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## Review article

## Sarus crane in lowlands of Nepal: Is it declining really?



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## ABSTRACT

Sarus crane (*Antigone antigone*) is a flagship species. Its population is declining globally. First recorded in 1877 in Nepal, so far only a few studies have been conducted on sarus crane and results of these studies confirm their declining state. Based on previous studies, the author reviewed the status of sarus crane in Nepal. Studies show that it is uncommon with patchy distribution from Chitwan to Kanchanpur districts. More than 90% of its habitats lie outside the protected areas. Rupandehi and Kapilavastu are stronghold districts with more than 85% of its overall population. Regression analysis showed that the overall population of sarus crane has increased in Nepal. Hatching success is more than 50% and new breeding sites are also being reported. Nevertheless, threats such as drying of wetlands, conversion of farmlands to settlements and industries, power lines, nest vandalization still persist. Farmlands provide important foraging and breeding grounds. It inhabits and breeds very close to the human settlements. Thus, increasing awareness to local people and wetland/habitat restoration are necessary for its conservation. Detail scientific studies on its ecology and monitoring using cutting-edge technology in existing and new localities along with crane conservation action plan are required for maintaining the sarus crane population in Nepal.

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## Introduction

Of the 15 species of crane found worldwide (Harris and Mirande 2013), four are recorded in Nepal (Bird Conservation Nepal and Department of National Parks and Wildlife Conservation 2016). Among them, three are migratory: common crane (*Grus grus*) and demoiselle crane (*Anthropoides virgo*) are passage migrant, black-necked crane (*Grus nigricollis*) is a vagrant, and sarus crane (*Antigone antigone*), the world's tallest flying bird (1.76 m), is the only the resident crane found in Nepal (Baral 2009; Grimmitt et al 2000) and in the Indian subcontinent, South-East Asia, and Australia (Archibald et al 2003; BirdLife International 2016; Harris and Mirande 2013). In the past, sarus crane was distributed in the entire lowlands from east to west; however, at present, its distribution is recorded only from central to western Nepal (Baral 2009; Inskipp et al 2016).

Sarus crane mostly prefers wetlands, agriculture lands, and grasslands (Archibald et al 2003; Aryal 2004; Bird Conservation Nepal and Department of National Parks and Wildlife

Conservation 2011; BirdLife International 2016; Grimmitt et al 2000; Inskipp et al 2016; Monichan and Sharma 2003; Sundar and Choudhury 2003) where green shoots of grass and cereals, tubers and corns of marsh plants, food grains, frogs, lizards, fish, grasshoppers, insects, etc. are abundant (Ali and Ripley 1987; BirdLife International 2016; Grimmitt et al 2000; Jha and Mckinley 2014). Because of the destruction of wetland habitats (BirdLife International 2016; Jha and Mckinley 2014), sarus crane has been found using paddy field as the breeding sites in most of the areas (Meine and Archibald 1996; Sundar 2009). Both International Union for Conservation of Nature and Natural Resources Red List and the National Level Red List have recorded its status to be "vulnerable" (Bird Conservation Nepal and Department of National Parks and Wildlife Conservation 2011; BirdLife International 2016; Harris and Mirande 2013; Inskipp et al 2016).

Sarus crane, first reported in 1877 in Nepal (Scully 1879), is a flagship species and is one of the 9 protected bird species in Nepal (Baral 2009). In recent times, its population is facing severe threats due to the destruction of its habitat, pollution, and agricultural development (Aryal et al 2009; Bird Conservation Nepal and Department of National Parks and Wildlife Conservation 2011). Despite its long recorded history, less research has been carried out in Nepal. Most of the earlier studies show the declining state of sarus crane in Nepal (Aryal 2004; Bird Conservation Nepal and

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Department of National Parks and Wildlife Conservation 2011; Paudel 2009, 2012; Suwal 1994). In this article, I have reviewed the studies on sarus crane in Nepal with special focus on its population trends, breeding ecology, and potential threats for its conservation.

## Materials and methods

Sarus crane is distributed in the southern lowlands (Terai) of Nepal (Figure 1). These southern lowlands of Nepal share border with India. Four protected areas lie within its range: from Chitwan National Park (central region) to Shuklaphanta Wildlife Reserve (far west). Chitwan National Park, farmlands in Lumbini (parts of Rupandehi and Kapilavastu districts), Bardia National Park, and Shuklaphanta Wildlife Reserve are identified as important bird and biodiversity areas by the BirdLife International (Baral and Inskipp 2005). Lowlands of Nepal have tropical climatic pattern with abundant wetlands. Most of the people depend on farming and animal husbandry. They grow paddy, maize, etc. in summer and wheat, mustards, and other cereals in winter. Tharu and Madehsi are the dominant communities while different hill communities are also found in almost all of the districts.

I collected studies from different unpublished reports, thesis, and articles related to sarus crane in Nepal, and reviewed the population data of sarus crane from 1995 to 2015 from Rupandehi and Kapilavastu districts. Data representing all years were not available, and therefore I could acknowledge only 9 records for Rupandehi and 8 for Kapilavastu districts. Linear regression was applied to the number of sarus crane with the number of years between 1<sup>st</sup>-year census and subsequent census to analyze its trends. Adjusted  $R^2$  and  $F$  test were used for fit of the model, whereas  $t$  test was used to assess the significance of model coefficients. Regression analysis was performed on R Console (R Foundation for Statistical Computing, Vienna, Austria). Populations at other districts are very few and are not monitored regularly, so it is difficult to perform the analysis.

## Results and discussion

Literature reviews show that sarus crane has been reported from 9 districts of Nepal, Chitwan to Kanchanpur (Figure 1). It is uncommon and locally resident, and has clumped distribution (Aryal

et al 2009; Grimmitt et al 2000; Inskipp et al 2016; Shrestha 2015; Suwal 1994), with more than 90% of their population found outside the protected areas. It is usually recorded below 300 m, but in Dang (Motipur), it was recorded at 545 m, the highest elevational record in Nepal (C. Khanal, personal communication, 2016). Very fewer studies were conducted before 1990. Studies on sarus crane significantly increased only after 1990, but focused on Rupandehi and Kapilavastu districts only. Around two dozen studies on sarus have been found after 1990. However, most of them were unpublished reports or thesis carried out by university students (Chaudhary 2008; Gyawali 2015; Manandhar 2014; Paudel 2012; Shrestha 1996; Suwal 1999), and only very few were published (Anon 2010; Aryal et al 2009; Paudel 2009; Suwal 2002; Suwal and Shrestha 1992).

In Nepal, sarus crane has a congregated population in Rupandehi and Kapilavastu districts only. More than 85% of its population lies in these two districts, which lie outside the protected areas. Regression analysis showed that the population has significantly increased in these two districts (Figure 2). In Rupandehi, inclusion of year showed a significant fit of the model ( $F=6.58$ ,  $p<0.05$ ,  $df=1.7$ ) over the null model. Here, year explained for 76.8% of variation for the number of sarus crane. A significant ( $p<0.05$ ,  $t=2.56$ ) increasing trend ( $b=7.07$ ) of number was recorded. In Kapilavastu also inclusion of year showed a significant fit of the model ( $F=21.67$ ,  $p<0.05$ ,  $df=1.6$ ) over the null model. Year explained for 35.78% of variation for the number of sarus crane. A significant ( $p<0.05$ ,  $t=4.65$ ) increasing trend ( $b=3.06$ ) of the number was recorded. Nevertheless, populations are simultaneously decreasing from other parts of Nepal (Table 1). Because its population in other districts is relatively lower, such decline does not have much effect in the overall population status. Thus, the population of sarus crane, as a whole, has increased in Nepal. One of the most prominent reasons is the increment of studies on sarus crane at present, which has covered more areas than previous study areas. For example, Aryal et al (2009) and Manandhar (2014) had surveyed only in the southern sites, whereas other studies also reported adequate populations from northern sites of the districts (Gyawali 2015; Paudel 2012). The difference in survey methods has also affected its count. The line/strip transect method (Aryal et al 2009; Gosai et al 2013; Shrestha 1996, 2015) has less population count than the direct count method (D. Karmacharya, personal communication 2015; A. Kurmi, personal communication 2015).

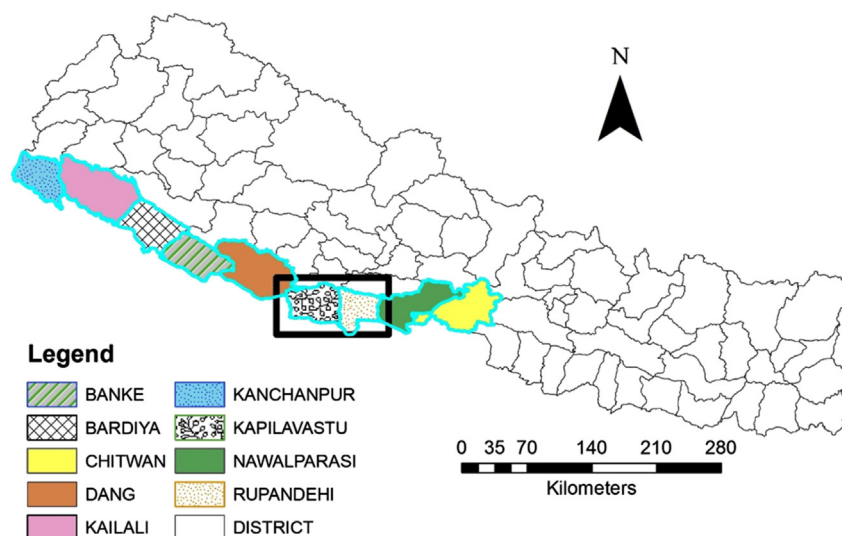


Figure 1. Distribution of sarus crane in Nepal: Stronghold districts are highlighted within the rectangle.

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