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Ethology and Nesting Behavior of Sarus Crane (*Grus antigone*) in Faridpur *Tehsil* Under Bareilly District of Uttar Pradesh

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ABSTRACT

Sarus crane is one of the most impressive birds on earth and an indicator of healthy agricultural land and wetland. This study between August 2011 to July 2012 was to examine the Sarus crane ethology and nesting behavior during breeding season in Faridpur *tehsil* under Bareilly District of Uttar Pradesh. The survey method consisted with the collection of data from primary and secondary resources. During the study, a total 11 nests was encountered in 10 selected villages. Study showed that in every village Sarus crane was present in a pair. During the nesting time they become territorial. All nests were located in the marshland and agricultural land with the different variety of plant species. The nests size varied with height and width. The mean nest diameter was recorded to be 166.16±1.04 cm whereas mean nest height was 30.5±0.68 cm. The mean diameter of nesting area in paddy field was 159±1.35 cm.

Key Words: Ethology; Nesting Material; Courtship; Breeding

INTRODUCTION

A nest is the place where a bird lays and incubates eggs and raises its young ones. Nest-site selection is an important determinant of individual fitness in birds. Understanding what information individuals use to choose nest sites is therefore important for understanding the (Citta and Lindberg 2007).

Indian Sarus crane (*Grus antigone antigone*) is the world's tallest flying bird and the State bird of Uttar Pradesh (Ansari 2015). The Sarus Crane ranges from India to Australia and has been classified as 'Vulnerable' to extinction (BirdLife International 2012). There are 15 crane species in the world, and Sarus crane is one of them. It is resident breeding crane in India. Indian Sarus crane is a worthy flagship species for the reason that it is a charismatic, and symbolic bird species inhabiting large wetland area scattered in agricultural landscapes of Uttar Pradesh and known for its marital fidelity, believed to mate for life and pine the loss of their mates even to the point of starving to death (Jha 2013 and Yaseen et al. 2013).

Mated pairs of cranes, including Sarus cranes, engage in unison calling, which is a complex and extended series of calls where male and female vocalizations differ but are coordinated. The birds stand in a specific posture, usually with their heads thrown back and beaks skyward during the display. In Sarus cranes the female initiates the display and utters two calls for each male call. The male always lifts up his wings over his back during the unison call while the female keeps her wings folded at her sides. All cranes engage in dancing, which includes various behaviors such as bowing, jumping, running, stick or grass tossing, and wing flapping. Dancing can occur at any age and is commonly associated with courtship, however, it is generally believed to be a normal part of motor development for cranes and can serve to thwart aggression, relieve tension, and strengthen the pair bond (ICF 2017).

Nests of all Sarus Cranes consist of wetland vegetation. In India, nests located in flooded rice paddies are constructed entirely of rice stalks. Indian Sarus cranes breed primarily during the rains, with few pairs breeding outside this season in response to chick loss and creation of nesting habitat due to flooding caused by irrigation canals (ICF 2017).

Sarus crane is an agricultural and wetland bird with the largest population in Uttar Pradesh; therefore in this study we summarize the ethology and nesting performance of Sarus crane in Faridpur tehsil of Bareilly District, Uttar Pradesh.

STUDY AREA

Bareilly district is located in the north western part of U.P. and lies between latitude 28°10 N, and longitude 78°23 E. The district consists of six tehsils (district subdivisions) and fifteen blocks (Figure 1): These are Aonla, Baheri, City of Bareilly, Faridpur, Meerganj and Nawabganj. Bareilly district is a part of Bareilly Division. Faridpur Tehsil is also known as Pitamberpur. Faridpur is a town and a nagar panchayat in Bareilly district. Presently Faridpur is famous for Jari (embroidery work on cloth) work, and Gold and Silver Jewelry. Faridpur is located at 28.208611°N and 79.538056°E. It has an average elevation of 215 meters. Faridpur Tehsil located between 271 km in the north to Delhi and 228km in the east to Lucknow. There are two rivers namely Ramganga and Behgul. Ramganga flows in the south and Behgul in the north in Faridpur Tehsil. There are 385 villages in Faridpur tehsil which is divided into two blocks Faridpur (298.38 km^2 area) and Bhuta (323.84 km^2 area).

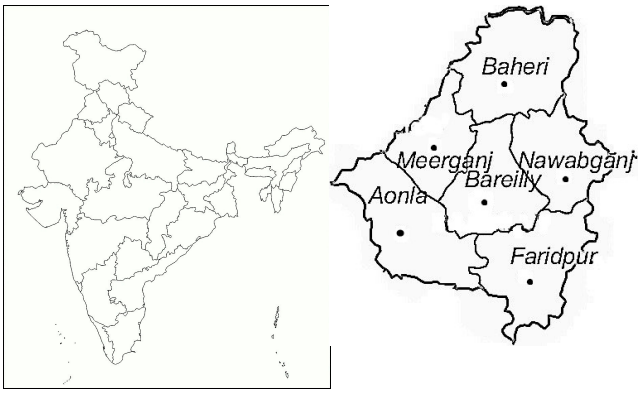

Figure 1. Location of Bareilly District in India (left) and various tehsils in Bareilly District (right)

METHODS

Field work was done from August 2011 to July 2012. Locations were selected from the villages where Sarus crane inhabits the whole year. Primary and secondary resources data were collected. Primary data were collected by direct field visits (Singh and Sharma 2011) and secondary from other sources. Multi-stage random sampling was used to selected survey villages. Faridpur tehsil composed of 385 villages. During the present study a total of 32 villages of Faridpur tehsil were extensively surveyed for the presence of Sarus cranes. Out of these 10 villages selected for the study which is 2.59 % of the whole (Table 1).

The survey was done to assess the current status of habitat and food resources use by Sarus crane. Field observations were carried out which cover agricultural fields, wetlands, river side and ponds. Several visits were done in the early morning and late evening near the Sarus crane inhabits in the selected villages.

To study various aspects of bird habitat use and feeding ecology *ad libitum* sampling was used. Often abbreviated as *ad lib*, records as much information as possible. It is informal, non-systematic, and often used in field notes. *Ad lib* sampling may sound thorough, but because the observer can never keep track of everything that is going on, the results of these observations will always be biased by the behaviors, individuals, or situations that most attract the observer's attention. It is therefore hard to derive reliable, precise and quantitative information based on these observations. Its main value is in research planning, and in studying rare but fairly obvious behaviors (Altmann 1974).

Table 1. GPS locations and area of villages with the presence of Sarus cranes

S. No.	Village	Area (ha)	Latitude	Longitude
1	Pachomi	442.93	N 28^{0}10.290’	E 079^{0}33.943’
2	Khanjanpur	345.679	N 28^{0}08.830’	E 079^{0}34.730’
3	Hasanganj	217.557	N 28^{0}09.627’	E 079^{0}36.899’
4	Khanpura	193.883	N 28^{0}11.465’	E 079^{0}37.985’
5	Billaua	162.430	N 28^{0}11.833’	E 079^{0}37.962’
6	Piperthara	206.252	N 28^{0}13.024’	E 079^{0}37.571’
7	Badra	358.629	N 28^{0}13.794’	E 079^{0}37.759’
8	Mewa	371.577	N 28^{0}13.501’	E 079^{0}38.414’
9	Kaherua	44.18	N 28^{0}13.685’	E 079^{0}35.895’
10	Nabada van	488.85	N 28^{0}10.495’	E 079^{0}32.753’

The secondary data were collected from the published literature such as management plans, government documents, official statistics, previous studies on the Sarus crane, technical reports, scholarly journals, review articles, books, computerized databases, and newspaper articles (Shell 1997, Cnossen 1997)

Statistical Analysis

Both quantitative and qualitative data were recorded and considered for statistical analysis. The standard statistical analysis procedure was used that included mean, median, standard deviation as per the requirements (Snedecor and Cohran 1994).

RESULTS AND DISCUSSION

Ethology of Sarus Crane

Sarus crane is basically a wetland bird and commonly seen in marshland, paddy field, non-cultivated agriculture field, marshlands, potato, lentil, mustered and wheat fields where they feed on insects, snails, grains, tuber etc. They spend a long hour of the day in the feeding. During night time, they rest on agricultural field and marshland. During nighttime, they do not allow coming close and also produce loud calls if approached. It was observed that Sarus cranes rarely sit on the field during daytime. In the field for the rest Sarus cranes stand on one leg. Sarus cranes make calls during courtship and also while feeding in a flock. When a flock of Sarus feeds in a marshland and agricultural field and other Saruses are passing in flight over this group, both the flock give a note call to each other. They spend more time in feeding during summer because the water sources get dry and food availability is less.

Courtship Behavior

Bird exhibits the courtship behavior to attract a receptive mate. Cranes were seen dancing and singing in the breeding season to attract their mate. Sarus cranes have a loud trumpet call. In the groups, cranes pronounce it for attracting their mates and also make this call to show aggressive behavior. The male starts dance and make the force full tone to attract the female. During dancing the crane shows jumping and bowing movement. They move their back and tail upward with its long bill in upward direction making matting calls (Figure 2).

Number of Mates

Sarus cranes are basically monogamous. They love each other and make pair for life. Sarus cranes were always seen moving in the field in a pair. Both sexes look same making it difficult to distinguish the sex but generally male is slightly larger than the female.

During the study, one dead Sarus crane was found on 28 November 2011 in Pachomi village in the agricultural field. As per postmortem report of the IVRI, it was a female. Both legs were fractured. The site was visited twice every month and the lonely male was seen feeding in the same area. During visit to the same site on 18 February 2011, the male was seen with another female. Perhaps the lonely male paired with the other female. This was an incidence of mate replacement (Figures 6-8).

Territory

Sarus cranes were seen in pairs and groups. The young Sarus were seen in large groups before making the pairs. In the breeding season, Sarus cranes are territorial. Only breeding pairs make territory and other Sarus crane feed in groups. After the pairing, they make the territory and leave the group and search other place where the water availability is present for nesting. They make the force full tone at the time of making territory. The Sarus pair may allow other species of birds to feed in its territory. However, sometimes it may attack other nuisance birds

During the present study, a breeding pair of Sarus crane was dancing in the paddy field on 13 September 2011. Suddenly one Sarus attacked and killed a cattle egret feeding in the same field. No other Sarus cranes are found near the nest but other birds such as pond heron (*Ardeola grayii*), little egret (*Egretta garzeetta*), white breasted water hen (*Amaurornis phoenicurus*), and black-winged stilt (*Himantopus himantopus*) and other birds were seen. Cranes also show aggressiveness and make the force full tone when the nest and young are in danger.

Nest Construction and Nesting Material

The numbers of nest along with their GPS location were recorded in surveyed village. The breeding season in Faridpur tehsil starts from July and lasts up to October. Sarus cranes prefer the agricultural marshland and non-agricultural marshland for making the nest. The nests of varying size are usually made using aquatic vegetation.

Figure 2. Photographs showing the dancing pattern of Sarus crane

Figure 3. A pair of Sarus crane busy in making nest in Faridpur Tehsil

We recorded different sized nests. The nest diameter, height and place of nesting were also recorded. The Sarus nests were found more frequently in water-logged area followed by crop field area. The height of nests from water surface was recorded along with the diameter. The mean nest diameter was 166.16±1.04 cm whereas mean nest height was 30.5±0.68 cm. The mean diameter of nesting area in paddy field was 159±1.35 cm (Figure 4).

Table 3. Village wise GPS locations and size of nests built in waterlogged area

Village	Nest Numbers	Nest Location	Nest diameter (cm) *	Nest Height (cm)**	Nesting Place
Pachomi	1	N 28^{0}10.104’			
		E 079^{0}34.133’	165	34	Pond
	1	N 28^{0}10.135’			
		E079^{0}35.180’	156	32	Marshland
Khanjanpur	1	N 28^{0}08.830’			
		E079^{0}34.730’	168	30	Marshland
Billaua	1	N 28^{0}11.833’			
		E079^{0}37.962’	164	32	Marshland
Badra	1	N 28^{0}13.794’			
		E079^{0}37.759’	176	26	Marshland
Mewa	1	N 28^{0}13.501’			
		E079^{0}38.414’	168	29	Marshland

* Mean 166.16; SD 6.52; SE 1.04

** Mean 20.5; SD 2.81; SE 0.68

Table 4. Village wise GPS locations and size of nests built in crop fields

Village	Nest Numbers	Nest Location	Nesting Area diameter (cm) *	Nesting Place
Hasanganj	1	N 28^0 09.627’		
		E 79^{0}36.779’	146	Paddy field bund
Piperthara	1	N 28^0 12.203’		
		E 79^0 37.860’	170	Paddy field
	1	N 28^0 13.024’		
		E 79^0 37.571’	156	Paddy field bund
Kaherua	1	N 28^0 13.695’		
		E 79^0 35.902’	158	Paddy field
Nabada van	1	N 28^0 10.447’		
		E 79^0 32.813’	165	Paddy field

* Mean 159; SD 9.16; SE 1.35

The nests of Sarus crane were present in the marshland, paddy field and in the pond. During the study, 11 nests were recorded in 10 villages under study. Sarus crane starts making their nest 12-15 days before egg lying. Both pairs are involved in nest construction. They build the large nest with the use of green grasses and aquatic plants. They pile up rushes, straw, grasses with their roots, durva grass or Bermuda grass (*Cynodon dactylon*) to make a nest (Figures 3 and 4).

When the eggs are laid in paddy fields, nesting material is not collected for nest construction. The eggs are laid in the bunds or somewhere in the field. If the








Figure 4. Nests of Sarus crane in wetlands and agricultural field in Faridpur tehsil (on page 140)

eggs are to be laid in bunds, the area can be well demarcated by presence of dried grasses, small feathers and absence of vegetation in the area. When the eggs are laid in the paddy field, the paddy shoots are pressed down by the bird and eggs are laid upon it. The water availability in the area is necessary for selecting the site for nest building (Figures 4).

During our study, two nests were seen each in Pachomi and Piperthara villages, while only one nest was observed each in Khanjanpur, Hasanganj, Billaua, Badra, Mewa, Kaherua and Nabada-van, with total 11 nesting bird pairs. In village Pachomi, one nest was present near the pond and the second nest in a marshland at a distance of 1.5 km. Similarly, two nests were found in the Piperthara with the distance of 1 km.

Nesting Material

Sarus crane use different type of local grasses, twigs, leafs, shoots, roots and tubers of variety of plants for nest construction. Nest is simple, round in shape with slight depression in the centre.

Table 5. Nesting materials commonly used by Sarus cranes (*Grus antigone*)

Common name	Botanical name	Family
Asian rice	*Oryza sativa*	Poaceae
Jungle rice	*Echinochloa colona*	*Poaceae*
Durva grass	*Cynodon dactylon*	Poaceae
Large crabgrass	*Digitaria sanguinalis*	Poaceae
Knotgrass	*Paspalum distichum*	Poaceae
Benghal dayflower	*Commelina benghalensis*	Commelinaceae
Water Hyacinth	*Eichhornia crassipes*	Pontederiaceae
Bullrush	*Scirpus littoralis*	Cyperaceae
Morning glory	*Ipomoea nil*	Convolvulaceae
Indian Reedmace	*Typha angustata*	Typhaceae
Coco grass	*Cyperus rotundus*	Cyperaceae
Tuber of cyperus	*Cyperus* sp.	Cyperaceae
Unidentified leaf	-	-

Nest Sanitation

During the study, the nests of Sarus crane were seen in neat and clean condition. Droppings were not present in any nest which means they do not defecate in the nest. The egg shells were removed after the hatching. The birds restructure and design the nest from time to time and keep it clean and tidy.

For nesting time, both sexes participate in the construction of nest. Mukherjee et al. (2000) found that both sexes participate in the collection of the nesting material. Nest size was varying and made with the aquatic vegetation. Eleven nests were reported in the study in ten villages and nests were noted in the pond, marshland and paddy fields. Likewise Ali and Ripley (1983) also reported that the Sarus cranes prefers nesting in marshland where they use the grasses, twigs, leafs, shoots, roots and tubers of variety of plants for nest construction. It was observed in the present study that the Sarus cranes construct nest 12-15 days prior to egg lying. The findings are similar to those of Cody (1985) who documented that nest site selection involves the specific choice of a site to build a nest and in marsh nesting birds it usually occurs just prior to egg laying. Mukherjee et al. (2000) found that the Sarus crane started nest building activity just two or three days prior to egg laying. Both sexes participated in the collection of nesting material. Besides using green plants from the surrounding area, dried roots of *Oryza sativa,* straw of *Pennisetum typhoides* and rhizomes of *Cyperus rotundus* were used.

Sarus crane breeding pairs were seen in the July and breeding lasts up to October. Ali and Ripley (1983), Parasharya et al. (1989) and Mukherjee (2000) noted that the breeding season of the Sarus crane in north western India and particularly in Kheda District of Gujarat coincides with the South–West monsoon. Birding in India and Indian Subcontinent documented that Sarus Cranes in India typically breed during the monsoon (July to October) with few pairs breeding outside this period in response to loss of chicks and formation of adequate wetland habitat.

Eleven nests were counted in the study in ten villages. In which one nest was recorded in the pond and five nests each in marshland and paddy fields. Board et al. (2001) committed that most nests were in agricultural marshland (97.14%). Nesting sites on paddy field bunds and marshy wasteland had a common feature in that they were on elevated land within an inundated area. However, selection of non-cultivable agricultural marshland was more common than cultivated paddy crop area. The mean nest diameter was recorded to be 166.16 ±1.04 cm

Figure 5. An old nest of Sarus crane in a dried wetland

Figure 7. The fractured legs of sarus crane

Figure 6. A carcas of Sarus crane in Faridpur Tehsil killed for its blood to use in the treatment of gout

Figure 8. Pair mate of the dead Sarus crane mourning near its carcass

whereas mean nest height was 30.5±0.68 cm in the marshland. Walkinshaw (1973a) had measured dimension of nine nests of Sarus crane. Probably all were taken from natural marshland. His values of length and width at water level averaged 150.7 and 167.7cm across and the nests were narrow on the top. The finding are similar likewise Borad et al. 2001 stated that Sarus cranes avoid deep reservoirs and other wetlands for habitation and, although Indian Sarus Crane is wetland bird, it prefers nesting in marshland and paddy rice (Sundar 2009) of water depth varying between 25 and 65 cm (Mukherjee et al. 2000). Similarly, Aryal (2009) affirmed that average area covered by the nest was 1.45 square meters and average height of nest was 20.3 centimeter that ranged from 45 cm to 12 cm in height from the ground and water level of the ground. The mean depth of water around the nest was 7.9 cm with maximum depth of 25 cm with one egg recorded at Maharajgunj of Kapilvastu district. Mukherjee et al. (2002a) suggested that financial assistance to the farmers for conservation in lieu of paying for crop damage during nesting would reduce egg-chick damage, and, in turn, would improve breeding performances of the cranes.

We recommend that the research with the primary level education for the conservation of the Sarus crane in the Bareilly District should be done with the project. Since Sarus crane is the state bird of Uttar Pradesh and presents a high number in the region, therefore, it is necessary to conserve this majestic species and its habitat. It could be attractive to the visitors and students in the region for tourism and research.

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