Nesting Ecology of Asian Openbill at Raiganj Wildlife Sanctuary, West Bengal

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Abstract

About 30-40% of the existing population of Asian Openbill breeds every year at the Raiganj Wildlife Sanctuary of West Bengal from the end of June to December. Spots near the central zone of the heronry, around water bodies where human interference was least, were most preferred for nesting. Openbills were found to utilise 32 tree species for nesting, with a clear preference for *Lagerstroemia speciosa*(49.7%), *Barringtonia acutangula* (10.4%), *Terminalia arjuna* (10.1%) and *Alstonia scholaris* (7.4%). The nesting height ranged from 3.25 m to 14.1 m, and the nests were placed at a distance of 0.58 (± 0.21) m from the nearest one. Fresh twigs and branches constituted about 46% of the nesting materials; dry materials collected from the ground made up 13%, and rotten leaves, aquatic weeds, etc. collected from water bodies constituted 41%. It took 4-10 days (average 6.88 ± 1.58 days) to construct a full-fledged nest, with a diameter of 0.32 m (n = 76; SD = 0.043) and a cup height of 3-4 cm. However, nesting materials were added regularly to the nest right up to the fledging of the young. Both sexes contributed to the nesting activities, having major contribution of male up to laying stage. After the laying and hatching of eggs, the females played an increasingly greater role in nest maintenance. During the incubation stage, prior to hatching period, each nest was watered 2-6 times (3.35 ± 1.21 times) in a day. Probably water was sprinkled over the nest to decompose the leaves and shrubs so as to form a cementing material that was useful in holding all the hard parts together. Despite huge parental investment and care, 11.2% of the nests were destroyed due to various reasons. Intraspecific fighting for space and mates was the main cause for most (71.3%) of the nesting failure.

Keywords : *Asian Openbill; Nesting ecology; Raiganj Wildlife Sanctuary; Heronry.*

Introduction

The Asian Openbill Stork *(Anastomus oscitans)*, the smallest member of the stork group, is restricted mainly to South-east Asia and the Indian Subcontinent. The remarkable gap between the arching mandibles makes this bird distinct from the other members of the group. Openbills are colonial in habit and frequently nest in mixed species colonies, called heronries, with other waterbirds. A huge breeding assemblage of adult Openbills in white and glistening black breeding plumage is a splendour to appreciate.

In 2002, Wetlands International (Anon. 2002) estimated the global population of the Asian Openbill as 1,30,000. About 30-40% of the existing population of Asian Openbills visits Raiganj Wildlife Sanctuary regularly for breeding. As a result, this is not only an internationally acclaimed heronry but also a centre of attraction from the conservation view point.

Several factors play important role in the selection of a habitat for nesting and in the selection of specific nesting strategies (Kushlan 1981). Specific nesting activities (Hansell 2000) are related to intra- and interspecific adjustments (Burger 1981, Datta & Pal 1995). Storks in particular are more selective in nesting, and many factors such as water level, habitat destruction and human interference have been found to impair their nesting (Luthin 1987, Singha *et al.* 2002, Verheugt 1987, Winn *et al.* 2008). So studying the nesting ecology of the Openbill Stork at Raiganj Wildlife Sanctuary, one of the largest heronries of its kind, will provide details of the ecology of the smallest stork.

Tanmay Datta | Associate Professor, Department of Zoology, Ananda Chandra College, Jalpaiguri-735101, West Bengal | **Email :** tdatta1963@gmail.com

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Methods

Study Area

Raiganj Wildlife Sanctuary (25°38′14″N, 88°07′08″E) is located in Uttar Dinajpur District, of West Bengal, about 4 km away from the town of Raiganj. Since 1962, Openbill Storks have been breeding in this sanctuary regularly. The total area of the sanctuary is 321.23 acres, but the area of the heronry itself is only about 36 acres. The sanctuary is traversed by a number of artificial canals. The central U- shaped canal is the main one, and it is connected to the River Kulik. The nesting area sprawls around this central canal, and birds use this perennial canal for various purposes all through the breeding season. The average annual rainfall of this area is about 1840 mm, with almost 78% of the precipitation occurring during the monsoon (June–September).

Data Collection

Ecological and behavioural data were collected throughout the breeding season. Observations were made between 0430 and 1930 hrs, particularly in the morning and afternoon hours. Most of the observations were made using a 10X50 pair of binoculars from a 11 m high observatory and from some vantage spots on the ground where the bird life was affected least by human disturbance. Nest-site characteristics were measured after the emergence of the first batch of hatchlings since the chances of changes in the number and position of nests after this period are low. Habitat characteristics were measured just before the breeding season.

Results and Discussion

Nesting Season

The first batch of storks used to arrive in this sanctuary for breeding in the third week of June. But initiation of nesting starts a week back. Many nests (19.4%) were initiated even 2 months after the first nesting attempt in the sanctuary or later. Young ones were raised successfully even in some nests that were initiated after mid-September. As found in some other studies (Custer & Davis 1982, Ryder 1980), the nesting season was prolonged by the late arrival of younger birds.

Selection of Nest-Site

On arrival at the heronry, the Openbills first settled on some lofty trees that were not their usual nesting trees. After two or three days, they took possession of sites on the nesting trees. However, during the next day or two, they changed the sites a few times before they selected the final nest-sites. During this period of searching, the birds tried to determine the best available site. The choice of site often determines the ultimate breeding success (Hatchwell *et al.* 1999, Kolbe & Janzen 2002). The time between the arrival at the nesting tree and the final selection of a particular spot varied greatly among individuals. Birds that arrived early spent lot of time in nest-site selection, probably because they had sufficient time to rear a brood and there were plenty of sites to choose from.

The Openbills utilized all available suitable spots at heights between 3.25 m and 14.1 m for nesting. The nesting height was mostly determined by the height of the nesting tree. On average, the distance between a nest and the nest closest was 0.58 (± 0.21) m. Nests were more densely spaced in those trees that were closer to water bodies and where human interference was less.

Roles of Sexes in Nest-Site Selection

Male Openbills took various initiatives to find out a suitable nesting site. After selecting a spot, a male tried to attract the mate with pair-forming displays from that spot. In 83.6% of the cases, that spot was ultimately used for nesting; but if a male failed to attract any female within 2–3 hours, it deserted that spot. Thus a male choses a site first to attract its mate, and when it obtained a positive response from the female, that spot was used for nesting.

After pair formation, both the partners passed most of their time at the nest-site and exhibited pair-maintenance displays from time to time, with 'twig swaying' behaviour (1.26/10 minutes). At the onset of the season, it took on average about 4.8 days for nesting to start after pair formation, but at the end of the season birds started nesting almost immediately after pair formation.

Preference of Nesting Tree

In this sanctuary, Openbills were found to utilize 32 tree species for nesting. However, the preference was clearly skewed towards *Lagerstroemia speciosa* (49.7%), *Barringtonia acutangula* (10.4%), *Terminalia arjuna* (10.1%) and *Alstonia scholaris* (7.4%). Nesting in many unconventional tree species such as *Dalbergia sissoo*, *Neolamarckia cadamba, Tectona grandis*, *Ailanthus excelsa*, *Swietenia mahagoni* and *Eucalyptus sp*. was commonly observed. Actually the Openbills preferred to nest in almost any available tree species in the central zone compared with nesting on a conventional tree species in the peripheral zone.

Nesting in Relation to Water Body

Colonially nesting waterbirds, particularly Openbill Storks, usually nest in trees situated in or surrounded by water (Kushlan 1986). During this study period, about 35% of the nesting zone remained inundated, under 15–25 cm of water, for more than 70 days during July–September. However, most (52.3%) of the nesting trees were situated in dry areas. But the canals and ditches of the sanctuary create a natural moat of water that keep away terrestrial predators. Birds of the order Ciconiiformes lack specialized nest defence mechanisms and rely mostly on water moats for protection against land predators (Frederick & Collopy 1989).

Construction of Nest

In the beginning, only twigs and fresh branches were used in nest construction. All these materials were light and flexible and had several leaves. In nests that were started later in the season, shrubs were also used at this stage. As a result of the high moisture content, these soft materials wither and get wrinkled within a short period and thus get glued to one another, forming an anchored mesh-work of considerable strength. Usually 14–20 twigs were required for this phase of construction.

After the construction of a circular structure of diameter about 0.20 m, a large number of hard components were gradually added to the nest. These included fresh branches, dry branches and sticks measuring about 30–60 cm in length and weighing 40–80 g. Those allowed the nest to withstand the weight of an incubating bird and, later, nestlings. Around 60 to 80 of these items were added to form a thick circular pad in the form of a low cup, about 1–2.5 cm high. At this stage the nest appears complete, but its construction is still loose, and the constituent nesting materials are easily separable from one another.

Table 1 : Size of nest at different phases of breeding with for different brood sizes

No. of nestlings	n	Area of nest at hatching (cm^2)	Area of nest at fledging (cm^2)	Increase in nest area from hatching to fledging (%)
1	21	774.72	929.83	20.02
2	40	794.58	998.83	25.33
3	56	829.95	1257.2	51.48
4	38	824.85	1425.95	72.88

Roles of sexes in nesting. Both the partners took part in nesting; however, the male carried out most of the work, collecting almost 70% of the nesting material. Especially at the first part of breeding, the male performed most of the nesting related work. However, with nestlings in the nest, females had an increasingly larger role in nest maintenance.

Guarding of nests was also attributable to both partners, with a male bias. Thus the success of nesting depends on both the sexes.

Use of Materials for Nesting

Although the Openbills used fresh twigs and branches from all the available trees in the sanctuary, the preferred species (indexed as plucking of twigs/tree/hour) were definitely *Lagerstroemia* speciosa, *Barringtonia acutangula, Dalbergia sissoo, Eucalyptus sp., Ailanthus excelsa and Albizzia lebbeck*. Some unusual materials such as cloth, paper, plastic and jute fibre were also found in the nests. About 46% of the materials were fresh twigs and branches, 13% were dry materials collected from the ground, and 41% were rotten leaves, aquatic weeds, etc. collected from water bodies. Aquatic materials were increasingly added in the later phase of nesting and continued till the end.

Water Sprinkling at Nest

Like many other storks, Openbills also sprinkle water at the nest. Usually, when both the partners were present at the nest, one of them went to the water body and, on returning to the nest, placed nest materials on the nest first and then regurgitated almost 80–150 ml water over the nesting materials. Water drooling was observed mostly (70.5%) during the incubation stage. In the pre-laying and post-hatching periods, the levels of incidence were 12.54% and 16.96%, respectively. Watering of nests was observed only after 0730 hours and peaked between 0845 and 1130 hours. Thereafter it decreased abruptly. These incidents were not recorded after 1535 hours. During the egg stage and early hatching period, each nest was watered 2–6 times (3.35 ± 1.21 times) in a day. Both sexes were found to sprinkle water. But in the pre-laying period, it was done mostly (85.71%) by males. The participation of females in this work increased as the age of the clutch increased. However, the overall contributions of males (53.47%) and females (46.53%) were almost equal ($\chi^2 = 0.97, P > 0.1$).

Kahl (1972) and Thomas (1984) presumed that water drooling serves the function of thermoregulation and is useful in egg cooling and in maintenance of the right humidity. But Datta (1992) opined that water drooling is associated primarily with nest maintenance. Probably water is sprinkled over a nest so that the leaves and shrubs decompose so as to form a cementing material that holds the hard parts (branches and sticks) together. Actually, on analysis it was found that the hard materials of the Openbill nests were not interwoven (as is found in the nest of many other birds); rather, they were piled one over other and held together in a single mass by decomposed leaves and herbs.

Nesting Synchrony

Nests on a particular tree were mostly (65.8%) initiated within a period of 2 weeks. In more than 80% of the birds, the nearest neighbours initiated nesting within 8 days (3.65 ± 1.88 days, n = 868). Nesting asynchrony was prevalent in the peripheral zone. In four instances, the interval between the initiation of the first and last nests on a particular tree was more than 75 days, and all these trees were located in the peripheral zone. Nesting synchrony probably helps reduce aggression (Burger 1980, Petterolf 1984). Synchronous nesting reduces intraspecific interference because of the similar reproductive drives (in time) of neighbouring birds (Petterolf 1984, Jovani & Grimm 2008).

Nesting Failure

Despite huge parental investment and care, 11.2% of the nests were destroyed due to various reasons. The following were the three main causes of nesting failure:

Intraspecific fighting: Intraspecific fighting for space and mates was a common feature. During the prolonged course of fighting, many nests were destroyed, even those with eggs and hatchlings. Of all nesting failures, this particular type of failure alone accounted for 71.3%.

Clutch/brood stealing by House Crow : House Crows (*Corvus splendens*) used to steal eggs or hatchlings in the absence of parent birds. After the total loss of clutch or brood due to such opportunistic stealing, parents deserted the nests. This accounted for 7.7% of all nesting failures.

Nesting on unusual spot : Young, inexperienced birds often nested in some unusual spots that were not suitable for nesting and ultimately faced the fate of failure at different stages of reproduction, ranging from 7 days of nesting to the nestling stage. This type of nesting failure accounted for 4.9% of all failures.

In 16.1% of the cases, however, nests were found to be abandoned due to some unknown reasons. Intact or partially lost clutches were found in 26.1% of such unattended nests, and there were dead nestlings in 8.7% of such nests. Nesting loss due to natural calamities such as storms and floods was also a common feature at this heronry.

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