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BREEDING CHRONOLOGY OF CATTLE EGRET *Bubulcus ibis*

Abstract

One of the most fascinating aspects in the life of birds is their breeding phase. The family Ardeidae belongs to order Ciconiiformes. The family Ardeidae is found almost all over the world as well as in India. It is a colonial breeder except Indian Pond Heron and Purple Heron. There is very little information available on the breeding biology of the colonial nesting bird in India. For the study of breeding biology, Visnagar city and its surrounding area were selected. The study area was surveyed thoroughly from the month of March to September. Nesting activity was observed everyday by going to the nesting site. The nesting materials were identified up to species levels. The data on nest diameter, depth of nest and quantity of nesting material were also collected. Measurements were recorded using a 60 cm long ruler with 1mm accuracy. Numbers were given to eggs by sketch pen at approachable nests, to determine the clutch size and egg laying periods. After nest building and during egg laying, when observation of the nest was difficult, sometimes climb on the tree or in a case when climbing was impossible, set the mirror on the long pole, and observed the nest activities. *Acacia nilotica* is a likeable tree for nesting in the study area; out of 304 nests, 293 nests are on it, while only 11 nests were observed on *Azadirachta indica*. Cattle Egrets do not prefer less than 5m height trees. The average tree and nest heights are 5.45 ± 0.12 m and 4.40 ± 0.07 m. The average nest diameter is 20.3cm; the depth of the nest is 4.76 cm. About 80.23% and 74.63% of the nesting material was collected from the *Acacia nilotica* and *Azadirachta indica* trees themselves, while very little material was collected from the nearby trees. They completed their nest building within 3 to 7 days (4.41 ± 1.14). Eggs are broad ovals, very pale sea green, almost white or skim milk blue. Mean clutch size is 3.32 ± 0.48 (ranged 3-4 eggs). The egg laying period ranges from 4 to 7 days (6.82 ± 0.66), incubation period is 16 to 21 days (18.73 ± 1.80) and nesting period is 46 to 56 days (49.64 ± 3.57). The entire nesting cycle is complete within 50 to 60 days (53.95 ± 3.30). In the present study, 64.38% hatching success and 77.65% fledgling success was observed. All findings and accounts show 50% nesting success in Cattle Egrets in this area.

Keywords: Clutch size, Nesting period, Hatching success, Nesting success

INTRODUCTION

One of the most fascinating aspects in the life of birds is their breeding phase, which is intimately tied to the distribution and abundance of food resources in their environment. However, food is not evenly distributed in space and time, and this is thought to have been one of the factors affecting the evolution of nesting strategies. To understand how birds have evolved different types of nesting patterns, ornithologists have used a variety of approaches, the most useful of which have been to build simple models based on optimality principles.

The family Ardeidae is belongs to order Ciconiiformes. The family Ardeidae found almost all over world as well as in India. It is a colonial breeder except Indian Pond Heron and Purple Heron. The breeding biology and nesting requirements of many heron species have been studied in several countries. The breeding biology of Cattle Egret *Bubulcus ibis*, has been studied by several investigators (Skead 1966; Lowc-McConnell 1967; Blaker 1969; Jenni 1969; Dusi and Dusi 1970; Lancaster 1970; Siegfried 1972; Weber 1975; Maxwell and Kale 1977).

There is very few information available on breeding biology of the colonial nesting bird in India. General information on the nidification is given by Salim Ali and Ripley (1968). Singh (1985) described the biology of Cattle Egret in Punjab. In Gujarat, Parasharya (1984) did the detailed study on breeding biology of some birds of order Ciconiiformes in selected costal area. Acharya (2003); gave some information regarding breeding biology of wetland birds in this area, Joshi *et al.* (2010); gave some information regarding breeding chronology of Little Cormorant, Senma (2011); gave details about birds of family Threskiornithidae regarding breeding chronology of Black Ibis and Black-headed Ibis. The present study is conducted to fulfill the gape of ecological study, in the family Ardeidae in Visnagar and surrounding area.

Several aspects of breeding biology of the Cattle Egrets are considered for the study such as breeding season, morphological changes of the bird during breeding season, heronries, nesting ecology, breeding colony, nest site selection, nesting trees, nest materials, measurement of the nests, nest building, egg laying, clutch size, colour of the eggs, incubation period, egg mortality, hatching success, brooding, fledging period, nestling period and chick mortality.

METHODOLOGY

For the study of breeding biology, the study area was survey thoroughly from the month of March to September. Modified method adopted from Senma (2011). Nesting activity was observed everyday by going to the nesting site. The measurement of the nesting tree relation to the height were made with the help of ebony level, girth of the tree trunk at breast height (GBH) was measured with the help of measuring tape and the canopy cover was measured by taking four apposite points from the tree trunk to the end of the most extended respective branches and an average was considered. Nests height was measured by considering the distance from the bottom of nest platform to the ground. Number of nests, size and species of nesting trees were also recorded. The nesting materials were identified up to species levels. The data on nest diameter, depth of nest and quantity of nesting material were also collected. Measurements were recorded using 60 cm long ruler with 1mm accuracy.

Collected nests from different nesting trees were examined to observe the nest composition and dimensions. The composition includes the number and percentage of nesting material to observe the preference towards any particular nesting material. The nesting materials were identified up to species levels. Non Plant materials were also recorded in the nest. The data on nest diameter, depth of nest, and quantity of nesting material were also collected. Measurements were recorded using 60 cm long ruler with 1mm accuracy. Nest diameter was measured across the middle part of nest periphery from one end of the edge to the widest edge of the other end. Sticks extending beyond the bulk of a nest were excluded from the measurement (Sykes 1987). The depth of nest cup was measured from the centre of the nest bottom to the horizontal plane of the rim.

When bird started to build the nest, it was given a number to all selective sites. This number was maintained till the end of the nesting cycle, it was considered as a nest number. Every day it was observed and the information was noted in the nest wise sheets. After nest building and during egg laying, when observation of the nest was difficult, sometimes climb on the tree or in a case when the climbing was impossible set the mirror on the long pole, and observed the nest activities.

Number was given to eggs by sketch pen at approachable nests, to determine the clutch size and egg laying periods. Nesting success of Egrets and Herons were recorded under the categories of clutch size, hatching success from the number of hatchlings in a nest and fledgling success by number of chicks fledged. A failure was denoted as the nest in which no young could fledge or failure of hatching. As birds could not be marked due to technical difficulties a few aspects of the breeding biology could not be worked out.

RESULTS & DISCUSSION

The Cattle Egret *Bubulcus ibis* has a wide spread distribution around the globe. The reproductive ecology of the Cattle Egret has been well documented in its traditional range (Siegfried 1971; Skead 1956). Certain aspects of breeding biology of Cattle Egret have been studied in detail at Fox's Bay, in Montserrat, West Indies (Arendt *et al.* 1988). Nesting behaviour of Cattle Egret was recorded for the first time in the Indian subcontinent by Ali in 1941. Thereafter, much scatted studies were conducted on the breeding biology of this species in India; the last decade when the role of Cattle Egret as a potential biological pest control agent it was highlighted.

In the study area Cattle Egret prefer to build their nest in associated as well as free heronry. According to physiognomy the nest found in compact heronry. All the nests in the study area are observed on homogeneous tree. They never built their nest in pure heronry; it is always built their nest with other birds in mixed heronry. Most of the nests located at associated, compact, tree, homogeneous and mixed heronry.

Cattle Egret is known to nest in the mixed colonies with Cormorants, ibises and other member of family Ardeidae (Ali & Ripley 1968; Maccarone *et al.* 1988). It is also known to nest in a monospecific colony with no other Ardeidae member nesting in the neighborhood (Arendt & Arendt 1988). In the study area it built their nests a company with Intermediate Egret, Black Crowned Night Heron and Black Headed Ibis in their mixed heronry. Cattle Egret build their nest on 65% middle inside, 12% on middle outside, 15% on lower inside and 8% on lower outside canopy on the tree.

The bird starts their breeding season from mid May and completed up to early September in study area. Many herons have spectacular courtship displays. Some develop delicate lacy breeding feathers on the head, back or breast, which are used during the courtship displays. Senma and Acharya (2009) recorded mysterious characters during breeding season in Black-headed Ibis. Similar observation reported by Acharya (2003) in Visnagar and Parasharya at Bhavnagar (1984) but Ali and Ripley (1968) at North India and Sivasubramanium (1992) at Bharatpur noted that the breeding season of this bird is June to August so little bit variation in Gujarat and other part of the country. During study total 304 nests were observed. Cattle Egret starts nesting in the 2nd week of May and fledge left their nest in 1st week of September. The maximum activated nests seen in the 1st week of June.

Cattle Egret have been reported to nest in rural as well as urban set up, that depends upon availability of food, safe nesting places, availability of nesting material and environmental factors of the area (Gopal *et al.*

2004; Mathew & Gadhvi 2004; Rao 2004). Out of 304 nests, 94 were located in urban area and 210 nests in rural area. It is proved that above factors, on which birds depended for nesting are more favorable in rural areas rather than urban areas.

Acacia nilotica is a likeable tree for nesting in study area; out of 304 nests 293 nests are on it, while only 11 nests observed on *Azadirachta indica*. Thorny tree like *A. nilotica* is provide strength to the nest against wind and rain (Plate Fig. 1). It is also protect the nests against predators so thorny tree provided the ideal nesting platform. (Senma and Acharya 2010). A well covered nest does not require wing shading provide by parents to their chicks, which considerably reduced energy loss to the parents (Senma and Acharya 2015). Cattle Egret do not prefer less than 5m height tree. The average tree and nest height are $5.45 \pm 0.12\text{m}$ and $4.40 \pm 0.07\text{m}$. The distance between two trees and the nearest wetland are 1.2m and 837 m. The average distance of nest from tree trunk were 2.15m and average 2.1crotches supporting the nest.



Plate Fig. 1: Nest of Cattle Egret

The G.B.H. is 0.28 ± 0.02 and 0.30 ± 0.02 , the nest diameter is 19.3 and 21.4cm, the depth of the nest is 4.57 and 4.95cm and the weight of nest 112.4 and 147gm respectively in *Acacia nilotica* and *Azadirachta Indica*.

It used more than 100 (112 average) sticks for their nest building. They used plant materials of *Acacia nilotica*, *Azadirachta India*, *Mangifera indica* and *Prosopis chinensis* as well as plastic material for nest building. The Cattle Egret used variety of nesting materials to build a nest; they collected sticks from the grounds as well as from the nesting trees (Plate Fig. 2). About 80.23 % and 74.63% of the nesting material was collected from the *Acacia nilotica* and *Azadirachta Indica* trees itself while very little material was collected from the nearby trees. The collection of nesting materials from the nesting tree itself was beneficial because it saved lot of time and energy in going away from the nest site for the collection of nesting material. For nest building both sexes share their duties. They completed their nest building within 3 to 7 days (4.41 ± 1.14) (Table 1).



Plate Fig. 2: Collection of nesting material from tree

Eggs are broad ovals very pale sea green, almost white or skim milk blue. Mean clutch size is 3.32 ± 0.48 (ranged 3-4 eggs) (Plate Fig. 3). Maximum clutch size earlier reported is five eggs (Arendt & Arendt 1988; Gopal *et al.* 2004; Iyer 2004). However, in the present study maximum 4 clutches were observed. The mean

length and breadth of egg is to be 43.61 X 34.06mm (n=50). It is little different that reported by Baker (1935) (44.1X 36mm (n=80)).



Plate Fig. 3: Clutch size of Cattle egret

The egg laying period is range in between 4 to 7 days (6.82 ± 0.66), incubation period is 16 to 21 days (18.73 ± 1.80) and nesting period is 46 to 56 days (49.64 ± 3.57). The entire nesting cycle complete within 50 to 60 days (53.95 ± 3.30) (Table 4). In the present study 64.38% hatching success and 77.65% fledgling success was observed. All finding and accounts shows 50% of nesting success in Cattle Egret in this area (Table 2), it is enough to maintain the population of the species in the area. Egg mortality and chick mortality were decline the population of the birds. The predators like Crow, Black Headed Ibis, Snakes and bird itself were main causes for egg mortality. Starvation due to competition for food among the siblings is the main cause of nesting mortality. The reports of 50% deaths were due to starvation. The death of 16.66% chicks was due to predation (Table 3).

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Table 1: Breeding schedule in Cattle Egrets

Nest building period Mean ± SD	Egg laying period Mean ± SD	Incubation period Mean ± SD	Nestling period Mean ± SD	Complete nesting cycle Mean ± SD
4.41 ± 1.14 (03-07)	6.82 ± 0.66 (04-07)	18.73 ± 1.80 (16-21)	49.64 ± 3.57 (46-56)	53.95 ± 3.30)

* Value in parenthesis shows range

* Period is in days

Table 2: Hatching success in Cattle Egrets

Total Number of Nest	Total Number of eggs	Total Number of chicks	Hatching success in %	Total Number of chicks fledge	Fledgling success in %	Nesting success in %
44	146	94	64.38	73	77.65	50

Table 3: Cause of egg and chick mortality in Cattle Egrets

Cause of mortality					
Egg mortality			Chick mortality		
Hatching failure	Predation	Unknown	Starvation	Predation	Unknown
34.61	53.84	11.53	50.00	16.66	33.33

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