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New Black-necked Crane *Grus nigricollis* subpopulation recorded in southern Tibet, China

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Black-necked Crane *Grus nigricollis* is classified as Vulnerable (BirdLife International 2015) with an estimated total population of 10,070–10,970. It breeds in wetlands on the Qinghai–Tibetan plateau, China, with a small population in adjacent Ladakh, India (BirdLife International 2001, 2015). Six wintering areas have been identified at lower altitudes on the Qinghai–Tibet and Yunnan–Guizhou plateaus in China, and it also winters in Bhutan and Arunachal Pradesh, India. On the Qinghai–Tibetan plateau, it is considered that there are three main distinct populations—west, central and east (Wu *et al.* 1993). The west population is the largest, estimated to be 7,400 individuals, and it occupies the most southerly breeding grounds (Bishop & Tsamchu 2007), mainly in Nagqu prefecture, Ngari prefecture, Angren county, Xigazê prefecture and Damxung, Lhasa, Tibet Autonomous Region (Tsamchu *et al.* 2008). However, breeding has also occasionally been reported south of latitude 30°N: one pair was photographed on 'Tinki plain' on 15 June 1922 by Longstaff and Norton (Hingston 1927); a pair was seen at 15,000 feet (4,570 m) at Tingri on 7 July 1924 (Hingston 1927); in the 1991 breeding season, one nest (29.467°N 85.900°E) and two broods of four chicks (29.867°N 83.733°E, 29.983°N 83.533°E) were reported by an International Crane Foundation expedition (Dwyer *et al.* 1992)—the most southerly breeding record for the species. Li & Bishop (1999) included an undated report of breeding in Tingri county.

In summer 2014, we carried out a 13-day survey along the road network in the Pumqu River basin, an area very little surveyed previously for cranes. During the course of our survey, we recorded 111 adult Black-necked Cranes and 22 chicks, confirming the existence of a new subpopulation in this area.

Fieldwork was carried out from 16 to 28 July 2014 in the Pumqu River basin, which is situated in south-west Tibet just north of the border with Nepal and Sikkim between 27.817°N 85.633°E and 29.083°N 88.950°E. The source of the river is the Yebokangjiale glacier on the north face of Mt Shishapangma, Nyalam county, Tibet Autonomous Region, China; it flows eastwards through Tingri county and turns south towards Nepal to the east of Mt Everest. The basin is about 320 km long from west to east and up to 120 km in breadth from north to south, with a total catchment area of about 25,000 km². For 280 km, from the glacier outflow to Tingri town, the upper and middle reaches of the river lie in broad valleys with gentle gradients at 4,500 m or more in altitude. There are many winding reaches and meanders with well-established wetlands, which offer the potential to be good habitat for the Black-necked Crane. However, in lower reaches, the gradient increases as the river flows off the plateau through narrow, deep V-shaped valleys and the steep slopes and fast-flowing torrents are not crane-friendly habitats.

We used the direct counting method to search for the Black-necked Crane. At vantage points chosen for their extensive views, we used a telescope to search the appropriate habitats on either side of the road. The positions of cranes were determined by the simultaneous use of compass and wireless GPS Logger (Holux M-241), to record coordinates and direction relative to the observation points. Then we used frame-of-reference and cross-locating methods to position cranes on the map. In addition, we interviewed residents to obtain information on where cranes had been seen to help improve the efficiency and accuracy of the survey. They were also questioned about historical distribution, time of

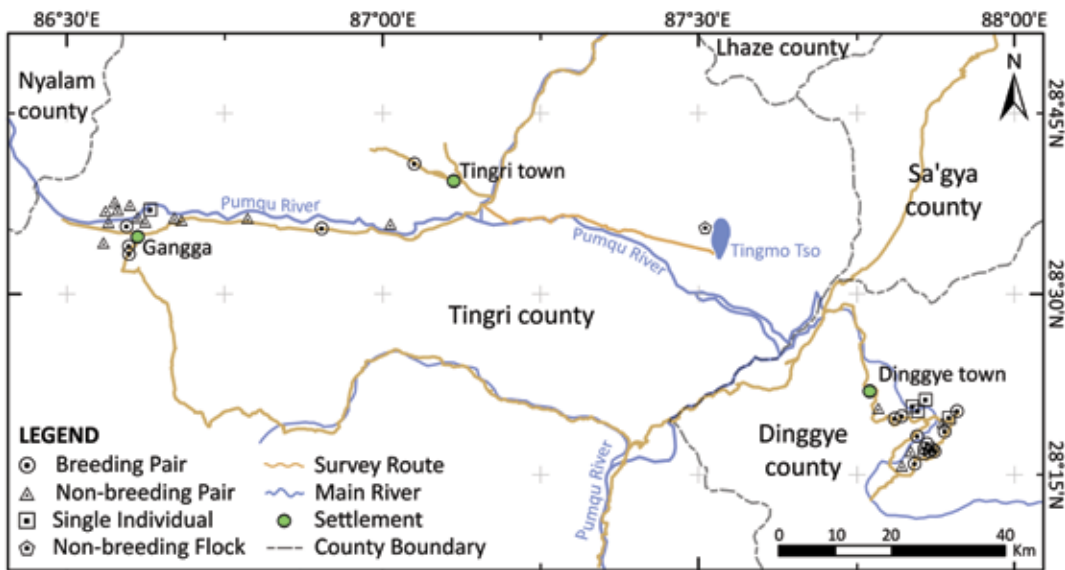


Figure 1. Location, number and habitat of Black-necked Cranes *Grus nigricollis* in the Pumqu basin, July 2014

Dinggye county (20 July 2014): 34 adults, 19 chicks

- Lacustrine marsh: 3 breeding pairs with 2 chicks, 2 breeding pairs with 1 chick
- Marsh: 3 breeding pairs with 2 chicks, 3 breeding pairs with 1 chick, 2 non-breeding pairs, 1 solitary non-breeding individual
- Meadow: 1 breeding pair with 2 chicks, 2 non-breeding pairs, 1 solitary non-breeding individual

Tingri county (23–26 July 2014): 77 adults, 3 chicks

- Lacustrine marsh: 1 non-breeding pair, 32 non-breeding flocked individuals
- Marsh: 1 breeding pair (hatching eggs), 3 non-breeding pairs, 2 solitary non-breeding individuals
- Meadow: 2 breeding pairs (on nest), 9 non-breeding pairs, 1 solitary non-breeding individual, 2 pairs status unknown
- Cropland: 1 breeding pair with 2 chicks, 1 breeding pair with 1 chick
- Slope: 1 non-breeding pair

arrival and departure, breeding status, etc. Details of the distribution of Black-necked Cranes in the Pumqu basin are shown in Figure 1.

During the 13-day fieldwork period, 1,900 km were covered by road and 111 mature Black-necked Cranes and 22 chicks recorded in an area between 28.250°N 86.583°E and 28.667°N 87.900°E. Of the adults, 17 pairs were accompanied by 22 chicks, a potential overall recruitment rate of 16.5%; 18 pairs were unaccompanied. Five individuals were solitary and 32 were foraging and living together as a single flock. The status of the remaining two pairs could not be confirmed owing to the extreme distance (Figure 1). The Black-necked Cranes recorded in the Pumqu basin, which included breeding pairs, non-breeding pairs, single individuals and a non-breeding flock, are believed to be an integrated group forming a specific subpopulation, not a random collection of stragglers. In fact, the Pumqu basin population may be underestimated, because our survey methodology only allowed us to assess the species's population up to 6 km on either side of the roads used. The broad wide valleys, small alluvial plains and extensive high-altitude meadows which formed the study area extended beyond the capabilities/capacity of our technique to ensure that all individuals had been found. Nonetheless, this population of 111 mature Black-necked Cranes equates to 1% of the estimated global population (10,070–10,970), and demands more attention. At 28.250–28.667°N, these birds are the most southerly breeding population so far discovered.

Most of the Black-necked Crane breeding pairs were found nesting in the marshes near Dinggye town, Dinggye county (19 chicks seen, 17 in marshes) and around Gangga, Tingri county (3 chicks seen); the latter site held most of the non-breeding pairs. The only non-breeding flock (32 individuals) was observed at Tingmo Tso, Tingri county, an open lake about 11 km² in area. Basically all the cranes were distributed in marshes, lacustrine wetlands and earthy banks beside slow-moving water, in preference to rocky areas beside fast-flowing torrents. According to local residents,

Black-necked Cranes have also been seen wintering in the Pumqu basin (Li *et al.* 2013) and it remains to be determined whether the population is sedentary or if breeding birds migrate in during spring and wintering birds migrate in during autumn.

The most recently recorded new breeding site of Black-necked Cranes was in Lop Nur, on the north edge of the Qinghai-Tibet plateau, Xinjiang Uygurv Autonomous Region, China, which advanced the breeding range of this species 2° north (Ma *et al.* 2011), and our new discovery has advanced it 2° south. These discoveries might be taken to indicate that Black-necked Cranes' breeding range is expanding, but the possibility cannot be excluded that cranes have always inhabited and bred in both these new areas, remaining undiscovered owing to their remoteness. If the species is indeed expanding its range, this may be due to the increasing size of the population which is taking over empty ecological niches or because it is vacating locations which are no longer habitable, e.g. due to increasing human activity. Winter counts in Bhutan indicate that the wintering population there has increased annually, from 370 to 550 since 1986 (RSPN 2015).

According to Johnsgard (1983), crane populations are healthy if the recruitment rate is maintained between 10–15%. Although our counts were made rather early for there to be complete confidence that all offspring would survive to fledge, the data from the survey suggest that the Black-necked Cranes breeding in the Pumqu basin today represents a healthy and possibly expanding subpopulation. A more detailed study is needed to make an objective assessment of breeding success and the current condition of the habitats they are using.

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Rapid range expansion of Asian Openbill *Anastomus oscitans* in China

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Introduction

Range expansions have been documented in many avian studies (e.g. Newton 2008). Most studies have demonstrated that numerous species are spreading to higher latitudes or higher altitude areas (Burton 1995, Pounds *et al.* 1999, Walther *et al.* 2002, Hitch & Lebus 2007, Sekercioglu *et al.* 2008, Thomas 2010). Such spatial spreads have usually been attributed to climate warming (Burton 1995, Davis & Shaw 2001, Pearson & Dawson 2003, Visser & Both 2005, Wu *et al.* 2012). Habitat change has also been indicated as the driving force in the range expansions of some species, e.g. Barred Owl *Strix varia* in North America (Livezey 2009).

There are only two species of openbill storks—Asian Openbill *Anastomus oscitans* and African Openbill *A. lamelligerus* (Kahl 1987). The Asian Openbill has a large range, including India (from Gujarat in the west to the Assam valley), Sri Lanka, south Nepal, Bangladesh, central Myanmar, Thailand, Cambodia and southern Vietnam in the east (BirdLife International 2015). Historically there are no records of the species from China (Yang 1995, MacKinnon *et al.* 2000, Zheng 2005). In 2006, the first Asian Openbill was recorded at Xihu wetland, Yunnan province, a small lake surrounded by paddyfields (Wang 2007). Since then, the species has expanded across a large area of south-west China (Jiang & Ning 2010, QL pers. obs. 2012, F. Li pers. comm. 2012). In this study, we report and review the distribution and population size of Asian Openbill in China. Our objectives are to document the habitat and range expansion of a tropical lowland species to subtropical high plateaus in China, and to discuss its possible causes.

Methods

We collected data on the distribution and status of the Asian Openbill from interviews and field surveys. We gathered records, primarily from the internet, in particular birdwatching forums, to get the basic distribution information. After collating this information, we contacted wildlife officers of the local forestry or wetland departments within the known and potential range. These officers were asked to provide information on the species in their area, including numbers, locations and observation dates, and to describe

the circumstances and habitat associated with any sightings. We also made rapid field surveys at Shangri-La county, Dali city and Puer city, all in Yunnan province, and Caohai Reserve, Guizhou province, between July and August 2012—in total 15 survey days—to verify the interview results, including locations, numbers and habitats (Zhang *et al.* 2006).

Results

Range expansion

The first confirmed record of Asian Openbill in China was in October 2006 at Xihu wetland, Dali city, Yunnan province. There was no further record until 2010, when a single bird appeared at Caohai wetland and two in Pingba county, both in Guizhou province, one at Baise city, Guangxi province, and two at Puer city, Yunnan province. The Asian Openbill then rapidly spread to the cities of Lincang, Puer, Jinghong, Dali, Kunming and Yuxi, all in Yunnan province, and Guiyang city, Zunyi county, and Weining county, both in Guizhou province (Figure 1; Table 1), in 2012. The largest flock of this species consisted of up to 200 individuals (Table 1). Six years since its first recorded appearance in China, the Asian Openbill has spread quickly through three provinces and across an area of about 421,000 km². The core areas were Mengpeng, Mengban-Bian, Yunxian and Menglie in south-west Yunnan province. The lowest and highest altitude sites, respectively, were Longjiang Reservoir, Baise city (130 m) and Wudi Lake, Shangri-La county (3,840 m).

Behaviour

We observed that the Asian Openbill roosted colonially at night in tall trees, mostly pines, but sometimes on branches of dead poplars. During our 15 survey days, the species foraged in paddyfields (52%), reservoir-paddyfields (32%), lakeside marshland (9%) and river-paddyfield (7%). Asian Openbill mostly foraged in flocks in the paddyfields and fed mainly on large snails and freshwater mussels, especially Chinese mystery snail *Cipangopaludina chinensis*, river snail *Bellamya aeruginosa* and Chinese pond mussel *Anodonta woodiana*. Asian Openbill fed in flocks with other wading species