
Nest- 3	54	45.4	33
Nest- 4	38	48	27.2
Nest- 5	41	58.3	30.4
Nest- 6	55	62.3	30.2
Nest- 7	48	51.2	29.4
Nest- 8	62	45	35

Table.3 Tree species used by *Egretta intermedia* for nesting in Pattambi during 2016-2017

Sl No	Tree Species	Number of nests		Height (m)	
		2016	2017	2016	2017
1	*Azadirachta indica*	15	4	7 – 8	8
2	*Ficus bengalensis*	11	14	7.5 – 9	8 – 9
3	*Mangifera indica*	18	17	7 – 9	7 – 9
4	*Aegle marmelos*	6	12	10 – 14	10.5 – 15

5. Clutch size

The first batch of the large egret arrived at the study site on the second week of June. The egg laying in large egret started during last week of June. A total of about 132 eggs were observed in 63 clutches during June to October 2015; meanwhile 168 eggs were observed in 78 clutches during June to October 2016 and 170 eggs in 67 clutches during June to October 2017. The colour of eggs was sky blue or light sea green. Clutch size varies from 1-3. Larger clutches of 3 eggs generally found laying during August, while smaller clutches of 2 eggs often laid during the period between June and September. Totally 132 eggs, 168 eggs, and 170 eggs were studied during the entire study periods 2015-2017(Table.4). The mean clutch size was 2.1 ± 0.51.

The arrival of median egret is rather late, that is during the first week of July. The egg laying in median egret started during last week of July. Nest formation completes within 4-5 days. A total of about 45 eggs were observed in 17 clutches during July to September 2015. 58 eggs were observed in 18 clutches during July to September 2016 and 35 eggs in 14 clutches during July to September 2017. The colour of eggs was also light sea green. Clutch size varied from 1-4. Larger clutches of 4 eggs generally found laying during the first week of September, while smaller clutches of 1 egg was seen in the course of time in between July and September. Altogether 45 eggs, 58 eggs and 35 eggs were observed in Pattambi temple area during 2015- 2017 (Figure.1). The mean clutch size was 2.640 ± 0.61 (figure 3).

6. Incubation

Both sexes are take part in incubation. The first egg was laid within 4-5 days after completion of nest building. Incubation period in large egret ranges from 23-27 days (Pulmer 1962, Wiese 1975, Dwyer 1988). The above observation is attested in the present study. Incubation in great egret begins at laying of first egg (Maxwell and Kale 1977) or soon thereafter (Mock 1985, Dwyer 1988), resulting in asynchronous hatching intervals (Custer et al.1992). In the present study the mean incubation period recorded for 59 eggs was 23.59 ± 1.05 days. The frequency distribution of incubation period of 59 eggs is recorded. (Table.5)

Incubation in median egret also starts after laying the first egg. Both sexes are taking part in incubation. The first egg was laid within 3-4 days after completion of nest building. The mean incubation period of 50 eggs was 24.880 ± 0.73 days. The frequency distributions of incubation period of 50 eggs are recorded in 2016. (Figure 4)

Table 4 .Clutch size of *Egretta alba*

Month and year	Clutches	Clutch size			Mean clutch size (eggs)	SD (eggs)
		1	2	3		
June-October 2015	63	4	49	10	2.1	0.46
June- October 2016	78	7	52	19	2.2	0.56
June-October 2017	67	8	48	11	2.04	0.53

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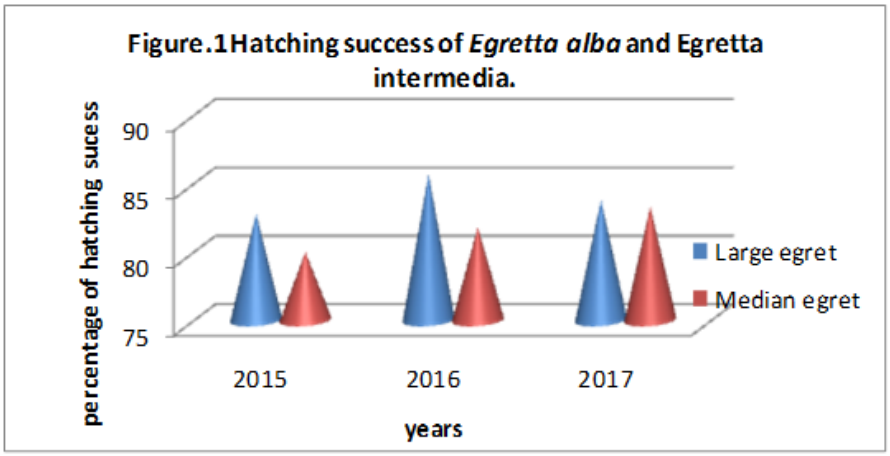
Table 5. Frequency distribution of incubation period of *Egretta alba* during 2016							
Total no of eggs studied	Incubation period (days)					Mean (days)	Standard deviation (SD)
	21	22	23	24	25		
59	2	6	18	21	12	23.59	1.05

7. Hatching and Fledging Success

In large egret, 85 eggs were hatched out of 101 eggs under observation during 2015-2017. 16 eggs were lost by various reasons like falling from the nest due to heavy rain and wind and nest desertion. Mean hatching success and fledging success of large egret in the present study was 84.09 ± 1.2 and 90.6 ± 0.72 respectively. (figure.1). Out of 85 chicks hatched, 77 chicks were successfully left out during 2015-2017. Few chicks (n=8) were lost due to adverse climatic conditions like wind and heavy rain and also by degeneration of nests. (Figure 2)

Out of 55 eggs 46 eggs were hatched in *Egretta intermedia* during 2015-2017. Mean hatching success and fledging success was 81.7 ± 1.3 and 91.4 ± 1.9 respectively. Out of 46 eggs hatched 42 chicks were successfully fledged during 2015-2017. (Figure 1 & 2)



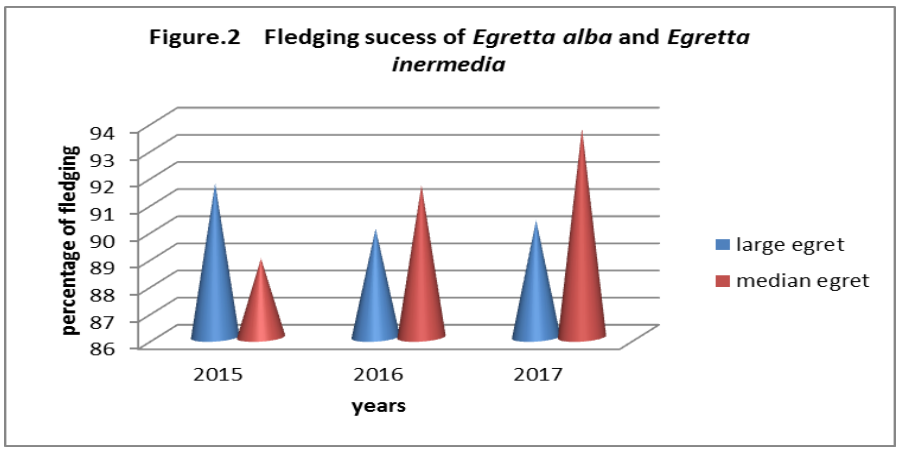


Figure.3

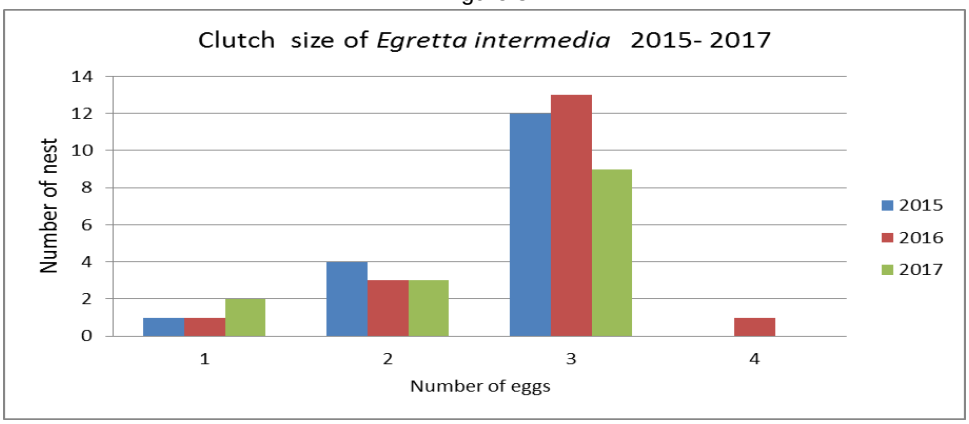


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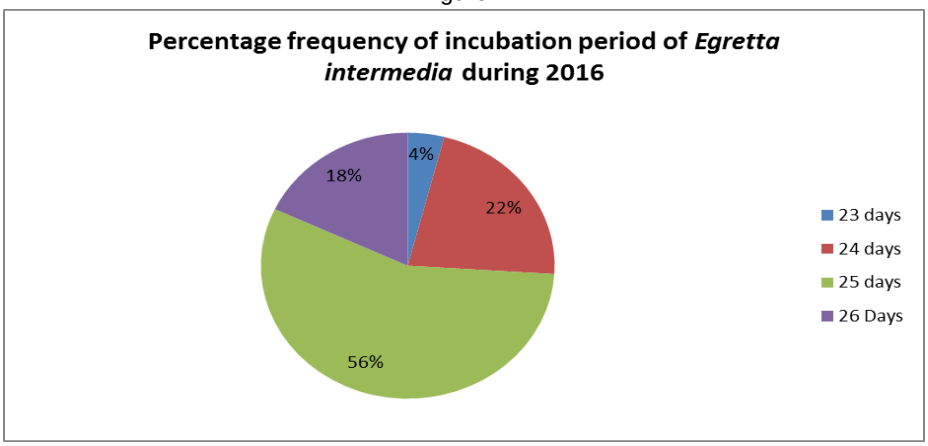
Figure.4



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