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# Extinct in the Wild to Endangered: the History of Przewalski's Horse (*Equus ferus przewalskii*) and its Future Conservation

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## Abstract

This paper summarises published research on Przewalski's horse, *Equus ferus przewalskii*. Biology of the species is described, as well as its history in the wild and in captivity. Reintroduction efforts at Takhiin Tal and Hustai National Park are discussed, with current population levels given, as well as some survivorship data. Ecology of the Przewalski horse at the different reintroduction sites is described, showing similarities and differences. Finally future conservation of Przewalski's horse is discussed, with particular reference to the change in status from Extinct in the Wild to Endangered, based on the IUCN Categories and Criteria.

Keywords: *Equus ferus przewalskii*, Mongolia, Reintroduction, takhi

## Introduction

The Mongolian Biodiversity Databank workshop took place at Hustai National Park in November, 2005. This Park was one of the first reintroduction sites of Przewalski's horse, *Equus ferus przewalskii* (Groves, 1986), in Mongolia, so was a fitting place for its conservation status to be changed from Extinct in the Wild (EW) to Endangered (EN) (based on the IUCN Categories and Criteria). This note briefly describes the history of the Przewalski's horse ('takhi' in Mongolian), extinction causes and reintroduction efforts. Ecology of the horse since reintroduction is described, together with the potential impacts of the re-classification on future work.

## Biological data

The Przewalski's horse is the last of the wild horses. Stocky, with a big head, this species is different from domestic horses (*E. caballus*) both phentotypically and genotypically (Groves, 1994). The Przewalski's horse has an erect mane with no forelock and short guard hairs along the dock – two traits not seen in domestic horses. They are typified by being a dun brown colour, with black or dark brown manes and tails, and often a dorsal line and stripes on the legs. *E. caballus* and *E. f. przewalskii* have a different number of chromosomes (2n = 64 and 66 respectively), but can interbreed to produce fertile offspring (Ryder, 1994). Although their karyotypes differ by only one Robertsonian fusion (Ahrens & Stranzinger, 2005), the two equids are separate species, with Przewalski's horses not being ancestral to the domestic horse (Oakenfull *et al.*, 2000).

## Historic range and captive breeding

Although the horse is likely to have once roamed throughout the Eurasian land mass, as evidenced by cave paintings in southern Europe, in recorded history it has only been found within Tibet, China and Mongolia (Wakefield *et al.*, 2002). All sightings within the last 200 years occurred within the relatively small area around the current Chinese-Mongolian border (85-95°E, 44-50°N) (Mohr, 1971). It was in this region that the last wild horse was seen in 1969 (Bouman & Bouman, 1994), and where all Przewalski's horses were captured around the turn of the 19th and 20th Centuries. Fifty three horses reached the west alive from these capture expeditions, and since then only two horses are known to have been caught (Bouman & Bouman, 1994). Of these horses only 12 contribute any genes to the current population, with one additional founder, and the possibility of at least two of these animals being F1 domestic-Przewalski's hybrids (Wakefield *et al.*, 2002). After the Second World War the captive Przewalski's horse population went through another bottleneck as only 12 of the 31 horses that survived the war bred (Wakefield *et al.*, 2002). Until the 1970s Przewalski's horses tended to remain in the same zoos and there were many instances of consanguinous mating, causing the level of inbreeding to rise sharply in most collections (Bouman & Bouman, 1994). Some genetic diversity was lost

due to the small population size and there was evidence of inbreeding depression causing the population to grow more slowly than its potential (Ryder, 1994). To ameliorate this a Species Survival Plan was set up for the Przewalski's horse in the USA in 1979, and this was followed in 1986 by a European breeding programme, or EEP (Europaisches Erhaltungszucht-Programm) (Bouman & Bouman, 1994). These programmes led to a greater exchange of animals between zoos with efforts being made to reduce inbreeding and increase or maintain genetic diversity by ensuring that all the founders were represented in the captive population. By the 1990s there was a population of nearly1500 Przewalski horses in captivity and plans were being made for their reintroduction.

## Extinction

The Przewalski's horse was categorised as Extinct in the Wild by the IUCN as no more animals have been seen in the wild since 1969, despite efforts to find them in Mongolia or China (Wakefield *et al.*, 2002). The Przewalski's horse only remained extant as a species due to captive breeding programmes (Ryder, 1994). It is likely that Przewalski's horses were already quite rare in the wild in the first half of the 20th Century, with only occasional sightings of small groups of horses being reported (Bouman & Bouman, 1994). There are many factors that could have caused the extirpation of the horse after the Second World War, and it is likely that it was a combination of these acting on a small population that caused their extinction. One major factor affecting the horses was the change in the political climate of the area. In the 1940s and 1950s modern weapons became more abundant in the region, coinciding with a series of harsh winters (Bouman & Bouman, 1994). This would have caused the death of large numbers of livestock, resulting in increased hunting pressure on an already stressed population. In the 1950s the border post between Mongolia and China was moved, providing local herdsman access to grazing and springs that until then had only been used by the wildlife (van Dierendonck & Wallis de Vries, 1996). Finally it is possible the Przewalski's horse become extinct as a species due to hybridisation. One case of a Przewalski stallion acquiring a harem of domestic Mongolian mares is known (Mohr, 1971), and it is likely there were more. It has been found in the red wolf (*Canis rufus*) that when the wild population became small, and when reintroduced to North Carolina, dispersing young wolves mated with coyotes if they could not find conspecifics (Moore & Smith, 1990). As the Przewalski's horse population became small it would not have been difficult for them to become assimilated into local herds of domestic horses.

## Reintroduction

There are currently three sites where Przewalski's horses have been reintroduced to the wild in their former range, although since 1980 Przewalski's horses have been released into large enclosed reserves in Holland, England, France, Hungary, Ukraine and Uzbekistan where they are essentially free living. In the 1990s two sites were chosen for reintroduction in Mongolia: Takhiin Tal, in the Ikh Gobi Strictly Protected Area, Section B, an International Biosphere Reserve in the south western part of Mongolia where Przewalski's horses were last seen in the wild, and Hustai National Park, a smaller protected area north of the centre of Mongolia. Takhiin Tal was set up by the Christian Oswald Foundation, Germany and the Mongolian government, subsequently being run by the International Takhi Group. Hustai National Park was set up in 1990 by the Dutch Foundation Reserves Przewalski Horse (FRPH) in association with the Mongolian Association for the Conservation of Nature and the Environment (MACNE). Both reintroduction centres brought horses to Mongolia for the first time in 1992. Between 1992 and 2000, a total of 84 horses were brought to Hustai National Park from reserves in Europe. The population is currently 168 free ranging horses in about 15 groups. Since 1997 five harems have been released into the desert-steppe of the Ikh Gobi-B Strictly Protected Area. The population now consists of 85 free ranging horses in 7 groups. In 2004 12 horses were brought to a third reintroduction site, the Khomyn Tal buffer zone of Khar Us Nuur National Park, with more individuals brought in 2005.

The reintroduced population of Przewalski's horses has grown in both previously established sites through births, as well as imported animals. At Hustai National Park, of 115 foals born between 1994 and 2001, 57% were still alive at the end of this time period (King & Gurnell, 2005), with reproductive rate of adult mares being 60.4% between 1994 and 2004 (Bandi, 2004). On average, in each year between 1995 and 2000, foals made up 25% of the population, and 12% of the population died (King & Gurnell, 2005). A tenuous overall per capita growth rate ($r$) of this population is 0.066 per year, based

on 142 horses in Khustai National Park in 2002 (84 of which were reintroduced), increasing to 162 horses by June 2004 (King & Gurnell, 2005). Over the last 10 years, 54 foals were born at Takhiin Tal, with 42% surviving (Ganbaatar, 2004).

Twenty-six per cent of deaths at Hustai National Park were caused by babesiosis (a tick borne blood disease), which particularly affected newly released (adult) horses (three died from this in 1998 and nine in 1999; previous deaths from this disease are also possible, but were not diagnosed). Most other deaths were foals (63% of all deaths). Predation by wolves, *C. lupus*, was low with a mean of 2.8 horses taken each year, all one year old or less (16 % of all foals born between 1994 and 1999) (King & Gurnell, 2005). Survival of horses born in Mongolia tended to be higher than imported animals (Bandi & Enkhtur, 2004). Similar causes of mortality were seen at Takhiin Tal. Of the 28 dead horses recovered since 1999, 18% died from babesiosis, with other animals dying from wolf predation, strangles (infection by *Streptococcus equi*) and other diseases, trauma, exhaustion and reproduction related mortality (Robert *et al.*, 2004).

## Ecology of reintroduced populations

The Przewalski's horse was never studied properly in the wild before it became extinct, so only anecdotal accounts of its social structure and behaviour were available (Mohr, 1971). In captivity Przewalski's horses had been kept in harems (a stallion with adult mares and their offspring) as it was assumed that this was their natural social structure, similar to feral horses (Linklater, 2000). On release into the wild the horses have retained this structure, forming family and bachelor groups. Both males and females leave their natal harem at between 2 and 4 years of age (King, 2002a; Bandi & Enkhtur, 2004). As in feral horse populations, mutual grooming is seen between familiar animals, as well as formation of a dominance hierarchy within each harem, and between stallions (Boyd, 1998). Less aggression was seen in harems at Hustai National Park than had been noted in any other study on equids (King, 2002a), possibly due to greater freedom to escape from any harassment if necessary. Time budgets of released animals corresponded to other studies (e.g. Boyd *et al.*, 1988). Activity was normally greatest in the morning and late afternoon/evening, with most grazing occurring in these time periods, and most resting during the hottest hours of the day (Boyd, 1998; King, 2002b; Souris, 2004).

Home ranges at Hustai National Park between 1995 and 2000 ranged from 1.3 $km^2$ to 24.0 $km^2$ (95% kernel home ranges); 80% core use areas from 61 ha to 499 ha (King & Gurnell, 2005). Ranges at Takhiin Tal were larger – 117 $km^2$ to 1526$km^2$, with ranges of newly released harems tending to be smaller in both sites (Kaczensky & Walzer, 2004). All home ranges contained water sources (Ganbaatar, 2004; King & Gurnell, 2005), and tended to also contain areas where horses could shelter from adverse weather and flies. The horses showed a preferential selection of vegetation, choosing vegetation typically containing *Achnatherum splendens* and *Stipa krylovii* at lower altitudes in Hustai National Park (King & Gurnell, 2005).

## Conclusions

At the Mongolian Biodiversity Databank workshop the Przewalski's horse was downlisted from Extinct in the Wild to Endangered based on the fact that there are now 253 animals in the wild, and the population is increasing without human interference. This is a conservation success story. Most reintroductions end in failure (Fischer & Lindenmayer, 2000), so a successful attempt deserves to be lauded. The success of the Przewalski's horse reintroduction in Mongolia is at least partly due to the attitude of the local people – there has been great support for the return of 'their' horse. It has also helped that the reintroduction was to a relatively sparsely populated country where hunting pressure and competition with livestock was likely to be low.

Lessons learnt since the reintroduction began are the importance of a soft release – animals more acclimatised to the Mongolian environment had greater survival on release (King & Gurnell, 2005), and also the effect of local diseases on naïve animals (Ruegg, 2004). Babesiosis (piroplasmosis) has been the main cause of death in both reintroduction sites. *Babesia equi* and *B. caballi* are endemic to Mongolia and transmitted by the tick *Dermacentor nutalli* (Ruegg, 2004). Unless treated, between 25% and 100% of cases are fatal (West, 1992). However, animals can acquire immunity during the course of an infection, and mortality depends on the general immune status of the animal, and the virulence of the piroplasm (Schein, 1988). Maternal antibodies are produced, thus although foals can be infected during pregnancy, they gain some protection (Donnelly *et al.*, 1982). Local domestic horses and takhi born in Mongolia do not appear affected

by the disease (Ruegg, 2004), but newly introduced animals with no immunity and that may become stressed for reasons such as transport, release, or poor body condition in early spring, are likely to be susceptible. In particular there is a high mortality rate during the initial infection of older animals when brought from a country where *B. equi* is not endemic (Schein, 1988).

Dangers to the future of the population are related to hybridisation. Przewalski's horses and domestic horses can and do interbreed, and as the offspring are fertile it is feasible that a hybrid might re-join the population and breed. Captive breeding over the past 50 years has been conducted with an aim to reduce inbreeding and any phenotypic effects of domestic horse founders (Wakefield *et al.*, 2002). Management of wild horses is needed to ensure that inbreeding in these small populations is also kept to a minimum – possibly through exchange of animals between reintroduction sites. Questions related to animals leaving the park also need to be addressed. Policy needs to be created and implemented to confront the possibility of a hybrid – would the resulting animal be destroyed and what efforts would be made to remove it from the population? Would animals leaving the park be allowed to settle, or would they be removed from a potential situation of competition with local people for pasture?

Relatively little has been published on the behaviour and ecology of Przewalski's horses in Mongolia. Knowledge of the ecology of this animal is important as the populations grow, and the lack of data after release is compounded by the fact that all other published information is from captive populations. It is vital to have better information about their use of habitat so that informed estimates of carrying capacity can be made. This is becoming more critical as there is greater pressure on release sites from local people seeking pasture for their livestock. Competition between livestock and Przewalski's horses needs to be examined so that any effects can be mitigated in the future as animals leave the protected areas they currently occupy. The social system of the horses needs to be studied further so that knowledge of dispersal can be gained and applied to management of current populations, and to future release sites. Hopefully international acceptance of the Przewalski's horse as a wild animal in its own right, and not just a reintroduction experiment, will motivate this research and create an avenue for funding, allowing the Przewalski's horse to increase its population in Mongolia, its rightful home.

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