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Status and abundance of sarus crane (*Grus antigone*) in Faridpur tehsil under Bareilly district of Uttar Pradesh

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Abstract

The present survey was planned to evaluate the status and abundance of Sarus Crane in Faridpur Tehsil under Bareilly District of Uttar Pradesh. The study method consisted with the collection of data from primary and secondary resources. A total of 32 villages were extensively surveyed for the presence of Sarus Crane whereas 10 villages showed the presence of Sarus crane. The mean population of the Sarus Crane entire was 27.17 ± 0.55 in 10 villages respectively. Mean density of bird in 10 villages was therefore 1.447 birds per km². The projected number of villages with the presence of Sarus Cranes was 120. The area inhabited by the Sarus cranes was estimated to be 228,8896 km². Hence, projected total Sarus Crane population in Faridpur tehsil was 220 with the overall mean density of 0.35 Sarus Cranes per km². The total number of singing male was 12 and the estimated breeding population was 24. The calculated projected breeding population in Faridpur tehsil was 194. The study could be helpful for the research planning and conservation efforts for the Sarus Crane under Bareilly District of Uttar Pradesh.

Keywords: abundance, Sarus, status, threats

Introduction

Sarus crane is the tallest flying and an ancient bird in the world. They are magnificent and beautiful birds and are an icon of the wilderness. They are well known for their call and dance. The bird is good indicators of the ecological health of its habitat such as wetlands, grasslands and agricultural lands. The bird has high flagship value as ambassadors of grassland and wetland habitats, both considered to be threatened. However, the population of the bird is declining in many parts of the country.

There are 1233 species of birds found in India and about 358 bird's species are recorded in Uttar Pradesh (Hegde and Venkatraman 2014) [7]. A great number of communities take pleasure in bird watching or birding. There are 15 crane species global and 5 species have been recorded from India which includes Common crane (*Grus grus*), Sarus crane (*Grus antigone*), Black-necked crane (*Grus nigricollis*), Demoiselle crane (*Anthropoides virgo*) and Siberian crane (*Grus leucogeranus*). The last documented sighting of Siberian Cranes in India during the winter months was in 2002 (International Crane Foundation). Sarus Crane (*Grus antigone*) which has also received the status of State bird of Uttar Pradesh is the world's largest flying and non-migratory bird. The bird is found in parts of the Indian Subcontinent, Southeast Asia and Australia. The common Hindi name "Saras" is derived from the Sanskrit sound *Sarasa* for the "lake bird" (Yule 1903, Stocqueler 1848) [19, 13]. Indian Sarus Cranes have adapted to the crowded human population and interact closely with people in areas where society of acceptance succeed. They inhabit open, cultivated, well-watered plains, marshlands, and lake (Ali and Ripley, 1980) [1] yet it has successfully adapted to agricultural fields, canals, dams, village tanks and seepage marshes (Parasharya *et al.* 1989, Gole 1989, Ramachandran and Vijayan 1994) [9, 6, 10]. Uttar Pradesh is considered as the heaven state of the birds. Aquatic birds such as the Sarus Crane have adequate number of places to rummage and breed within the state. Sarus Cranes are most common and densely distributed in the Indian states of Uttar Pradesh, Rajasthan, Gujarat, and Haryana; they are less common in Bihar and Madhya Pradesh. It is the only crane species breeding south of the Himalayas and it is the only resident crane in India (Ali and Ripley 1980; Sunder *et al.*, 2000; Tomar *et al.*, 2018; Tomar *et al.*, 2017) [1, 17, 18].

The Sarus cranes are considered internationally threatened and classified as vulnerable under the IUCN Red List Categories.

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It is also listed in Appendix II of the CITES Convention and in India, bird has received legal protection in the Wildlife (Protection) Act, 1972 under Schedule IV. Sarus crane numbers have declined greatly in the last century and it has been estimated that the current population is a tenth or less (perhaps 2.5%) of the numbers that existed in the 1850s. In this study we provide the current status and abundance of Sarus Crane under Bareilly District of Uttar Pradesh

Material and Methodology

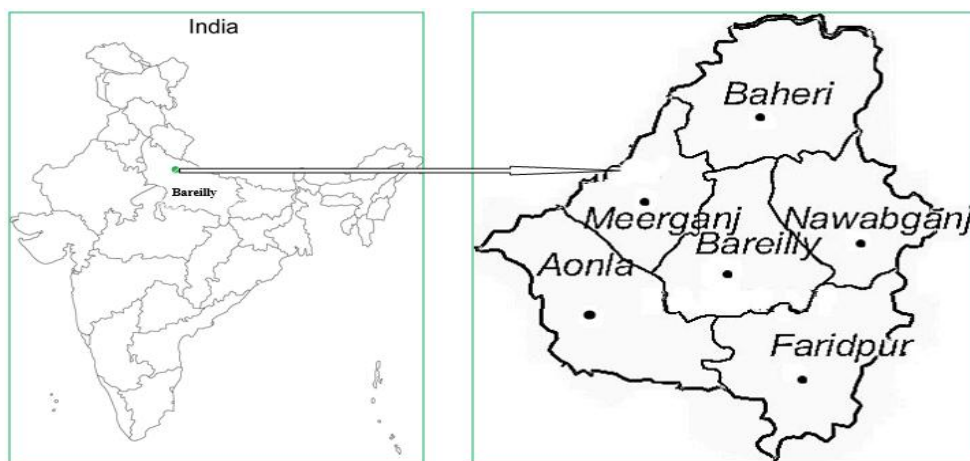
Study area

The study was conducted in selected villages of Faridpur Tehsil under Bareilly district of Uttar Pradesh. The Bareilly district is located in the north western part of Uttar Pradesh 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 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 in 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	-	-



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

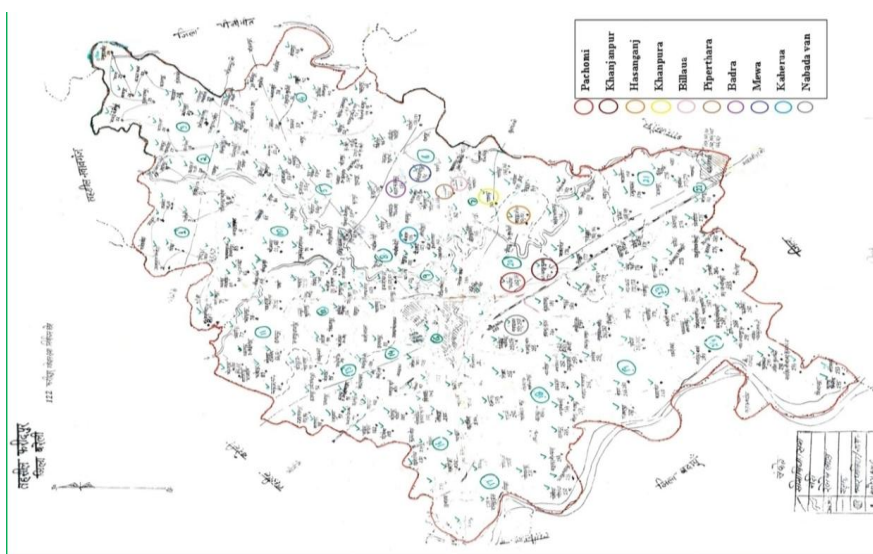


Plate 2: Map of Faridpur Tehsil showing different villages

Methods

The study was completed from August 2011 to July 2012 in the villages of Faridpur Tehsil under Bareilly District of Uttar

Pradesh. Agricultural fields, wetlands, river side and ponds were visited to know the stats and abundance of Sarus crane. Several visits were done in the early morning and late evening

in the selected villages. The study method consisted with the collection of data from primary and secondary resources. Primary data was collected by questionnaire survey to collect information on different aspects of sarus crane population was used. 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. 3 to 4 visit were made in each village and the number of birds and their GPS location were recorded. *Ad libitum sampling* (Altmann, 1974) [2], GPS tracking, Sample count, foot transect by absolute and relative abundance (Singh 2009) [12], territory mapping was used to know the status and abundance of Sarus crane. Thus the number of birds in each village, total number of birds, breeding population, were counted and calculated.

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°10.290'	E 079°33.943'
2	Khanjanpur	345.679	3.45679	N 28°08.830'	E 079°34.730'
3	Hasanganj	217.557	2.17557	N 28°09.627'	E 079°36.899'
4	Khanpura	193.883	1.93883	N 28°11.465'	E 079°37.985'
5	Billaua	162.430	1.6243	N 28°11.833'	E 079°37.962'
6	Piperthara	206.252	2.06252	N 28°13.024'	E 079°37.571'
7	Badra	358.629	3.58629	N 28°13.794'	E 079°37.759'
8	Mewa	371.577	3.71577	N 28°13.501'	E 079°38.414'
9	Kaherua	44.18	0.4418	N 28°13.685'	E 079°35.895'
10	Nabada van	488.85	4.8885	N 28°10.495'	E 079°32.753'
Total area		2831.967	28.31967		

The secondary data information was collect 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, computerized database, the world wide database magazines and newspaper were collected (Shell, 1997; Cnossen, 1997) [11, 4].

Results and Discussion

During the present course of investigation the status and abundance of Sarus Crane, we visited in total of 32 village's survey to know the presence of Sarus Crane whereas 10 villages were explored for the presence of Sarus Crane in Faridpur Tehsil under Bareilly district of Uttrar Pradesh. One pair of Sarus Crane was recorded from the each village whereas they noticed from the agricultural fields, wetlands, river side canals and ponds. During the study, the mean population of birds (Mean±SE) was 3±0.28 in Pachomi, 2±0 in Khanjanpur, 4.50±0.43 in Hasanganj, 1.83±0.21 in Khanpura, 2±0 in Billaua, 5.33±0.46 in Piperthara, 2.50±0.27 in Badra, 2±0 in Mewa, 2±0 in Kaherua and 2±0 in Nabada van respectively. At the time of study, Piperthara and

Hasanganj village shows the high number of Sarus crane presence whereas one pair of Sarus crane was present in the other villages. In Hasanganj and Piperthara village the number of sarus crane was increase in summer season. During the span of twelve months the mean population of the bird entire was 27.17±0.55 in 10 villages respectively (Table 3, Fig.1).

Present study tends the mean density of birds in twelve months (Mean±SE) was 0.67±0.13 in Pachomi, 0.58±0 in Khanjanpur, 2.07±0.29 in Hasanganj, 0.94±0.15 in Khanpura, 1.23±0 in Billaua, 2.83±0.29 in Piperthara, 0.69±0.14 in Badra, 0.54±0 in Mewa, 4.52±0 in Kaherua and 0.40±0.14 in Nabada van respectively. Calculated mean density of birds in 10 villages was therefore 1.447 birds per km² (Table 4).

Therefore, the projected number of villages with the presence of Sarus Cranes was 120 and that without cranes was 265. Similarly, the area inhabited by the Sarus Cranes was estimated to be 228.8896 km² and without Sarus Cranes was 393.3303 km². Hence, projected total Sarus Crane population in Faridpur Tehsil was 220 with the overall mean density of 0.35 Sarus Cranes per km².

Table 3: Month wise number of Sarus Cranes in different villages

Month	Pachomi	Khanjanpur	Hasanganj	Khanpura	Billaua	Piperthara	Badra	Mewa	Kaherua	Nabada van	Total No. of birds
Aug	2	2	2	2	2	6	2	2	2	2	24
Sept	2	2	2	2	2	8	2	2	2	2	26
Oct	4	2	4	2	2	8	2	2	2	2	30
Nov	4	2	2	2	2	4	2	2	2	2	24
Dec	3	2	4	2	2	6	2	2	2	2	27
Jan	3	2	8	2	2	6	4	2	2	2	33
Feb	4	2	8	2	2	6	4	2	2	2	34
Mar	4	2	6	0	2	4	4	2	2	2	28
April	4	2	4	2	2	4	2	2	2	2	26
May	2	2	7	2	2	4	2	2	2	2	27
June	2	2	5	2	2	4	2	2	2	2	25
July	2	2	2	2	2	4	2	2	2	2	22
SM	3	2	4.50	1.83	2	5.33	2.50	2	2	2	27.17
SD	0.95	0	2.31	0.57	0	2.55	0.90	0	0	0	3.61
SE	0.28	0	0.43	0.21	0	0.46	0.27	0	0	0	0.55

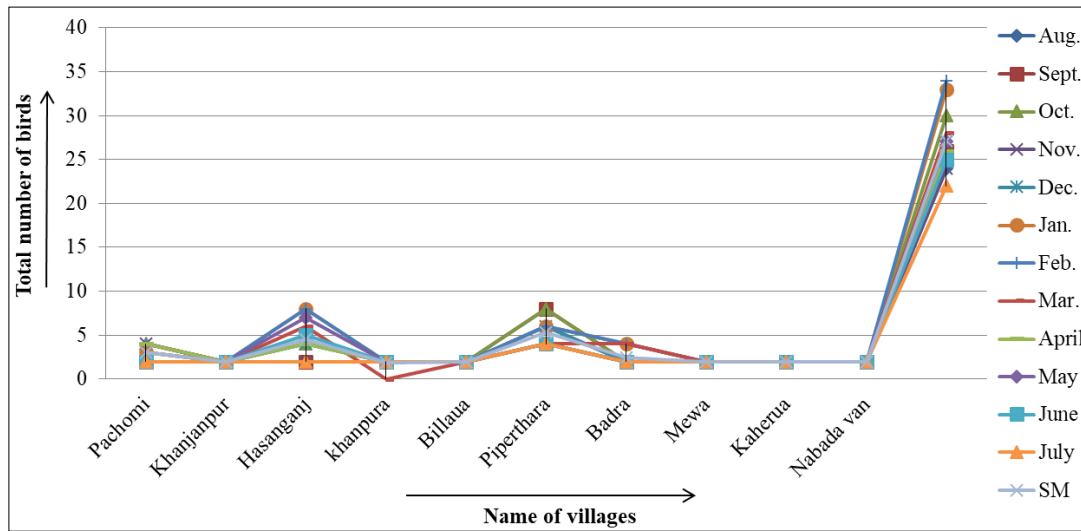


Fig 1: Month wise number of birds in different villages

Table 4: Density of Sarus cranes in surveyed villages

Month	Pachomi (Density per km ²)	Khanjanpur (Density per km ²)	Hasanganj (Density per km ²)	Khanpura (Density per km ²)	Billaua (Density per km ²)	Piperthara (Density per km ²)	Badra (Density per km ²)	Mewa (Density per km ²)	Kaherua (Density per km ²)	Nabada van (Density per km ²)	Total
Aug	0.45	0.58	0.92	1.03	1.23	2.91	0.55	0.54	4.52	0.40	13.13
Sept	0.45	0.58	0.92	1.03	1.23	3.88	0.55	0.54	4.52	0.40	14.10
Oct	0.90	0.58	1.84	1.03	1.23	4.85	0.55	0.54	4.52	0.40	16.44
Nov	0.90	0.58	0.92	1.03	1.23	1.94	0.55	0.54	4.52	0.40	12.61
Dec	0.67	0.58	1.84	1.03	1.23	3.88	0.55	0.54	4.52	0.40	15.24
Jan	0.67	0.58	3.68	1.03	1.23	3.88	1.11	0.54	4.52	0.40	17.64
Feb	0.90	0.58	3.68	1.03	1.23	2.90	1.11	0.54	4.52	0.40	16.89
Mar	0.90	0.58	2.76	0	1.23	1.94	1.11	0.54	4.52	0.40	13.98
April	0.90	0.58	1.83	1.03	1.23	1.94	0.55	0.54	4.52	0.40	13.52
May	0.45	0.58	3.22	1.03	1.23	1.94	0.55	0.54	4.52	0.40	14.46
June	0.45	0.58	2.29	1.03	1.23	1.94	0.55	0.54	4.52	0.40	13.53
July	0.45	0.58	0.92	1.03	1.23	1.94	0.55	0.54	4.52	0.40	12.16
SM	0.67	0.58	2.07	0.94	1.23	2.83	0.69	0.54	4.52	0.40	14.47
SD	0.21	0	1.06	0.29	0	1.05	0.25	0	0	0	
SE	0.13	0	0.29	0.15	0	0.29	0.14	0	0	0	

Mean density of birds in 10 villages = 14.47/10 = 1.447 birds per km²

Table 5: Estimated Sarus crane population and density in Faridpur Tehsil.

Sarus crane status and abundance in surveyed villages					Projected Sarus crane status and abundance in Faridpur Tehsil			
Sarus crane status	No. of villages	Area (km ²)	Mean bird population	Mean density (per km ²)	Projected Sarus crane status in 385 villages	Projected area wise Sarus crane status in Faridpur Tehsil (622.22 km ²)	Projected total Sarus crane population in Faridpur Tehsil	Projected overall mean density in Faridpur Tehsil (per km ²)
With Saruses	10	28.31967	27.17	1.447	10x385/32=120.31 Equivalent to 120	28.31967x622.22/76.98498 =228.8896 km ²	27.17x228.8896/28.31967 =219.59 equivalent to 220	219.59/228.8896 =0.96 per km ²
Without Saruses	22	48.66531	0	0	22x385/32=264.69 Equivalent to 265	48.66531x622.22/76.98498 =393.3303 km ²	0	0
Total	32	76.98498	27.17	27.17/76.98498 = 0.35 per km ²	385	622.22	220	219.59/622.22 =0.35 per km ²

Territory mapping

The number of singing males was counted separately. Assuming that all of these are monogamous, the breeding population was estimated in 10 villages.

Table 6: Number of singing males and breeding population in ten villages

Village	Average number of singing males	Breeding population
Pachomi	2	4
Khanjanpur	1	2
Hasanganj	1	2
Khanpura	1	2
Billaua	1	2
Piperthara	2	4

Badra	1	2
Mewa	1	2
Kaherua	1	2
Nabada van	1	2
Total	12	24

Thus, the total number of singing male was 12 and the estimated breeding population was 24. The projected breeding population in Faridpur Tehsil would be: $24 \times 228.8896 / 28.31967 = 193.98$ equivalent to 194.

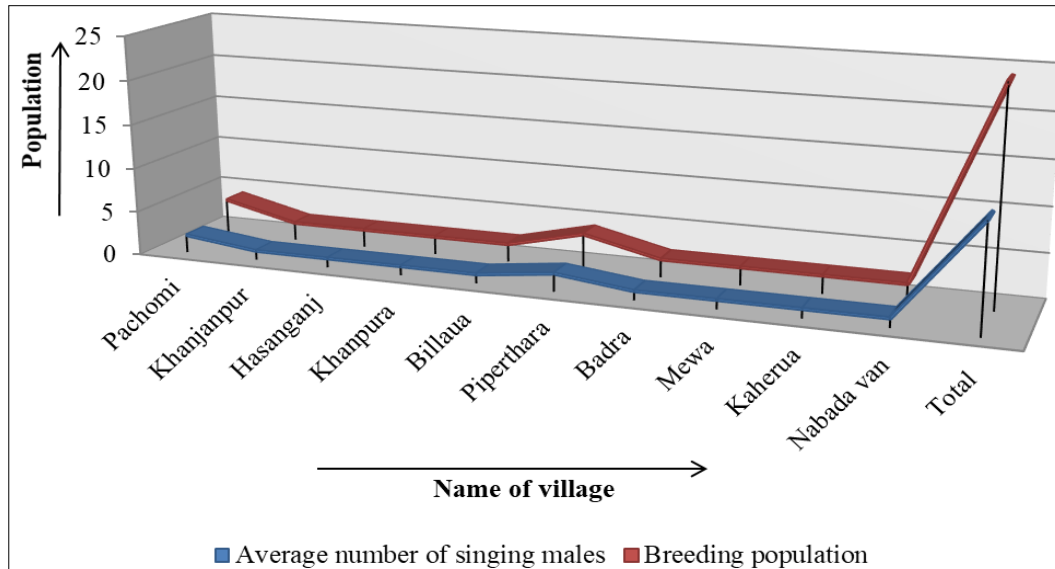


Fig 2: Average Number of singing males and breeding population

Major threats to sarus crane

Sarus Cranes face main threat due to loss and degradation of wetlands due to agricultural developments and expansion of human settlements. The other significant factors are destruction of eggs due to anthropogenic involvement, poaching, predation of eggs and chicks by crows and feral dogs, flood, cattle and buffalo feeding in cranes nesting places and electric shock from high voltage electric cables. In Khanjanpur village a pair of cranes made a nest in the pond prior to egg laying. However, they soon changed the site and made another nest little away due to the disturbance of the wallowing buffaloes. Some of the villages like Piperthara, Khanjanpur and Khanpura had sugarcane and peppermint factories whose left over chemicals and wastes get mixed with the water of wetlands inhabited by Sarus cranes and other birds. However, there are no studies on the impact of these wastes on the water quality, habitat or the birds itself. Sarus cranes prefer the marshland and paddy field for nest making and egg lying but since past few years the farmers prefer sugarcane cultivation due to its high market value which had further resulted in the loss of nesting and feeding places. Some people kill the birds, as they think they have medicinal uses.

Villagers use the pesticides and weedicides to save their crops from harmful insects and weeds. These chemical compounds may cause damage to the birds, their young or even the eggs besides damaging the insect and floral biodiversity which are important constituent of bird habitat or are the part of their diet.

Bird Life International (2009) [3] pointed a decline in the population of Sarus Cranes in India. In our present study, the number of Sarus Crane was ranged from 2-10 whereas one pair of Sarus Crane was always in the selected 10 villages. In Hasanganj village the number of Sarus Cranes in the Behgul

River gradually increases up to 80-100 in summer whereas in other season very few Sarus were spotted in the area. In this study the total number of singing male was 12 and breeding population was 24.

During the present study to enumerate the Sarus Crane population in Faridpur Tehsil under Bareilly district of Uttar Pradesh, earlier Sunder (2002) mention that “IUCN estimate that there are about 8000–10000 Sarus Crane left in the world today”. Likewise Sunder *et al.* (2000) mentioned Sarus Crane population in only 19 selected districts of Uttar Pradesh with a total of 1,398 cranes from 57 sites.

The census conducted by Social Forestry Department, Bareilly in 2010 showed 104 Sarus Cranes in 22 different villages, but no Sarus were found in any village under Faridpur Tehsil. In the E-magazine of U.P. State Biodiversity Board (2010) [5] mentioned that the number of Sarus Crane in Bareilly district 108 with the 66 adult, 42 juvenile and 11905 total Sarus Crane in 69 district of Uttar Pradesh. The census data 2010 shows the highest number of Sarus Cranes in Mainpur (2180) followed by Etawah (1512) and Etah (828). It appears from the study that the Faridpur Tehsil had a considerable number of Sarus Cranes and a detailed scientific study is necessary to access the bird population.

World Wildlife Fund for nature acknowledged that the main threat to the Sarus Crane in India is habitat loss and degradation due to draining the wetland and conversion of land for agriculture. The landscape of its historic range is rapidly changing due to construction of highways, housing colonies, roads, and railway lines. More recently, many deaths have been recorded due to collision with power lines. Also, due to the increase in agricultural land, Sarus Cranes are left with no choice but to forage in these fields, and as a result ingest pesticides, which lead to poisoning.



1. A flock of Sarus Crane in Behgul river in Hasanganj village at Faridpur Tehsil



2. A flock of Sarus Crane in Piperthara village village at Faridpur Tehsil



3. A flock of Sarus Crane in a wetland in Faridpur Tehsil during monsoon



4. An egg of Sarus Crane (*Grus antigone*) destroyed and eaten up by a group of crows in Billaua Village



5. Photograph showing a buffalo wallowing near the nest of Sarus Crane in a pond in Khanjanpur village



6. An electric cable passing through Sarus Crane habitat in Kaherua

Conclusion

It was concluded that the mean population of the Sarus Crane was 27.17 ± 0.55 in 10 villages respectively. Mean density of bird in 10 villages was therefore 1.447 birds per km^2 . The projected number of villages with the presence of Sarus Cranes was 120. The area inhabited by the Sarus cranes was estimated to be 228.8896 km^2 . Hence, projected total Sarus Crane population in Faridpur tehsil was 220 with the overall

mean density of 0.35 Sarus Cranes per km^2 . The study could be helpful for the research planning and conservation efforts for the Sarus Crane under Bareilly District of Uttar Pradesh.

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