Our Nature (2011) 9: 55-60

# Distribution and Encounter Rates of Large Herbivores in Chang Chenmo and Daulat Beg Oldi, Ladakh, Jammu and Kashmir, India

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Received: 19.04.2011, Accepted: 23.09.2011

**Abstract**
The Ladakh region of the Indian Trans-Himalaya supports twelve large herbivores, including eight mountain ungulates. Many of the species like the Tibetan antelope are highly endangered with rapidly declining populations. Yet there is little information on their status and distributions, especially in remote, inaccessible areas. We report on the status and distribution of five large herbivores in the Chang Chenmo and the Daulat Beg Oldi (DBO) areas of Ladakh, which remain the least known areas in Ladakh in terms of wildlife populations because they are very remote and politically highly sensitive. During the surveys, we observed 246 Tibetan antelopes and 40 blue sheep in DBO. In Chang Chenmo we observed 40 Tibetan antelopes, 2 wild yaks, 42 Tibetan argalis, 67 Tibetan wild asses and 30 blue sheep. In DBO, the encounter rate was higher for the Tibetan antelope (mean = 2.54, SE = 0.63) than the blue sheep (mean = 0.29, SE = 0.19). In Chang Chenmo the highest encounter rate was for the Tibetan wild ass (mean = 0.48, SE = 0.26), whereas the wild yak had the lowest (mean = 0.02, SE = 0.01). Since Chang Cehnmo and DBO are important areas for rare species in India, and are located right at the border with China, there is an urgent need for international collaboration to protect these threatened animals.

***Key words*:** Chiru, wild yak, Tibetan argali, Chang Chenmo, Daulat Beg Oldi

## Introduction

The Ladakh region of the Indian Trans-Himalaya represents a unique biogeographic zone in the Indian sub-continent (Rodgers, 2000). It has a relatively diverse assemblage of large herbivores, including eight wild ungulates that are adapted to the region's cold and harsh environment (Fox *et al*., 1991). Although several studies have been carried out on large herbivores in various parts of Ladakh (Namgail, 2009), there are still some places that remains virtually unknown in terms of wildlife populations. The Chang Chenmo and the Daulat Beg Oldi (DBO) are two such areas, which were important historical sites for trophy hunting (Stockley, 1936; Fox *et al.*, 1991).

The large herbivores in Chang Chenmo and DBO constitutes a unique

assemblage due to their physiological, behavioural, morphological and ecological adaptations. However, they occur in very low densities, which have been attributed to illegal hunting, habitat degradation associated with intensive livestock grazing and environmental stochastisities (Mishra, 2001; Namgail, 2009). Populations of several species continue to decline apace (Bhatnagar *et al*., 2006; Namgail *et al*., 2009), and conservation efforts are hindered by an apparent lack of information on their status and distributions, especially of species like the Tibetan antelope *Pantholops hodgsoni* and wild yak *Bos mutus.*

Of the wild ungulates that occur in eastern Ladakh, the Tibetan antelope is listed as an 'Endangered' species on the red list of the International Union for the Conservation Nature (IUCN, 2008), while the wild yak is listed as a 'Vulnerable' species and the Tibetan argali *Ovis ammon* as 'Near Threatened' species. Such precarious status of these species and the increasing encroachment of natural habitats by humans warrant studying these species on a priority basis. The blue sheep *Pseudois nayaur* and the Tibetan wild ass *Equus kiang* are listed as species of 'Least Concern'.

Furthermore, it has long been known that Chang Chenmo and DBO support small populations of the endangered Tibetan antelope (Fox *et al*., 1991), but it is not clear if the population is migratory like those on the Tibetan Plateau or is resident. Similarly, the population dynamics and distribution of wild yak in the Chang Chenmo still remains to be explored. Recognising these and the conservation needs of these species in India, we conducted surveys to determine their status and distributions two of the most inaccessible areas in the Ladakh Trans-Himalaya.

## Materials and methods

### *Study area*

Ladakh is a high altitude cold desert in the northern Indian state of Jammu and Kashmir (Fig. 1). It encompasses an area of about 90,000 $km^2$. Ladakh is floristically treeless; planted trees are generally found growing along the rivers (Awasthi, 1997). There are three main elements in the region's flora viz., alpine, desertic and oasitic (Stewart, 1916). The characteristic feature of the vegetation is the cushion like habits of plants which is an adaptation for cold dry winds and blizzards (Kashyap, 1925).

Chang Chenmo valley is located in the Changthang High Altitude Wildlife Sancturay, and is drained by the Chang Chenmo River. It is bounded by the low hills on the north and south, Silung Burma on the east and Silung Yogma on the west. DBO is located in the Karakoram Wildlife Sanctuary in the Karakoram Range. The Karakoram nullah drains the catchment southwards and meets the DBO nullah and Chip Chap River flowing westwards to drain into the Shayok River. Both Chang Chenmo and DBO are located at the border between India and China, and thus are under direct administration of the Indian Army. Both are devoid of local people due to their political sensitiveness, and are important habitats for the endangered Tibetan antelope outside China.

### *Surveys*

The surveys were carried out during the months of August 2007 in the Chang Chenmo Valley and September 2007 in

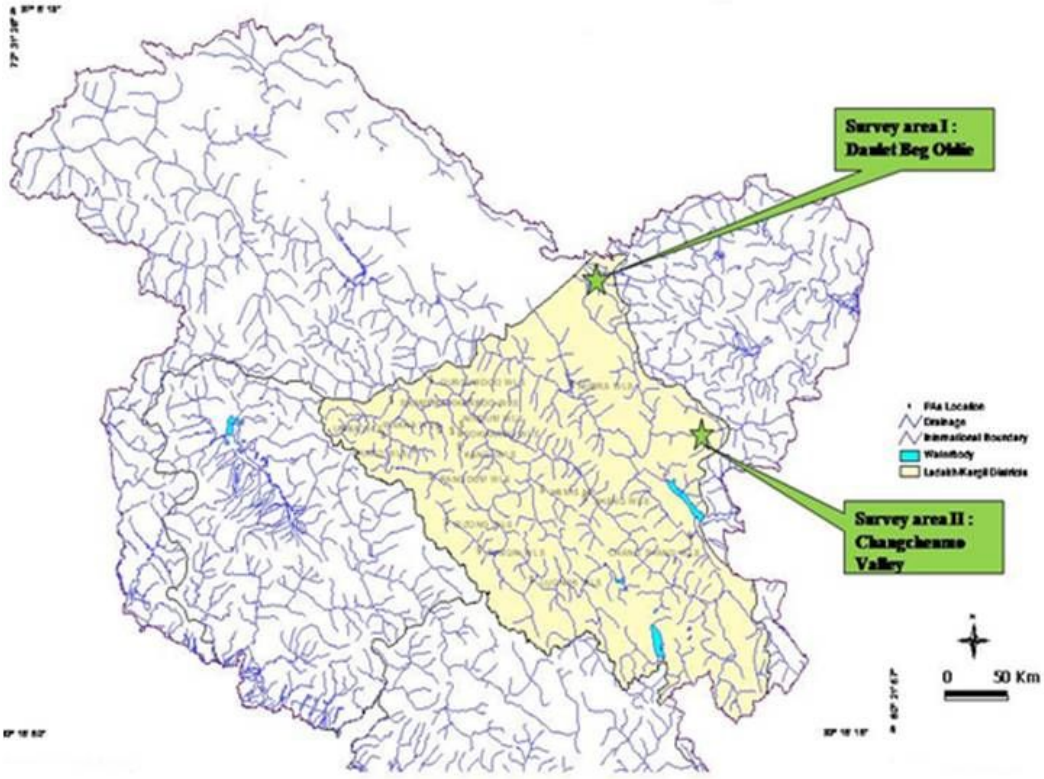


**Figure 1**. Map of Jammu and Kashmir with the study sites indicated

**Table 1**. Transects walked in the Chang Chenmo and Daulat Beg Oldi (DBO) areas of Ladakh.

| Location | Transect features | | | | |
|---|---|---|---|---|---|
| | No | Start point | End point | Locality | Distance (km) |
| Chang Chenmo | 1 | Phobrang | Marsamik La | Marsamik la | 15 |
| | 2 | Marsemik La | Bahu Nullah | -do- | 16 |
| | 3 | Hotspring | Konka La | Hotspring area | 12 |
| | 4 | Hotspring | LoC Nullah | LoC area | 6 |
| | 5 | Hotspring | Silung Yogma | Silung Yogma | 12.5 |
| | 6 | Silung Yogma | Kugrang | Kugrang area | 10.5 |
| | 7 | Hotspring | Silung Burma | Hotspring area | 7 |
| | 8 | Marsemik La | Tsogtsalu | -do- | 25 |
| DBO | 1 | Chong Tash | Bursey | Chong Tash area | 22 |
| | 2 | DBO | Depsang Plains | Depsang area | 20 |
| | 3 | DBO | Baltipullu | Baltipullu | 20 |
| | 4 | DBO | Chipchap River | Chip Chap area | 6 |
| | 5 | DBO | Behind Chipchap River | -do- | 8 |
| | 6 | DBO | Gapstian | Gapstian area | 18 |
| | 7 | DBO | Trek Junction | Trek Junction | 28 |
| | 8 | Trek Junction | Lake area | -do- | 5 |
| | 9 | Lake | Upper Trek | -do- | 5 |

**Table 2**. Wild ungulate numbers and mean encounter rates in Chang Chenmo Valley of Changthang Cold Desert Wildlife Sanctuary and Daulat Beg Oldi (DBO) of Karakoram Wildlife Sanctuary, Ladakh, India.

| Species | | Numbers and mean encounter rates (animals/km) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Chang Chenmo Valley | | | Daulat Beg Oldi | | |
| **Common name** | **Scientific name** | **N** | **Mean** | **SE** | **N** | **Mean** | **SE** |
| Tibetan antelope | *Pantholops hodgsoni* | 48 | 0.33 | 0.13 | 246 | 2.54 | 0.63 |
| Wild yak | *Bos mutus* | 2 | 0.02 | 0.01 | - | 0 | - |
| Tibetan argali | *Ovis ammon* | 42 | 0.32 | 0.22 | - | 0 | - |
| Tibetan wild ass | *Equus kiang* | 67 | 0.48 | 0.26 | - | 0 | - |
| Blue sheep | *Pseudois nayaur* | 30 | 0.28 | 0.19 | 40 | 0.29 | 0.19 |

Daulat Beg Oldi. In Chang Chenmo, we surveyed the valleys and hills around Kugrang area, Marsemik La, Bahu Nullah, Silung Yogma, Silung Barma, Tsoktsalu area and the Line of Control (LoC) Nullah (Tab. 1). These transects covered most of the Chang Chenmo area. In DBO, we surveyed the areas around Chongtash, Depsang plains, Pullu, Upper Chipchap, Gapstain, Trek Junction and the Trek Junction Lake area. A total of eight transects were walked in Chang Chenmo, and nine were walked in DBO (Tab. 1).

The survey team was divided into two groups in both areas. These groups counted the animals simultaneously along two transects. Observations were aided by binoculars and spotting scopes. The groups walked along randomly selected transects. Once an animal or a herd sighted, the time, location, number, age and sex composition were recorded. Start and end times of each walk were also recorded. The distances covered during transect monitoring were recorded using a Global Positioning System (GPS). The total number of animals seen on a transect were divided by the distance (km) walked on that transect to obtain the encounter rate for a species. We then calculated the standard error of the mean of encounter rate for each species.

## Results

A total of five large herbivore species: Tibetan antelope, Wild yak, Tibetan argali, Tibetan wild ass and blue sheep were observed during the surveys. There were only two species: Tibetan antelope and blue sheep in DBO, while Chang Chenmo had all the five species.

Tibetan antelope was the most abundant species along the transects in DBO. We counted a total of 246 individuals of this species, which translates into a mean encounter rate of 2.54 (SE = 0.63; Tab. 2). The largest herd of chiru consisted of 59 individuals at Gapstain followed by 56 in upper Chipchap area and 46 in Trek Junction area. The altitudinal range of the species was 4,443 m to 5,137 m above sea level. The mean encounter rate of blue sheep in DBO was 0.28 (SE = 0.19; Tab. 2).

Within Chang Chenmo valley, Tibetan wild ass was the most abundant species (mean encounter rate = 0.48, SE = 0.26) along the transects. The largest herd was 27 individuals. The Tibetan antelope was the second most abundant species (mean encounter rate = 0.33, SE = 0.13). We observed a total of 42 individuals (mean encounter rate = 0.32, SE = 0.22) of the Tibetan argali. Sixty nine percent of the observations on this species were made in

the LoC area, while the rest were observed around the Marsemik La and Silung Yogma. We also observed 30 individuals of blue sheep (mean encounter rate = 0.28, SE = 0.19). The wild yak was the least abundant, as we observed only two indviduals (mean encounter rate = 0.02, SE = 0.01).

***Sex ratio***

The Chang Chenmo population of the Tibetan antelope comprised all males, while in DBO females and fawns were also sighted. Therefore, the sex ratio of Tibetan antelope in Chang Chenmo was 23:0 in favour of males, whereas that in DBO was 1.67:0.86 in favour of females. The sex ratio of Tibetan argali in Changchenmo valley was 5.02:4.5 in favour of females. Blue sheep had also a female-biased ratio in Chang Chenmo (1.62:1) as well as in DBO (9.33:3). The two wild yaks observed were both males. It was not possible to establish sex composition of kiang because the observers could not distinguish between male and females.

**Discussion**

The surveys recorded a total of 246 individuals of the endangered Tibetan antelope in DBO. This is higher than 230 individuals recorded in 2005, and 46 in 2006 (Sarkar *et al*., 2008). Historically, all the wild ungulates that occur in Ladakh had wider distributions in the region except the Tibetan antelope, which always had a restricted distribution. This could be related to the antelope's migratory behaviour, and the non-availability of adequate open areas in Ladakh, as there are several east-west oriented ranges in Ladakh, which might hinder their latitudinal migration. Therefore, although the populations of other wild ungulates in Ladakh are affected by hunting and competition with the domestic livestock (Namgail *et al*., 2007), the small population of Tibetan antelope is likely to be a result of the limited suitable habitat for the species.

At the beginning of the 20$^{th}$ century, the global population of the Tibetan antelope was estimated at around one million individuals, which dwindled drastically due to large scale killing mainly for its under-wool, which is a highly valuable fiber for making the Shahtoosh shawl. One shawl is sold at a whopping $15000 in the international market. It is reported that about 4 to 5 chiru are killed for making one shahtoosh shawl. It is believed that the present population of the antelope is between 75,000 and 100,000 individuals. Given these threats, and the rapid decline of its population on the Tibetan plateau, it is imperative to protect the species in Ladakh.

We observed only two wild yaks; one in Silung Yogma and the other in Silung Barma of Chang Chenmo valley. Others have reported 79 yaks in 2005, and 22 in 2006 in the Chang Chenmo area (Sarkar *et al*., 2008). Another team comprising wildlife officials recorded 108 yaks in five herds near Sirlung Barma in the Changchenmo valley in Aug 2008 (Jigmet Takpa, unpubl. data). Furthermore, 10 wild yaks were observed by herders near the Marsemik La. We however did not see any yaks in the DBO area.

**Recommendations**

A collaborative study involving Chinese conservationists across the border would pave the way for long-term conservation of chiru and wild yak, and lead to formulation of comprehensive management plan. The presence of stray dogs near security camps at DBO and Chang Chenmo is a matter of serious concern. These dogs, feeding largely

on the left-over food at the camps, also chase many ungulate species including the Tibetan antelope. There are anecdotal reports of young antelopes getting killed by these dogs. The dogs also dig out marmots and pikas from their burrows and kill them. Therefore, given the importance of DBO and Chang Chenmo in terms of maintaining the unique biodiversity of Ladakh, the menace of dogs needs to be dealt on a priority basis.

**Acknowledgements**

We thank A.K. Srivastava, the Chief wildlife Warden, Jammu and Kashmir Government, for encouraging and supporting us to conduct this study. We also thank J.V.S. Singh, then Deputy Inspector General, Indo-Tibetan Border Police (ITBP) Leh, for facilitating our survey by helping and providing us with logistic help in Chang Chenmo valley. A. Rauf, Wildlife Range Officer Leh; T. Angchok, Wldlife Range Officer Changthang; T. Angchok- II, Wildlife Range Officer Durbok Block assisted in making necessary logistic preparations and finalization of the survey progamme. We also thank all the wildlife guards, Wildlife Department, Leh for all their assistance in the field. We thank A. Upadhyaya, Researcher wildlife Institute of India for his association and involvement in this survey.

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