



Assessment of Major Threats for Conservation of *Anthropoides virgo* in The Thar Desert of Rajasthan (India)

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Abstract: The Demoiselle crane (*Anthropoides virgo*, Linnaeus 1758) is one of the winter migratory bird in Thar desert of India. The study aims to critically analyze the major threats and post-rehabilitation scenarios faced by the crane. The scan and focal sampling methods were used for the study of crane behavior and their threats. Powerlines are considered to be havoc when contacted take a toll on almost 50% of the crane. A total of 138 birds were injured and post-rescue treatment shows only 32% healthy Individuals and 14 % of crane mortality was observed due to dog attacks. Insecticide poisoning due to Monocrotophos is a major threat. Furthermore, change in land-use pattern remains another threat with an increase of IGNP network for agricultural expansion. This species also shows lesser improvement in rehabilitation. Post rescue rehabilitation observes the death of 49% of species and only 16% of the bird can be successfully released back into the wild. With a globally declining trend of the majestic bird due to facing several pressures, in pertinence to their habitat, population, and above-mentioned threats. Thus, there is an urgent need for the hour to conserve this species.

Keywords: Thar desert, Demoiselle crane, Conservation, Threats

The Thar desert on the eastern range longitudinally joins the Great Sahara Desert of the western range thus, completing the Iranian Arabian desert extension. The Thar is about 640 km long and 160 km wide and shifts continuously from the southwest due to high wind velocity (Kotia 2008). It is one of the bio-geographic regions of India and is very rich in avian diversity, particularly migratory birds (Gehlot et al 2021a). Birds are ideal bio-indicators and useful models for studying a variety of environmental problems. The Rajasthan state of India harbours about 510 species of birds (Grimmett and Inskipp 2018). The Demoiselle Cranes breed on wetlands across Eurasia ranging from Eastern Europe to north-eastern China, and they migrate to the Indian subcontinent during winter. The Demoiselle Crane is one of the 15 known species of cranes in the world and is the most abundant winter visitor birds of India. It is confined to the Thar desert of Rajasthan at various artificial wetlands in Jodhpur, Pali, Barmer, Nagaur, and Jaisalmer districts. The famous winter ground of Demoiselle Crane is Khichan, where a large congregation of the visitor Crane forms every winter (Jain et al 2013). The Thar desert has a very significant Avian diversity (Gehlot et al 2021a) but, due to alarming increase of anthropogenic pressure, such as uncontrolled development and increase of urbanization, and climate change the population and diversity of bird species are on a decline (Chen et al 2011, Şekercioğlu et al 2012). Increased anthropogenic activities is resulting in habitat destruction,

fragmentation and altering of the birds' habitat, thus increasing threats not only for birds but also several resident faunal species as reported by Datta (2011) and Gautam and Kafle (2007). Similarly, birds present near the lakes are affected by pollution, perturbation by anthropogenic activities, and unmaintained water bodies (Rathore and Sharma 2000). Therefore, we studied Demoiselle crane every year from September to March in the Thar Desert of Rajasthan, whose major threats have thus far remained undocumented. The objective of the present study is to assess the major threats to Demoiselle crane in the Thar desert of Rajasthan, India.

MATERIAL AND METHODS

Study was carried out in the Thar desert landscape which is situated in the extreme west of the India, which predominantly shares its border with Pakistan. Thar landscape comprises 12 districts of Rajasthan extending from 24° N and 35°5' N and 70°7' N and 76°2' E. Study area were surveyed from 2015 to 2020 each year during September to March. Sites such as wetland, riverbank, village pond, Scrubland (Oran), agricultural fields were selected. Survey site selection was done on the basis of earlier experience and from the secondary data gathered from the Forest department of Rajasthan about the presence of Demoiselle crane in the region. Demoiselle cranes were observed using 8×42 mm Bushnell H₂O binoculars. Garmin

Oregon 650 GPS was used to gather spatial information. The scan and focal sampling method were adopted to gather threats to Demoiselle Crane (Gehlot et al 2021b). The focal sampling procedure is particularly adopted for injured, sick, or bird with distinctive behaviour. Identification of the bird species was carried out using a field manual and identification guide as prescribed by (Kazmierczak 2000). A questioner survey was also executed for identification and gathering of information about threats of cranes species in the study area. Two peoples were randomly chosen from each village to be interviewee of the questioner survey irrespective of their sex, age, and occupation.

RESULTS AND DISCUSSION

During the study period the following major threats were assessed in Thar desert of Rajasthan (Table 1).

Anthropogenic pressure: Several anthropogenic pressures affect the distribution and density of migratory birds in village ponds and their other habitat in the desert region. Villagers use water from the village ponds for their domestic purposes, for cattle bathing. Excessive grazing by livestock, encroachment of habitats like oran and gauchar by residents for cultivation and developmental activities and solid waste dumped in the area adjoining the village pond all leads to major encroachment on the habitat of the cranes imposing serious threat. During the study period, changes in the migration period of cranes at different locations in the desert region. Commonly, the cranes left migrating ground in March before the onset of the summer season but during study they left Cherai village on 28 December 2017, Guda Bishnoi on 10 December 2017 and korna village on 15 December 2017, Jajiwai on 30 December 2018 and Guda Bishnoi on 25 December 2018. All locations are good wintering grounds for crane but due to anthropogenic pressure; they left before their usual time. Migration of crane is depended upon the protection by local people and the current situation of the habitat. Destruction of desert grassland and habitat fragmentation due to various anthropogenic activities like grazing by livestock, fodder collection, encroachment on orans and gauchar. The traditional water bodies of Thar desert like nadi, village pond or *talab* are going to disappear due to these above-mentioned anthropogenic activities which are making the acute effect on crane population during winter. The global avian diversity is declining constantly due to climate change and human disturbances (Chen et al 2011). Consequently,

Bird Life International, (2020) has documented 1486 bird species as threatened globally and India reported 94 threatened bird species, thus ranking the seventh position. Perveen and Khan (2010) has revealed the decrementing trend in populations of Eurasian and Demoiselle Cranes due to poaching, mismanagement of natural habitats and human activities. The minimum anthropogenic interference in the ecosystem in terms of developmental activity near wetlands are the other major features that provide conducive conditions to the migratory birds (Nalawade et al 2008).

High voltage power lines: High voltage power lines are a threat for all key avian species of the Thar Desert. Power lines passing through their habitat make an extremely high collision risk for the Crane population in the Thar Desert. Seventeen cranes were injured and 11 had died due to electrocution by power lines in the Thar Desert. Recently, the High Court of the state of Rajasthan has ordered the state government to shift high voltage power lines from the feeding place of migratory birds at Khichan. Similarly, death of five Great Indian Bastard (GIB) was due to Powerline in the Jaisalmer district of Thar Desert during 2017-18. Many times, High voltage power lines are responsible for the death of bird species (Parasharya et al 2000, Sundar and Choudhury 2005). Suthar et al (2017) also observed that the power lines and windmills which are in close proximity to important bird areas and water bodies make the barrier for flying and sometimes leads to electrocution and collision causing injuries or even death to the birds. Gruiformes, particularly cranes, are on the verge of extinction due to electrical wires in America and Europe (Bevanger 1998), and at least three of the 15 existing species experience increased mortalities rates that are of major concern to endangered species and local populations in South Africa and North America (McCann and van Rooyen 2002, Wassenich 2003).

Increase of feral dog population: The population of natural predators like wolves, fox, and the desert cat is on a decline while the feral dog population has increased remarkably in the desert landscape (Chishty et al 2021, Rajpurohit et al 2011). The feral dogs are attacking more rampantly on migratory cranes and which at times become hazardous for this migratory species at different water bodies in the Thar Desert of Rajasthan. The porous area boundaries of the resting ground of cranes make it easy for stray dogs to enter from various adjoining villages and cause heavy toll on this majestic migratory bird. During the study, 29 cranes were injured and 5 were dead owing to attack of feral dogs. The 18

Table 1. Mortality and Injury of Demoiselle crane owing to different causes at the Thar desert

Total rescued	Feral dogs	Electric wire	Accident	Disease	Poison	Tangled in thread
238	34	28	20	6	138	12

episodes of a dog attack on the migratory bird (Demoiselle Crane, pelican, painted stork, and water birds) were recorded and many incidents of a dog attack on common birds like peafowl, sandgroves, dove, and vulture were also noticed. Furthermore, Dogs also attack small mammals like the hare, desert cat, gerbil as well as prey upon desert antelope viz. Chinkara, Blackbuck, and fawn of bluebull in the Thar Desert. Our findings were similar to Gehlot (2006). Gehlot and Jakher (2015) stated that the major death of Blackbuck (45%) and Chinkara (35 %) is owing to the rising feral dog population in their habitat during fawning hours. Apart from migratory birds, sometimes the feral dog attacks on Great Indian Bustard in the Thar desert (Dutta et al 2013) and in remote protected areas and former "closed areas" (Collar et al 2015). The dogs make an adverse effect on many threatened wild species which was (Doherty et al 2016, Hughes and Macdonald 2013). The alarming increase of dog population in natural habitat could have diverse and complex ecological effects, potentially influencing community dynamics. Sometimes dogs compete with predator and prey upon wild fauna (Ritchie et al 2014).

Poisoning: A total of 138 birds were fell sick due to insecticide poisoning, out of which 32% of birds rescued and later released back into its habitat. Two major incidents of insecticide poisoning were recorded during the study period after eating pesticide laden seeds. Approximately 39 Demoiselle cranes were found dead due to insecticide poisoning at Khichan on 07 November 2019, and 15 cranes were injured at Vijay Sagar pond, 16 carcasses were reported at Ratri nadi village pond and 6 birds near Lordia road, 2 cranes at the agricultural field of Khichan area and added to it 11 birds were injured and 04 were killed at Luni river basin area. Another case of crane mortality was reported where 5 were found dead and 40 other fell sick on 01 January, 2020 at Khichan village of Jodhpur. The National Centre for Avian Ecotoxicology attributed the mortality to a toxic insecticide Monocrotophos. Similarly, 15 Sarus Cranes (*Grus antigone*) were found dead due to food poisoning in Keoladeo National Park of Rajasthan (Pain et al 2004). Muralidharan et al (2017) has reported 40 Cranes dead in the Amreli district of Gujarat during December 2012 attributed to Phorate poisoning, and a few Demoiselle Crane deaths were noted at Sakria lake due to rodenticide.

It was estimated that about 672 million birds are exposed to pesticides and 10% of these die in the USA every year (Mitra et al 2011). More than 4000 Swainson's Hawk (*Buteo swainsoni*) died in Argentina during 1995-96 (Pimentel and Burgess 2014) pertaining to the use of pesticide. Austin (2018), has reported that insecticide poisoning is one of the greatest threats to Blue Crane (*Grus*

paradisea) in South Africa during 1980's and 90's as well as the cause of mass mortality for 145 Demoiselle Crane (*Grus virgo*) in *Mangolia*.

Land use changes: The Indira Gandhi Nahar Project (IGNP) is one of the largest canal projects in India which was constructed to convert Desert wasteland into an agricultural field. Majority of the IGNP canal lies in the north-western part of Jaisalmer District. The Major canal has a length of 257.57 Km along with the secondary canal network of 3811.82 Km which was digitized using ArcMap (Fig. 1). Canal irrigation has led to an increase in land degradation and has also surged the weed population in the desert region. The canal lines now extended with the subsidiary branches and had reached till Desert National Park and it was observed that many exotic and local plants are also growing alongside the IGNP likewise: *Tecomella undulata*, *Eucalyptus camaldulensis*, *Acacia tortillaria*, *Acacia nilotica*, *Ziziphus mauritiana*, etc. In the vicinity of IGNP canal along with adjoining protected regions of Desert National Park and the crane migrating regions 150 villages had been surveyed, and discussed for behavioural changes in cranes as perceived by locals. The demoiselle crane getting bad reputation for raiding croplands and 210 interviewees perceived it as a crop destroyer. Direct sightings of the Crane from field had concluded that 90% of the times they are either raiding on Moong (*Vigna radiata*), or Moth bean (*Vigna aconitifolia*) fields and rest on the Gram (*Vigna mungo* (L.) Hepper) field and rarely seen in the field of cash crops. The availability of canal water in the desert area has helped extremely in the growth of irrigated areas and has led to a substantial change in agricultural land productivity. On the contrary, the irrigation has resulted in rapid changes in the desert ecosystem. The vast extension in the cultivated area has been mostly at the expense of desert grasslands. Furthermore, it also has been noticed that, agricultural area is on the bloom near IGNP canal along with the increase in cash crop like Cotton (*Gossypium arboreum*), horticultural crops like Pomegranate (*Punica granatum*) and Date palm (*Phoenix dactylifera*), rabi crops like Mustard (*Brassica juncea*), Wheat (*Triticum aestivum*), and cumin (*Cuminum cyminum*) and medicinal plant like *Isabgol* or Desert Indian wheat (*Plantago ovata*) than that of traditional crops like Bajra (*Pennisetum glaucum*), Jau or Barley (*Hordeum vulgare*), Guar or Cluster Bean (*Cyamopsis tetragonoloba*), Gram (*Vigna mungo* (L.) Hepper), Moong (*Vigna radiata*), Moth bean (*Vigna aconitifolia*), Maize (*Zea mays*), ground nut (*Arachis hypogaea*), sesame (*Sesamum indicum*) etc. Few typical desert faunas are now seen rarely like Great Indian Bustard, desert cat, and caracal. Another effect of the increase of irrigation in the desert region is the alarming increase in the

human density i.e. 165 people per square kilometre (Gehlot et al 2021a) as well as livestock populations including sheep, goats, cows, and camel which are present in the desert region along with hundreds of shepherds moving with their herds. Thus, there is insufficient habitat left for the survival of crane and desert wild fauna owing to the newly irrigated area and its occupants (Sharma 2001). It has been also mentioned that land use pattern significantly effects habitat and displacement of a bird from its native ranges (Wani et al 2021). About 27% of the total irrigated area is fed by canals, while 70% by wells and tubewells (NITI Ayog 2016) but due to irrigation, there has been an increase of the exotic *Prosopis juliflora* in the Thar Desert, leading to the decline in total productivity of grass (Gehlot and Jakher 2015). Lakshmi (2006) concluded that the arid region of Rajasthan fulfills basic food, safety, and shelter for migratory birds, although the agricultural expansion and increasing use of pesticides, fertilizers has been destroying habitat and amplifying disturbance for wildlife, (Collar 2017). Thus, owing to the growth of the IGNP, tremendous ecological changes are taking place in the Great Thar Desert of Rajasthan.



Plate 1. Anthropogenic pressure (A), Feral dog attack (B), Power line (C), and Food poisoning (D)

Poaching: Poaching is another major threat to the avian fauna. The poaching of the crane was not recorded during the study period, although author had observed that the injured cranes were captured by local tribes for their meat for consumption at Sardarsamand area in Pali district. As per the rescue centre data of Jodhpur zoo, Rajasthan. Many of the injured or dead Demoiselle Crane subjected to different causes were rescued (Fig. 2). Availability of food, location of nest sites, and nest materials and the occurrence of predators are the major factors influencing the bird population and their diversity.

CONCLUSION

Pertaining to the anthropogenic pressure, Demoiselle cranes are leaving before their usual hours. Generally, Cranes are roosting and feeding in the village common property resources leading to interspecies resource competition and sometimes conflict. Developing network of high voltage powerlines are making increased mortalities. Alarming increase of feral dog population and attacks making this species more vulnerable and need attention in present hours. Insecticide poisoning has caused large mortalities in the recent years. Abrupt landuse change is another huge attribute making impact on the feeding behaviour of the species as well as few poaching activities are reported in the different corners of this huge Thar landscape are remain unaddressed. This piece of work will facilitate to fulfil the great need of framing the diverse conservatory strategies for the reduction of various forms of anthropogenic influence over the water birds and their habitat.

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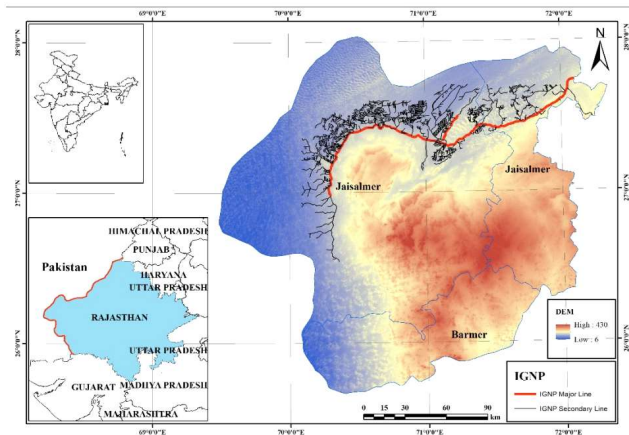


Fig. 1. IGNP canal network in Jaisalmer, Rajasthan

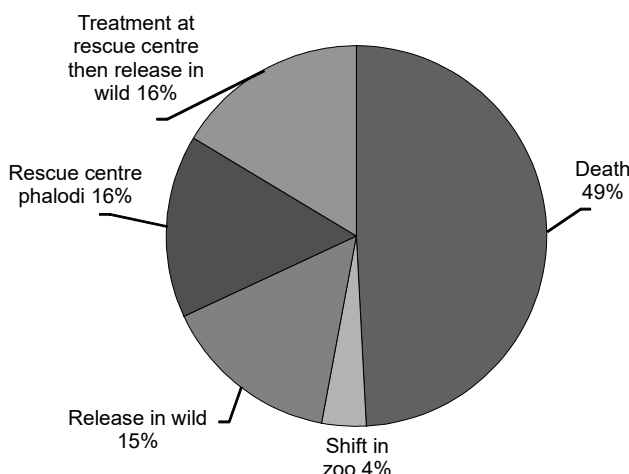


Fig. 2. Rehabilitation of rescued Demoiselle Crane

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