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Current status of habitat and food resources use by Sarus crane (*Grus antigone*) in Faridpur tehsil under Bareilly District of Uttar Pradesh

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Abstract
The present survey was carried out in August 2011 to July 2012 to assess the current status of habitat and food resources use by Sarus crane (G*rus antigone*) in Faridpur Tehsil under Bareilly district of Uttar Pradesh with total survey area of 62222 ha. The survey method consisted of the collection of data from primary and secondary resources. The study results showed that Sarus cranes were seen more frequently in the paddy field in the rainy and winter season because of the availability of water whereas in Hasangaj village the number of Sarus cranes in Behgul River was gradually increased up to 80-100 in summer whereas in another season very few Sarus were spotted in the area. In the pond and marshland, Sarus crane was seen probing the snails by their long bill and also feed on small toads, fishes in the pond, panicles of paddy and insects in the submerged water field. Sarus crane searchs the food in agriculture field and feed on germinated seed in the mustard, lentil, ground nut, ear of wheat, and roots of Bermuda grass. The tubers of plants and corn of the aquatic plants also form the diet of Sarus crane.

Keywords: Agriculture, food, G*rus antigone*, habitat, resources

Introduction
A habitat includes all four necessities for a bird's survival – food, water, shelter and nesting areas – though these features can vary greatly between different types habitats. In addition to having the appropriate features to support bird survival, a habitat also includes all the associated landforms (mountain ranges, coasts, plateaus, valleys, etc.), seasonal climate patterns, predators and other wildlife [1]. Non-migratory birds occupy the same habitat year-round, but may adjust their behavior to suit different seasons, such as changing their diet to the most abundant food sources throughout the year [1].
They are conspicuous and iconic species of open wetlands [2]. The Indian state of Uttar Pradesh uses the Sarus crane as its official bird symbol. An Indian 14-seater propeller aircraft, the Sarus, is named after this crane [3, 4]. The stronghold of the species is in India, where it is traditionally revered and lives in agricultural lands in close proximity to humans.
Throughout their range Sarus Cranes utilize a wide variety of landscapes, depending on food availability, cropping patterns, and other seasonal factors. Their optimal habitat includes a combination of small seasonal marshes, floodplains, high altitude wetlands, human-altered ponds, fallow and cultivated lands, and rice paddies. Often they focus their foraging on underground tubers of native wetland vegetation such as *Eleocharis* spp. Compared to other crane species, Sarus Cranes will utilize open forests where wetlands occur as well as in open grasslands more so than other crane species. Where possible, the nests are located in shallow water where short emergent vegetation is dominant [5].
Elsewhere, the species has been extirpated in many parts of its former range. The global range has shrunk and the largest occupied area is now in India. With marshlands largely destroyed, these cranes are increasingly dependent on wet paddy fields in India [5]. In rice-dominated districts of Uttar Pradesh, Sarus crane abundance was highest in the western districts, intermediate in the central districts, and minimal in the eastern districts. Sarus crane abundance was positively associated with the percentage of wetlands on the landscape, and negatively with the percentage of area under rice cultivation [6].
Unlike many other cranes that make long migrations, Sarus cranes are largely non-migratory; they may, however; make short-distance movements in response to rain or dry-weather conditions. The only migratory population is in South-east Asia [7]. They roost in shallow water, where they may be safe from some ground predators [8].

The present study was undertaken to find out to assess the current status of habitat and food resources use by Sarus crane (G*rus antigone*) in Faridpur tehsil under Bareilly District of Uttar Pradesh.

Material and Methods

Study Area

The present study was conducted in selected villages of Faridpur Tehsil in Bareilly District of Uttar Pradesh. The 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 and fifteen blocks:
These are Aonla, Baheri, City of Bareilly, Faridpur, Meerganj and Nawabganj. Bareilly district is a part of Bareilly Division. Faridpur Tehsil also known as Pitamberpur. Faridpur is a town and a nagar panchayat in Bareilly district. Presently Faridpur is famous for Jari work, Sarrafa (Gold and Silver Jewelry). Faridpur is located at 28.208611°N 79.538056°E. It has an average elevation of 215 meters (705 feet). Faridpur Tehsil located between 271 km in the north to Delhi and 228km in an east to Lucknow. There are two rivers present in the Faridpur Tehsil namely Ramganga and Behgul. Ramganga flows in the south and Behgul in the north in Faridpur Tehsil. There are 385 villages are present in Faridpur Tehsil and it is divided into two blocks Faridpur and Bhuta the detail are given below:

Table 1: Name of two Blocks and total area of Faridpur Tehsil.

Tehsil	Block	Area (Hectare)	Area (Km^2)	Block Headquarters	Distance from Headquarter (Km.)
Faridpur	Faridpur	29838	298.38	Faridpur	22
	Bhuta	32384	323.84	Bhuta	34
Total area	-	62222	622.22	-	-

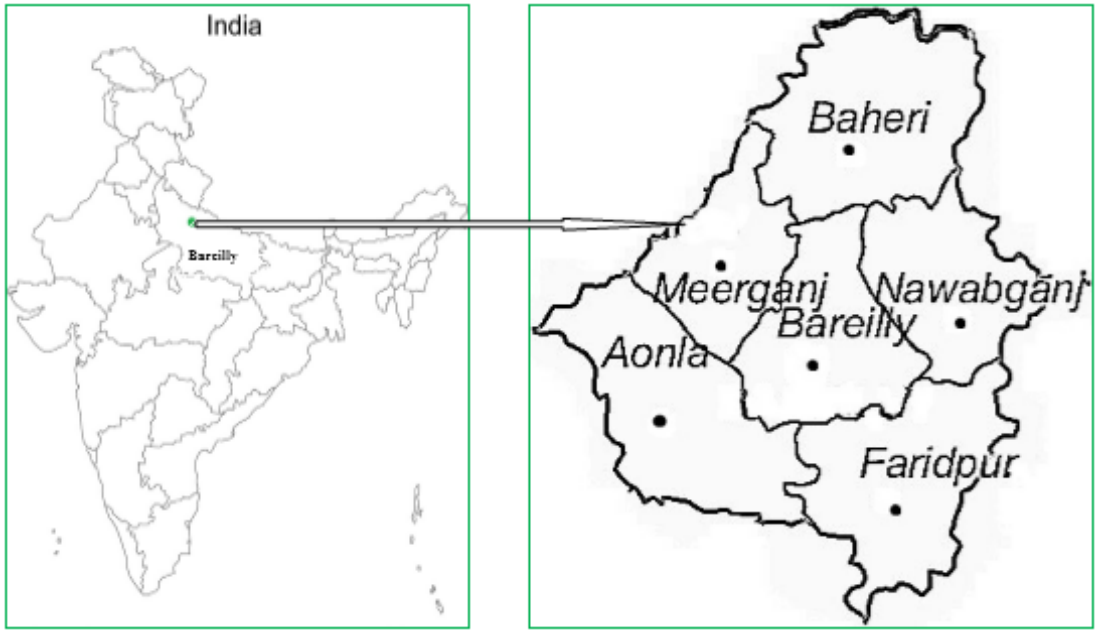
Methodology

The work was held in August 2011 to July 2012 in Faridpur Tehsil under Bareilly District of Uttar Pradesh. During the study, locations were selected from the villages of Faridpur Tehsil where Sarus crane inhabits the whole year. The study method consisted of the collection of data from primary and secondary resources. Primary data were collected by direct field visits, site inspection [9]. Multistage random sampling was used to selected survey villages. Faridpur Tehsil is 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.
The survey was done to assess the current status of habitat and food resources use by Sarus crane (G*rus antigone*) in the area. Field observations were carried out with cover the 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.
During the study, to know the information's on 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 [10].

Table 2: GPS locations and area of villages with the presence of Sarus cranes.

S. No.	Village	Area in hectare	Area in Km^2	Latitude	Longitude
1	Pachomi	442.93	4.4293	N $28^0$10.290’	E $079^0$33.943’
2	Khanjanpur	345.679	3.45679	N $28^0$08.830’	E $079^0$34.730’
3	Hasanganj	217.557	2.17557	N $28^0$09.627’	E $079^0$36.899’
4	Khanpura	193.883	1.93883	N $28^0$11.465’	E $079^0$37.985’
5	Billaua	162.430	1.6243	N $28^0$11.833’	E $079^0$37.962’
6	Piperthara	206.252	2.06252	N $28^0$13.024’	E $079^0$37.571’
7	Badra	358.629	3.58629	N $28^0$13.794’	E $079^0$37.759’
8	Mewa	371.577	3.71577	N $28^0$13.501’	E $079^0$38.414’
9	Kaherua	44.18	0.4418	N $28^0$13.685’	E $079^0$35.895’
10	Nabada van	488.85	4.8885	N $28^0$10.495’	E $079^0$32.753’
Total area		2831.967	28.31967		

The secondary data information was collected from the published literature such as management plan, government document, official statistics, previous studies on the Sarus crane, technical report, scholarly journals, review articles, books, the computerized database, the world wide database magazines and newspaper were recorded [11, 12].



1 (a) Map of India showing Bareilly district **1(b)** Map showing different tehsils in Bareilly district.

Plate 1: Location map of Faridpur tehsil under Bareilly district of Uttar Pradesh, India

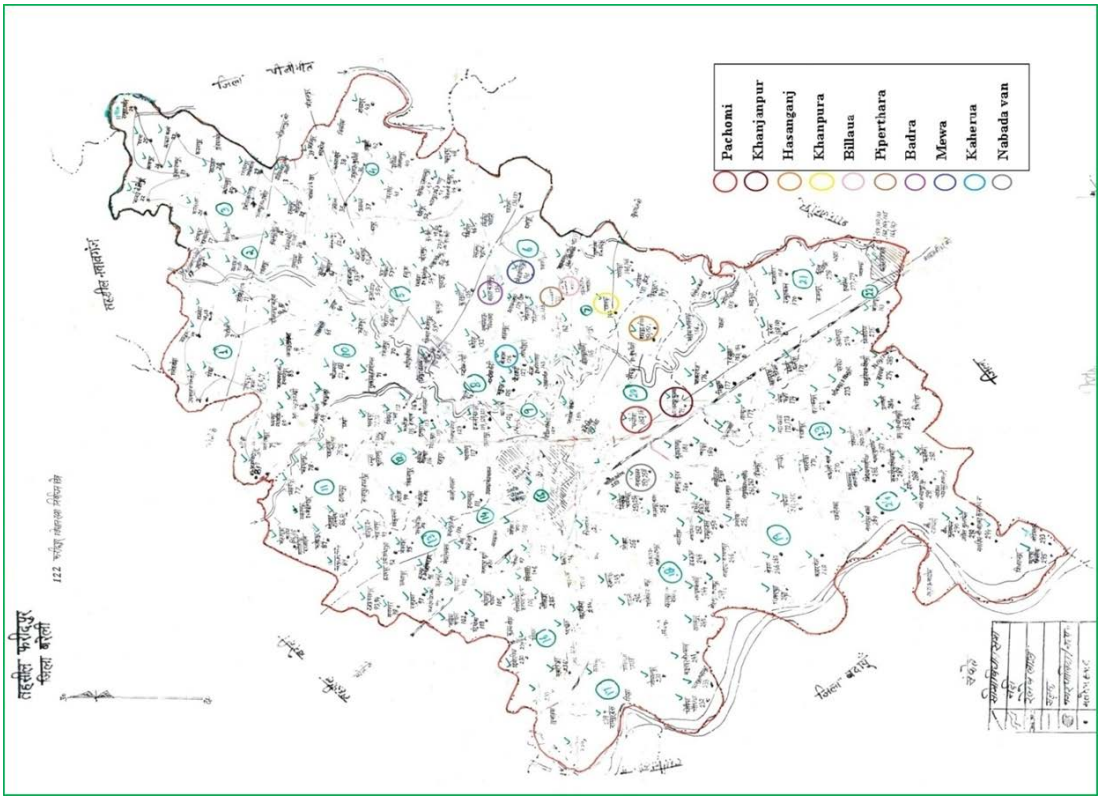


Plate 2: Map of Faridpur Tehsil showing different villages.

Results and Discussion

Habitat use and feeding ecology

1 (a) Habitat use pattern

Sarus cranes preferred the habitat near water bodies and were seen inhabiting in agricultural fields, rivers, village ponds and the marshland. They were seen more frequently feeding and resting in the paddy, wheat, mustard, lentil, potato and ground nut fields.

During the study, Sarus cranes were seen more frequently in the paddy field in the rainy and winter season because of the availability of water. During evening time they sit on the bunds of paddy filed. The paddy and sugarcane crop fields provide the bird roosting and nesting cover for hiding the nests, fledglings and the young birds.

The birds spend the whole day in some marshland and search for food. During winter the birds spend a lot of time in sunlight, perhaps taking the sun bath. During summer season many water resources get dry and under such conditions, the Sarus cranes move in the another areas in search of food. In Hasangaj village the number of Sarus cranes in Behgul River was gradually increased up to 80-100 in summer whereas in other season very few Saruses were spotted in the area. It was reported in the study that Sarus cranes are very much fond of potato and spend long hours feeding in on potato in the field. (Table.3).

Table 3: Habitat use pattern by Sarus crane (*Grus antigone*) in different villages.

S. No.	Village name	Habitat
1	Pachomi	Pond, marshland, paddy, wheat, mustard, potato and sugarcane field
2	Khanjanpur	Pond, marshland, paddy, wheat, mustard and sugarcane field
3	Hasanganj	Pond, marshland, paddy, wheat, mustard, sugarcane field and near the river
4	Khanpura	Pond, marshland, paddy, wheat, mustard, sugarcane and potato field
5	Billaua	Pond, marshland, paddy, wheat, mustard, sugarcane and potato field
6	Piperthara	Pond, marshland, paddy, wheat, mustard, sugarcane and potato field
7	Badra	Marshland, paddy, wheat, mustard, sugarcane and groundnut field
8	Mewa	Marshland, paddy, wheat, mustard, sugarcane and groundnut field
9	Kaherua	Marshland, paddy, wheat, mustard, sugarcane and potato field
10	Nabada van	Marshland, paddy, wheat, mustard, sugarcane and potato field

1(b) Feeding ecology of Sarus crane

Sarus cranes are omnivorous and largely spend their time in search of food and walking in the field. They feed near the pond, river and marshland, agricultural and non-agricultural field. In the pond and marshland they were seen probing the food by their long bill. They probe the snails in it. Sarus cranes break down the big snails by their bill and eat up the content. They also feed on small toads, fishes in the pond and submerged water filed. In the paddy field they feed on the panicles of paddy and insects. They search the food in the wheat field, potato field. Sarus crane feeds the germinated seed in the mustered and lentil fields. They like the ground nut in their diet. Ear of the wheat was feed by the Sarus crane in wheat field. In the non-agricultural area, they feed the roots of Bermuda grass. The tubers of plants and corn of the aquatic plants also form the diet of Sarus crane (Table. 4).

Table 4: Common food items in Sarus crane (*Grus antigone*) diet in Faridpur Tehsil.

S. No.	Common name	Scientific name
1	Panicle of paddy	*Oryza sativa*
2	Ear of wheat	*Triticum spp.*
3	Apple Snail	*Pila globosa*
4	Roots of Bermuda grass	*Cynodon dactylon*
5	Potato	*Solanum tuberosum*
6	Germinated lentil	*Lens culinaris*
7	Mustard	*Brassica rapa*
8	Pea	*Pisum sativum*
9	Tubers of aquatic plants	-
10	Snake headed fish	*Ophiocephalus spp.*
11	Fish fingerlings	-
12	Common Indian Bull Frog	*Rana tigrina*
13	Crustaceans and insects	-

Sarus cranes were present in the marshland, ponds and in the agricultural field. The presence of Sarus crane indicates the presence of healthy environment in the area. They were present with the human society. The findings are in accordance with Ali and Ripley, (1980) [13] who reported the presence of Sarus cranes in open, cultivated, well-watered plains, marshland and jheels. Sarus cranes inhabit in wetland areas in close association with human beings. Gole, (1989) [14] also described the ability of Sarus cranes to live in association with humans. Sarus cranes were commonly reported in the paddy field in the rainy season and also in the marshland. In the summer season, they move to different areas where water resources were present or seen in the cultivated agricultural fields. Sundar, (2009) [15] stated that Sarus cranes preferentially use wetlands or uncultivated patches amid flooded rice paddies for nesting in India. Sundar and Kittur, (2013) [16] reported that in south-western Uttar Pradesh, Sarus crane numbers increased with wetland size, though they were found in wetlands of all sizes despite extensive use of wetlands by humans. Kumar and Kanaujia, (2017) [17] admitted that the sighting of the population of Sarus cranes in the study area, it was documented that, the density of Sarus crane in agriculture habitat greater than wetlands. The abundance of Sarus crane in agriculture was less with compared to the wetlands habitat. It was also observed that, the density of Sarus crane was more in agriculture habitat in comparison to the wetlands.

Kaur, (2008) [18] acknowledged that over their entire distribution range, Sarus cranes utilize wetlands, both natural and man-made, and are well-known for their ability to live in association with habitation. Kumar and Kanaujia, (2017) [17] documented that the habitat is being degraded rapidly due to increasing human population, industrialization, loss of habitat (rapid declining of wetlands) and other developmental activities.

Sarus cranes were reported in the ponds, marshlands and agricultural areas for the feeding. They feed on the insects, aquatic plants, and fish, small frogs etc in the pond and the marshland areas. They probe the snails in the marshland. In the agricultural field, Sarus cranes feed on the paddy, potato, wheat, lentil, mastered, pea and the insects. In the non-agricultural area, they feed the roots of Bermuda grass. They were also seen in the ground nut for feeding. Law (1930) [19] stated that Sarus cranes are omnivorous eating insects (especially grasshoppers), aquatic plants, and fish (perhaps only in captivity) however, during the present study the Sarus cranes were reported to feed upon the fishes and fingerlings in the pond and marshland. Occasionally tackling larger vertebrate prey such as water snakes (*Xenochrophis piscator*) [8], Sarus cranes may in rare cases feed on the eggs of birds [20] and turtles [21]. Johnsgard, (1983) [8] also observed that plant matter eaten includes tubers, corms of aquatic plants, grass shoots as well as seeds and grains from cultivated crops such as groundnuts and cereal crops such as rice. Sundar and Choudhury, (2003) [22] also documented that Sarus cranes forage in shallow water (usually with less than 30 cm (0.98 ft) depth of water) or in fields, frequently probing in mud with their long bills. They are omnivorous, eating insects (especially grasshoppers), aquatic plants, fish (perhaps only in captivity), frogs, crustaceans and seeds.

In this modern scenario, it is necessary to re-establishment, management and education towards the existing wetlands in the area are required in order to provide healthy habitat for Sarus Cranes. Education should be must in educational institutions to given the traditional association between the Sarus Crane and community. Education should be about the modern ecological and habitat aspects likewise rural agricultural land and wetlands use with the focused the role of community in the conservation of Sarus crane and wildlife.

1. Sarus crane uses natural wetland for habitat and food.

2. shells of Apple snail (*Pila globosa*) recovered from wetland

3. A pair of sarus crane using the marshland near the railway line.

4. a pair of sarus crane using agriculture land

5. A pair of sarus crane feeding in paddy field and showing aggressive behavior.

6. two adult and one young using the sugarcane crop for their shelter hide

7. A pair of sarus crane hollow outs potato.

8. a pair of sarus crane feeding in the wheat and mustard field.

9. a pair of sarus crane probing snails and fishes in a wetland.

10. a flock of sarus crane feeding in a paddy crop field.

Conclusion

It was concluded that Sarus cranes were seen more frequently in the paddy field in the rainy and winter season because of the availability of water whereas in Hasangaj village the number of Sarus cranes in Behgul River was gradually increased up to 80-100 in summer whereas in another season very few Sarus were spotted in the area. Sarus crane feeds on snails and also on agriculture field. Hence there is need for development of Sarus mitra network of farmers, village communities especially school and college students which enabled improved conservation of the species.

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