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Status and distribution of state bird of Uttar Pradesh, Sarus crane (*Grus antigone antigone*) in Jhansi and Lalitpur, India

Sonika Kushwaha[1], Akhilesh Kumar[2], Devendra Kumar[3], Abhishek Namdev[4]
[1, 2, 4] Indian Biodiversity Conservation Society, B.H.E.L-Jhansi, Khailar, Uttar Pradesh, India
[3] Project Director (M&E), U.P. Participatory Forest Management and Poverty Alleviation Project (Assisted by JICA), Lucknow, Uttar Pradesh, India

Abstract
The study was undertaken to know the status and distribution of the Sarus crane (*Grus antigone antigone*) that is categorized as vulnerable on International Union for Conservation of Nature (IUCN) red list. The present study was undertaken by Indian Biodiversity Conservation Society and Forest Department, Bundelkhand Region from 2015-2017. The population size was estimated as 8 and 177 Sarus cranes in Jhansi and Lalitpur respectively. In Jhansi, Sarus has been observed only in 2 Forest ranges, while in Lalitpur they have been reported from 7 Forest Ranges. The maximum Sarus cranes were observed near the water Reservoirs (77), followed by Ponds (30), agricultural fields (28) and open fields (24). Only 22 Sarus cranes were seen along the river banks. This study reveals the population status of the State bird of Uttar Pradesh in 2 districts which face severe climatic adversities and is a backward region regarding the importance to wetlands and its biodiversity. It requires instantaneous actions to shield the water bodies as well as awareness amongst the local residents.

Keywords: Sarus cranes, state bird, population, Uttar Pradesh

Introduction
For centuries, humans have been induced sensitively to the social behavior, elegance and stately expression of cranes. The human art, archaeology, mythology and cultures around the world have been motivated by their magnitude, social relations, inimitable calls and graceful movements [1]. Cranes belong to the family (Gruidae) which is divided into two subfamilies, Crowned Cranes (Balearicinae) and the Typical Cranes (Gruinae). India has five species of the subfamily Gruinea: Siberian Crane (*Grus leucogeranus*), Demoiselle Crane (*Grus virgo*), Black-necked Crane (*Grus nigricollis*), Common Crane (*Grus grus*) and Sarus Crane (*Grus antigone*) [2].

Uttar Pradesh is known to be the home of Sarus cranes (*Grus antigone antigone*) with the largest population in India [3]. It is also the State bird of Uttar Pradesh. It is categorized as vulnerable on International Union for Conservation of Nature (IUCN) red list [4]. This is the tallest crane species standing at six feet tall, with a wingspan of eight feet. It is the only crane species breeding to the South of Himalayas and the only residential crane of India. The Sarus cranes pair for life. The sarus crane is easily distinguished from other cranes in the region by the overall grey colour and the contrasting red head and upper neck. The sexes do not differ in plumage although males are on average larger than females**.** The Indian Sarus Cranes *G. a. antigone* have adapted to the dense human population in India, and interact closely with people in areas where traditions of tolerance prevail. Farmers in Uttar Pradesh regard Sarus as a watchdog for crops and use crane alarm calls in night to ward off intruders. The most favorable habitat preferred by *Grus antigone* consist of a amalgamation of small marshy sites, reservoir edges with agricultural fields, wetlands, ponds, uncultivated and cultivated fields. Wetland loss and degradation are critical problems throughout the range of Sarus Cranes. Destruction of wetlands due to agricultural expansion, however, is increasing dramatically and poses a significant threat as well. These threats reflect increasing human population pressures [5]. Other threats to their habitats includes high rates of sewage inflow, extensive agricultural runoff, high levels of pesticide residues, and intensification of agricultural systems, collision with electrical wires, change in the traditional open canal system of irrigation and urban sprawling[6]. There is no record on the status of Sarus cranes in the selected area except that of the study undertaken in 2010 by the Forest Divisions of Uttar Pradesh [3]. Presently, the Sarus crane is categorized as "globally threatened", and the need of the hour is to understand the requirements of the species to assist in practical, field conservation of habitat and crane populations. Research has been done in Etawah and Mainpuri districts of Uttar Pradesh and much of the published information today comes from these districts. Bundelkhand Region about 190 Sarus Crane individuals according to the U.P. Sarus Census, 2010, but no individual data for Lalitpur and Jhansi is available. There is considerable need to increase the basic understanding of the State Bird by expanding over a larger area and including additional aspects of biology. The actual population status of any species is the data base that leads to further related studies such as the breeding status, roosting behaviour, foraging habitat and finally the mitigation of threats and their

conservation. This study will further help in understanding the ecology of this tallest flying bird in a region that has limited water bodies and severe climatic adversities.

Study Area

The study was carried out in Jhansi and Lalitpur districts of Bundelkhand Region, Uttar Pradesh for two years (December 2015- December 2017). According to the grey literature available, it is evident that so far no systematic detailed study and monitoring has been done on Sarus cranes in the selected districts. The geographical co-ordinates of Jhansi are 25°07′-25°57′ N and 78°10′- 79°25′ E and that of Lalitpur are 24°11'-25°14' N and 78°10' - 79°0' E. The districts Jhansi and Lalitpur have an area of 5028 km² and 5039 km^2 respectively. Physio-graphically the entire drainage of Bundelkhand forms a part of Ganga basin. The area is chiefly drained by the river Betwa and minor rivers like Jamini, Dhasan and Pahuj. The area with poor soil cover and uncertain rainfall has limited agricultural development [7, 8]. It comes in semi-arid climatic zone. The Average rainfall per year is 800-900 mm and dry months in a year may range between 3 mm to 7 mm. The highest temperature ranges between 48 -50°C in summers while in winters ranges between 8-12°C. The region receives scanty rainfall which, coupled with severe heat, accounts for the stunted growth of flora and scarce availability of winged fauna. Jowar, Gram and Wheat are the main crops of the area [9].

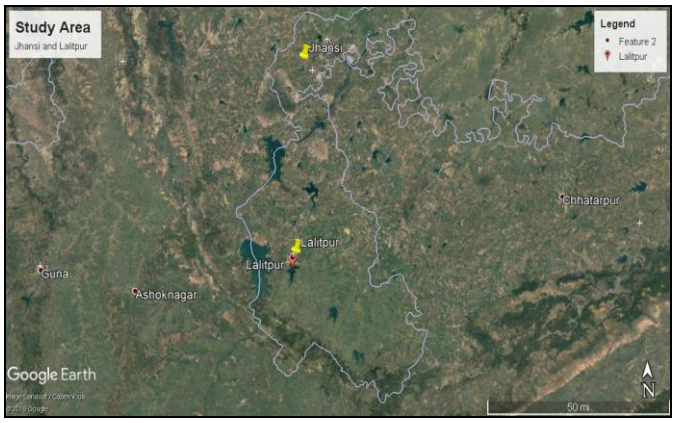

Fig 1: Map of study area (***Source*:** Google Earth)

Methodology

The secondary data was collected with the help of Forest Department and through discussion with the local people. Posters of Sarus cranes were used while interacting with the people so that they recognized the bird correctly before providing the information. Questionnaire was also used to collect the data. Direct observation method was followed to know the status and population of sarus cranes. To census the flagship species Sarus Crane line transect method was commonly used [8]. Minimum and maximum populations were estimated based on habitat associations using assumptions of line transect theory. All the possible habitats such as ponds, rivers, reservoirs, paddy fields, cultivated and uncultivated areas were covered during the field work. Majority of the areas were covered by vehicle and on foot depending on the feasibility. Boat surveys were also carried out for more accurate data. Observations were made with the aid of 10x50 mm binoculars. Canon 7D DSLR and 70D DSLR cameras were used for photographic evidences. GPS was recorded for all the sites. Since the study area was vast, the surveys were started in early morning and continued till the evening. During the summers, the sites with possible water sources were visited during the afternoon as well so as to know the congregations.

Result and Discussion

During the two years study, four sites in Jhansi and thirty one sites in Lalitpur were identified to host the Sarus cranes. The population size was estimated as 8 and 177 Sarus cranes in Jhansi and Lalitpur respectively. Their distribution was sparse and varying. In Jhansi, Sarus has been observed only in 2 Forest ranges, Moth and Gursaria (Table 1). Before this study was undertaken, no sarus cranes were reported from Jhansi in the previous census undertaken. This was a result of effectual network with the local people and repeated visits to the probable sites. In both the ranges in Jhansi 4 sarus cranes were reported in each (fig. 2A & B). The low number of Sarus cranes in Jhansi district may be attributes to the inadequate management of natural resource. Non scientific use of land creates numerous problems like land degradation, ravine and water logging. Jhansi region is severely affected by ravine/land eroding problems [9]. The mining activities in the district have also adversely affected the biodiversity directly and indirectly. In spite of controlled drainage and low sediment pollution, water resources are predominantly exposed to deprivation. Groundwater problems are particularly troublesome in the semi-arid region of Bundelkhand since, water is a limited resource and people rely on groundwater which is very difficult and expensive [11]. It becomes all the more difficult for the animals to survive particularly the birds associated with wetlands. The major cause for low Sarus population in Jhansi is the disturbed and destructed habitat.

Table 1: Population of Sarus Cranes in Jhansi

S. No	Area	GPS	Type of habitat	No. of Sarus
1	Moth	25°55'40.03" N 78°57'15.41"E	Agricultural fields	2
2	Moth	N 25°46′05.67″ E078°57′24.57″	Agricultural fields	2
3	Gursarai	N 25°23′16.74″ E079°18′44.81″	River	2
4	Gursarai	N 25°28′18.09″ E079°21′54.15″	River	2
	Total Sarus			8

Fig 2A: Sarus crane in paddy field, moth

Fig 2B: Sarus crane pair in harvested wheat field in moth

In Lalitpur they have been reported from 7 Forest Ranges (Lalitpur, Jakhora, Gauna, Talbehat, Baar, Mehroni, Madawara) that includes 32 sites (Table 2). The potential population of Sarus Cranes in Lalitpur is a consequence of large number of reservoirs as well as the sustained habitats. Urbanization in Lalitpur district is less as compared to Jhansi, with more favorable habitats for the Sarus Cranes. It still has 11.07 percent forest cover within its 5039 km^2 of geographic area [12]. According to the data of Krishi Vigyan Kendra in Lalitpur, out of the total geographical area, 519.3 thousand hectare, forest waste land and uncultivated area constitute about 23.39% which point out the possibilities for further expansion in cultivated area. Cultivable waste is also about 119179 hectare which is significant and further indicates additional prospects of amplification and diversification of agriculture and related production systems. One of the important features of land utilization of the district is current unsown land, which can be converted into production system [13]. There are potential opportunities for the Sarus crane population in Lalitpur with availability of water bodies as well as agricultural fields.

Table 2: Population of sarus cranes in Lalitpur

S. No	Area	GPS	Type of habitat	No. of Sarus
1	Lalitpur	N 24°27′53.62″ E078°16′23.93″	Dam	13
2	Lalitpur	N 24°49′52.23″ E078°28′06.86″	Open field	2
3	Lalitpur	N 24°49′45.67″ E078°25′30.16″	Dam	2
4	Jakhora	N 24°53′33.88″ E078°13′15.58″	Agricultural fields	2
5	Jakhora	N 24°47′50.71″ E078°20′56.74″	Agricultural fields	2
6	Jakhora	N 24°48′42.96″ E078°20′17.25″	pond	2
7	Jakhora	N 24°51′31.90″ E078°20′29.13″	Pond	2
8	Jakhora	N 24°53′56.57″ E078°19′52.62″	pond	2
9	Jakhora	N 24°54′34.60″ E078°20′27.91″	river	4
10	Jakhora	N 24°58′49.91″ E078°19′13.71″	Dam	4
11	Gauna	N 24°32′49.46″ E078°41′00.73″	Agricultural fields	20
12	Talbehat	N 24°54′29.05″ E078°29′56.35″	dam	4
13	Talbehat	N 24°58′30.12″ E078°26′57.45″	pond	2
14	Talbehat	N 25°02′02.67″ E078°26′29.57″	pond	2
15	Talbehat	N 25°01′37.25″ E078°26′02.10″	pond	2
16	Matatila	N 24°55′09.11″ E078°19′13.15″	pond	6
17	Baar	N 24°56′11.26″ E078°32′13.87″	Pond	2
18	Baar	N 24°56′01.89″ E078°32′05.10″	Dam	12
19	Baar	N 24°51′21.56″ E078°34′35.90″	Pond	2
20	Baar	N 24°55′36.07″ E078°38′25.12″	pond	2
21	Mehroni	N 24°35′04.96″ E078°44′53.14″	Dam	2
22	Mehroni	N 24°35′56.80″ E078°41′26.39″	Dam	20
23	Mehroni	N 24°35′50.76″ E078°41′24.51″	river	6
24	Mehroni	N 24°31′27.59″ E078°53′00.71″	Open fields	2
25	Madawara	N 24°20′25.44″ E078°46′49.19″	Dam	6
26	Madawara	N 24°21′27.01″ E078°41′17.23″	Dam	14
27	Madawara	N 24°53′37.23″ E078°30′22.01″	River	6
28	Madawara	N 24°22′23.64″ E078°51′23.52″	River	4
29	Madawara	N 24°22′38.70″ E078°48′03.04″	pond	6
30	Madawara	N 24°21′29.06″ E078°54′01.82″	Open field	20
31	Madawara	N 24°18′05.59″ E078°44′36.91″	Agricultural fields	2
		Total	177	

Out of the 31 sites, the percentage of only a single pair located was 52% while 4-6 sarus cranes formed 29%. Sarus cranes above 10 formed only 19% (Fig 3). Mostly they were seen foraging in pairs (Fig. 4 A & B). The congregations were not more than 20 in any of the 31 sites identified.

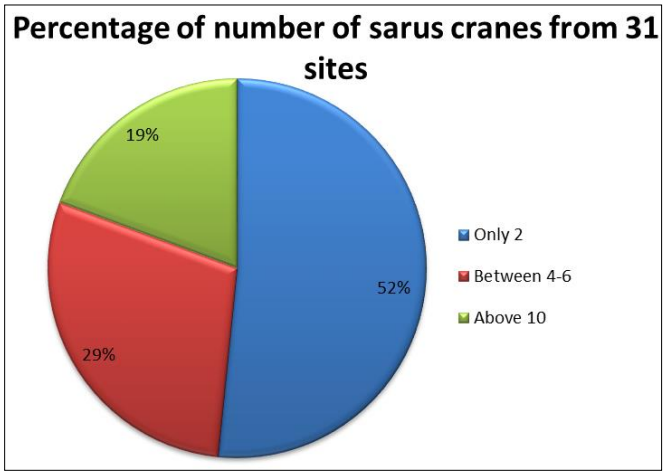

Fig 3: Percentage of number of Sarus Cranes from 31 sites

Fig 4A&B: Sarus Cranes in and around agricultural fields in pair

Maximum population was reported from Madawara Range (58), followed by Mehroni (30). The other five sites (Lalitpur, Talbehat, Baar, Gauna and Jakhora) had the population varying from 16-20 (Fig 5).

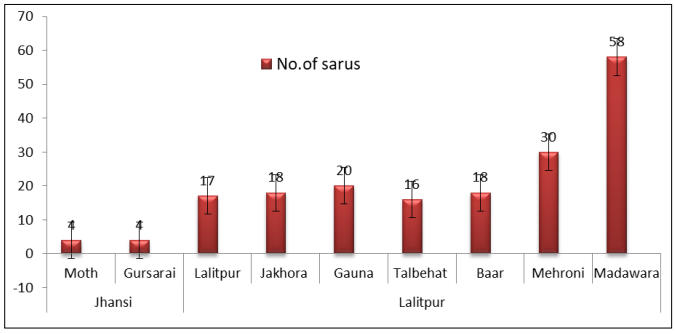

Fig 5: Sarus Population in Forest Ranges of Jhansi and Lalitpur

The maximum Sarus cranes were observed near the water Reservoirs (77), followed by ponds (30), agricultural fields (28) and open fields (24). Only 22 Sarus cranes were seen along the river banks (Fig 6). The river banks are usually disturbed due to the sand mining that occurs in the districts. The river banks are mostly disturbed due to various anthropogenic activities. The marshy areas along the reservoirs were mostly used for foraging by *Grus antigone* (Fig.7).

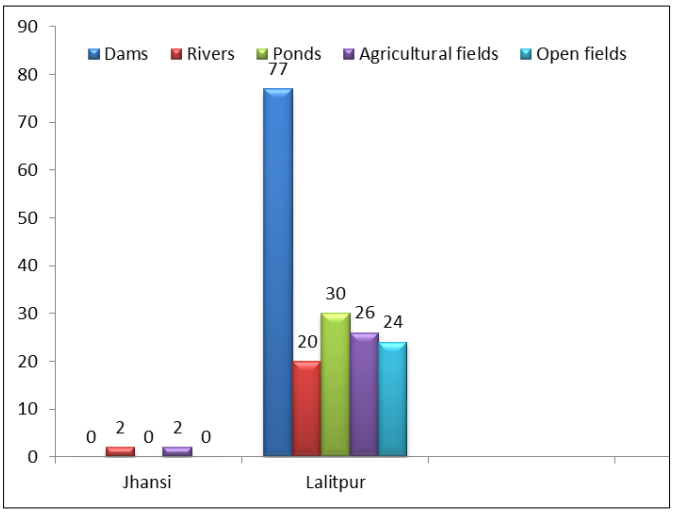

Fig 6: Distribution of Sarus Crane in various habitats in Jhansi and Lalitpur.

Fig 7: Congregation of Sarus at Govind Sagar Reservoir

The marshy sites of reservoirs were less approachable by the people and hence less disturbance. The marshy areas of reservoirs also had agricultural fields adjoining to them. They were seen more frequently feeding and resting in the wheat, paddy, mustard, pea and gram fields (Fig.8). Both these habitats are preferred by the cranes. The ponds were also visited by the cranes as foraging sites where they usually search for insects, snails and fishes (Fig.9).

Fig 8: Sarus cranes foraging in wheat and mustard fields

Fig 9: A pair foraging in a pond, Talbehat

During the summers they were seen in open uncultivated fields searching for food. But these sites always had a source of water nearby. The fields filled with rain water were also probable foraging sites. visited by them. Congregations ranging from 12 to 20 were observed at 6 sites of Lalitpur. These included Dhojri near Govind Sagar Dam (N 24°27′53.62″ E078°16′23.93″), Digwar part-I (N 24°32′49.46″ E078°41′00.73″), Barauda Dang Part-5 (Terai Fatak, Dam) N 24°56′01.89″ E078°32′05.10″, Bhaunrat part-I Jamini Dam (N 24°35′56.80″ E078°41′26.39″), Jamunia Khurd (N 24°21′27.01″ E078°41′17.23″), Bhikhampur part-2 (N 24°21′29.06″ E078°54′01.82″). According to the study undertaken by Gopinathan Maheswaran *et al*., in 2010, approximately 75% of the total area of the Uttar Pradesh is cultivated so most of the Sarus sightings were from the agricultural fields in the 12 districts surveyed [14]. Conversely, they are always near water-mainly lakes and water-logged areas formed by seepage from canals. Sarus pairs though used the agriculture and other uncultivated areas were still by no means too far-off from water. They customarily returned to their roosting sites i.e. the wetland at the dusk.

Conclusion

This study reveals the population status of the State bird of Uttar Pradesh in 2 districts which face severe climatic adversities and is a backward region regarding the importance to wetlands and its biodiversity. Baseline data is fundamental observable fact for the habitat management of Sarus crane. The data regarding the status and population of Sarus cranes will help in finding out their other requirements. Continued monitoring will be helpful in conserving foraging and breeding sites. It requires instantaneous actions to shield the water bodies as well as awareness amongst the local residents so as to establish a stable and healthy population of Sarus cranes and ascertain long term merits regarding the Sarus crane protection. Awareness amongst the local people plays an important part in conservation of any species. Conservation of biological diversity depends on people's knowledge and actions. People do not know or realize how their daily activities may lead to the population decline of any species. Once the farmers are made aware they will put a check on the activities that have negative effect on the Sarus crane and its habitat. There is also a need for socio-economic approach to habitat conservation of Sarus Cranes in. It is required to make the village panchayats understand the various benefits of wetlands so that they take the responsibility to protect them.

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