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On the move – Do domestic and wild ungulate species distributions overlap in the Mongolian Gobi?

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Abstract

In the Great Gobi B Strictly Protected Area (SPA), wild and domestic ungulates seasonally share the forage of the semi-desert and desert habitat. Around 130 herder families are grazing their livestock, mainly goats and sheep, in the protected area in winter. Wild ungulates of global significance in Great Gobi B SPA include the reintroduced Przewalski's horse (*Equus ferus przewalskii*), which had previously been extinct in the wild. To determine potential habitat overlaps between Przewalski's horses and livestock, we mapped the movements of 19 livestock herds monitored via GPS collars and ranger observations of Przewalski's horse herds over a one year period from September 2018 to August 2019. We additionally conducted focus group interviews with nomadic herders about their rangeland management. We found that pasture use in and around the Great Gobi B SPA is still following the nomadic tradition, with herders moving camp locations on average eleven times per year, depending on forage availability. Our results show that the range of Przewalski's horses and livestock mostly overlap around permanent and ephemeral water points. However, the same resources are used in different seasons. The protected area was recently expanded to twice its size, now also including additional herder households and traditional pastures. For the ongoing discussion about concerning the new zonation of the enlarged protected area it is important to consider both, herder and wildlife movements patterns, to meet the conservation goals of the protected area but also meet the needs of the traditional pastoral herding community.

Introduction

Nomadic pastoralism has been practiced worldwide for millennia as an adaption to temporal and spatial environmental variability (Dyson-Hudson 1980). The mobility of herders and their livestock is a livelihood strategy especially practiced in arid regions high in biodiversity but with overall low biomass productivity (Berzborn and Solich 2013). Biodiverse areas inhabited by livestock are often located in close vicinity to protected areas leading to interactions between wild and domestic ungulates (Du Toit et al. 2012). The rural economy of Mongolia is mainly based on livestock production by a semi-nomadic herding tradition (Fernandez-Gimenez 1999). To meet the nutritional needs of their livestock, herders have to move over long distances and cover large areas of grazing land, which can also include protected areas (Bedunah and Schmidt 2004; Fernandez-Gimenez and Batbuyan 2004). In many arid regions worldwide livestock share pasture resources with wild equids (Moehlman 2002). In Central Asia, the Przewalski's horse (*Equus ferus przewalskii*) became extinct in the wild and the range of Asiatic wild ass (*Equus hemionus*) shrank dramatically (Feh et al. 2002; Kaczensky et al. 2007). One of the key concerns for the conservation of wild equids in Mongolia is the unprecedented increase in livestock numbers (Šturm et al. 2017). For present day Central Asia, it is estimated livestock by far dominates the ungulate biomass and wild ungulates account for <5% (Berger et al. 2013). In Mongolia, reintroduction of the Przewalski's horse started in two locations simultaneously in 1992, one being the Great Gobi B Strictly Protected Area (SPA) where the last wild Przewalski's horses were observed until the late 1960s (Kaczensky et al. 2017a). Great Gobi B SPA was created to conserve wild equids but also allowed for the continuation of winter grazing by traditional nomadic pastoralists at pre-defined locations. Hence the range of livestock and Przewalski's horses overlaps seasonally. The aim of this study was to gain a better understanding of pasture use by local pastoralists and evaluate when and to what degree their range overlaps with that of the reintroduced Przewalski's horse population. We expected seasonal differences in the overlap of Przewalski's horses and livestock due to the prevailing nomadic herding tradition. Our data provides the first detailed analysis of herder movements in the Great Gobi B SPA and it is expected to guide zoning of the newly extended Great Gobi B SPA and other management decisions aiming to support traditional nomadic pastoralism in the region.

Study Site and Methods

Great Gobi B SPA was established in 1975 and originally stretched over 9,000 km², but was enlarged to around 18,000 km² in May 2019. It is located in south-western Mongolia and is dominated by semi-deserts and deserts habitats with poorly developed soils (Wehrden et al. 2006). The climate is characterized by short hot summers and long cold winters, and highly variable in precipitation averaging 96 mm rainfall per year (Kaczensky et al. 2008). The flagship species of the Great Gobi B SPA is the Przewalski's horse (*Equus ferus przewalskii*) numbering around 300 Przewalski's horses, the Asiatic wild ass (*Equus hemionus*) estimated to number around 9,000 animals, and the goitered gazelle (*Gazella subgutturosa*) estimated to number around 14,000 animals (Kaczensky et al. 2017b). These plains ungulates share the protected area with domestic livestock of around 130 nomadic herder families, primarily in winter. Herders in the Great Gobi B SPA keep goats (*Capra aegagrus hircus*), sheep (*Ovis aries*), but additionally have cows (*Bos taurus turano mongolicus*), horses (*Equus ferus caballus*), camels (*Camelus bactrianus*) and yaks (*Bos grunniens*). Only sheep and goats are accompanied by a herder on a daily basis while large stock grazes unaccompanied. Our study focussed on sheep and goat because they are by far the most numerous livestock and also constitute the most important source of income for local herders. The protected area in its original border consisted of a core zone with no human use allowed and a limited use zone plus, the protected area was surrounded by a buffer zone (Kaczensky et al. 2004). Zoning of the extended area of the Great Gobi B SPA is in progress.

In total, we equipped 19 livestock herds with GPS collars between September 2018 and August 2019 which recorded GPS positions at 30 min intervals between 7:00 and 22:00. We installed GPS collars on male goats between the age of 3 to 5 years. Based on the GPS tracking data we manually identified the camp sites of the herder families with QGIS (2.18). Great Gobi B SPA rangers obtained location data of Przewalski's horse groups as they checked on Przewalski's horse groups on a weekly basis and marked their position on a grid map (personal report Ganbaatar, 2021).

In autumn 2019, we conducted four focus group interviews with a total of 36 local herders using Great Gobi B SPA. During the focus group interviews we discussed the preferences of livestock for certain plants and the decision-making process behind camp site selection. To identify the most commonly used vegetation units by herders for their camp and grazing sites we used the vegetation map by Wehrden et al. (2006). The five major plant communities of the Great Gobi B SPA are *Stipa spec.* grasslands, and shrubby units of *Caragana spec.*, *Nanophyton erinaceum*, *Reaumuria soongorica* and *Haloxylon ammodendron*. The livestock herd movements were plotted on the vegetation map to identify the most commonly used vegetation units by herders and their livestock and Przewalski's horses.

Results

Camp sites by herders in and around the Great Gobi B SPA

According to our interviews, the main reason for herders to move their livestock was the rangeland quality. On the one hand, they claimed it was important to find sufficient forage resources to fatten the livestock, but on the other hand that moving also contributed to protecting the rangeland from overexploitation. Herders in and around the Great Gobi B SPA used on average 11 (± 3) camps per year, with 2 (± 1) different summer camps and 3 (± 1) winter camps. Winter camps showed the highest intensity of use (mean = 40 \pm 31 days), while herders only stayed 27 (± 23) days at summer camps. The intermediate camps in spring (mean = 3 \pm 2) and autumn (mean = 3 \pm 1) were frequently changed with an average use of 22 (± 16) days in spring and 23 (± 12) days in autumn. Herders in the western part of the Great Gobi B SPA travelled more than 120 km between their summer and winter camps and stayed only inside the protected area between November and March. Herders in the eastern part covered a distance of around 70 km between summer and winter camps and stay from September to May in the protected area (Fig. 1).

Herders often erected their camps close to smaller mountains and hills, which shelters the camp from the wind (our own observation). According to the herders, *Stipa* grasslands and specifically *Stipa gobica*, *Stipa glareosa* and *Allium mongolicum* are the most important fodder plants throughout all seasons. The shrubby plant communities are mainly important for livestock during winter months. Summer camps in the North are located at higher altitudes, offering relieve from the heat of the Gobi, biting insects and guaranteeing access to fresh water from mountain streams. During winter, areas sheltered from the wind and near areas where the wind blows away the snow cover to expose vegetation are the main reasons selection criteria for suitable camp locations. Intermediate season camps in spring and fall are located near permanent and ephemeral water points providing drinking water for people and livestock. Moving to spring camps is primarily motivated by the start of the growing season, while autumn camps are chosen in areas where vegetation availability is still high to fatten the animals before winter.

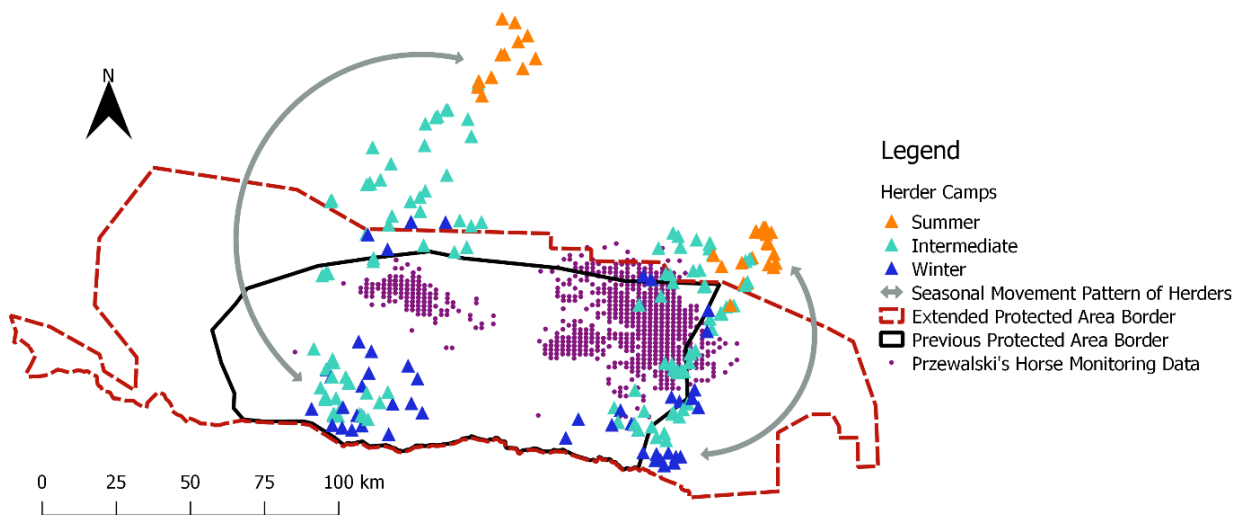


Fig. 1: Map of the Great Gobi B Strictly Protected Area in Mongolia showing seasonal herder camps (triangles). Grey arrows illustrate the seasonal movements between summer camps in the North and winter camps in the South. Purple dots visualize grid-based Przewalski's horse monitoring data in the years 2018 and 2019 recorded on a weekly basis. The dotted red line shows the extended protected area border (since May 2019), the black line shows the previous protected area border.

Przewalski's horses avoiding areas of livestock use

The Przewalski's horses are rather conservative in their movement patterns, stay close to water, and do not show seasonal migrations (Ganbaatar 2003, Kaczensky et al. 2008). The range of the Przewalski's horses in 2018-2019 was still focussed around the main release site in the NE part of Great Gobi B SPA and a secondary release site in the North-western part. Only a rather small part of their range is within the core zone of the original Great Gobi B SPA. In the NE part, the Przewalski's horse range overlaps primarily with intermediate camps utilized in spring and fall. Przewalski's horses in the West hardly overlapped with herder camps at all. Przewalski's horse make intensive use of the Takhi us oasis in the west and Khonin us oasis in the east, two areas where herder camps are strongly discouraged.

Discussion

In line with Kaczensky et al. (2007), our results show that Przewalski's horses seem to avoid areas of livestock presence and wildlife-livestock interactions are negligible during summer months when herders move to the summer pastures high in the Altai Mountains (Kaczensky et al. 2008). We found that, in times when livestock is absent, the Przewalski's horses use the same water points that were visited by herders and their livestock during spring and autumn. In other areas of Mongolia, wild ungulates are often negatively affected by the presence of herder camps (Olson et al. 2011; Young et al. 2011). However, reintroduced Przewalski's horses are the flagship species of the protected area and are highly valued by the local people, so that negative encounters between people and Przewalski's horses have been rare and Przewalski's horses are more tolerant to human presence than other wildlife subject to poaching (Kaczensky 2007; Šturm et al. 2017). Furthermore, Przewalski's horses are very conservative and stay mainly in the area where they had been released and only slowly expand their home range (Ganbaatar 2003, Kaczensky et al. 2008). Our results show that herders prefer the wide grass pastures of the Great Gobi B SPA to feed their livestock, especially during spring and autumn. We recorded Przewalski's horse distribution mainly in the plant community *Haloxylon ammodendron*, the most characteristic shrub species of this desert-steppe (Hilbig 1995; Wesche et al. 2005). In the Eastern part, however, we found that Przewalski's horses also used the same grass pasture as livestock. Our observations are in line with the findings of Šturm et al. (2017) who showed that Przewalski's horses mainly feed on grass dominated pastures and prefer to hide in the higher stands of *Haloxylon ammodendron*. Our study was limited to identifying range overlaps between Przewalski's horses and livestock. Yet, findings by Šturm et al. (2017) showed diet overlaps between Przewalski's horses and domestic horses, but did not look at overlap with small livestock. The livestock herds in the Great Gobi B SPA consist mainly of goats and sheep and especially goats are grazing and browsing, and are thus very likely to compete with all wild ungulate species (Berger et al. 2013). Considering the overlap in space and pasture use between sheep and goat flocks identified in this study, we strongly suggest that more research is needed to identify to what extent Przewalski's horses and livestock are competing for resources in the Great Gobi B SPA. We also suggest that both herder and ungulate movement

patterns are considered when identifying new zones inside the Great Gobi B SPA, so that the zonation meets the needs of traditional nomadic pastoralists and threatened wildlife which have coexisted in the Great Gobi B SPA ecosystem until now.

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