

# Current Status of Black-Necked Crane *Grus Nigricollis* in Southern Xinjiang China: Conservation Implications

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## Research Article

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# Abstract

In this paper, we update the status of Black-necked cranes (*Grus nigricollis*) in Xinjiang Uyghur Autonomous Region, China where it has hardly been recorded. We report on research in Southern Xinjiang—mainly in Altun (Arjin in Chinese) and Kunlun Mountain ranges and their adjacent areas, including part of Pamir Plateau and the southern edge of Lop Nur Basin. Black-necked cranes were observed in seven counties, by direct observation in 2010 to 2017, and we deduced that 180-220 individuals of the species inhabited Kunlun and Altun Mountains and the surrounding areas. 137 cranes, the largest population, were recorded in the autumn migration season in the Altun Mountain Nature Reserve in 2013. The most recent record of Black-necked cranes in the Lop Nur Basin ( N 40°19', E 91°58', alt. 790 m) was observed on May 2010 would be the northernmost distribution location with the lowest latitude and extreme arid environment.

## Introduction

Black-necked cranes *Grus nigricollis*, a Globally Vulnerable species endemic to Tibetan Plateau, was the last of the world's cranes to be discovered by the scientific community (BirdLife International 2001). Its range covers 28°-41° N and 78°-104° E, stretching from the Altun and Kunlun mountain ranges east to the Qimantagh and Wumeng Mountains and south to Himalayas (Bishop 1996). It was first recorded by the Russian naturalist, Count Przewalski near Kok Nor Lake in north-eastern Tibet in 1876, and sighted by the Russian naturalist, P. K. Kozlov in Altun Mountains, Xinjiang China on his second expedition to Tibetan Plateau in 1899–1901 (Schaller, 1998; Luo, 2005). Xinjiang, dotted with some of the world's most unique and spectacular wetlands, also holds the distinction of being one of the known breeding grounds of Black-necked cranes in China. According to its migration patterns, Black-necked cranes are divided into western, central and eastern populations (Li and Bishop, 1999), and those that breed in Xinjiang at the northern edge of the Tibetan Plateau belong to the western population. Due to geographical inaccessibility and lack of scientific research across much of its range, the status of Black-necked cranes in Xinjiang remained unknown until it was rediscovered in Altun Mountain Nature Reserve in the 1980s (Chen, 1985; Gao, 1986; Huang et al., 1989; Feng, 1991). There have been few studies of its distribution that estimate its population. In this paper, we summarize the current population distribution of Black-necked cranes in Xinjiang, China and provide a population estimate based on direct field observations, questionnaire surveys and previously-published studies in order to provide a scientific baseline to monitor future population trends, as well as to document the major threats to the species conservation.

## Materials And Methods

This study was mainly conducted in the Altun and Kunlun mountain ranges on the edge of the Tibetan Plateau and adjacent areas including parts of the Pamir Plateau and wetlands of the Lop Nur Basin, as these sites have been demonstrated as potential habitats of Black-necked cranes by previous reports (References). The elevation ranges from 3,800–6,900 m and mountains above 5,500 m have permanent snow (Butler *et al.*, 1986; Achuff and Petocz 1988; Bleisch et al. 2009). The climate of the area is

continental, dry and cold with average daily temperatures from – 21 to 2.4 °C in winter and – 3.4 to 21 °C in summer. Precipitation is sparse and frequently falls as snow or sleet even in summer. The Altun Nature Reserve, covering an area of 45,000 km<sup>2</sup> and characterized by high elevations, low annual precipitation, low nutrient levels and extremely cold weather in the winter (Butler et al., 1986; Achuff and Petocz 1988; Ablimit, 2004, Ma, 2010; Mardan et al., 2013, Mardan et al., 2021).

We also surveyed the suspected areas within the Pamir Plateau, Tarim River Basin and Bostan Lake which were reported to presumably have crane distributions (Fig. 1, areas with the question marks) (Chen, 1985; Gao, 1986; Huang et al., 1989; Feng, 1991; Tian, 1999). These reports assumed that there may be ideal habitats for large populations of the species, and that, there were more than 1000 Black-necked cranes in Xinjiang. We assume that this population estimate is too large because it is not justified to extrapolate the density of the main distribution regions to the total area, given that approximately 20% of the total area of Xinjiang is considered to be suitable habitat for Black-necked cranes (Tian, 1999; Ma et al., 2011).

The present study comprises the second nation-wide field survey of wildlife resources of China, which was initiated in 2010 and completed in November 2017. The entire population was counted with direct count method at a total of 25 sampling sites (Fig. 1). Surveys were made in March-April, and October-November to establish the arrival and departure dates of the species. Data was collected on the number of individuals, nests, number of eggs laid, hatching success and survival of fledglings (Oring and Lank 1982). Nikon binoculars and spotting scopes were used to spot the birds. Locations were taken using a Garmin 12 CX GPS. A digital stop watch, a hand tally counter and a still camera were used to record specific events. Direct or visual count method was used to count the birds. Such a method has been widely used for counting aquatic birds (Eltringham and Atkinson 1961; Roux 1973; Zewarts 1976; Alford and Bolen 1977; Amat 1984; Sridharan 1989). Interviews with local wardens and pastoralists, and officials of the administrative were administered to get information on the distribution and conservation status of the cranes. The severities of the potential threats to the cranes at different sites were estimated based on literature reviews, preliminary interviews and field assessment. We analyzed our survey data using SPSS 15.0 (SPSS 2005).

## Results And Discussion

We observed Black-necked cranes in seven Counties within the the Altun and Kunlun mountain ranges and their adjacent areas viz., Qakilik County (Qimantagh, Altun Mountain Nature Reserve, Lopnur Basin), Qarqan County (Tura Wetland on the upper stream of Qarqan River), Guma County (Karkash River), Hotan County (Aksayqi Lake, Hotan River, Yorunkax River), Karkash County (Yorunkash River), Kaghilik County (Zarapshan River, Yarkant River) and Aktu County (Pamir Peak, Aktu Wetland) (Fig. 1, Table 1).

We estimated that 180–220 Black-necked cranes inhabited Southern Xinjiang viz.,Kunlun and Altun Mnts and the surrounding areas. () Among them, the Altun Mountain Nature Reserve is the most important breeding ground in Xinjiang, followed by the Aksayqi Lake and Yorunkash River Basin in Kunlun

Mountains, indicating that, populations at Dashanbao and Napahai in Altun and Kunlun Mountains constitute the bulk of Black-necked crane breeding and wintering grounds outside Tibet and Yunnan in China. The most cranes, 137 in total were recorded during the autumn migration season in the reserve in 2003. A lone crane was observed on the wetland of Aqqik walley at the southern edge of Lop Nur Basin ( N 40°19', E 91°58) on May 2010, the northernmost distribution location of the species in Xinjiang.. Furthermore, this record has extended the distribution region of this typical Qinghai-Tibetan Plateau species northwards by 2°-3° latitudes. As we expected, there were no cranes recorded in the suspected distribution locations above this latitude, in Tarim River Basin and Bostan Lake. The Cranes were observed in the Pamir Plateau only occasionally. A few individuals remained in the valley till October but they did not make any attempt at nesting, and some of them were not spotted again in subsequent visits (Fig. 1, Table 1).

Table 1  
The distribution and population size of *Grus nigricollis* in Xinjiang (2010–2017)

Sampling sites	Recorded Point	County	Breed ing size	Summer ing size	Migrat ion size	Total
Altun Mountains	At Atkan	Qakilik	4–6	20–30	137	4–6
Altun Nature Reserve	Kara Dong	Qakilik	8–10	2–4		8–10
	Ixak Patti	Qakilik	30–40	1		50–70
Qimantagh Mountains	Aqqikkol Lake	Qakilik	8–10			8–10
Lop Nur Basin	Duck Spring	Qakilik	2–4			2–4
Kunlun Mountains	Yusuwalik	Qakilik	4–6			4–6
Pamir Plateau	Tura Farm	Qarqan	6–10			6–10
Others	Ayakkum Lake	Qakilik	12–16			12–16
	Kara Qokka	Qakilik	6–10			6–10
	Qimantagh Farm	Qakilik	2–4			2–4
	Tumorlik Farm	Qakilik	10–16			10–16
	Uzunshor		4–6			4–6
	Aqqik walley	Qakilik	10–20			1
	Whale Lake	Qakilik	10–20			2–4
	Kiriya River	Kiriya				2
	Hotan River	Hotan				2
	Karkash River	Guma				40–60
	Aksayqi Lake	Hotan		2–4	2	50–80
	Yorunkash River	Karkash		2	2	2
	Zarapshan River	Kaghilik		2	2	2
		Kaghilik		20–40	2	2
Yarkant River	Aktu		20–30	2		
Pamir Peak	Kashghar		2			
Kashghar River	Awat					
Tarim River	Bostan					
Bostan Lake						
<b>Total</b>			<b>100</b>	<b>90</b>	<b>100</b>	<b>147</b>

Total	Recorded	County	Breed	Summer	Migration size	Total
Sampling sites	Point		ing size	ing size		
<b>Conservation Implication</b>						

Although the current status of Black-necked cranes in Xinjiang, is encouraging, the species is still under threat mainly due to the ever increasing human-wildlife conflict within its distribution from wetland loss and degeneration. Our analysis based on field monitoring, questionnaire surveys and previous research indicates that though the population seems to be increasing, the overall breeding productivity is declining. The increase in the population is due to the easy human access into new breeding sites and populations while the decline in breeding success is due to increased human activities, and secondary impacts, like direct killing by dogs as well as pressure on habitat because of human development. The intensity of the potential threats varied between sites, in which intensified competition with domestic livestock, road infrastructure construction and mining activities pose major threats to populations of overwintering cranes. We recommend that such threats need to be addressed and monitored specifically in future for the better conservation the species. Our study proposes well-protected reserves, enforcement of regulations against illegal hunting, and management and protection of the species' potential habitat. Therefore, in addition to ongoing research, further studies are needed on the use of lakes, rivers and marshes as stopover sites along migratory routes and as pre-wintering sites. Furthermore, changes in the environment of such stopover sites in the early and later stages of the overwintering period should also be addressed. It is also hoped that this research will inspire further in-depth work on this unique species and the ecosystems that support it.

## Declarations

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### DECLARATION

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**Conflicts of interest/Competing interests:**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

**Availability of data and material:**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request (Corresponding author: Dr. Mardan Aghabey Turghan [mardan@ms.xjb.ac.cn](mailto:mardan@ms.xjb.ac.cn)).

**Ethics approval:**

Ethics approval was not required for this study according to legislation of Chinese Wild Animal Protection Law (CWAPL).

**Consent to participate:**

Not Applicable

**Consent for publication:**

All authors provided written informed consent to publish the data contained within this article.

**Code availability:**

We analyzed our survey data using SPSS 15.0 (SPSS 2005).

**Authors' contributions:**

All authors whose names appear on the submission made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data:

1. Mardan Aghabey Turghan conceived and designed the study and performed the experiments and also contributed significantly to analysis and manuscript preparation.
2. Paul Jason Buzzard made substantial contributions to the conception or design of the work and manuscript preparation and its revision, and was a major contributor in writing the manuscript
3. Roller Maming made substantial contributions to the interpretation of data and helped perform the analysis with constructive discussions.

All authors approved the version to be published, and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

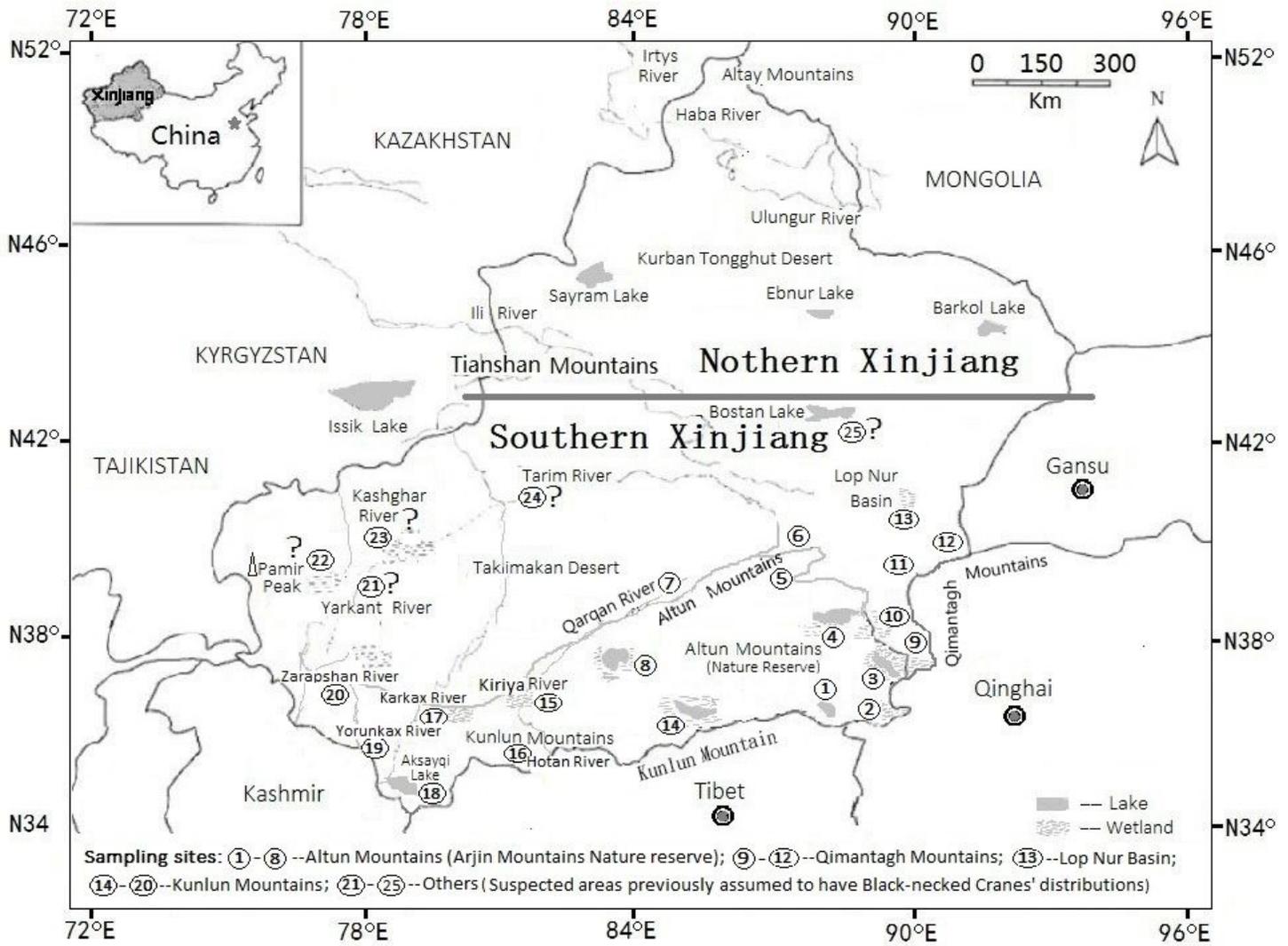
All authors read and approved the manuscript.

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## Figures



**Figure 1**

The geographical map of Xinjiang China, the Kunlun and Altun mountain regions in Southern Xinjaing were considered to be main the distribution locations of Black-necked-cranes while there has been no record of Black-necked cranes in Northern Xinjiang. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.