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Eternal Attachment of Demoiselle Crane (*Anthropoides virgo*) to the Thar Desert of Rajasthan, India

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Abstract The Thar Desert of Rajasthan is a paradise for birds, particularly for the migratory bird Demoiselle crane (*Anthropoides virgo*). The plentiful migratory birds of many species are flocking into desert region between the months of September to December from various parts of the world. The Demoiselle crane is the smallest out of 15 crane species found in the world, commonly called *Kurjan*. The eternal attachment of Demoiselle to Thar Desert is due to their conservation is etched in the religion, faith, culture, and attitude of local people. Every winter, thousands of them flock to Thar Desert of Rajasthan. The Demoiselle crane's conservation status is "Least Concern" under version 3.1 of IUCN Red List Categories (2012) and the species is listed in Appendix II of CITES. Observations were made in the winter season of every year during 2015 to 2019. These migratory birds were observed in the Thar Desert, Rajasthan state of India. This paper summarizes on the population status of Demoiselle cranes at different locations of western Rajasthan along with their percentage time spent on different habitats for roosting and feeding.

Keywords: *Demoiselle cranes, population, habitat, Thar Desert, Rajasthan*

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1. Introduction

The Thar Desert of Rajasthan is the heaven for avian diversity, particularly the migratory birds. Birds are one of the most significant indicators of the health of environments such as rural ponds because they respond to major factors and can be observed relatively easily [1]. The Birds are one of the most magnificent species of vertebrate in the world and approximately 10.85% bird species of the world (1,210 out of 11,147) are available in India and stood at 9th place for avian diversity [2]. It has been ranked 7th for threatened bird species for having almost 6.2% (92 out of 1486) of species [2]. India has 243 species of water birds and 67 species of wetland-dependent and associated birds, and almost half of which are migratory and come to the subcontinent from their breeding sites [3]. Similarly, [4] had recorded about 510 bird species in the Rajasthan. [5] and [6] had also observed that about 61 endemic bird species were found in India and out of them, 17 species are noticed in Rajasthan. There are 15 glorious species of cranes found in the world. Out of these, six species of cranes are found in India *i.e.*, Common Crane (*Grus grus*) Demoiselle Crane (*Grus virgo*), Siberian Crane (*Grus leucogeranus*), Hooded Crane (*Grus monach*), Black-necked Crane (*Grus nigricollis*) and Sarus Crane (*Grus antigone*). Out of these six species, one is winter migratory magnificent Demoiselle Crane, locally known as *Kurjan* bird. The Cranes are among the most spectacular birds on earth that travel thousands of kilometers without caring for boundaries created by human beings [7]. The Demoiselle crane's conservation status is "Least Concern" under version 3.1 of IUCN Red List Categories (2012) and the species is also listed in Appendix II of CITES. Thousands of flocks of Demoiselle Crane reach Thar Desert of Rajasthan every winter. The journey of this migratory bird starts right from Siberia, China, Mongolia, Ladakh, Tibetan Plateau and travels through Afghanistan and Central Asia before coming to a halt at Thar Desert of Rajasthan in the north-western part of India. The flock moves towards warmer areas to avert the extreme cold of the Arctic region. Khichan, the world fame wintering ground of Demoiselle crane near Phalodi town of Jodhpur district, also noted by [8]; holds second most abundant population of the world's demoiselle cranes. Korna village ponds of Barmer district and Sardarsamand of Pali district are another home for the Demoiselle cranes in the Thar Desert. The plentiful migratory birds of many species are flocking into the desert region from September to February month of every year. The stay of any migratory birds at a place during

visiting hours depends on temperature, security, food availability, and water level [9] while the large numbers of anthropogenic activities like uses of pesticide in agriculture, deforestation, livestock grazing, hunting, fishing, development of industries and urbanization, sound pollution are some of the major threats to the bird diversity [10] along with the mining of banks and beds of wetlands and rivers for sand, gravel and stones, lowering food supply and reduced roosting habitat for birds [11]. The minimum human interference in the ecosystem in terms of developmental activity in and in vicinity of wetlands are the other important feature which provides favourable conditions to the migratory birds [12]. The importance of local landscapes for conservation of avifauna can only be understood by knowing the structure of the bird community of that region [13]. and monitoring of wetland birds that provides valuable information on the ecological health and status of wetlands and further can be a very important tool for increasing awareness regarding the conservation value of the pond ecosystem [14]. Therefore, the small natural lakes and man-made reservoirs are acting as a typical wetland ecosystem and provides habitat for local and migratory birds and play a key role in maintaining the ecosystem function which in turn maintains the balance in nature [12]. This paper explains the status, distribution and threats to conservation of Demoiselle Crane in Thar Desert of Rajasthan.

2. Material and Methods

Selected sites of Thar Desert of Rajasthan were surveyed for Demoiselle cranes from September 2015 to March 2020. The survey was conducted in two phases. Secondary sources of information were from newspapers, magazine, literature and the forest department of Rajasthan. Surveys were conducted at different locations like agriculture fields, pond, river (nadi), lake, wetlands, scrubland (oran) and Grazing land (gauchar). All the sites were approached by vehicle. The survey sites were selected on the basis of our earlier experience and available information about the presence of Demoiselle cranes gathered during the survey. Demoiselle cranes were counted using binoculars (8 x 40), camera using canon 700 D with lens 55-300 mm and Global Positing System (GARMIN e_trex vista). The "Block Method" was used for counting the number through the binocular as it is an easy and accurate method for estimating numbers of cranes present in large, densely packed flock, either in flight or on the ground [15]. This method involves counting or estimating a block of cranes within a flock. Depending on the overall flock size a "block" can be estimated to 1000 or 500 or 200 cranes. The block is then used as a model to measure the remaining size of the flock. The birds were identified by their characteristic features following standard identification manuals and field guides as prescribed by [16], [17] and [18]. The information of cranes was also collected via questionnaire survey from local people who are living in the vicinity of the water bodies. Sighting information like flock size, preferred habitat, sighting points and activity etc. were recorded on the ornithological data sheet.

3. Study Area

The Thar Desert is located in the west of Aravalli range and lies between 24° N and 35°5' N and 70°7' N and 76°2' E. The present-day population density is 165 people per square kilometer, making Thar is one of the most densely populated deserts in the world. The desert has unique biodiversity while it has two wildlife sanctuaries Desert National Park and Tal Chhapar Wildlife sanctuary along with two International Birdlife Area (IBA) Khichan (Jodhpur) and Diyatra (Bikaner) as recognized by the Bombay Natural History Society, Mumbai. This desert tract is characterized by low and erratic rainfall (200-450 mm/year), extremely high day temperature during summer (maximum recorded: 49.9° C) and high wind velocity (up to 20 km per hours) in summer) with low relative humidity and evapo-transpiration. January is the coldest month and the dry hot summer sets in after mid-March and continues up to June, till the onset of the monsoon. Wide variation in rainfall is perceived each year and failure of monsoon is quite frequent. The Thar Desert is supported by good numbers of trees and shrub species. The thorny type of vegetation is the most dominant which consists of three series, namely, (i) *Calligonum polygonoides* - *Clerodendrum phlomidis* (ii) *Prosopis* - *Capparis-Ziziphus* and (iii) *Acacia* - *Capparis* and despite its harsh environmental conditions, the Rajasthan Desert has been supporting diverse wildlife [19]. The crane population has refuge in Thar Desert due to the protection afforded by the local community and the climate of desert during winter season. Selected sites were divided into different habitats on the basis of land use pattern and these are (1) Recently harvested crop field (RHCF), (2) Harvested crop field (HCF), (3) Fallow land (FL), (5) Scrub land (SL) and (6) Hedge Row (HR) and (7) pond bank (PB).

4. Result and Discussion

Demoiselle crane (*Anthropoides virgo*) is one of avian migrant species which fly over a distance of thousands of kilometres in order to find the best ecological conditions and habitats for feeding, roosting, breeding and raising their young. The eternal attachment of Demoiselle crane to Thar Desert is due to their conservation is etched in the religion, faith, culture and protective attitude of local people of this region. The cranes were using about 20 major locations of thar region during the winter season which were summarized in Table 1 and their detail information was shown in Figure 1. We recorded about 25000 Demoiselle Cranes, with the highest number at Khichan village of Jodhpur and followed by Sardarsamand lake of Pali (14000 cranes) and village ponds of Korna, Barmer district (7000 cranes) during year 2019-20 and similar trends with 21000 cranes at Khichan village, followed by Sardarsamand lake of Pali (12000 cranes) and Korna pond of Barmer district (8000 birds) were recorded during year 2018-19 (Figure 2) which may be due to the availability of good habitat and protection from the local people in the Thar Desert of Rajasthan. The Khichan is the world-famous wintering place of this

winter migratory bird (Demoiselle crane) and located at 27.1376 N 72.4176 E in the Thar Desert landscape. Flocks of Demoiselle crane, commonly known as *Kurjan* in Rajasthan, fly in from Siberia over the Tibetan highlands in China to the Himalayas in India every year looking for a warmer climate and reaches mostly at Khichan in Rajasthan. These cranes are regularly sighted at chugga ghar, village pond, Malar Rann (Salt Pan) and Bap Rann of khichan in Phalodi tehsil of Jodhpur district. They travel to the village regularly, and their number is increasing every year owing to the unique community effort. The local people protect and feed hundreds of kilograms of millet and sorghum every day to this winged guest at Khichan. The Demoiselle crane travels to the village regularly, and their number is increasing every year owing to unique community effort of feeding them. Thus, the Demoiselle crane lives in harmony with nature and people at Khichan. Sardarsamand is one more favourite area of Demoiselle crane in the arid region. It is located at 25.9826 N 73.3871 E in the east of Sardarsamand revenue village, Tehsil Sojat of Pali district. It is situated at the confluence of Sukri and Guhiya rivers which are tributaries of river Luni. Surface area of this reservoir is 35.5 sq. km. It has maximum depth of 7.6 m. The lake is getting its water from 1634.11 sq. km. catchment area of the two rivers originating from Aravali ranges. Another famous location for cranes is Korna, which is situated at 26.2161 N 72.5858 E in Barmer district of Rajasthan where no grains were feed. They displayed a definite pattern specific to species for arrival at and departure from various water bodies of desert landscape of Rajasthan. In September 2016, Barmer district authorities were going to allot about 27,225 square feet (400 bighas) of land in Korna for built a power substation. In revenue records, this land is listed as 'gauchar' and it has about 5 water bodies. Due to this favourable condition, a large flock of migratory birds come here every year. The local people fought united for wildlife conservation and protest against the government's decision to build Grid Substation. Finally, the National Green Tribunal (NGT), Bhopal had passed an order on March, 2017 for State Government of Rajasthan to look for an alternate site for proposed power grid station and gave relief to the local residents of Korna. It was that intimacy, that made flocks of cranes to migrate from different parts of the world to various regions of arid Rajasthan. The Pachpadra town of Barmer district is known for salt production, and it is becoming a newly emerging site with a fresh identity on the map of the country for migratory birds. Stay of these winged guests at Thar Desert during the visiting period depends on temperature, safety, shelter, food availability and water level. They come to the village ponds, nadi, lake or dams of Thar Desert from September and stayed up to March. October to January is the peak duration for observing Demoiselle cranes in the Rajasthan. Apart from these, there are a few locations for sighting cranes are namely Jajiwal, Jajiwal Dhora, Aulvi, Guda Bishnoian, Chrai, Osian, Shikarpura and Sarecha, Luni, Jaswant Sagar Dam of Jodhpur disctrict, Pachbadra of Barmer district, Bhaniyana, Gadisar, Delasar, Jaitasar Talai, Himala Nadi, Rakeshari Nadi, Rachan Nadi, Mawa Talai of Jaiselmer district and Hemawas dam of Pali district. Many scientists have conducted studies on the behaviour, ecology and distribution of Demoiselle crane in this region [3,8,13,20,21,22]. However, earlier, the population of Demoiselle Cranes in Thar Desert was not systematically assessed by any author.

Table 1. Sighting Habitat of demoiselle cranes in desert region of Rajasthan

S No	District	Name of Place/ water body	Habitat	GPS location
1	Jodhpur	Khichan	Pond	N 27.1376
				E 72.4176
2	Jodhpur	Jajiwal	Pond	N 26.3695
				E 73.1657
3	Jodhpur	Jajiwal Dhora	Scrub land (Oran)	N 26.3276
				E 73.2156
4	Jodhpur	Guda Bishnoian	village pond	N 26.1363
				E 73.1051
5	Jodhpur	Chrai, Osian	village pond	N 26.6861
				E 72.7124
6	Jodhpur	Shikarpura, Luni	Pond	N 26.0350
				E 73.0370
7	Jodhpur	Sarecha, Luni	Pond	N 26.0590
				E 72.9786
8	Jodhpur	Jaswant Sagar	Dam	N 26.2165
				E 73.6877
9	Barmer	Pachbadra	Oran	N 25.9249
				E 72.2472
10	Barmer	Korna	ponds & Oran	N 26.2161
				E 72.5858
11	Jaiselmer	Bhaniyana	Pond	N 26.6276
				E 71.8637
12	Jaiselmer	Gadisar	Pond	N 26.9084
				E 70.9221
13	Jaiselmer	Delasar village	Pond	N 26.9686
				E 71.4062
14	Jaiselmer	Jaitasar Talai	Pond	N 27.0466
				E 71.9051
15	Jaiselmer	Himala Nadi	Pond	N 27.4548
				E 72.2960

S No	District	Name of Place/ water body	Habitat	GPS location
16	Jaiselmer	Rakeshari Nadi	Pond	N 27.4640
				E 72.2945
17	Jaiselmer	Rachan Nadi	Pond	N 27.5969
				E 71.5772
18	Jaiselmer	Mawa Talai	Pond	N 27.0451
				E 71.8987
19	Pali	Hemawas	Dam	N 25.7344
				E 73.3620
20	Pali	Sardarsamand	Lake	N 25.9826
				E 73.3871

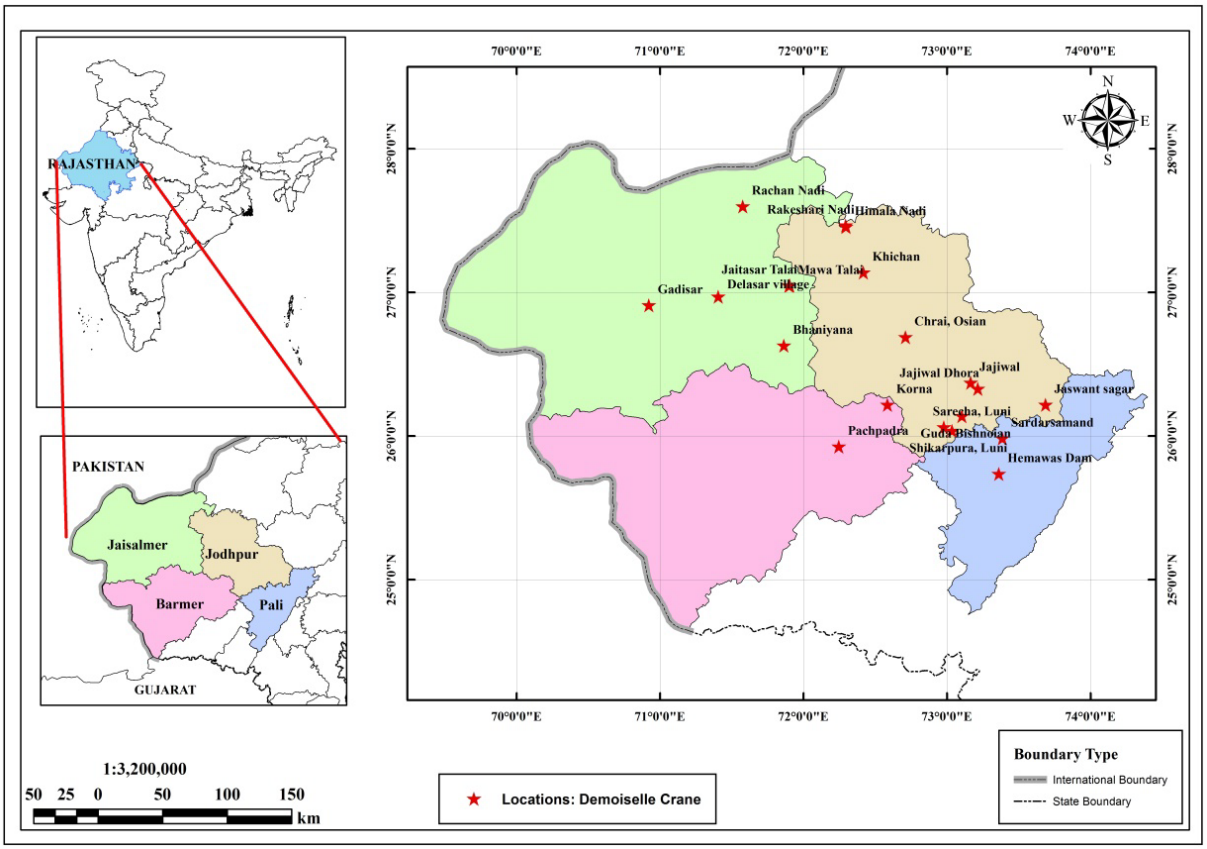

Figure 1. Sighting locations of demoiselle cranes in desert region of Rajasthan

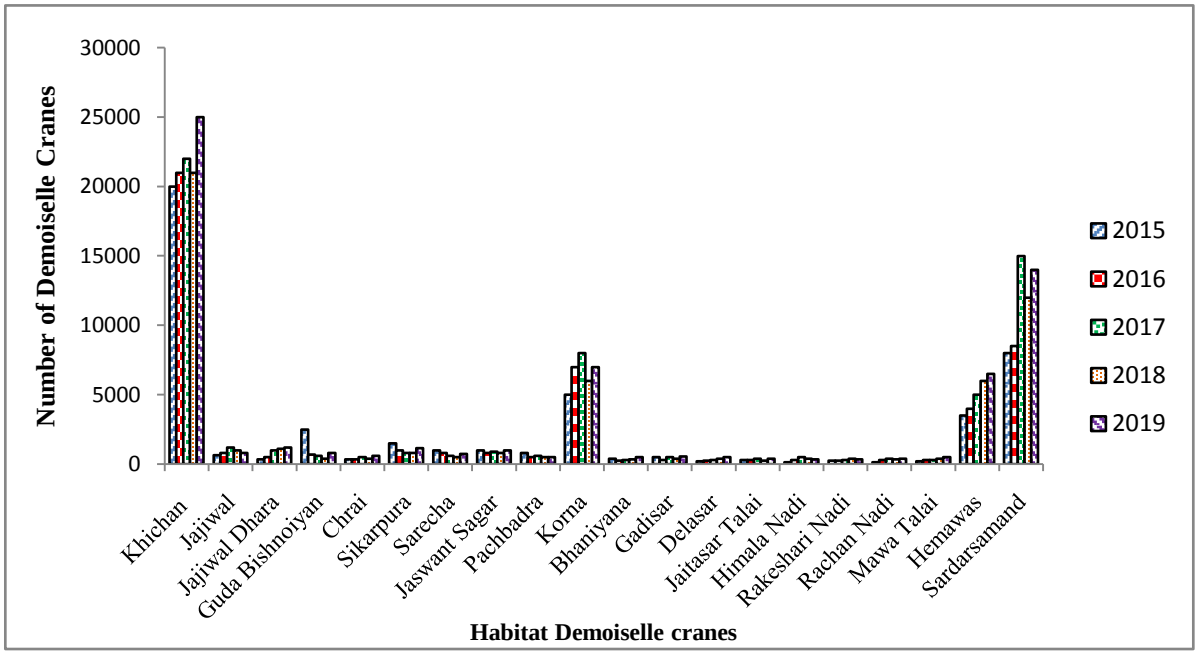

Figure 2. Numbers of Demoiselle Cranes at different sites of Western Rajasthan

Table 2. Differential habitat utilization (%) by crane at different study sites in Thar Desert

Study site / Habitat	Artificial feeding (Chuga Ghar)	RHCF	HCF	FL	SL	HR	PB	Time spent (Min.)
Khichan, Jodhpur	45	14	0	10	9	0	22	1080
Sardarsamand, Pali	0	15	8	10	5	5	57	
Korna, Barmer	0	18	5	8	5	2	62	
Bhaniyana, Jaiselmer	0	32	9	12	25	8	14	

Figure 3. Feeding and roosting sites of Demoiselle crane at Different location of Thar Desert (A-Roosting site Sardarsamand pond bank, B- Feeding house at Kheechan and C- Feeding ground at Jajiwal Dhora)

Cranes were found to utilize different habitats extensively for feeding at agricultural field or oran, foraging and roosting on the emergent and fringed vegetation of village's water bodies. Generally, cranes raid on the agricultural field of kharif crop during the night hours and come back to the bank of water body for rest or roosting during day times. They are omnivorous but mainly feed on insects and beans of moth (*Vigna aconitifolia*) or mung (*Vigna radiatae*) in the arid region. In September, the agricultural crops were standing tall in fields but during November, the kharif crops were harvested thus shattered grains were available in the fields. During this time, the cranes prefer recently harvested crop field (RHCF) and before harvesting season they prefer bank of village's pond or adjoining oran. During total migration period, the habitat was utilized by crane is in the order of RHCF > SL > FL > HCF > HR. They spent maximum of 45% time at Chugga Ghar for artificial feeding in Khichan but 18 % and 32 % time was spent at the agricultural field (RHCF) in Korna and Jajiwal respectively and similarly, they spent 62% and 57% of their maximum time at the pond bank areas of Korna and Sardarsamand (Table 2 and Figure 3).

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