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Short communication

Reintroduction of Przewalski's horse (*Equus ferus przewalskii*) in Xinjiang, China: The status and experience

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ABSTRACT

Przewalski's horse reintroductions to Xinjiang, China were initiated in 1985. Here, we present the first data on population development and current problems of the Przewalski's horse in both captive and released populations in Xinjiang. From 1985 to 2005, a total of 24 captive Przewalski's horses (14 males and 10 females) were brought from western zoos to the Jimsar Wild Horse Breeding Center (WHBC) in Xinjiang. In 1988, the first foal was born. Since then, a total of 285 foals have been born and the number of animals in the captive population continues to increase. In August 2001, the first group of horses was released into semi-wild conditions in the Kalamaili Nature Reserve (KNR). Released horses were allowed to range freely from spring to fall, but were driven into a winter coral to allow for supplemental feeding and to increase winter survival, and to reduce competition with domestic horses from local herdsmen who use the KNR as winter pasture. By December 2013, a total of 89 horses (32 males and 57 females) in 14 groups had been transferred to semi-release; and within two years after the first release, the first foal was successfully born in the wild. By 2013, the reintroduced animals had formed into 16 groups (127 individuals, 13 breeding and 3 bachelor group) in 5 sites. To date, this is the most comprehensive and successful Przewalski's reintroduction effort in China.

1. Introduction

The Przewalski's horse (*Equus ferus przewalskii*) was first discovered in the Gobi Desert in Mongolia in 1880 by a Russian officer named Colonel Nikolai Przewalski; I.S. Poliakov was the first to scientifically document this species in 1881 (Poliakov, 1881). The last recorded sighting of a wild Przewalski's horse occurred in the Dzungarian Gobi of Mongolia in 1969 (Bouman, 2006), and since then, this species has been extinct in the wild with only a few remnant populations existing in small captive breeding herds in western countries (Kaczensky et al., 2007; Wakefield et al., 2002). All Przewalski's horses alive today are descendants from only 13 individuals that were the nucleus for captive breeding (Bowling and Ryder, 1987; Boyd et al., 1988; Wakefield et al., 2002). These initial animals reproduced successfully in captivity, with the current captive population now exceeding 1 800 individuals scattered across about 112 breeding centers and zoos around the world.

One ultimate goal of captive breeding of threatened species is to reintroduce animals back into their former habitats in the wild (Sheldon, 1986; Stanley-Price, 1989). Reintroduction efforts of Przewalskis's horse started in the 1990 in Central Asia – Mongolia, Russia and northwestern China (Boyd and Bandi, 2002; Kaczensky et al., 2007; King and Gurnell, 2005; Zimmermann, 2005; Pantel et al., 2006). To sustain reintroduction projects over the long term a well-managed, captive population of Przewalski's horses is needed. However, until recently most captive populations existed in western zoos, requiring expensive, logistically difficult, and potentially dangerous transport of captive animals for release from the west to Asia. In 1992 the first group of captive-born Przewalski's horses was transported to Mongolia, and to date, three reintroduction projects in Takhiin Tal, Hustai National Park and Khomiin Tal exist. Approximately 350 free-ranging Przewalski's horses now roam these sites in Mongolia (Walzer et al., 2012). Although the status of the captive breeding programs and the reintroduced Przewalski's horse populations in Mongolia have been reported on at length (Bouman, 2006; Boyd and Bandi, 2002; Kaczensky et al., 2008,2011; King and Gurnell, 2010; Zimmermann, 1999), data from China's program are largely lacking for both captive and released populations. In this paper, we will present the status and current challenges of the Przewalski's horse in both captive and released populations since 1985 – the year the first Przewalski's horse was returned to Xinjiang, China.

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2. Materials and methods

2.1. Study sites

2.1.1. Wild horse breeding center

As an *ex-situ* conservation measure, a captive breeding program was initiated in 1985 at the Wild Horse Breeding Center (WHBC) Jimsar County, in the southern part of the Gobi's Junggar Basin in Xinjiang, China. WHBC's main objective is to establish a self-sustaining captive population from which animals can be released into the wild. WHBC is 600 ha in size and surrounded by a 2.5 m brick wall. The WHBC has two feed-storage sheds, three horse housings and eight enclosures, including enclosures for a breeding group, foal group, female-foal group, mixed group, male group, sick individuals and the biggest enclosure for acclimatization of horses before they are transported to the Kalamaili Nature Reserve (KNR) for release in the wild. The main food of the captive Przewalski's horses is alfalfa, supplemented by corn, carrots, watermelon given as required.

As the captive population continues to grow, WHBC is facing a shortage of space. Existing facilities are now >25 years old and are greatly in need of updating to improve animal care and management. The main problem is a lack of visual barriers and buffer areas between harem groups and between harem and bachelor groups. As a result, stallions exhibit increased stress and excessive herding behavior. Serious fights occur regularly along enclosure fences which can potentially result in serious injuries (Pantel et al., 2006).

2.1.2. Kalamaili nature reserve

The KNR and the adjacent areas in Mongolia were the last refuge for the Przewalski's horse (Allen, 1938; Bannikov, 1954; Gao, 1984, 1989). This reserve is located in the northeast part of Junggar Basin, only about 150 km from the WHBC and 200 km from the Great Gobi B Strictly Protected Area (SPA) in Mongolia. The KNR is at an elevation of 600–1700 m. This region has a harsh continental-type local climate with an average yearly temperature of +1.99 °C. Winters are long and cold; summers are hot and short. Average annual rainfall was 186.8 mm. Vegetation cover is quite sparse and consists mostly of desert shrubs and dwarf shrubs from the families Chenopodiaceae, Ephedraceae, Tamaricaceae, and Zygophyllaceae. The most common desert tree is the saxaul *Haloxylon ammodendron*. Common shrubs are *Anabasis salsa*, *Atraphaxis frutescens*, *Calligonum mongolicum*, *Ceratocarpus arenarius*, *Ceratoides latens*. Species from the genera *Sterigmostemum*, *Alyssum*, *Scorzonera* are common here. Around 3379–5318 khulans (*Equus hemionus*) and 6628–19,677 goitered gazelles (*Gazella subgutturosa*) also live in KNR (Chu et al., 2009).

In 2002 and 2004, KNR failed to upgrade its protection level due to the ongoing human activities inside the core reserve areas. Since then, KNR has been reduced from 18,000 km^2 to 12,800 km^2 due to coal mining. During winter, about 2000 herdsmen and 200,000 livestock (including horses) occupy the best pastures in the reserve (Chu et al., 2008; Liu et al., 2008). Moreover, national road line 216 is an important transportation route between Urumqi and Altay, and divides KNR into two parts. The line 216 became very dangerous to Przewlski's horses after it was upgraded to a highway in 2005, and five Przewalski's horses have been killed by motor vehicle collisions.

Prior to release, a 20-ha pre-release enclosure was constructed at the reintroduction site. Then enough hay/alfalfa and water was provided to allow the Przewalski's horses to acclimatize to their new environment. They were released when the chances for their survival were the most suitable – late spring when the temperature was increasing and food was more abundant. Released horses were allowed to range freely from spring to fall, but were driven into a winter coral to allow for supplemental feeding to increase winter survival, and to reduce competition with domestic horses from local herdsmen who use the KNR as winter pasture.

2.2. Data collection

Przewalski's horse at WHBC is marked by using plastic ear labels with individual number for identification and tracking released groups. Data from the development of the captive population were recorded by WHBC staff and the reintroduced population by KNR staff. These data included the number of pregnant and post-partum females, the number of newborn foals and surviving foals, and a total number of all individuals and their distribution. For the captive population, the Przewalski's horses were fed four times a day at 7:00, 13:00, 18:00 and 00:00. Each adult was fed 2.5 kg of food per feeding and each sub-adult was fed half of the adult portion (Wang, 2004). The status of animals were monitoring and checking during their feeding and cleaning routines. In the enclosure, Przewalski's horses were checked daily, while free roaming groups were checked from cars by KNR staff once per two days.

3. Results

3.1. Population growth of the captive population

The WHBC breeding population of 24 animals (14 males and 10 females) arrived in five groups from captive facilities in Germany, the United Kingdom, and the United States over the period from 1985 to 2005 (Table 1). Prior to their arrival at WHBC, all Przewalski's horses were first kept at Urumqi Zoo in Xinjiang for a period of 16 months to allow them to adapt to the local environment and changes in climate.

Between 1988 and 2013, 339 foals were born and 285 survived at WHBC (Table 2). The mean survival rate of foals averaged 86.7%, resulting in a steady increase in the captive population that reached 142 individuals by 2006 (Table 2). This breeding success opened the door for the reintroduction of these horses into the wild, providing sufficient individuals with complete studbook information and relatively low inbreeding coefficients (<0.2, before 2006).

3.2. Population growth of the reintroduced population

In August 2001, the first captive-bred group of 27 individuals (11 males and 16 females) was released at KNR. Thirteen more groups followed and in total 89 captive-born Przewalski's horses (32 males and 57 females) were transported to the KNR between August 2001 and December 2013 (Table 3). Five release sites were chosen during that same time frame based on the combined impacts from available water resources, forage quality and quantity, and the interference level from human activities, as well as a

Table 1
Reintroduced Przewalski's horses from around the world.

Time of reintroduction	Numbers			Source area
	Male	Female	Total	
1985–08-06	2	3	5	Germany
1985–08-22	2	4	6	United Kingdom
1988–09-24	2	3	5	Germany
1991–12-28	2	0	2	United States of America
2005–09-07	6	0	6	Germany
Total	14	10	24	