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# Population Dynamics And Habitat Preference Of Sarus Crane (Grus Antigone L.) In Selected Pockets Of Central Gujarat.

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Abstract: Indian Sarus Crane (*Grus antigone* L.) is a flagship species of marshland and wetlands, frequently sighted on the agricultural landscape. In total 33 individuals of Sarus crane recorded from Matar (District-Kheda) and Tarapur (District-Anand), two tehsils of two adjoining districts from the plains of Central Gujarat region. The maximum numbers of males 11(33.33%) were observed followed by 10(30.30%) females, 6(18.18%) juveniles and 6(18.18%) sub-adults during the time period of January to March of 2017. 25 (75.76%) Sarus cranes recorded in Agriculture field, 21 (63.64%) individuals in Wheat field and 4(12.12%) in Chana field, followed by 8(24.24%) in Waste/Fallow land. Different activities of Sarus Crane such as foraging, flying, courtship dance, resting, feeding and resting also recorded. Change in cropping pattern, stealing of eggs from the nest and use of different chemicals in agricultural practices challenge Sarus Cranes to maintain the population in the area.

# Key words- Sarus crane, Flagship species, Agricultural fields.

# I. INTRODUCTION

Indian Sarus Crane (ISC) (*Grus antigone* L.), a magnificent and beautiful bird which is an icon of the wilderness. The world's tallest flying bird is listed in schedule IV of the Wildlife (Protection) Act, 1972 (Tripathi, 2014) and globally a 'Vulnerable' species as per IUCN Red List of Threatened Species (Bird Life International, 2016). The only resident breeding crane in India reaches up to the height of 1.8 metres (Kumar *et al*, 2019). It is a large grey stroke like bird with long bare red legs and naked red head and neck (Ali, 1941), having an iris of orange-red colour, a grey ear patch and a greyish - green bill, while juveniles have a bill with yellowish base and the fully feathered brown- grey head (Prasad *et al*, 1993). Coloration in males and females does not differ at all but the females are smaller than males, although juveniles differ from adults by their yellowish brown head. During the breeding season the mating pair exhibits peculiar ludicrous dancing display and capering, spreading their wings and prancing and leaping in the air around each other (Ali, 1941).

Three distinct populations of the Indian subcontinent, South-East Asia and Northern Australia were estimated with a total world population of 15,000-20,000 individuals (Archibald *et al.* 2003). One of worlds 15 known species of cranes, the most sedentary and tallest of the three crane subspecies is residing in northern and central India, Nepal and Pakistan, with occasional vagrants in Bangladesh (Meine and Archibald, 1996, 1996b). Distribution range has contracted towards the north and west of the Indian subcontinent (Sundar *et al.* 2000) and its population is considered under declining trend (Archibald *et al.* 2003).

Once common and widespread in several northwestern states of India (Salim Ali, 1941, Ali and Ripley, 1983, 1980), the distribution and concentration of the Sarus Crane is now restricted to few states like Assam, Gujarat, Haryana, Madhya Pradesh, Maharastra, Rajasthan, and Uttar Pradesh (Anonymous, 2000; Gabhane,2015; Gole, 1989,1987,1991; Singh And Tatu, 2000; Sundar *et al.* 2000).Gujarat is the third most important State as far as the global population of the Sarus crane is concerned – the first being Uttar Pradesh, second Rajasthan. Ahmedabad, Anand, Vadodra and Kheda are important districts for the Sarus Crane. During the All-India Sarus Crane Count in the year 2000, almost 30% of the cranes were counted from Gujarat (Mukherjee, 2002). The diet of this omnivores bird consists of grains, shoots and other vegetation as well as they consumes insects, mollusks and small reptiles (Ali, 1941). Sarus crane indicates good rainfall and healthy wetland ecosystem (Kumar and Kanaujia, 2017a). Even though cranes are recognized as a mascot of wetland, Sarus crane also utilizes the irrigated agricultural fields to build the nests for raising chicks as they became temporary wetlands (Mukherjee, 2006).

#### **II. RESEARCH METHODOLOGY**

#### 3.1 Study Area

Anand and Kheda districts of central Gujarat, located between two major rivers; Mahisagar on the eastern side and Vatrak, a tributary of Sabarmati on the western side. The southern side is attached to the Gulf of Khambhat. The major area of both the districts has canal irrigation facility and therefore irrigated farming is practiced. Paddy is extensively cultivated in this region. Paddy fields are temporary wetlands and they provide an alternative to the natural marshland habitat of the Sarus crane.

Tarapur and Matar are small towns and the administrative seat for the tehsil from Anand and Kheda district respectively. They share boundaries with each other, Tarapur serve as a major trading centre of Bhal region and Matar as the gateway to the Charotar region. The entire landscape of the Tarapur and Matar is mainly agricultural landscape; Tarapur located at 22.49°N 72.66°E and Matar at 22.75°N 72.68°E.



Figure 1: Surveyed area map of Sarus Crane (G. antigone L.) in Tarapur tehsil of Anand district and Matar tehsil of Kheda district.

#### 3.2 Methodology

The survey was conducted in the months of January to March of 2017 as winter and summer are most suitable to study the Sarus crane in the region (Sundar, 2005). The motorcycle was used to travel from one place to another for survey of Sarus cranes. The study was conducted in the morning between 0600–0900 hr and in evening 1400–1700 hr during routine field trips. Motorcycle speed was maintained at 30-40 km/h to know the presence or absence of the Sarus cranes. Since Sarus Crane is a huge bird and visible from a fair distance, direct observations were made in these thirteen sites to assess the population size and different activities. Observations were taken along the roads to cover the maximum accessible area. If sighting area was large to be scanned from one place, the whole periphery was walked to assess the presence of Sarus cranes. 10x50 binocular was used for the distant vision. The knowledge of local people was also considered to ensure the presence and the population size of Sarus cranes in their vicinity.

Locations of the Sarus cranes were noted down and coordinates were taken with the help of hand-held GPS. Later on, the exact locations were marked on a map that was already been geo-referenced. Various other parameters such as number, habitat and different activities of Sarus crane were also recorded. Other than Sarus crane, the number of other wetland birds as well as terrestrial birds which are often seen together in the wetlands and inundated crop fields, were recorded during the survey period.



Figure 2: A pair of Sarus crane photo captured in human dominated landscape

Identification of different species was aided by using standard guides "The book of Indian birds" (Ali, 1941) and "Birds of the Indian Subcontinent" (Grimmett *et al.* 2011). Population Density of Sarus crane was calculated using the formula (Aryal, 2004) **Population density of Sarus Crane = Total Number of Sarus Crane observation**/Total Available habitat area

#### **IV. RESULTS AND DISCUSSION**

Sarus crane presence was significant at Tarapur tehsil of Anand district and Matar tehsil of Kheda district (Table 1). Total 33 individuals were recorded during the survey, out of which 11(33.33%) males were observed followed by 10(30.30%) females, 6(18.18%) juveniles and 6(18.18%) sub-adults during the time period of January to March of 2017 (Table 2). Overall mean Sarus density for Tarapur and Matar (with respect to the total geographic area of Tarapur and Matar) was 0.046 individual/km<sup>2</sup>. Density was 0.028 individual/km<sup>2</sup> and 0.066 individual/km<sup>2</sup> for Matar and Tarapur respectively (Table 2). Mukhrjee *et al.* (2001) recorded 166 individuals of Sarus crane from Matar tehsil with total 573 individuals from Kheda district, compared it with the previous estimates and stated 62% overall decline in population predicting 38% future declining rate for the district. Tatu *et al.* (2013) reported 0.84 individuals/100 km<sup>2</sup> mean Sarus population in Gujarat state during the decade 2001—2010. Sarus population in Kheda- Anand district was 598±208.7 and density with respect to the total geographic area of the central Gujarat region had also been the highest (i.e., 4±0.8) from different regions of Gujarat. Nirmal kumar *et al.* (2007) found that Sarus crane population was highly dynamic, in summer the mean density observed was highest (98), and lowest (19) in monsoon, which suggest the availability of food to other locations leads to local migration during monsoon season.

It is also observed that the activity of Sarus crane depends upon the time duration of the day; Juvenile preferred early morning time, while Sub-adults prefer midday time, male and female rather prefer noon time (Table 1).

### 4.1 HABITAT SUITABLE FOR INDIVIDUALS MACRO HABITAT

From total of 33 sightings, maximum 25 individuals (75.76%) were recorded in agriculture field, followed by 8 sightings (24.24%) in waste/fallow land. 11 males (33.33%) were observed in macro habitat followed by 10 female (30.30%), 6 juveniles (18.18%) and 6 sub-adult (18.18%). Out of 25 individuals recorded in agricultural field, maximum number of 10 male, 9 female, 3 juvenile and 3 sub-adult were observed. And out of 8 individuals recorded in waste/fallow land, 3 were juvenile, 3 Sub-adult, 1 male and 1 female. Yaseen *et al.* (2013) concluded that  $62.69\pm13.9$  (Mean, SD) (78%) Sarus cranes were observed in the marshes and close to the Perennial wetlands, whereas  $10.75\pm3.0$  (13%) were found in agricultural and harvested field, and  $7.44\pm1.1$  (9%) were in fallow and inundated field during summer season. Tiwari *et al.* (2017) estimates the frequency of the Sarus cranes were highest in farmlands (62.74%), followed by wetlands (31.37%), and grasslands (5.88%) in Banke district, Nepal. Aryal *et al.* (2009) recorded 70% of Sarus cranes were using farmland while 30% using wetland as a regular habitat in west-central region of Nepal. Nandi (2006) counted more than 160 Sarus cranes (>1% of the reported total population in India) at the Bhoj wetland in Bhopal, Madhya Pradesh.

Tehsil (District)	No.	Observation Location (Latitude, Longitude)	Time (12.00)	Sarus Crane*					HABITAT	
				М	F	J	SA	Total	Macro (500 m)	Micro (50 m)
Tarapur (Anand)	1	22°28'31.68"N 72°37'14.93"E	12:10 PM	1	1	0	0	2	AF	Wheat
	2	22°28'12.10"N 72°34'54.31"E	12:20 PM	1	1	0	0	2	AF	Wheat
	3	22°27'1.56"N 72°32'37.52"E	12:40 PM	0	0	0	3	3	AF	Wheat
	4	22°25'55.72"N 72°33'0.60"E	01:10 PM	1	1	0	0	2	AF	Chana
	5	22°25'56.75"N 72°34'0.91"E	01:15 PM	1	1	0	0	2	AF	Chana
	6	22°25'4.64"N 72°34'46.42"E	01:36 PM	1	0	0	0	1	AF	Wheat
	7	22°26'0.85"N 72°37'27.91"E	01:49 PM	1	1	0	0	2	AF	Wheat
	8	22°27'4.37"N	02:10	1	1	1	0	3	AF	Wheat

ral

# 4.2 HABITAT SUITABLE FOR INDIVIDUALS MICRO HABITAT

72°38'20.75"E

22°29'44.88"N

72°31'31.65"E

22°32'46.66"N

72°31'52.34"E

22°31'27.55"N

72°37'45.65"E

22°35'9.16"N

72°37'1.14"E

22°35'36.23"N

72°35'2.34"E

**Total Sightings** 

10

11

12

13

Matar

(Kheda)

PM

11:55

AM

12:13

PM

11:42

AM

08:55

AM

11:26

AM

1

1

11

2

3

2

33

AF

FL

AF

AF

FL

Wheat

Fallow land

Wheat

Wheat

Fallow land

Maximum 21 sightings were observed in Wheat (Triticum aestivum L.) field, followed by 4(12.12%) in Chana (Cicer arietinum L.) field and 8 in waste/fallowland (24.24%). Of these maximum 21 individuals (63.64%) observed in Wheat field, 8 were males, 7 females, 3 juveniles and 3 sub-adults. 2 males and 2 females were observed in Chana field. Whereas, in fallow/wasteland, 1 male, 1 female, 3 juveniles and 3 sub-adults were recorded (Table 3). Parasharya et al. (1986 and 2000) concluded that Sarus crane damage to paddy crop and established a significant positive correlation between percentage of land under paddy crop, Sarus crane density (r =0.82024, df 10, P < 0.05) in Kheda district and observed that the roadside density was higher in Matar tehsil ( $0.277/km^2$  in September & 0.371/km<sup>2</sup> in December). Mainly due to human disturbance and higher predation risk, hatching success was higher in non-cultivable agricultural marshland (68.18%) compared to paddy cultivated marshland (38.48%). Overall breeding success was 19.51%. Juveniles comprised only 8.96% of the total number of Sarus cranes sighted during the post-breeding period (Borad et al. 2002). Mukherjee (2000) found 68 nests in the agricultural marshland from which 31 were built in paddy fields and the rest in inundated fallow/wasteland lost due to water logging and only two in the non-agricultural area.

10 6 6

	Area (km <sup>2</sup> )	No of sightings/Area	Density
Matar	386.19	11	0.028
Tarapur	335.32	22	0.066
Total	721.51	33	0.046

Table 2 Density delination of Sarus crane (G. antigone L.)

# Table 3 MICRO HABITAT (DELINEATION OF SEX- M/F/J/SA) preferred by Sarus crane (G. antigone L.).

Micro Habitat	Micro Habitat Male		Juvenile	Sub- adult	Total	
Wheat	8	7	3	3	21	
Chana	2	2	0	0	4	
NA	1	1	3	3	8	
Total	11	10	6	6	33	

# 4.3 ACTIVITY PATTERN AND ASSOCIATE BIRD SPECIES

Of the 33 sightings, maximum 9 (27.27%) individuals were engaging in foraging activity and 7 (21.21%) in flying activity, 2 (6.061%) in courtship dance, 4 (12.12%) in feeding, 6 (18.18%) in resting, 2 (6.061%) in feeding and resting and 3 (9.091%) in feeding, resting and flying (Chart 2). Total 23 associate bird species within 150 meters periphery of the Sarus crane were noted down during this study (Table 4). Borad and Parasharya (2018) recorded 80 species of birds under wheat (*Triticum aestivum* L.) fields in Matar and Thasra Tehsil of central Gujarat during winter (rabi) season of year 2007-2008.

Sr. No	0	Common Name	Scientific name	IUCN Threat category
1		Black Drongo	Dicrurus macrocercus (Vieillot, 1817)	LC
2		Black-headed Ibis	Threskiornis melanocephalus (Latham, 1790)	NT
3		Black-winged Kite	Elanus caeruleus (Desfontaines, 1789)	LC
4	1.5	Black-winged Stilt	Himantopus himantopus (Linnaeus, 1758)	LC
5	-	Cattle Egret	Bubulcus ibis (Linnaeus, 1758	LC
6	-	Common Myna	Acridotheres tristis (Linnaeus, 1766)	LC
7		Common Pigeon	Columba livia (Gmelin, 1789)	LC
8	245	Glossy Ibis	Plegadis falcinellus (Linnaeus, 1766)	LC
9		Green Bee-eater	Merops orientalis (Latham, 1802)	LC
10		House Crow	Corvus splendens (Vieillot, 1817	LC
11		House Sparrow	Passer domesticus (Linnaeus, 1758)	LC
12		Indian Peafowl	Pavo cristatus (Linnaeus, 1758)	LC
13		Intermediate Egret	Egretta intermedia (Wagler, 1829)	NR
14		Large Grey Babbler	Turdoides malcolmi (Sykes, 1832)	LC
15		Oriental Magpie-Robin	Copsychus saularis (Linnaeus, 1758)	LC
16		Painted Stork	Mycteria leucocephal (Pennant, 1769)	NT
17		Pied kingfisher	Ceryle rudis (Linnaeus in 1758)	LC
18		Red-vented Bulbul	Pycnonotus cafer (Linnaeus, 1766)	LC
19		Red-wattled Lapwing	Vanellus indicus (Boddaert, 1783)	LC
20		Rose-ringed Parakeet	Psittacula krameri (Scopoli, 1769)	LC
21		Rosy Starling	Pastor roseus (Linnaeus, 1758)	LC
22		Spotted Dove	Spilopelia chinensis (Scopoli, 1786)	LC
23		White-throated Kingfisher	Halcyon smyrnensis (Linnaeus, 1758)	LC

Table 4 List of associate birds of Sarus crane (G. antigone L.)

During the survey, it was observed that most of the Sarus cranes were sighted at second or third farm from the road with the some obstruction faces from the road side (Either manmade or natural as grass cover of *Typha angustifolia* L. Commonly known as cat tail grass). The observations recorded in Matar tehsil was less compared to Tarapur tehsil due to dense canopy of the trees on both the side of road.

Sarus cranes are most numerous in Gujarat, eastern Rajasthan, on the Gangetic Plain. In north east India (Assam) there are early breeding records from Dibrugarh and Chotta Bheel, Cacher (Johnsgard,1983). Tariq and Aziz (2015) found out that migratory flock of cranes decreased by 95% in the last 15-20 years and now are rarely passing through these routes. As compared to existing population in other parts of the natural distribution range in Unnao district of Uttar Pradesh, the abundance and density of Sarus cranes had decreased and the social composition including group was different in the drier areas (Kumar and Kanaujia, 2017). Thus we conclude wetlands as the primary habitat of Sarus during the breeding season. During the non-breeding season, Sarus also prefers agricultural fields of wheat and rice paddies for feeding and to congregate for pairing (Kumar *et al.* 2019). Sree (2008) concluded change in copping pattern and dam construction on upper reaches of rivers play a significant role in a sharp decline of about 93% population of Sarus crane in and around Alwara Lake (UP) due to favorable environmental conditions (Verma *et al.*, 2016; Verma and Prakash, 2016). No such evidence support decline of Sarus crane, but change in location wise population is result of change of agricultural landscape, differences in survey methods and threats to habitat due to overpopulation (Jha and McKinley, 2014).

#### V. CONCLUSION

The present investigation on population dynamics and habitat preference of Sarus crane (*G. antigone* L.) in selected pockets of central Gujarat conclude that male individuals dominate the surveyed landscapes, followed by female individuals, with an equal number of subadults and juveniles. Agricultural landscape was the most preferred habitat of Sarus crane then fallow/wasteland. Amongst individuals, males and females preferred agricultural land, while sub-adults and juveniles had an inclination towards fallow/wasteland. Sarus cranes were found to prefer wheat fields, followed by wastelands, and chana fields. Sarus cranes successfully utilized different types of human dominated landscape which are most essentials for the species.

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