



Research Article

NESTLING BEHAVIOUR OF CATTLE EGRET (*BUBULCUS IBIS*) IN RURAL AND URBAN AREA OF SHEKHAWATI REGION

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ABSTRACT

The Cattle egret (*Bubulcus ibis*) is a snow white bird, about 90 cm long distinguished by the bill colour and breeding plumage is found in Cattle egret that is clearly visible during breeding season. Breeding season of a bird species is a result of specific environmental adaptations. Incubation is done by both the parents alternatively. During parental care Cattle egret (Both Parents) collected their food from the vicinity and give to their young ones. They live collectively in the breeding colonies on trees and therefore they have no fear from other birds. Still they do not leave their nest for a long time. Adult were ever seen at the site and they were regularly seen foraging nearby fields. The young birds of the Cattle egret were able to move in the nest at the nest when 12 days old. They were able to fly well at 21 days and left the nest at the age of 45 day.

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INTRODUCTION

The Cattle egret (*Bubulcus ibis*) is a snow white bird, about 90 cm long distinguished by the bill colour and breeding plumage is found in Cattle egret that is clearly visible during breeding season. It prefers to feed near water, but uses a wide range of aquatic and terrestrial foraging site especially lakes or WWB, man-made tanks, agriculture fields, grasslands, municipal garbage dumping stations, animal dead bodies dumping stations and sand dunes close to human habitation it recorded same manner in black ibis Soni and Sharma 2006. The Cattle egret is commonly found almost throughout in India. It is solitary breeder and nest high up on tall trees like Neem, Peepal, Barged Vilayati babool & palm (Ali & Ripley 1983) In spite of its common occurrence and wide distribution range, surprisingly no systematic studies have yet been carried out on any aspects of breeding biology of the species inhabiting the arid zone of Rajasthan. Lathigara 1989, Hancock *et al.* 1992, Soni 2007, breeding chronology has been studied only in ibises (Skeed 1956) from an ever expanding field of avian breeding ecology and behaviour a wide variety of aspects are open for choice to study here we provide a detailed descriptive account of the nestling behaviour of the Cattle egret in Urban and Rural area of laxmangarh.

Breeding Season

Breeding season of a bird species is a result of specific environmental adaptations. Each species apparently adjusts its breeding time of the year when raising young is profitable (Lack 1950). Since breeding birds need adequate amount of energy (Ricklef 1974) availability of adequate food for the breeding pair and young's strongly influences the onset of breeding season in bird species. Breeding season in the Cattle egret is less known. Ali and Ripley (1983) described breeding season of the Cattle egret ranging from last April to October in North India and later in South.

Nesting ecology

Selection of nest site is often considered as an important determinant of reproductive success in many bird species (Hilaluddin *et al.* 2003, Hancock & Kushlan 1984, Patankar *et al.* 2007, Joshi and Shrivastava 2012). Study of nest site selection in birds may lead to design conservation strategy. Nest site selection is closely related to individual fitness since it influences the probability of successfully raising. Offspring.

Nests made at places not easily accessible to predators such as cliffs, tall trees, thick vegetation, have high breeding success. Since selection pressure for nest sites is intense, the choice of less safe places is very common. As a rule such a choice could occur when competitive pressure for the best sites is very strong.

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Nest attendance rhythms

In many bird species nest attendance by at least one of a pair is essential to maintain favorable thermal and gaseous environmental for eggs and chicks, which also prevents predation. Incubating bird may spend most of its time on the nest. Consequently foraging opportunity may be reduced by nest attentiveness (Walsberg 1983a). When only one parent attends nest, foraging time constraint is most critical to meet its own energy demand while attending nest. Therefore, most studies on foraging and nest attendance rhythm were focused mainly on uniparental incubator probably because both the parents share nest attendance duty alternatively, so that, it is rarely energetically stressful. However, over exploitation of a partner in parental care often results in desertion.

Behaviour of Nestling

Nestling aggression

Nestling aggression wide spread among avian taxa. Amount of food delivery to nestling is considered as an ultimate causes of nestling aggression in many species (O' Connor 1978, Mock *et al.* 1990). Nestling aggression has been recorded to increase during food supply in some species. However in some species, amount of food did not seem to affect nestling aggression (Mock *et al.* 1987). It is attributed to the fact that various other factors also influence nestling aggression of proximate level such as.

1. Degree of hatching asynchrony (Fujioka 1985, Mock & Ploger 1987).
2. Size of food items (Mock *et al.* 1987)
3. Current food amount delivered at nest (Drummond and Garcia Chavelas 1989).
4. Current brood size (Jakubas 2004).

These factors ultimately related to amount of food but mechanism in which they operate may vary with species depending upon ecological adaption. The study was carried out to find out the proximate factors which govern nestling aggression in the Cattle egret and how it effects food distribution among siblings.

Food Provisioning

In altricial bird, chicks are helpless at the time of hatching and require appreciable amount of food for growth to fledge. Therefore food provisioning rate should be high to satisfy energy demand of rapidly growing chicks. Several studies have shown that food provisioning rate is governed by number of nestling in the nest or by begging rate. As self-feeding parents have to forage for hungry chicks, increase in brood size often imposes stress on parents which is revealed by increased rate in the loss of parents body mass and reduced growth rate or weight of chicks at fledgling stage. Because parents have limited resources (i.e; time and energy). Parental role is crucial in determining food provisioning rate and the number of chicks fledged.

Only with nestling exercising their wings or making short flights. Although it has been proposed that structured flight formations have behavioural functions e.g. advertising information centers (Williams *et al.* 1976, Ward 1978), one benefit of the close association with other birds is that it reduces energy expenditure as a result of improve aerodynamics. Lissaman and Schollenberger (1970) suggested

that by flying together rather than separately, 25 birds could increase their flight range by approximately 70%.

RESULT

Nestling development

Chicks hatched asynchronously. At hatching, the Cattle egret chicks were altricial with close eyes. Most of its body had a sparse cover of soft feather almost after 12-15 days chicks were seen in the nest distinctly have black beaks with pinkish white plumage. The grayish down covered the head and dorso lateral area with whites in colour. The bill was black while legs were uniformly pinkish white in colour.

At 1-3 days, the chicks was blind and having grayish coat of down. The 3-6 days old chick was having open eyes. It was raising the body, and threatened the intruder by creating sound. They tried to stand erect on their weak legs with support of the bulging abdomen. The chicks gave short note "Cheek" at that time. The sheath of the premises and rectrices began to grow. Feathers having snow white in colour, Plumage began to turn more whitener and chicks initiated stepping in the nest. The bill legs, neck and wings also grew. The nestling attained 175 gm. weight.

At 6-9 days of age the nestling was having grayish colour on back side of feathers. The body parts further develop and the colour become grayish white. Beak was small black in colour and legs were grey and enlarged especially at the joint between tibia-tarsus and tars metatarsus. The neck area turned grayish to pinky creamiest and further whitish.

Fledgling development

The nestling started flapping the wings at the age of 9-12 days. The chicks were not guarded all the time during this stage. The body was covered by feathers along with the snow white on the whole body and on the down surfaces of feather was grayish. The nestling becomes fledgling at this stages chicks were noticed more active, alert, and aggressive with full white plumage and with yellow beak. The fledgling continued to more around the nest.

At 9-12 days of age the young egrets attained 220 gm. weight. It excreted fecal matter outside the nest. The fledgling stood on the nest most of the day and begged for food from parents. Chicks were flapping their wings vigorously, walking on the nest and greeting parents at the time they arrived.

The young Cattle egret of 12-15 days was fully feathered and the feathers began to unsheathe. The fledgling attained 245 gm. Weight.

At 15-18 days of age climbed to the nest tree but returned to nest after some time. It moved about the nest and made the nest flat. The fledgling become more aggressive.

Activities like preening and clearing the waste out of the nest were seen in fledgling at the 15-18 days of age. The nap area becomes yellowish. The fledgling attained 375 gm. weight .

The fledgling made short flight between the branches of nest tree at 18-15 days of age. It attained 399 gm. Weight.

At 21-24 days, the body parts of the fledgling continued to grow. It walked atop the tree parents fed fledgling out of the nest but on the nest tree.

The fledgling at 24-30 days of age was fully grown. It left the nest under safe guarding by the parents. Female guided the fledgling to the safe site out of the nest tree. The young egret attained 456 gm. weight at the time of leaving the nest. Body measurements of developing nestling and fledglings are tabulated in Table: 6.15. During the chick's development, parents were found to feed 6-10 times a day by mouth to mouth packs chicks begging for the pack of a food was seen as a darting of the beak on parent's lower mandible. Whenever chicks failed to pack, they continued mock pocking by thrusting their beaks in the direction of parents bill. As hatching was synchronized, competition among the different aged siblings was noted in a nest having two and three successfully growing chicks. The chicks having better growth took advantages as a rule of thumb, empty stomach younger chick mocked for a longer time than the elder sibling's parent's continued to feed chicks out of the nesting site also.

DISCUSSION

Incubation is done by both the parents alternatively. During parental care Cattle egret (Both Parents) collected their food from the vicinity and give to their young ones. They live collectively in the breeding colonies on trees and therefore they have no fear from other birds. Still they do not leave their nest for a long time. Adult were ever seen at the site and they were regularly seen foraging nearby fields. A good parental care was seen in Cattle egrets. Both the parents took equal part in the weaning of chicks. The chicks were continuously fed through the day from morning till late afternoon. Analysis of chick's droppings and the regurgitates pulp fallen from the mouth of the adults revealed that the chicks were fed chiefly on insect diet. When after some time chicks, was able to fly the Cattle egret live near with their young ones in the first week of September the birds with their younger once were seen in rice field near water in the morning time. Both the parents ensure success incubation by regularly attending the nest. However, at night only female attends the nest whereas; the male usually remains in the vicinity of the nest. Both the parents follow energy stress during nest attendance. It may because of reduced foraging period (Walsberg 1983a, 1983b).

The male egret for a longer period than the female during day time. The female exclusively incubates in the night. Therefore, the incubation burden is almost justified. Feeding of female by male at nest is also very common in Cattle egret. Such behaviour exhibits leading and responsible role of the male. The chick rearing is exclusively carried out by the female Cattle egret. The male egret feeds the female during this period. Thus it is energetically period of the nesting cycle as reported in birds (Ricklefs 1974, Walsberg 1983b). For aging time constraint as a result of obligation to remain present at nest imposes considerably energetic stress on parents to gather food for young's and self-maintenance. Therefore coordination between the parents in most essential during this period. Number of feeding trips and amount of food delivered to nestling by male and female are almost equal. Paternity assurance actually induces parental care in the parents of birds (Moller and Birkhead 1993b). The male parental care in birds is reported as reduced when the female is engaged in cuckoldry (Westneat 1988). Equal parental care observed in the Cattle egret further supports the finding that EPC is not common in the population the Cattle egret our finding are in consonance with the findings of Rodger's 1980b. In the Cattle

egret both the parents attended the nest alternately and they changed their duties twice or four times a day. Though change in duties facilitates feeding parents, but nest attendance definitely affects feeding as reported in other birds also (Walsberg 1983 a). Cooperation between the nesting partners is essential to relieve one another for foraging. Conflict was never observed during nest attendance in the Cattle egret. The birds at nest during incubation often change the position to avoid facing the sunlight. While changing its position; the bird also rotates its eggs to incubate evenly. The incubating egret adopted many gestures to adjust with the rising heat. It also kneeled down and placed its neck on a rim of the nest to rest in the afternoon. Such as the egret regulates the temperature during incubation. It also vigorously flutters its neck to keep itself cool.

As chicks are nidicoles or "nest dwellers" one of the parents duties is to protect them against weather and especially from extreme heat of Rajasthan. Thus continuous guarding of chicks of the Cattle egret for 2 weeks is essential. Because after 2 weeks the chicks were noticed to exhibit forwarded display; a jobbing to intruders such as House crow and research assistants etc. It indicates their ability of self-protection in the absence of parents and hence constant guarding by parents was no longer required.

Asynchronous hatching in birds leads to avoid more fight among equally grown chicks, more food demand and increase survival rate (Mock and Ploger 1987). Mouth to mouth feeding of asynchronously hatched chicks by regurgitating semi digested food was observed in the Cattle egret following their continue begging display. Feeding packs were more or less equal to growing chicks with the little increase of visits made by parents. However, the chicks hatched earlier gained slightly more food than the other one. But synchronously hatched chicks like other birds do not suffer much and hence the mortality is comparatively less in the Cattle egret. Growth trajectories of nestling Cattle egret within a brood found is typical hierarchy, in which senior sib achieved highest growth rate than the younger sib. Discrepancies in growth rate between B and C chicks were greater than A and B chicks. A similar pattern has been recorded in Great Egret by (Mock 1985), and in Black ibis by (Soni and Sharma 2007). The result is consistent with the prediction from hierarchical model, that greatest discrepancy should exist between last two than first two nestlings. Nestling growth in birds is related to amount of food they received Quinney *et al.* 1986. Therefore, the disproportionate growth rate of siblings among a brood is clearly attributed to unequal food distribution among brood members which were skewed towards senior sib. Asynchronous hatching created competitive asymmetry among sibling that confers feeding advantage to senior sib because of better locomotive ability. Therefore, senior sib succeeded more often to scissoring parent's bill and thus sequesters substantially more share of parental feeding leaving behind junior sib. The last hatched chick received food whatever left by its seniors. But in the Cattle egret the youngest chick does not die due to shortage of food as clutch size is not big as in many other species (Zach 1982, Mock 1985). The growth trajectory of chick that dies due to starvation is 'D' Chick which is rare in the Cattle egret.

Nestling aggression seems to play a crucial role in monopolization of food during parental feeding. Prey size hypothesis predicts that selection favours senior nestling that

assault on junior sib and gets the prey if it is small (Mock 1984b). The result of the present study agrees with the hypotheses. The nestling Cattle egret mainly feeds chick with the small prey and senior chicks can easily monopolize food by gaping into parent's mouth. Fighting among the nestlings may not be fatal as external injuries were not found on junior chicks. Nestling aggression increases with number of chicks in the nest. Contrary to this the fighting rate in the Cattle egret was recorded higher in B/2 brood than B/3 brood. Nestling aggression in birds increases when food is scarce (Mock 1984b). However, it did not appear in the Cattle egret as food was sufficient to the small number of chicks. In present study it was also observed that male parent feed mainly to first chicks and female feed more to second or junior chicks. The senior chicks achieve highest individual fitness through nestling aggression by maintaining dominance status and monopolizing food. Similarly in osprey, it was observed that's senior chicks dominated junior one.

The young birds of the Cattle egret were able to move in the nest at the nest when 12 days old. They were able to fly well at 21 days and left the nest at the age of 45 day (Table: 1). These results agree with the other egrets and wading birds (Urban 1974, Olmos and Silva 2001). However, in some egrets the chronological development is completed earlier than the Cattle egret inhabiting arid zone of Rajasthan where scarcity of food exists. Body parts developed at different rates in the Cattle egret. Leg structure grew fastest and wing and tail were the next fastest. The tail did not begin to grow until day 16 but reached 90% of its final size only 15 days later. The bill was the slowest growing structure. At fledgling time, toes and tarsi were adult size. The bill only 68% and took 120 days to reach adult size. The feathers required 66 days to reach the adult size. The weight of fledgling was 80% of adult weight. The initial rapid growth of feet and legs enables nestling egret to perch walk climb and cling at an early age. They are able to remain near the nest, move in trees or land to follow parents and avoid predators. Such a fast development of legs in other ciconiiformes is very common. As the Cattle egret forage by walking and probing, full development of walking structures at fledgling is obviously adaptive conversely a bird with a fledgling strategy involving walking does not depend on the rapid maturation of flight structure.

The development of the bill and weight is slow. Increase in weight gets lowered when the nestling begin to flap the wings. Flapping of wings is resulted in loss of energy. Lowered body weight probably results in significant metabolic savings. Slow bill development may be related to a gradual increase in foraging proficiency. The development of orange colour on the around feather on the neck and upper side of anterior site in and around Laxmangarh city during breeding season takes more time as compared to such egrets of Gujarat region become of availability of crabs as food in the later region.

Table Number of nests in breeding season from 2010 to 2012.

Nesting Site	Location	Nesting tree	2010	2011	2012
Todi College Camps (U)	Laxmangarh	Vilayati babool	1	1	1
Shradhanath Ashram (U)	Laxmangarh	Peepal	1	1	1
Nehru Stadium (U)	Laxmangarh	Vilayati babool	1	1	1
Nehru Stadium(U)	Laxmangarh	Vilayati babool	1	1	Nil
Bhooth nath mahadev(U)	Laxmangarh	Neem	Nil	1	1
Bhooth nath mahadev(U)	Laxmangarh	Neem	1	1	1
Bhooth nath mahadev(U)	Laxmangarh	Neem	1	1	Nil
(R)Bagri road farm house(R)	Laxmangarh	Peepal	1	1	Nil
Forest campus (R)	Laxmangarh	Peepal	1	1	1
Sheep breeding station(R)	Fatehpur	Vilayati babool	1	Nil	1
Front of MITS(U)	Laxmangarh	Vilayati babool	1	1	1

Bagari School(U)	Laxmangarh	Neem	1	1	1
Gurukul School(R)	Harswa	Neem	1	1	1
Shree Shyam Mandir (R)	Chudi miyan	Neem	1	1	Nil
Panchayat Samiti(U)	Fatehpur	Peepal	1	Nil	Nil
Guawarian Mohala (R)	Laxmangarh	Peepal	1	Nil	1
Badka Balaji(U)	Laxmangarh	Peepal	1	1	1
Todi Kui Mandir(U)	Laxmangarh	Neem	1	1	1
Nehru Stadium(U)	Laxmangarh	Vilayati babool	Nil	1	1
Nehru Stadium(U)	Laxmangarh	Vilayati babool	1	1	Nil
Budh giri mandi(U)	Fatehpur	Neem	1	1	1
Powar house area(R)	Manasi	Neem	1	Nil	Nil
Kabristan Bhumi (U)	Laxmangarh	Neem	1	1	1
Krishna Goshala(U)	Laxmangarh	Peepal	1	1	1
Goenka public school campus(R)	Ghassu	Neem	1	Nil	Nil
			24	20	17

U=Urban R=Rural

Table The Cattle egret nestling development chronology studies at the nest in the Urban and Rural area of Laxmangarh city a Table: 6.15 Body measurements of developing nestling of the Cattle egret s assessed during 2010-2012 breeding session.

Ages (days)	Characteristics
12-15	Incubation
1-3 days	Unable to move blind and having light pinkish creamy coat of feathers, black feather on head and bill is also black in colour. Can raise the body, and threaten the intruder by creating sound. The sheath of the remiges and rectories begin to grow. Wing and tail feathers sheathed and growing, some feathers appearing on back and very thinly, belly feathers have some coloured pigment. The bill and legs also grow the nestling attains 175 gms weight.
3-6 days	Nestling has differed coloured spots on shoulder primaries are 7.2" in length. Bill, legs and tail feathers further develop. The color of body becomes greaish white.
6-9 days	The while body is covered by feathers. Head is snowy white and bill is yellowish in colour: now it starts the flapping the wing. The bill legs and spots on shoulder further develop. The fledgling moves about the nest.
9-12 days	The bill, legs, wings, tail feathers develop. The fledgling attains 245 gm weight. It excretes fecal matter outside the nest and can feed on the food reaming at the nest. The young stands on the nest most of the day and begs for food from parents. Body fully feathered; wing and tail feathers beginning to unsheathe.
12-15 days	Wing feathers fast losing their sheathes. Body, bill, neck, legs, tail, wing continue to grow. Climbs to the nest tree but returns to nest after some time. Moves about the nest and makes the nest flat. Both parents feed. The fledgling becomes aggressive; feathers continue to lose their sheath. The fledgling attains 375gms weight.
15-18 days	The body, bill, legs, tail, neck, wings continue to grow. The fledgling attains 399 gms weight. It becomes aggressive and flap wings at the time of feeding. The nape area becomes whitish. It clears the waste out of the nest. Preening is performed.
18-21 days	The body part continues to grow. The fledgling makes short flight between the branches of nest tree. It makes a sound for begging food from parents the female feeds more than male. The fledgling attains 456 gms weight.
21-24 days	The body parts continue to grow slowly. The fledgling attains 476gms weight. It is able to make short flight from nest to branch of nest tree. Walk atop the tree. Parents feed fledgling out of the nest but on nest tree.
24-27 days	Fledgling is fully grown. It leaves the nest under safeguarding by the parents. Mother guides it to the site out of the nest tree. Both parents continue to feed this fledgling out of the nest tree. The fledgling attains 510. gms weight at the time of leaving the nest.
27-30 days	
After 45 days	The young Cattle egret left the nest independently

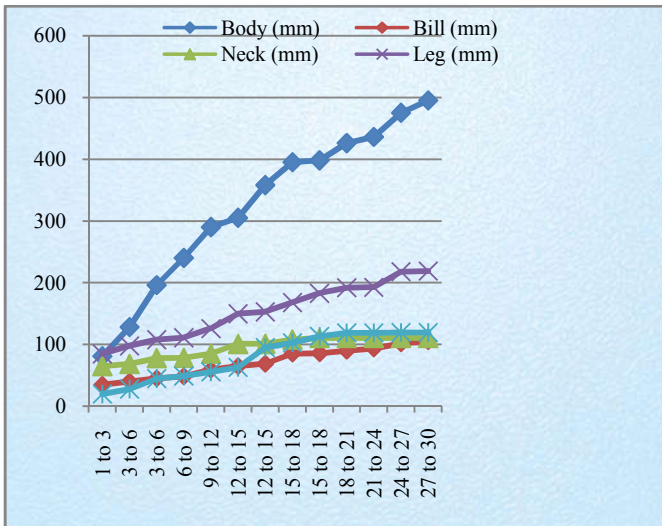


Fig Growth of various body parts of the Cattle Egret

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