

# HABITAT SURVEY OF *EQUUS KIANG KIANG* FROM CHANGTHANG WILDLIFE SANCTUARY OF LADAKH, INDIA

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*Equus kiang kiang* Moorcroft, 1841 is one of the subspecies of wild asses, belonging to the family *Equidae*. The historical distribution of *Equus kiang kiang* was the entire Tibetan Plateau but the current population is restricted to the Ladakh region of India and the plains of the Tibetan Plateau. Though *Equus kiang kiang* is listed as the least concerned by IUCN but it is an unexplored and data-deficient wild ass. During this study, we investigated the potential habitat of *Equus k. kiang* in the Changthang Plateau of the Ladakh region. We employed photographic records of the *Equus k. kiang* from its entire distribution range in order to survey the habitat and abundance of animal. At the same time, the human-kiang conflict was deciphered by personal interviews of people residing in the nearby hamlets of the Changthang Plateau of the Ladakh region. The faecal samples of *Equus k. kiang* were also collected from different locations in Changthang Plateau to extract genomic DNA. The species was found to occupy all different habitats within the sanctuary confirming the negative impact of human interference on *Equus k. kiang*. The interviews with the local residents and pasture owners reveal potential human-kiang conflict.

**Keywords:** habitat survey, Ladakh, conservation, wildlife management, human-wildlife conflict.

## INTRODUCTION

*Equus kiang kiang* is one of the robust wild equids belonging to the family *Equidae* and it is the only odd-toed wild ungulate, currently inhabiting the cold, arid, and hypoxic habitat at the Ladakh region of India and the Tibetan plateau (Shah *et al.*, 2015). The word kiang originated from the Tibetan language, “rkyang” (Huber, 2005), with no apparent meaning (Prejevalsky, 1876; Groves & Mazak, 1967; Gotch, 1979). In various regions, *Equus k. kiang* is denoted by various vernacular names; in Ladakh, the common name of *Equus k. kiang* is “skiang” (Humbert-Droz & Dawa, 2004; Pfister, 2004) and in China, it is commonly known as “zang yelu” (Smith & Xie, 2008). *Equus k. kiang* is listed as the Data deficient animal by IUCN. The domestic donkey, *Equus africanus asinus* has been considered a subspecies of the African wild ass, *Equus africanus* (Blench, 2000).

The *Equus k. kiang* has never been domesticated like other wild equids (Schaller, 1998), despite many previous attempts. Being a well-adapted creature to the cold and hypoxic conditions of Ladakh, *Equus k. kiang* is the largest of all the wild asses, following Bergmann's rule. According to the IUCN status of 2003, the *Equus k. kiang* is considered a Data deficient species and there is no baseline data available about the conservation status of *Equus k. kiang* found in Ladakh, hence from the conservation point of view, it is crucial to address this animal (Shah *et al.*, 2015). In India, *Equus k. kiang* is categorized as a Schedule-I species in Indian Wildlife Protection Act, 1972 and it is also on Appendix II of CITES (IUCN SSC Equid Specialist Group).

In this study, we also collected faecal samples as a non-invasive source of genomic DNA and successfully extracted the genomic DNA of *Equus k. kiang* which will be used in the future to address the questions related to the population genetics of *Equus k. kiang* in Ladakh.

The aim of this study was: 1) to identify the potential habitat of *Equus k. kiang* in Changthang Cold Desert Wildlife Sanctuary; 2) to identify human threats to *Equus k. kiang* populations and 3) to collect the faecal samples of *Equus k. kiang* from Changthang Cold Desert Wildlife Sanctuary to extract genomic DNA using standardized DNA extraction protocol in our lab.

## MATERIAL AND METHODS

### Study Area

The study was carried out in the Changthang Wildlife Sanctuary (~33.96°N to 78.20°E) of Ladakh region (approximately 75°50' to 75°80'E; 32°30'N to 32°37' N), extended in an area of 4000 km<sup>2</sup> (Wildlife Department Ladakh), the only protected area for *Equus k. kiang* in India where it is found exclusively (Fig. 1; Fig. 2). It is a high-altitude wildlife sanctuary with the average altitude of 4000 m MSL which is also known as the Changthang Cold Desert Wildlife Sanctuary. The overall climatic conditions are like that of any cold desert with minimal annual precipitation ranging from 670 mm (at Drass, the II<sup>nd</sup> coldest inhabited place after Siberia) to ~100 mm at Leh (Holmes, 2002). The temperatures also varies considerably from sub-zero temperatures (-19<sup>o</sup>C) in winters to fairly hotter summers (35-40<sup>o</sup>C) showing diurnal temperature ranges. Due to overall arid and hypoxic conditions, there are sparse vegetation resources limited to the areas close to the glacial-fed streams, and the cultivation is solely based on the human irrigation system (Juyal, 2014).

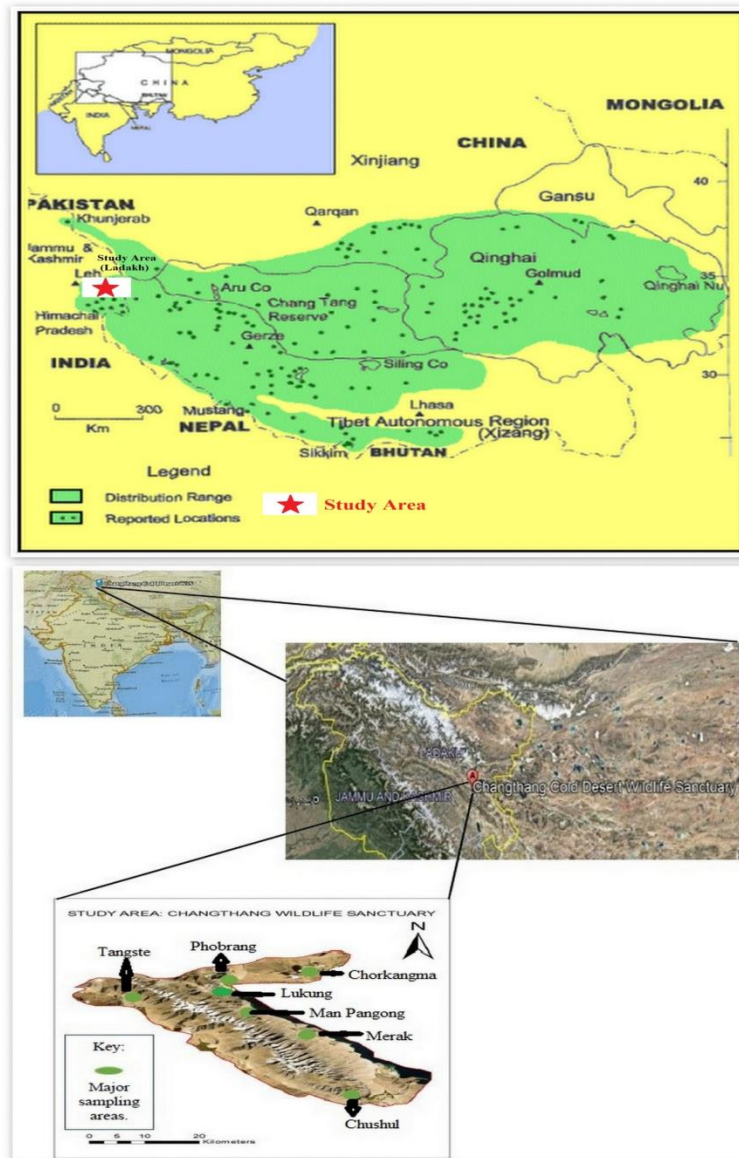


Fig. 1. Map of the study area, adopted IUCN and Google Earth Pro, and processed in ArcGIS.

### Habitat Survey

We carried out the survey to study the population status of *Equus k. kiang* by tracking down the animal using vehicle or from any nearest possible shelter so as to avoid disturbance to the animal using a binocular (when sighted from distant

places) and bare eyes (when sighted from close distances). A distance of almost 1000 km<sup>2</sup> was travelled within the sanctuary by recording the odometer of vehicle, starting from Tangste to Phobrang, Man, Merak, Chushul, Lukung, and Chorkangma. Their habitat choice *i.e.*, landforms (barren land or meadow), availability of water resources (waterholes, lakes, or stream channels), proximity with human interventions, and interspecific competitions were recorded from the major areas within the sanctuary for two years. A total of 68 visits were made in different seasons including the summer months (May–August), autumn and winter months (October–January).



Fig. 2. Photographs showing *Equus kiang* on various locations within the Changthang Wildlife Sanctuary.

One of the major threats to *Equus k. kiang* is human-wildlife conflicts, which was assessed by interviews with the local residents. Close observation of various herds was carried out to identify whether the group is permanent or temporary. We assessed different levels of human interference by determining the level of colonization, army installations and tourist encroachments during the interview of people inhabiting the different areas of this region. The name of places mentioned is the broad name of the areas since the local names are not available on the Google Earth Map.

## RESULTS AND DISCUSSIONS

According to our observation and previous published study by Sharma *et al.* (2004), the *Equus k. kiang* was found to occupy almost all types of habitats within the cold, hypoxic, and arid areas of the Ladakh and Tibetan plateaus. Animals were found more frequently in resource-rich grasslands like Mughleb, Thishulnua, and Phurantheu, etc. They are also found in areas like Tchanla which is covered with snow throughout the year at an altitude of 5693 m MSL. In the low-lying areas during the summer season, *Equus k. kiang* was mostly observed to feed on the major grass *Stipa*, followed by other grasses like *Kobresia*, *Carex*, *Poa*, and *Elymus*. During winter, the diet of *Equus k. kiang* was mostly *Stipa* species. The *Equus k. kiang* has been observed digging the roots of *Oxytropis* occasionally during winter when there's a scarcity of dry grasses. Very few studies were undertaken to date about the water intake capacity of *Equus k. kiang* (Schaller, 1998).

The population densities of *Equus k. kiang* were found to be very low in close proximities with the human interventions ranging from 1.5–1.9 individuals/km<sup>2</sup> in low human interference and 0.68 individuals/km<sup>2</sup> under medium human influence. This finding correlates with the finding of Fox & Bardsen (2005) and Bhatnagar *et al.* (2006), carried out in the Chang Tang Nature Reserve in Tibet. In the Changthang Wildlife Sanctuary, the habitat range of *Equus k. kiang* was found to be overlapped with the distribution range of six other wild ungulates, thus indicating interspecific interaction. The six other wild ungulates are: Tibetan gazelle (*Procapra picticaudata*), Chiru or Tibetan antelope (*Pantholops hodgsonii*), blue sheep (*Pseudois nayaur*), wild yak (*Bos mutus*), Tibetan argali (*Ovis ammon hodgsoni*) and white-lipped deer (*Prezwalskium albirostris*). Such interactions were also recorded independently by Yin *et al.* (2007) and St.-Louis & Côté (2014). Due to the rapid commercialization of livestock and cash meres (pashmina) in recent days, local residents of the Changthang valley have an intolerant attitude towards *Equus k. kiang*, they consider this wild equid as a direct competitor of their livestock for key resources in Changthang valley. During the interviews, a negative response towards *Equus k. kiang* was observed and people urged authorities to keep *Equus k. kiang* a distance away from their pastures. About 48 household were interviewed in Phobrang region where the fences observed mostly. Total 10 questions were asked in the questionnaire. People were also complaining about the raids of *Equus k. kiang* to the meadow which they protect for their livestock. The encroachments of local people were observed in the natural habitat of *Equus k. kiang* by building the wired fences and walls around the resource-rich areas (Fig. 3). A study by Bendeguz *et al.* (2020) suggests that fences above 150 cm are adequate to cause hindrance in the movement of large mammals. Many animals also get injured while trying to jump over the fences. Many instances of chasing *Equus k. kiang* on horseback driving them away from pastures and setting dogs upon them have also been reported (Bhatnagar *et al.*, 2006). Such fences were also

observed in the Hanle region (Nubra Valley) which is not included in our study area (Bhatnagar *et al.*, 2006). The decreased tolerance for *Equus k. kiang* among the locals can also be attributed to factors such as the loss of traditional pastures during an Indo-Chinese War (1962), while due to immigration of large-scale Tibetan refugees, the number of livestock increased to double in about 20 years (Bhatnagar & Wangchuk, 2001; Hagalia, 2004), and increasing commercialization of cashmere (pashmina) production (Bhatnagar *et al.*, 2006).



Fig. 3. Fences in the form of walls to restrict kiang entry into the key pastures.

Successful DNA extraction was carried out in the non-invasive faecal samples of *Equus k. kiang*, collected from the various locations of Changthang Wildlife Sanctuary. Fecal samples are an excellent source of genomic DNA in molecular ecological studies. The successful amplification of genomic DNA is the primer to generate the molecular data of *Equus k. kiang*. In future, these extracted genomic DNA samples will be used to generate the sequences of mitochondrial

markers as well as to genotype equine microsatellites loci in similar samples. This molecular data will be implemented to understand the population genetic and genomic diversity of *Equus k. kiang* from Changthang Wildlife Sanctuary of Ladakh in the future.

### CONCLUSIONS

*Equus k. kiang* was found to dwell in almost all habitats ranging from low-lying grassland to high-altitude barren lands within the sanctuary, thus showing the versatility to adapt in the harsh plateau habitat. This species is classed as data-deficient but after the Indo-Chinese war in 1962, the population of *Equus k. kiang* was greatly reduced in Ladakh, India. The population estimate of *Equus k. kiang* in Ladakh after late 1980s was approximately 2,500 individuals, while the current estimates from Ladakh reveals approximately 1,500 individuals (Fox *et al.*, 1991; Shah, 2002). One of the reasons for this reduction may be that this species is a border-dwelling animal and hence might have faced the maximum war consequences. Being a data-deficient and Least Concern species, this animal needs further studies to estimate various threats at the local levels, so as to protect this robust species.

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