

## Population Dynamics of Sarus Crane (*Grus antigone antigone*, Linn.) in and around Alwara Lake of district - Kaushambi (U.P.), India

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### ABSTRACT

Survey of Sarus Crane (*Grus antigone antigone*, Linn.) was carried out within a period of one year (from Jan. 2013 to Dec. 2013) in and around Alwara Lake of district Kaushambi (U.P.), India. Crane population was recorded as single, pairs, pairs with juvenile, juvenile and flocks. Population size was  $60.3 \pm 6.2$  (16-80). Population was significantly influenced by local climatic temperature than humidity. Only single and flocks more significantly correlated positive to climatic temperature. Maximum number of 723 Cranes was recorded with a density of 1.8/ hectare including all age groups. During the survey adult pairs were recorded with a maximum percentage of 40.1 preceded by flock (23.9%) among all the observed age groups.

In spite of extreme temperature and humidity cranes were observed enjoying this land form. Besides this openness of land, numerous marsh wet land including the lake, alterations of crop fields *i.e.* Kharif, Rabi and Jayad, availability of food resources, variation in aquatic plants make the crane life style compatible to this habitat. Hence the objective of this study was to explore conservational and distributional aspects of crane and its habitat which can be shared in public awareness programmes.

**Key words :** Conservation, population dynamics, Kaushambi, *Grus antigone*, Sarus Crane, Alwara lake.

### INTRODUCTION

Sarus Crane is the only resident breeding crane in India and its population is comparatively more in Uttar Pradesh than other states. Hence, it is declared as State Bird by the Government of Uttar Pradesh for its conservation. It is the world's biggest flying

water bird. It is widely distributed with maximum number in Uttar Pradesh than its adjacent states of Bihar and Madhay Pradesh (Gole, 1989) followed by Gujarat and Rajasthan.

In Uttar Pradesh, they are located mainly in district Mainpuri, Etawah, Etah, Kaushambi and Aligarh (Sunder, 2000). Among these only one species of crane has been recorded in and around the Alwara Lake, District Kaushambi. Biodiversity indices of aquatics as well as inland are sparingly productive and seasonal. The variations of rainfall, temperature and the Yamuna river flood are the abiotic factors which greatly attributes to its aquatic biodiversity. It is an old marshy riparian wetland surrounded by agricultural and nonagricultural land. The small seasonal marshy lands were considerably noticed around the lake among crops land. The large openness around the lake was noticed due to seasonal flooding by Yamuna river. These are the factors that provide optimum habitat for the Sarus Cranes. Prakash *et al*, 2014 reported 487 cranes from its three different transect and agrued that from ecological point of view site is very favourable for Sarus Crane, *Grus antigone* distribution. They further reported that the highest population of Sarus Crane was reported in Transect II (207) during the survey probably due to availability of sufficient food, mainly small molluscs, crustaceans, worms and grains present in

cropland vegetation, e.g., paddy fields and other kharif crops.

In India, there is an alarming crash in the population of this species especially in Uttar Pradesh. The loss of natural habitat seems to be the most important cause for this drastic change or reduction in number. Therefore the present study is an attempt to explore the census of crane population and its correlations to climatic parameters, natural habitat and Alwara lake.

#### Study area

The lake under exploration is a natural lake and now a part of important wetland. The study area was divided into three major transects of landscape on the basis of its vastness, diversity of flora and fauna and type of water body (wetland or taal, Image 1).

The lake is surrounded by agricultural fields and connected with river Yamuna towards transect III and terminal part of Kishanpur lift canal towards transect I. Thus the habitat in the form of wetland is perennial, although during summer the water level falls down. During rainy season water depth goes upto about 20 meters and during summer the depth comes down to about 15 meters. Lake has derived its name from village Alwara. Locally it is called **Alwara Taal**. Alwara lake is a naturally formed lake and covers about 400 hectare. The surrounding villages are Paur Kashi Rampur in East, Tikara in North and Shahpur in South and river Yamuna in west.

#### MATERIALS AND METHODS

The authors used binocular, camera, motorbike, chappu boat, field stick etc. for various purposes. The findings are based upon the work conducted between January to December, 2013. Investigations were

conducted in morning hours between 6.0am to 9.0am and evening hours between 2.0pm to 5.0pm during our routine field trips. All the observations were made while moving through the chappu boat and walking along the

croplands, mudlands, natural areas using 7.35 and 8.40 binoculars. Sights and calls were the devices to enlist a bird at a particular site. Identification of different species was aided by using standard guides. Besides actual sightings, inquiries from local people were also made to ensure the estimate of existing population and their perceptions about the existence of the Crane. Census was avoided during rainy days. Population comparison was determined as a single, pair, pair with one juvenile, pair with two juveniles and flocks comprising adults and juveniles. The encounter rate of Sarus crane population was calculated by the relationship:

$$\text{Encountered rate} = \frac{\text{No. of cranes counted}}{\text{Total Area surveyed}}$$

Systat 12 (Wilkinson, 1982) software was used for the statistical analysis of data. The local climatic temperature and humidity were recorded by mercury degree centigrade thermometer and alcoholic hygrometer respectively. Their monthly mean  $\pm$  standard error variations were tabulated.

#### Geography of Alwara Lake

By road the lake is 85 km away from Allahabad district, 45 km from Manjhanpur head quarter of Distric-Kaushambi and 290 km from Lucknow, capital of Uttar Pradesh. Its nearest railway station is Bharwari at a distance

of 50 km and nearest airport is Bamrauli, Allahabad at a distance of 75 km. It is situated between the latitude 25°24'05.84''N - 25°25'10.63''N and longitude 81°11'39.49''E -81°12'57.95''E.

#### Climate around Alwara Lake

Its weather is tropical to subtropical with some variations over the year. **Winter** occurs between the months of late October to early March. Mid December to mid January is season of severe cold and irregular appearance of fogs are the characteristic feature of winter. Usually **Spring** occurs from mid February to end of April. **Summer** approaches in the month of April and ends in late June. It is marked by high velocity of winds known as loo in the month of May and June. **Rainy-** Approximately 350 mm rainfall observed annually from late June to early October. Irregularity of rainfall was also noticed year wise which influenced the landscape ecology of the lake. **Autumn-** It commences in mid October & ends in late November. **Temperature** shows with high fluctuation over the year and noticed determinant parameters of this landscape. Maximum temperature is 48°C to 50°C during summer and minimum 01°C to 5°C during winter.

## RESULT AND DISCUSSION

The population of sarus crane was recorded as single, pairs, pairs with juvenile, juvenile, flocks in their respective numbers and age groups (Image 2, 3, 4). Their monthly variations are tabulated in Table 1 and statistical graphs are shown in Figure 1-4. The climatic variation (Atmospheric temperature and humidity) recorded monthly are shown in Table 2. A total number of 723 (16-80) cranes were recorded during the survey period of 2013 which was

more than previously reported 487 by Prakash *et al.*, 2014 during Sep, 2011-Dec, 2012. The enhanced crane population was due to more nesting sites (marshes) in the study area and short distance immigration of flocks across Yamuna river. Similar short distance migration in Sarus Crane has been also reported by Nandi, 2006. Since the adult pairs were recorded in maximum number 292 (4-40) with 40.1% preceded by flocks 169 (5-20) with 23.9%

**Table 1. The overall monthly variations of Sarus Crane in and around Alwara lake during 2013.**

S. No.	Months	Single	No. of Adult in Pair	No. of Adult in Pair+J	Juvenile	Flock Adult	Total Cranes observed	Density = TotalCrane /Hectare	Pairs No.	Pairs+J No.	Flocks No.
1.	Jan.,2013	0	4	3	4	5	16	0.0	2	1	1
2.	Feb.	3	18	9	17	8	55	0.1	9	3	1
3.	Mar.	9	22	12	14	12	69	0.2	11	4	2
4.	Apr.	12	26	9	8	17	72	0.2	13	3	3
5.	May	16	30	9	6	19	80	0.2	15	3	3
6.	Jun.	19	34	3	1	20	77	0.2	17	1	4
7.	Jul.	10	38	0	0	18	66	0.2	19	0	2
8.	Aug.	7	40	0	0	17	64	0.2	20	0	2
9.	Sep.	4	38	3	0	16	61	0.2	19	1	2
10.	Oct.	5	20	30	1	15	71	0.2	10	10	2
11.	Nov.	4	16	36	3	15	74	0.2	8	12	2
12.	Dec.	0	6	3	2	7	18	0.0	3	1	1
13.	Total	89	292	117	56	169	723	1.8	146	39	25
14.	Range	0.0-19.0	4-40	0-36	0-17	5-20	16-80	0.0-0.2	2.0-20.0	0-12	1-4
15.	Average +SE	7.4± 1.734	24.3± 3.5	9.8± 3.3	4.6± 1.6	14.5± 1.4	60.3± 6.2	0.16± 0.02	12.1± 1.8	3.5± 1.1	2.1± 0.9

**Table 2. The overall monthly climatic variation in and around Alwara Lake during 2013.**

S. No.		Temperature (°C)	Humidity (%)
1.	Jan., 2013	5.3±2.1	89.3±2.5
2.	Feb.	12.4±2.5	84.9±3.2
3.	Mar.	26.2±2.5	79.1±5.2
4.	Apr.	35.4±2.0	58.9±4.0
5.	May	40.0±2.2	57.8±4.3
6.	Jun.	45.8±3.6	59.6±5.8
7.	Jul.	30.5±4.8	84.0±9.0
8.	Aug.	30.0±1.0	92.8±2.6
9.	Sep.	29.3±1.3	94.6±1.6
10.	Oct.	25.9±1.7	87.7±2.5
11.	Nov.	12.3± 2.5	82.0±97
12.	Dec.	10.0±2.3	91.3±1.8

Table 3. Analysed values (r) of Pearson Correlation between the different age group of Sarus crane and climatic factors during 2013.

	Single	No. Adult in Pair	No. Adult+J in Pair	Juvenile	Flock	Total	Density /hectare	Tem. (°C)	Hum. (%)
Single	1.000								
No. Adult in Pair	0.622*	1.000							
No. Adult +J in Pair	-0.154	-0.319	1.000						
Juvenile	-0.028	-0.303	0.083	1.000					
Flock	0.807**	0.845***	0.041	-0.389	1.000				
Total	0.733**	0.688*	0.350	0.040	0.861***	1.000			
Density/ hectare	0.650*	0.788**	0.274	-0.114	0.887***	0.958***	1.000		
Tem. (°C).	0.919***	0.806**	-0.222	-0.207	0.894***	0.751**	0.752**	1.000	
Hum. (%)	-0.853***	-0.207	-0.016	-0.220	-0.529	-0.549	-0.380	-0.662*	1.000

Significant at \*P<0.05, \*\*0.01, \*\*\*0.001

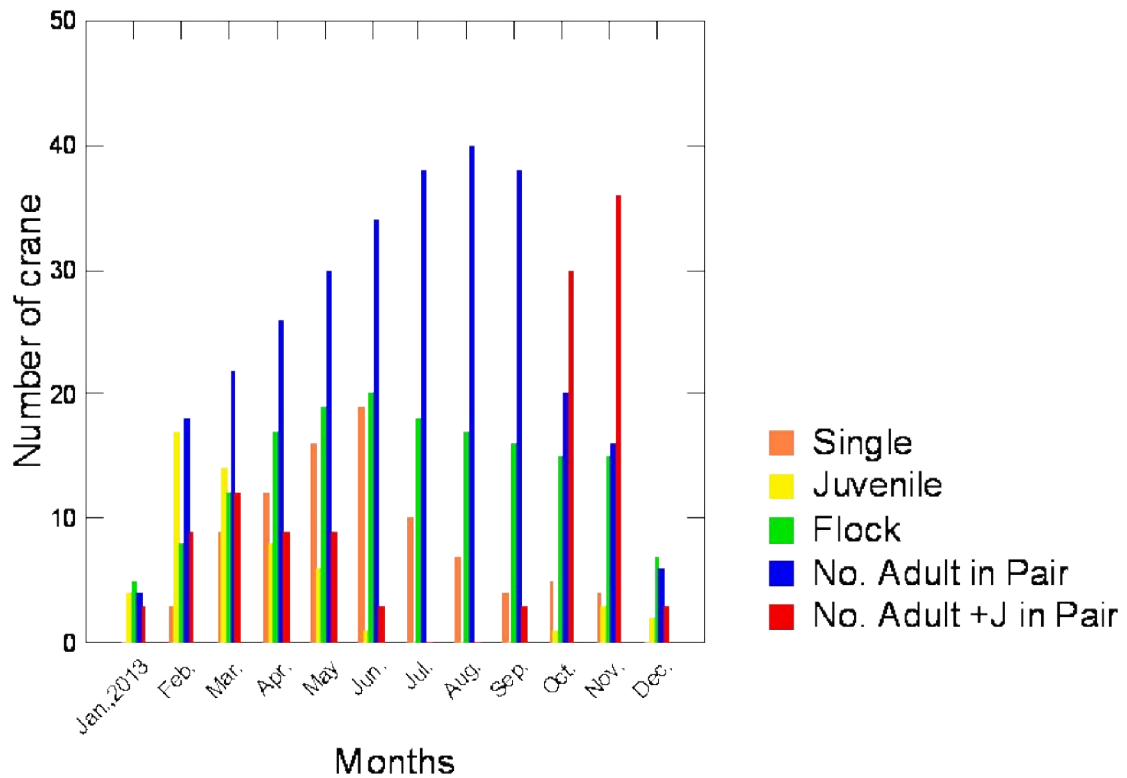


Figure 1. Bar Graph shows the observed monthly variations among the different age group of Sarus Crane during 2013.

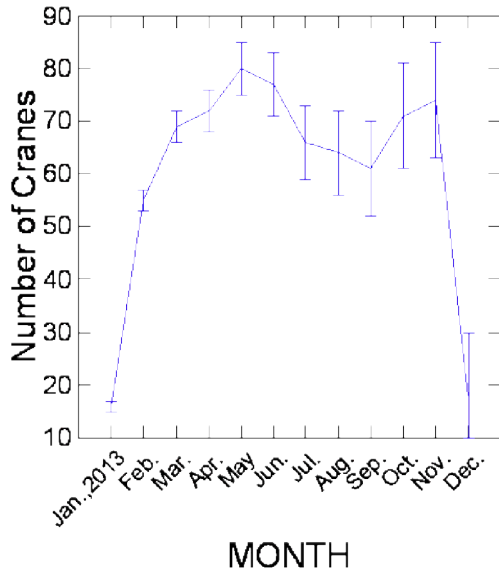


Figure 2. Line Chart shows the Monthly variations of total count crane with standard error in Alwara lake during 2013

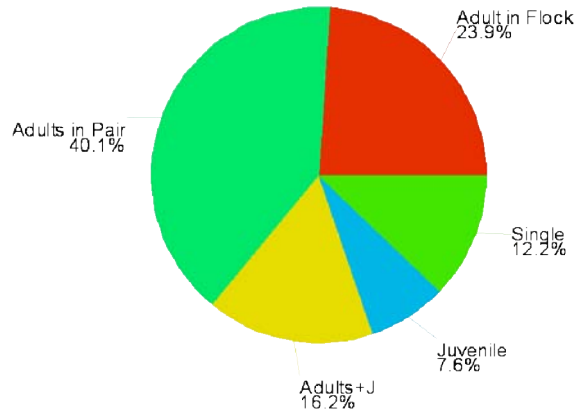


Figure 3. Pie chart represents the percentile variation of Sarus Crane population in Alwara lake during 2013.

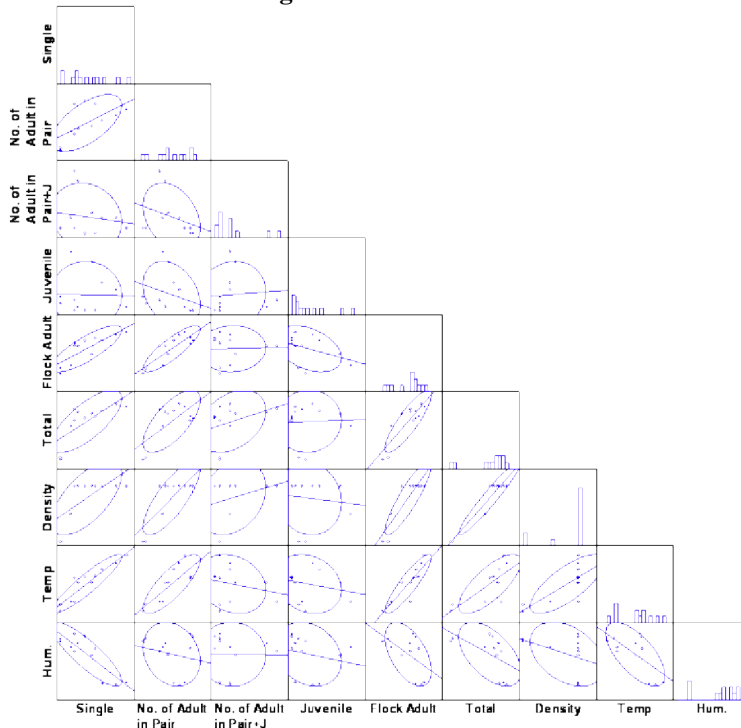


Figure 4. Pearson Correlation Matrix with linear regression line shows the significant correlation among all age groups of Sarus Crane and climatic factors of Alwara lake during 2013.

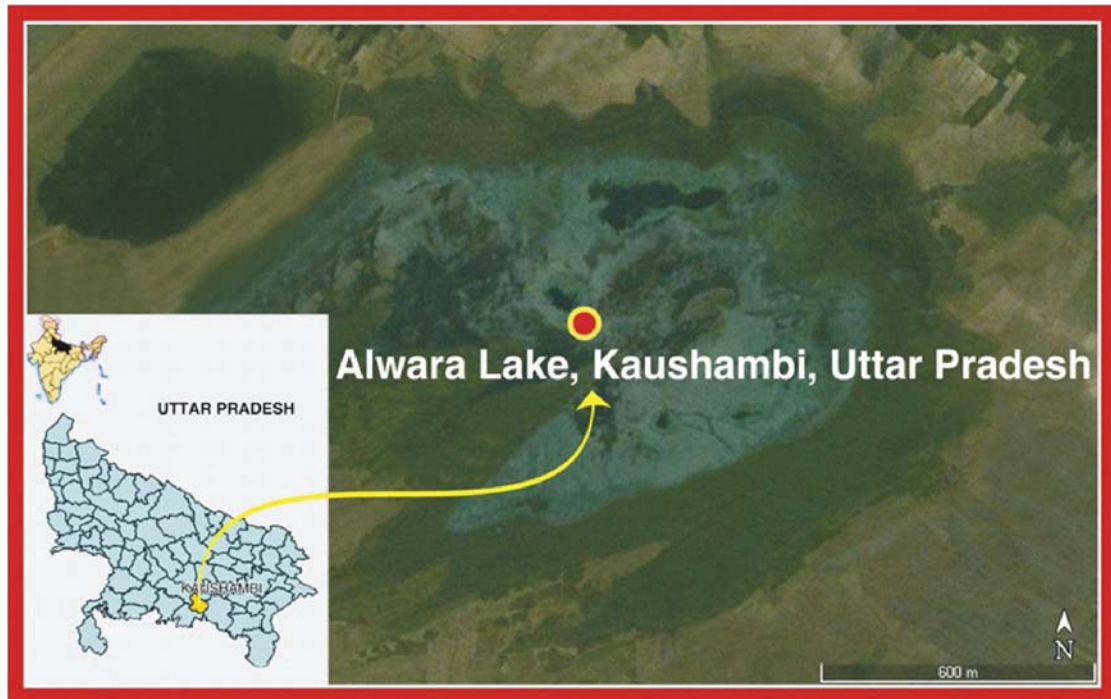


Image 1. The location of the study area



Image 2. Shows the single adult Sarus Crane in Alwara Lake.



**Image 3. Shows the adult pair of Sarus Crane in Alwara Lake.**



**Image 4. Shows the adult pair with juvenile of Sarus Crane in Alwara Lake.**



(Figure 3, Table 1); their numbers have been supportly increased in the month of August and May respectively. The increment in pairs is encouraged by the breeding site (marshes) around the lake (Lahiri, 1955 and Borad *et al.* 2001). Similarly flocks increased due to openness around the lake in the summer season from May-July (Livesey, 1937). Pearson correlation values (r) also strongly supported the relations between maximum temperature and flocks at  $P < 0.001$  and flocks were significantly related with pairs at  $P < 0.001$  (Figure 4, Table 3). Therefore, it could be hypothesized that flocks took short distance immigration to this favourable site across Yamuna river during summer season and imparted in pairing habit during the late rainy

season for preparation of breeding before winter season (August to October).

The atmospheric temperature (5.3 - 45.8° C; Table 2) of Alwara lake supported more significantly to the population of single crane at  $P < 0.001$  (Figure, Table 3) and flocks at  $P < 0.001$  than pair at  $P < 0.01$  but discouraged to adults with juvenile and juvenile. This correlation occurred due to general biological response of birds against climatic temperature. Perhaps the density/hectare was encouraged by atmospheric temperature at  $P > 0.01$ . This correlation was seen due to the openness and flora of the lake. The atmospheric humidity significantly showed negative effect only to the single crane population at  $r = -0.853$  ( $P < 0.001$ ) than insignificant to other individuals of crane populations (Table 3 and Figure 3, 4).

## CONCLUSION

The observed variations among all age group of Sarus Crane were seasonally correlated in and around Alwara lake. Their population pattern was significantly influenced by temperature than humidity. While other factors

like openness, agricultural land and seasonal marshes dominated over the climatic factors which resulted in increased population of Cranes during 2013 in and around Alwara lake.

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