

A SCHALLER CONSERVATION SURVEY

MOUNTAIN MIGRANTS



Survey of Tibetan Antelope (*Pantholops hodgsonii*) and
Wild Yak (*Bos grunniens*) in Ladakh, Jammu & Kashmir, India



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Wild Yak (*Bos grunniens*) in Ladakh, Jammu & Kashmir, India**

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PREFACE

The survey of the chiru and the wild yak in Ladakh was the second survey undertaken as Schaller Conservation Surveys by WTI. Both have been in collaboration with the Jammu and Kashmir Wildlife Department and both have been on mountain ungulates. The first one on markhor had been a landmark one in the conservation saga of that species as it set the tone, not only in establishing numerically that the markhor was alive and well in at least two pockets in the Kashmir Valley, but in the establishment of a new national park as part of the stratagem for its survival. Like the markhor survey, the chiru and wild yak survey has established with a little more scientific underpinning, the numbers of these wild animals that exist in Indian territory. The chiru, it is almost safely presumed, exists only in Ladakh in the Indian Union. The yak may have one or two other trans-himalayan incursions of its range into India, in the eastern sector. We now know that the chiru comes into India in two different regions of Ladakh; at Daulat Beg Oldi in Karokaram and in the Hot Springs Area of the Chang Thang. We also know that their combined number is unlikely to exceed 500 animals and the survey itself has established it as even below 400. Unlike the markhor survey, however, establishment of these numerical bases are not only critical for underlining the importance of these wild habitats of the state. It is also important in determining the future course of conservation of the species in a totally different manner.

The fight against the use of shahtoosh shawls has been one which has been spearheaded by the Wildlife Trust of India, since its inception and in fact by its Vice Chairman Ashok Kumar, long before its inception. It was the message and the photographic documentation of the senseless slaughter of the Tibetan Antelope provided by George Schaller to Ashok Kumar that raised the issue for the first time to Indian conservation and since then, through the aegis of three different organizations, Ashok Kumar has led the conservation brigade in its charge against the shahtoosh trade. Whether it was through litigation, or through enforcement action, or through a well orchestrated fashion campaign that declared the 'mousy shawl' unfashionable or indeed through the promotion of its alternative (the handmade pashma), WTI has spent most of its living history trying to make inroads into chiru conservation. One of these was to convince certain sections of the Jammu and Kashmir polity to the idea that the chiru could be captive bred and the wool shorn for the shawl was a pie-in-the-sky idea that would not take off. Through its representation in a high level committee of the Textile Ministry, WTI had put this idea forward and the final report of that committee had concurred with this. However, some sections of the Kashmir administration still believed that this was possible and should be explored. This Schaller Conservation Survey should put to rest such theories. An animal that has less than 500 numbers, sporadically visiting India from the Tibetan Autonomous Region of China, does not provide any sort of population that could sustain such a venture. Let alone captive breeding, even captive stocks of this species has not been possible thus far, as the animal is extremely shy and has low tolerance to living in captivity below its altitudinal range. It is now also clearly shown, after two years of work, that there are not many of them coming into India in the first place. The formation of all male groups in Chang Chenmo also points to the essentially migratory nature of these visiting herds. These are not resident Indian chiru, they are a migratory Tibetan species, a few of which enter Indian territory in its range extremity. To do, anything other than give it protection, while it undertakes this important biological march in its natural history, would be both ecologically insensitive and futile.

It is our hope, that this bit of science will be useful instead, in providing the background for the long term conservation of this flagbearer of the high reaches of the Tibetan plateau.

Vivek Menon
Executive Director

FOREWORD

Tibetan Antelope (chiru - *Pantholops hodgsonii*), a critically endangered mammal, is primarily restricted to the Xinjiang and Tibetan Autonomous Region of China and the Ladakh region in India. Although India does not have a resident chiru population, small herds are reported to migrate to Ladakh in the summers and return to the high plains of Tibetan Autonomous Region (TAR) in the winters. The habitat of chiru in our territory is D.B.O (Daulat Beg Oldie) north of Ladakh in Karakoram range and Chang Chenmo Valley in the north-east of Ladakh at altitudes between 3700-5500 meters above the sea level.

Over the years, the population of chiru has declined alarmingly. The animals are reported to be poached in Tibet for its prized underwool also called Shahtoosh. There are no reported cases of poaching or killing of chiru in the State of Jammu & Kashmir. The Government of Jammu & Kashmir is committed to conserving this endangered species and has put a complete ban on the trade of shahtoosh products in the State. The commitment of the State Government was further reinforced by re-scheduling this animal from Schedule – II to Schedule– I through the amendment in the J&K Wildlife Protection Act, 1978 in the year 2002. Also, as per orders of the Hon'ble Supreme Court of India, the people of Jammu & Kashmir including the shahtoosh traders have been given opportunities to declare the shahtoosh items in their possession and the same has been verified, and ownership documents issued to bonafide users.

Although, there has been a long-standing confusion over the true source of shahtoosh, there is now sufficient publicly available information for consumers to make an informed decision and to reject shahtoosh products. Killing of thousands of Tibetan antelope for shahtoosh is unwarranted as attractive and fashionable alternatives viz. the fine Ladakhi cashmere (also known as pashmina) are available as a substitute for shahtoosh.

It is necessary that all efforts are made to enhance the effectiveness of international conservation and law enforcement efforts to protect the Tibetan antelope and eliminate the shahtoosh trade. Proper survey and assessment of the population of chiru and concerted awareness campaigns in the targeted locations of shahtoosh sale in parts of India and even outside the country is necessary for conservation of chiru. In this regard, the Department of Wildlife Protection, J&K in collaboration with the Wildlife Trust of India undertook surveys in Ladakh region in the year 2005, 2006 and 2007 to determine the status and distribution of this animal and assessment of its critical ecological needs. The results of this joint survey are presented in this report. The team found about 400 chiru in the two areas in Ladakh-DBO and Chang Chenmo. Although dates of the inward migration could not be determined, the team found that most chiru left the Indian territory by October. Some possible birthing sites have also been found.

Some useful recommendations have been put forth in this report and it is hoped that these will help in the overall conservation initiatives of this critically endangered animal. Continued support of the local people, Ladakh Administration, Army and ITBP in protecting chiru is extremely essential. I hope that the State Wildlife Department and the Wildlife Trust of India will continue to work jointly to achieve the goals for conservation of chiru.

A.K. Srivastava
Chief Wildlife Warden
J&K Government

Jammu (J&K)
Dated: 05-12-2007

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We are thankful to the Indian Security officials at Deskit and Sassoma Camps, other transit camps between Sassoma and DBO, Trak junction, DBO, Phobrang, Tsogtsalu and Hotspring Camp for their logistic support during the period of survey. Special thanks to Mr S. K. Tripathy and other jawans at Hotspring for their cooperation, assistance and support during the entire period of survey without which it would not had been possible to successfully complete the survey in the harsh climatic condition. We would specially like to thank Mr. Munir Hussain who not only accompanied us but also actively participated in the survey of animals and vegetation.

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We are also thankful to Mr. Rinchen Wangchuk, Program Director, Snow Leopard Conservancy for sharing his experience from their last visit to Chang Chenmo Valley and for also briefing us on various aspects of the biodiversity of Ladakh.

We would like to extend our sincere thanks to our former colleague Mr V. Govindankutty, Programme Officer for preparation of the maps.

EXECUTIVE SUMMARY

The Tibetan antelope (*Pantholops hodgsonii*), locally called chiru, is mainly confined to the Tibetan plateau in China. A small population migrates into Chang Thang in eastern Ladakh in the state of Jammu and Kashmir in India. The chiru has a geographical range extending approximately 1,600 km across the Tibetan Plateau, with an eastern limit near Ngoring Hu (Tibet Autonomous Region) and a western limit in Ladakh (India). Large-scale hunting for wool and meat has resulted in a decline of its population and only an estimated 75,000 individuals of this species survive in the world today. Its status in India has not been studied in any detail, although sporadic spot surveys have been done in the past.

Similarly, very little information is available on status of wild yak (*Bos grunniens*), the progenitor (*closest ancestor*) of the domestic yak in India. The animal is distributed mainly in the highlands of the Tibetan plateau including the Qinghai province, Tibetan and Xinjiang autonomous regions and the Quilian mountains in the Gansu province. Small nomadic isolated populations are reported from Ladakh in Jammu and Kashmir (J&K), and even smaller numbers occasionally from Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh in India.

To obtain further information primarily about these two species, the Department of Wildlife Protection, Jammu & Kashmir (DWP) along with the Wildlife Trust of India (WTI) and the Indian Army initiated surveys in Ladakh in the years 2005 and 2006.

Surveys were conducted in the Chang Thang and Karakoram Wildlife Sanctuaries of Ladakh in Jammu & Kashmir. The Chang Chenmo (*Chang Thang*) area lies in the eastern part of Ladakh just north of the famous Pangong Lake, while the Karakoram WLS lies in the north-eastern part of Ladakh, south of the Karakoram Pass.

The team found 250 – 300 chiru in the Karakoram area in addition to other mammal species. Both male and female chiru were sighted here between altitudes of 4735 m and 5336 m. A total of 230 individuals were sighted (after deleting double counts) in the year 2005 and 45 individuals in 2006. Based on this, it is estimated that between 250-300 individuals occur in this area. Mean group size of chiru was 4.66 ± 0.435 and varied between one to 34 individuals during 2005, and 4.5 ± 2.77 (SE) during 2006. Apart from chiru, other species encountered from the area includes Tibetan wolf (*Canis*

lupus chanco), red fox (*Vulpes vulpes*), pale or mountain weasel (*Mustela altaica*), snow leopard (*Uncia uncia*), Ladakh urial (*Ovis vignei*), blue sheep (*Pseudois nayaur*), woolly hare (*Lepus oiostolus*), Ladakh pika (*Ochotona ladacensis*), Royle's pika (*Ochotona roylei*), Nubra pika (*Ochotona nubrica*), plateau pika (*Ochotona curzoniae*), Stoliczka's mountain vole (*Alticola stoliczkanus*) and silvery mountain vole (*Alticola argentatus*).

In the Chang Chenmo area, a total of 55-60 individuals of only adult male chiru were sighted in 2005. Mean group size was 6.18 ± 0.82 and ranged between one to 12 individuals. During 2006, only 18 individuals in 5 groups were sighted. Mean group size was 3.58 ± 1.6 (SE) and ranged between one to 8 individuals. Other animals sighted include wild yak, Tibetan wolf, blue sheep, woolly hare, long tailed marmot (*Marmota caudata*), wild ass (*Equus kiang*) and Tibetan Argali or Nayan (*Ovis ammon*).

Apart from chiru, wild yak was also sighted in the Chang Chenmo area between 4700 – 5300 m. A total of 79 individuals were sighted in 2005 and 22 individuals in 2006. Mean herd size was 19.75 (2 to 57 individuals) during 2005 and 3.14 (1 to 7 individuals) in 2006.

The male chiru seemed to occupy lower altitudes (mean $4936 \text{ m} \pm 41.55$) than the females ($5255 \text{ m} \pm 17.33$) in DBO. In the Chang Chenmo area, male chiru were found at a mean altitude of $4797 \text{ m} \pm 27.3$.

Chiru seemed to prefer lowlands rather than slopes and ridge tops in Chang chenmo. In DBO possibly because there were mainly females in the population, the animals seemed to be dispersed along the altitudinal gradient.

Major threats to chiru and its habitat were from solid waste accumulated from the defense personnel stationed in the area, feral dogs present in the area and livestock grazing by nomads from the village of Phobrang in the Chang Chenmo valley.

In order to provide long-term conservation of the species, it is recommended that the defense personnel stationed in these areas are made aware of the wildlife of the area and possibility of its illegal trade so that they can play a role in monitoring and prevention of wildlife crimes. It is also recommended to control the feral dog population threatening chiru. Grazing ground of the domestic and wild yak to be identified and segregated to prevent possible competition and hybridization.



Introduction

Chiru is regarded as a keystone species for the Chang Thang ecosystem. It is one of the world's hardest mountain ungulates that can survive in temperatures as low as -40°C because of the presence of a layer of dense, fine wool next to the skin. This wool is also its bane, as chiru are killed for this wool, known as "Shahtoosh"

1. Background

The Tibetan antelope (*Pantholops hodgsonii*), locally known as "Chiru", is threatened with extinction (IUCN, 2004). Although chiru is mainly confined to the Tibetan plateau in China, a small population reportedly also migrates into the extension of the Tibetan plateau into eastern Ladakh (Fox *et al.*, 1991) (Fig 1). The geographical range of chiru extends approximately 1,600 km across the Tibetan Plateau, with its eastern and western limits set by Ngoring Hu (China) and Ladakh (India), respectively. The Tibetan Plateau is about 950,000 square miles in size and includes most of the Chinese province of Qinghai, some part of the northwestern Sichuan Province, the southwestern part of Gansu province, the southern border areas of the Xinjiang Uygur Autonomous Region, and all of Xizang (Tibet Autonomous Region) (Schaller, 1993). In the Xinjiang Tula valley, chiru frequent elevations as low as 3,250 m, but most of their range lies above 4,000 m, and on the Depsang Plains in northern Ladakh, they can be found as high as 5,500 m (Roosevelt and Roosevelt, 1926).

Chiru was originally placed in the sub-family Antilopinae, based on morphological descriptions and similarities such as the presence of inguinal glands and horns restricted to the males of some gazelles (Sterndale, 1884 cited in Schaller, 1998). However, on the basis of skull characteristics (Pilgrim, 1939) and recent morphological and molecular work, researchers feel that the chiru is more closely allied to the goats and other members of the subfamily Caprinae (Gentry, 1992; Gatesy *et al.*, 1997). The males have elegant, lyrate horns nearly two feet long, striking black markings on face and legs that contrast with the grey to white pelage and are bigger than the females. The females are tawny in colour and hornless. Some chiru populations are fairly sedentary, whereas others, the larger ones, are migratory (Schaller, 1994).

Chiru is regarded as a keystone species for the Chang Tang ecosystem (Schaller, 1997). It is one of the world's hardest mountain ungulates that can survive in temperatures as low as -40°C. It can sustain such extreme cold temperature because of the presence of a layer of dense, fine wool next to the skin. This wool is also its bane, as chiru are killed for this wool, known as "Shahtoosh", from which fine woolen yarn is produced which commands a high price in the market (IFAW/WTI 2001; Gopinath *et al.*, 2003).

Shahtoosh is different from other wool in that it cannot be harvested and the only way to obtain its wool is by killing and skinning the chiru. One individual yields about 125-150 gm of shahtoosh. About 4-5 individuals of chiru are killed for wool enough to make just one shawl.



Fig. 1 : Global distribution range of Tibetan antelope (redrawn from Schaller, 1998)

More than a million chiru were found in the Tibetan Plateau at the beginning of the last century, but large-scale hunting for wool has resulted in a decline of about 90% of its total population. As a result, less than 75,000 individuals of chiru survive in the world today (Schaller, 2000). According to the China Forestry Association, about 20,000 chiru are killed every year for wool on the Qinghai-Tibetan Plateau alone.

Chiru is listed in Appendix-I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), making all international trade in Chiru products illegal. The species is also listed as “Vulnerable” (A 1c) by the World Conservation Union (IUCN). This species is also listed in Schedule-I of the Wildlife (Protection) Act of India and also in Schedule-I of the Jammu and Kashmir's Wildlife (Protection) Act, Amendment 2002 (which is the only state in India to have its own wildlife law). In China, the chiru is listed as a Class-I protected species under the Law of the People's Republic of China on the Protection of Wildlife (1989). In Nepal, it is listed as an endangered species under Schedule-I of Nepal's National Parks and Wildlife Conservation Act (1973).

Wild yak (*Bos grunniens*), is geographically restricted and endemic to high altitudes (over 5000 m) of the Tibetan plateau. Historically, the distribution of wild yak during the glacial period extended to north-east Siberia and reached south to the headwaters of the Hwang Ho and Yalang rivers in the Province of Tsinghat. Due to large-scale hunting for meat and wool, their distribution has narrowed down to the highlands of the Tibetan plateau, Qinghai province, Tibetan and Xinjiang Autonomous Regions and the Quilin Mountains in the Gansu province; extending from the Karakoram in the west, eastward along the south slope of the Altai Tang over the Kunlun Mountains to the Nanshan Mountains (Dyblor, 1957; Belyyar, 1980; Flerow, 1980; Olsen, 1991; Lu Zhonglin and Li Kongliang, 1994) (Fig 2). Some populations of wild yak have also been reported in the high ranges of the Chang Chenmo area of Ladakh and in some parts of Kumaon and Himachal Pradesh (Gupta and Kumar, 1994; Bedi, 1984; Alfred *et al.*, 2006). Recently, presence of wild yak has been reported from Nepal (Schaller, 1998). However it is considered possibly extinct regionally in Nepal (IUCN, 2007).

On the other hand, domestic yaks are found in Qinghai-Tibet plateau, Northeast Nepal, Bhutan, Northeast Afghanistan, Tajikistan, Kirgizia, Eastern Kazakhstan, Gorno Altai, Khakass, Tuva, Buryatia in Baikal lake area, Pamir mountains and some parts of Gobi desert of Mongolia and the western regions of Inner Mongolia, and Sikiang province P.R. China (Epstein, 1974). In India, domestic yak is found in the northern and western Himalayan states of Jammu & Kashmir and Himachal Pradesh, and eastern Himalayan states of Sikkim and Arunachal Pradesh. Some herds of domestic yak are also found in Garhwal hills adjoining Tibet in Uttarakhand.

There is a traditional method of cross breeding of domestic with the wild yak for improvement in local yak population. Some herdsmen willingly carry their herds close to the hills where wild yaks are found, and get their females bred with the male wild yak. Wild bulls are considered to be superior in body weight, growth rate, hair and wool yield and adaptability under harsher climate. This practice seems quite popular amongst the yak breeders of Qinghai province of Tibet (Lu Zhonglin

and Li Kongliang, 1994; Cai Li and Wiener, 1995). Similar practices are also reported from Nepal (Sherchand and Karki, 1996). This practice probably has led to the experimental crossing of captured wild yak bulls with domesticated yak cows using both natural mating as well as artificial insemination in China (Lu Hongji, 1987).

Wild yak have been one of the prime objects of hunt for the highland nomads for meat. Wild yak, like all other high-altitude mammals, have two types of hair that cover its body. The outer coat is of long and coarse but lustrous hair (guard hairs), while the undercoat is of wool fibre. The guard hair is used for making ropes, tents, felts etc. and the undercoat fibres for making rough garments, shoes etc. This has initiated its widespread killing in the last few decades that has resulted in a sharp decline of its number. Therefore, the wild yak is listed as Vulnerable (IUCN, 2003) and under Appendix-I of CITES. Wild yak is also listed as a Schedule-I species in the Wildlife Protection Act of India, 1972 and Jammu & Kashmir (Protection) Act 1978 (amended 2002).



Fig. 2: Global distribution range of wild yak (Source: redrawn from Helin *et al.*, 1999)

2. Aims and objectives of the survey

It is clear that the population of chiru and wild yak, which were once abundant and widespread across the Tibetan Plateau, are now greatly depleted in numbers. Unfortunately, very little scientific information is available on their population status, movement and migrations, distribution, ecology and threats particularly from India. Formulation of a comprehensive strategy for conservation of these two highly threatened species would be more meaningful only if these are based on some baseline information. The Wildlife Trust of India (WTI) in collaboration with the Department of Wildlife Protection, Jammu & Kashmir, International Fund for Animal Welfare (IFAW), the Indian Army and the Indo Tibetan Border Police (ITBP) initiated surveys of chiru and wild yak during the years, 2005 and 2006. The main objectives of the survey were:

- To assess the distribution of chiru and wild yak in Ladakh.
- To assess the population status of the two species.
- To collect information on their habitat use and seasonal migration.

- To assess threats to chiru and wild yak populations and their habitats.
- To help the state government to develop a comprehensive strategy for the conservation of chiru and wild yak in Ladakh.

3. Survey period

Two surveys were conducted, one during August-September 2005 and the other, during September-October 2006. A third survey in June 2007 was planned but could not be undertaken. The purpose of the three surveys was to cover the whole presumed period of stay of chiru in India – arrival in June their stay through to October and then their return migration.

4. Collaborators

The study was a joint operation of the Department of Wildlife Protection, J&K, Wildlife Trust of India, the Indian Army and ITBP. Members from other organizations like the Sher-i-Kashmir University for Agricultural Science and Technology (SKUAST) and the Ladakh office of WWF-India also participated for a short period.



Group of female Chiru in Karakoram area

Study Area and Constraints

Surveys were conducted in the Chang Thang and Karakoram Wildlife Sanctuaries of Ladakh, Jammu & Kashmir. The areas were selected on the basis of literature reviews and interaction with people familiar with the area.

1. Landscape

Surveys were conducted in the Chang Thang and Karakoram Wildlife Sanctuaries of Ladakh, J&K (Fig 3). The areas were selected on the basis of literature reviews and interaction with people familiar with the area. The Chang Chenmo area lies in the eastern part of Ladakh, north of the Pangong Lake, while the Karakoram WLS, which encompasses about 5000 km², lies in the north-eastern part of Ladakh, just south of the Karakoram Pass.

In the Chang Thang Wildlife Sanctuary at Hotspring, the team surveyed the valleys and hills around the Chang Chenmo River and Kugrung River and the Silung Burma and Silung Yogma nullahs. The valley lies at an average altitude of 4725 m and is bounded by river Chang Chenmo and the hills in the north, Silung Burma in the east, Silung Yogma in the west and in the south by hill range (altitude 5727 m at its peak) between Silung Burma and Silung Yogma nullah in the south. Chang Chenmo and Kugrung Rivers meet near K-Hills and finally merge with the Shyok river further downstream.

In the Karakoram Wildlife Sanctuary, the team surveyed three sites – Daulat Beig Oldi (DBO), Gaptain and Depsang Plains (The DBO is an area named after a trader who frequented this area with his caravans and died here during his travels. This was a frequently used trade route in the past with Central Asia).



View of Chang Chenmo Valley

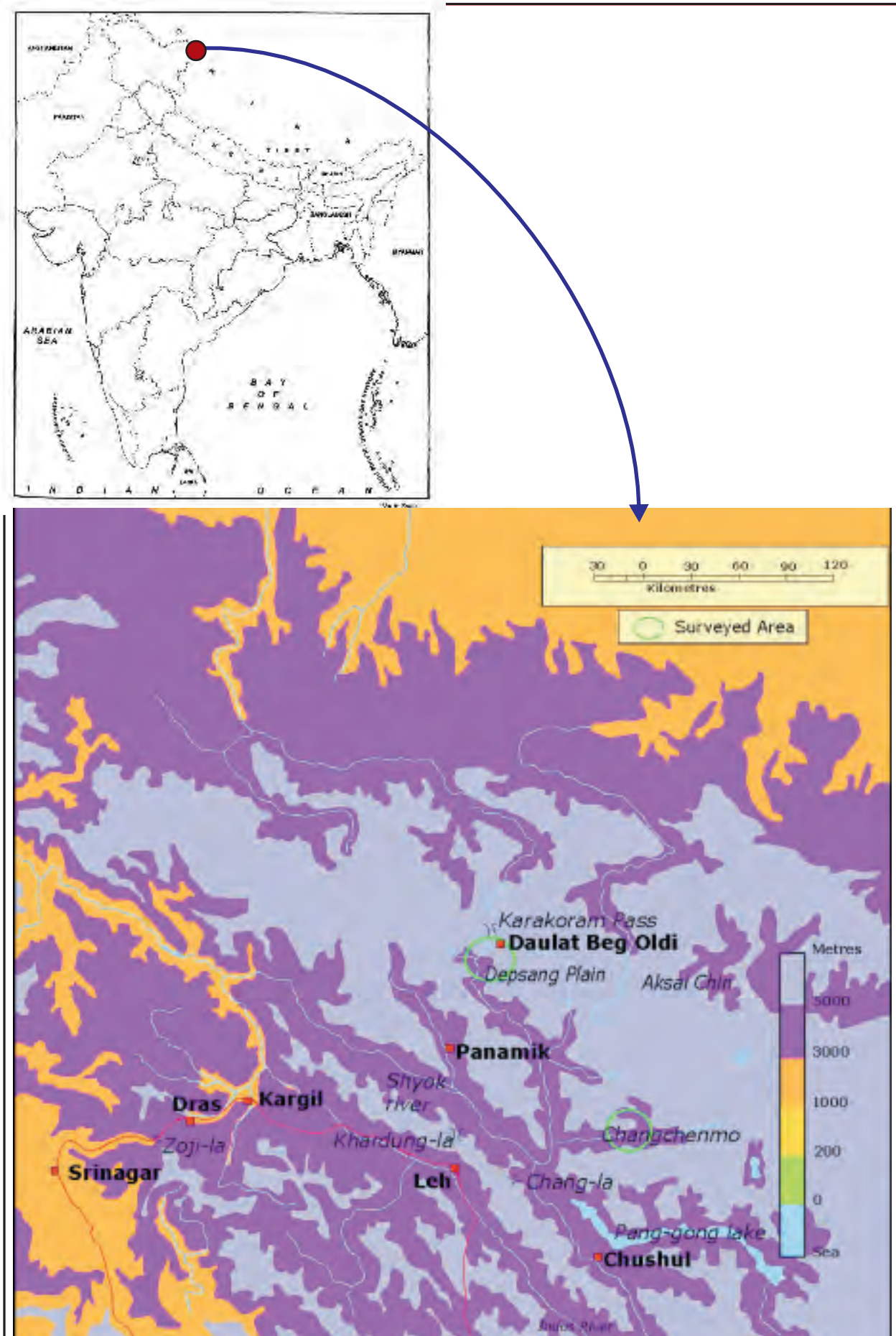


Fig 3: Location of the survey sites in Ladakh, Jammu & Kashmir

The DBO area has a mean altitude of approximately 5,500 m and lies just south of the Karakoram range. The Karakoram nullah drains the catchment southwards and meets the DBO nullah and the Chip Chap River flowing westwards to fall into the Shyok River, which originates from the Remo glacier. Above and to the south of the Chip Chap River is the Gaptain area which is also contiguous with DBO and is generally lower in altitude (5,200 m). The Depsang plains lie east and south of Gaptain and gently rise before falling eastwards towards and across the Line of Actual Control (LAC) into the Aksai Chin area.

The present survey areas (Karakoram and Chang Thang WLS) have limited human habitation and are restricted areas due to security considerations. Both areas are generally accessible by foot from July and August to October, after which heavy snow on the passes makes them inaccessible.

The climate of both the survey areas is cold-arid. During the summer, temperatures may exceed 20° C and in winter may dip to - 40° C. The wind blows with high velocity that may reach up to 50 to 60 km per hour in some parts. This often results in fierce dust storms.

The present survey areas (Karakoram and Chang Thang WLS) have limited human habitation and are restricted areas due to security considerations. Both areas are generally accessible by foot from July and August to October, after which heavy snow on the passes makes them inaccessible.

2. Constraints and limitations

The main limitation of this survey was its relatively short duration, although this effort still constitutes the longest survey of the chiru and wild yak in Ladakh region till date. The reason was mainly because the team was dependent on the opening and closure of passes for access as movement into the study area was by foot (to DBO) and vehicle (to Chang Chenmo).



A View of Depsang Valley (Karakoram)

Methodology

The survey was conducted over two years – the purpose being to document the movement of chiru from Tibetan Autonomous Region across the Line of Actual Control into India

1. Survey

The survey was conducted over two years – the purpose being to document the movement of chiru from Tibetan Autonomous Region (TAR) across the Line of Actual Control (LAC) into India, the timing of such movements and the approximate numbers present. In undertaking these surveys, it was assumed that the number of chiru would be highest in August when summer was at its peak and female chiru are with the young ones. We also assumed their numbers would be low in September, more towards the latter part after they start leaving for their winter grounds across the LAC.

Age-sex classification of Chiru

(i) Adult males:

- Having a pair of distinct antelope like lyre-shaped horn 50-60 cm long and which rise almost vertically from the head.
- Shoulder height about 80-85 cm.
- Weigh about 35-40 kg.
- A distinct black marking on the face and leg during winters.

(ii) Yearling:

- Horns are smaller (23-29 cm long at 16 months and >40 cm at 24 months).
- Body size almost half compared to adult.

(iii) Adult female:

- Lack of horns
- Shorter than the male (shoulder height of about 75 cm).
- Lighter than adult males (25-30 kg).
- Coat is fawn-colored, almost pinkish, often with rust brown on the nape, blending to a whitish underside.
- A pale white area encircles the tip of the muzzle and the eyes.
- The top of the muzzle and front of the legs are grayish.

(iv) Calves:

- Morphological characteristics are almost same as the females, but very small in size.
- Calf is closely associated with their mother.

Two teams were formed for the two survey locations (Chang Thang and Karakoram Wildlife Sanctuaries) and these worked independently of each other but used similar data collection methods and formats. The main objective was to encounter chiru to ascertain presence and to count their numbers. Since the relatively flat topography afforded sightings at long distances, trails, ridge tops and other vantage points were used to scan the area and spot chiru and also wild yak. Binoculars and spotting scopes were used to aid scanning and identification. Once chiru and wild yak were sighted, the time of sighting, location and its coordinates, number of individuals in the group, their sex and age composition, position on slope, elevation, aspect and habitat attributes were recorded. Starting and ending time of each monitoring trip was also noted to estimate the observer effort. In addition to direct sightings, indirect evidence (e.g. pellet groups, hoof marks, horn, shed wool etc.) was also recorded to document

occurrence of chiru and other wild animals in the area. In addition, a bird list was prepared for the two study areas.

The team also interviewed the defense personnel present in the study areas to obtain information about the chiru, especially for periods outside the survey duration.

2. Vegetation sampling

Vegetation was sampled to estimate the diversity of flora present in the area. This was done by laying plots located randomly across the survey area in the year 2005. A total of 64 quadrats of 10 x 10 m in dry land habitat, 10 quadrats of 2 x 2 m in riverine habitat and 10 quadrats of 1 x 1 m in marshy habitat, were laid to record the vegetation profiles of the Chang Chenmo area. In DBO, a total of 50 quadrats of 3 x 3 m were plotted.

Age-sex classification of Wild Yak

Source: Cai Li (1994)

Main physical characters which differentiate a wild Yak from a domestic Yak

- Massive in size compare to domestic yak.
- A silver-grey line extends down the back of the body behind withers in the wild yak.
- Hair is jet black or brown in colour.

(I) Adult males:

- Weight about 600-1,200 kg, i.e. 2-3 times heavier than domestic yak.
- Horn length: 34.45cm \pm 1.81 (4-5 yrs), 36.62cm \pm 0.74 (7-9 yrs), 38.45cm \pm 0.77 (10-12 yrs), 39.0cm \pm 1.50 (>13 yrs). (33 cm - 41 cm depending on age).
- Horn circumference : 76.00cm \pm 3.16, 80.64cm \pm 3.40 (7-9 yrs), 85.87cm \pm 1.86 (10-12 yrs), 86.20cm \pm 4.60 (>13 yrs). 76-86 cm depending on age.

(ii) Adult females:

- Weight about 350-450 kg.
- Horn length: 19.74 \pm 1.36 (10-12 yrs).
- Horn circumference: 50.70cm \pm 2.40 (10-12 yrs).

(iii) Yearling:

- About half the body size of the adult.

(iv) Calves:

- One third the body size compared to adult.
- At 3 months of age, the average body weight is 62.5 kg in comparison to 33.6kg of domestic Yak.

A herbarium of the plant samples collected during the survey was prepared. The frequency, density, diversity and dominance of different species of plants across the habitat and between the study areas were estimated.

3. Habitat use

For ease of recording and subsequent analysis, the habitat was categorized into three main types:

- (i) **Ridge tops and plateau lands:** Habitats which were generally at higher elevations and were drier.
- (ii) **Slopes:** These are generally gradual and undulating slopes or plain areas between the ridge tops and valley bottoms.
- (iii) **Valley bottom:** At the base of a valley, this type of habitat very often had a stream or a water body associated with it.



Vegetation sampling in Chang Chenmo Valley



Hoof mark of Chiru



Chiru Pellets

Distribution and Population Status of Chiru

1. Distribution

(a) Spatial distribution

Within the Karakoram WLS, the team surveyed three main areas - Depsang plains, DBO and Gaptian. The area surveyed was between the Thukso Doon Doon nullah near Depsang La in the southern part of the Depsang plains and to the North Pollu in DBO towards north, along LAC in the east and Gaptian in the west. The Karakoram Pass was also surveyed. In Gaptian, all the chiru were sighted on the left bank of Chipchap and Chipchap-Shyok rivers (after the two join in Gaptian). This area is contiguous with Depsang (Fig 4).

The southern most sighting of chiru occurred in Thukson Doon Doon nullah and its surroundings while the northern most area of sighting was the Karakoram Pass. Gaptian marked the western boundary of sighting. The area along LAC in Depsang area offered maximum sighting of chiru groups and also the highest number of chiru.

In 2005, the team sighted 149 individuals in 22 groups, all females and kids (103 females and 46 kids) in the Depsang area. In the DBO area, both, the number of sightings and number of chiru were comparatively low. The team sighted 18 groups of chiru totaling 42 individuals which included 22 females,

The southern most sighting of chiru occurred in Thukson Doon Doon nullah and its surroundings while the northern most area of sighting was the Karakoram Pass.



Female chiru at the track junction of Karakoram

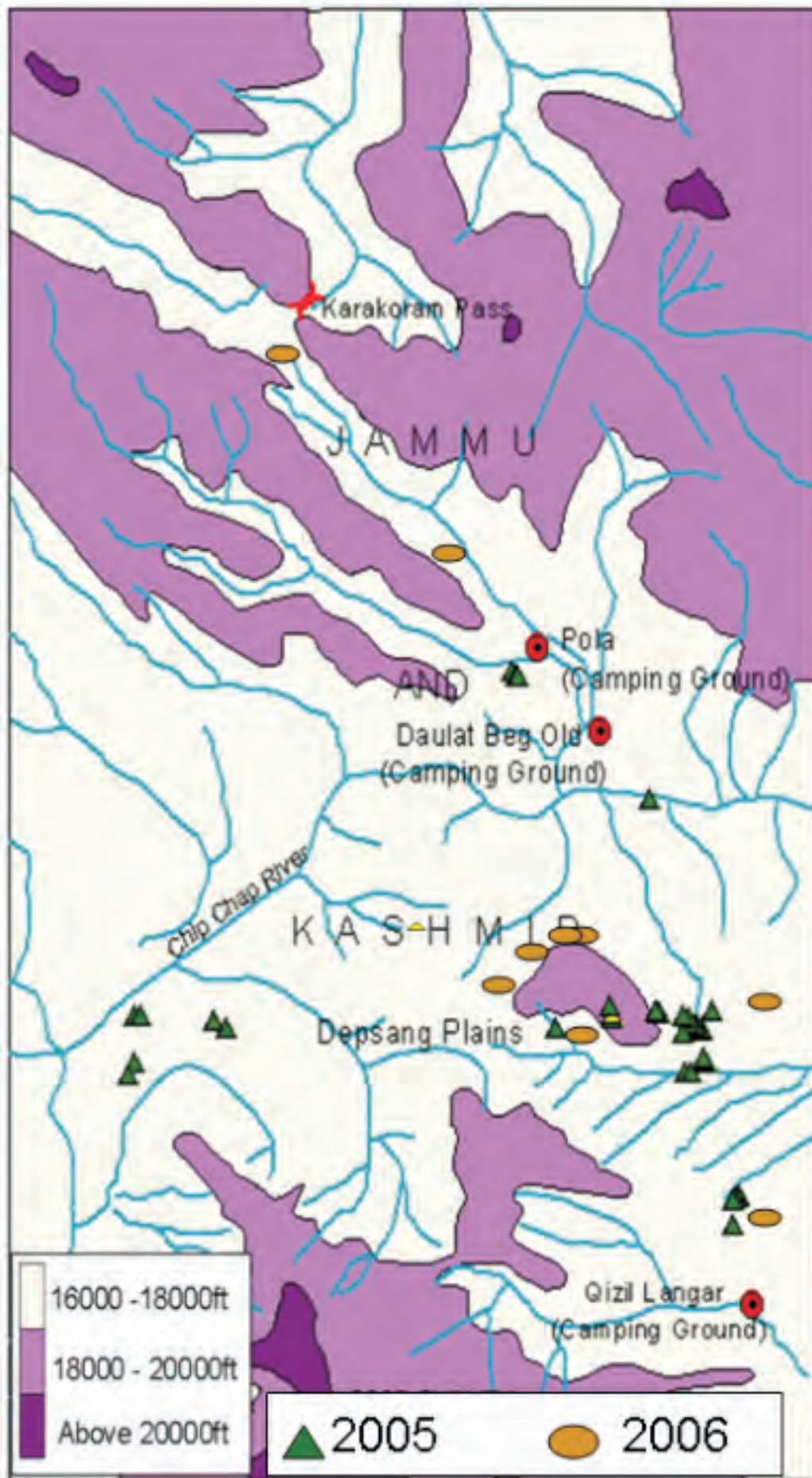


Fig 4: Map of Karakoram area showing sightings of chiru

10 kids and 10 males. In Gaptian, 8 groups were sighted totaling 39 individuals, which included 30 males and 6 females. In total, the team sighted 230 chiru in 48 groups (after deleting possible duplication) in the year 2005.

In 2006, the team conducted extensive survey of areas in and around Gaptian nullah and the Karakoram Pass. A total of 45 individuals (after eliminating double counts) of chiru which included 18 males, 19 females and 8 kids were sighted in and around DBO. These low numbers were expected during the second survey which was conducted in the second half of September by which the animals would have moved back into Tibet. On the basis of numbers observed in 2005, it is estimated that over all, about 250-300 chiru may occur in the Karakoram Wildlife Sanctuary.

It is also noteworthy to mention that in the Depsang plains, only females with kids were seen, while towards DBO, mixed groups constituted of males, females and kids were seen. The Gaptian area, to the west, had predominantly males.

In the Chang Chenmo valley, the team collected information on chiru and wild yak from nomads at Phobrang and Tsogsalu. Since no evidences of chiru were found in Phobrang and Tsogsalu, more emphasis was laid on surveying the Hot spring area across the Marsmik La. A total of 55-60 individuals of chiru in 11 groups were seen here during 2005 (after deleting double counts) and 18 individuals in 5 groups during 2006 in the Chang Chenmo valley. During both the years, only males were seen in Chang Chenmo. The chiru were spread in the valley, gentle slopes and hills around the Chang Chenmo River, Kugrung River, Silung Burma and Silung Yogma nullah (Fig 5).

It is estimated that between 55 and 60 chiru are present in the Chang Chenmo area.

Thus for the two areas surveyed it is estimated that between 300 - 400 chiru are present and accounting any undetected individuals of these two sites, it can be safely assumed that there may not be more than 500 chiru in Ladakh.



Male chiru in Chang Chenmo valley

The outwards migration also perhaps coincided with the season's first snowfall in early October. Similar observation was seen in the Chang Chenmo area where the chiru were seen concentrated in the hills near the Kugrung nullahs towards the Tibet Autonomous Region of China, probably indicating their outward movement route eastwards from the Chang Chenmo.

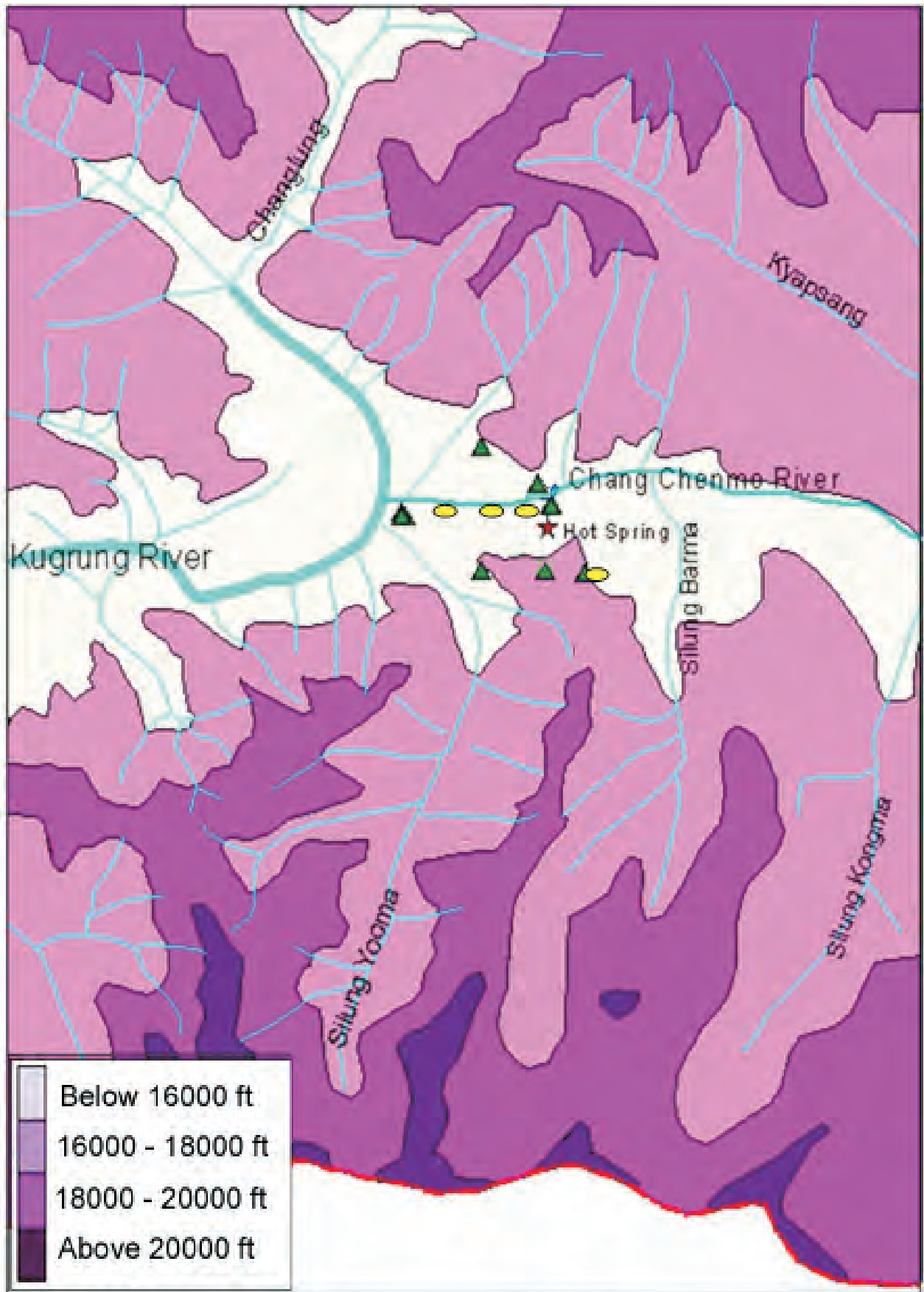
The teams saw less chiru in the year 2006. The last of the chiru in DBO were recorded from near the Karakoram Pass, leading to an inference that they may actually be taking this route on their way out. The outwards migration also perhaps coincided with the season's first snowfall in early October. Similar observations were made in the Chang Chenmo area where the chiru were seen concentrated in the hills near the Kugrung nullah towards the Tibet Autonomous Region of China, probably indicating their outward movement route eastwards from the Chang Chenmo, at around the same time (first week of October).

(b) Altitudinal variation in distribution

A number of earlier studies have reported chiru to be found from 3,000 m to 5,500 m in different parts of China, depending on the season. In Xinjian's Tula Valley, chiru was reported as low as 3,250 m (Roosevelt and Roosevelt, 1926). In Qinghai, chiru concentrate in the rolling upland areas above 4,600 m during winter (Schaller *et al.*, 1991).

During the survey in 2005, chiru were always seen above 4,735 m and the highest they were sighted was at 5,336 m in the Karakoram WLS. There were significant differences between the mean altitudes occupied by various social groups ($F=10.75$, $P<0.001$). Females with kids and females with sub-adults and kids occupied the highest mean altitudes ($5,255 \text{ m} \pm 17.33$), whereas adult male groups occupied the lowest mean altitudes ($4,936 \text{ m} \pm 41.55$). There was no significant association between social groups and slope of the terrain ($X^2=16.10$, NS) and its aspect ($X^2=10.58$, NS).

In the Chang Chenmo valley, chiru were found between 4,709 m - 4,964 m (mean $4,797 \text{ m} \pm 27.9$) during 2005. Although the Chang Chenmo landscape offered higher altitudes, the animals (males only) preferred the valley bottoms to the hillsides.



▲ 2005 ● 2006

Fig.5: Map of Chang Chenmo Valley showing sightings of chiru

In 2006, this analysis could not be undertaken due to less sightings of chiru in both the areas. However, the highest altitude at which chiru were sighted was 5,592 m in DBO and 5,226 m in Chang Chenmo, which was comparatively higher than in the previous years' survey (2005).

The choice of low altitudes by males and higher altitudes by females and their young is interesting. Due to the short duration of our survey, it was not possible to draw inferences on the habitat use patterns based on empirical data. Some speculations can however be made. Distribution of animals, to a large extent, is governed by availability of food resources. In the high altitudes, food resources would become progressively available with increasing altitude as summer advances. It is thus possible that more food resources were available at higher altitudes at that point of time and thus the females with kids occupied these areas.

2. Group Composition

The group composition (age-sex composition) varies throughout the year depending upon season and climatic conditions. Migration to calving grounds may lead to a change in age-sex composition of the group (Schaller, 1998). The climate (especially snowfall), has also been identified as the regulatory factor of variation in age-sex composition within a group. This is because mortality among calves may vary with the age and sex composition of the group (Schaller, 1993). Earlier studies conducted by Schaller (1998) reported a ratio of 29% males, 53% females and 18% young in Central and East Chang Tang (area) population of chiru.

In the Karakoram area, the team recorded a total of 662 chiru (individuals repeated) in 142 groups with a mean

group size of 4.66 ± 0.435 (SE) during 2005. About 230-275 individuals were estimated after eliminating double or multiple counts (as a single group was possibly seen more than once). During 2006, the team sighted 52 individuals in 12 groups with a mean group size of 4.3 ± 2.77 (SE). Most chiru were observed in groups of 1-4, the most common being in groups of two (Fig 6). The largest herd seen was of 34 individuals, but only once.

The age-sex composition of various groups sighted during 2005 and 2006 is given in Fig. 7. The sighting of adult females was less during 2006. This may be because the outward migration to wintering grounds had already been initiated with bulk of females and kids moving out earlier than males.

Chiru were observed in several social groups in the Karakoram Wildlife Sanctuary. However, most commonly sighted were adult females and kids (32%), followed by adult females, kids and sub-adult females (21.7%). The frequency distribution of chiru in various social groupings is shown in Fig 8.

In Chang Chenmo area, a total of 120 individuals were seen in 19 groups during 2005. Mean group size was 6.18 ± 0.82 . Frequency distribution of the group sizes of chiru found in Chang Chenmo is provided in the Fig 9. The largest herd sighted was of 12 individuals. After eliminating double counts, it is estimated that between 55-60 individuals were present in the area during the time of the survey. During 2006, the team sighted only 18 individuals in 5 groups (after eliminating double counts) with a mean group size of 3.58 ± 1.6 (SE). Most chiru were observed in groups of 1 to 8. Interestingly, the team sighted only adult males in both the years in Chang Chenmo.

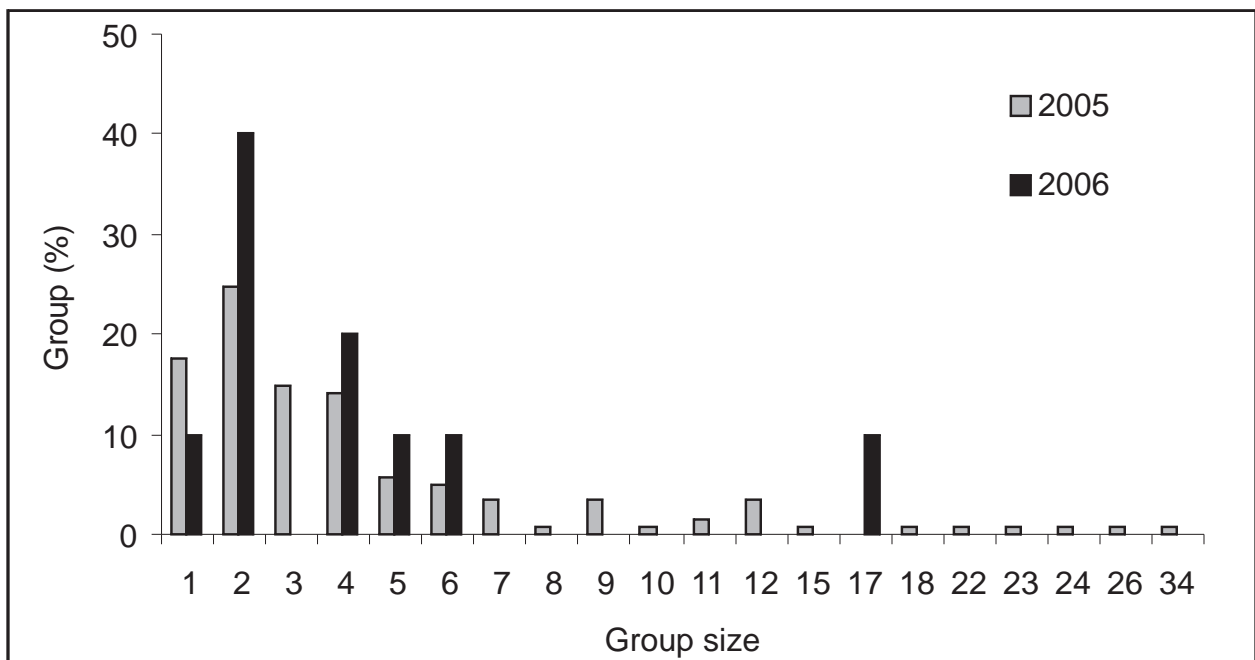


Fig 6 : Group size of chiru sighted in Karakoram during 2005 and 2006.

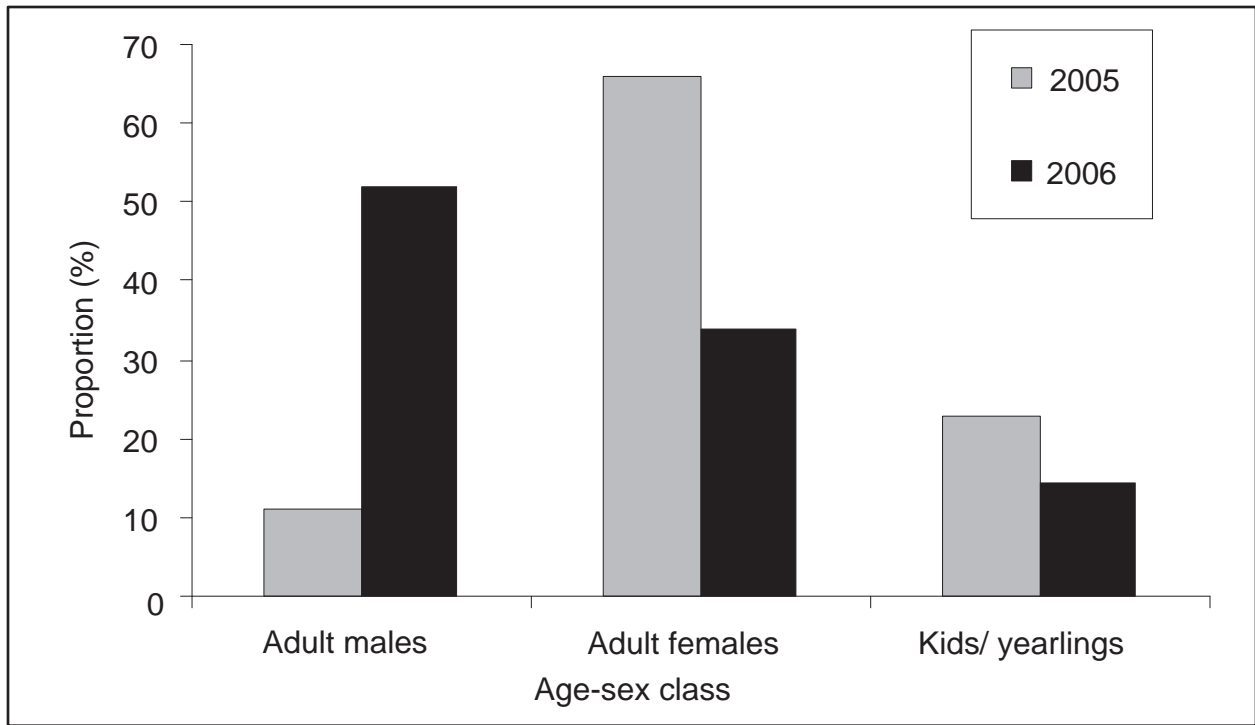


Fig 7: Age-sex composition of chiru in Karakoram during 2005 and 2006

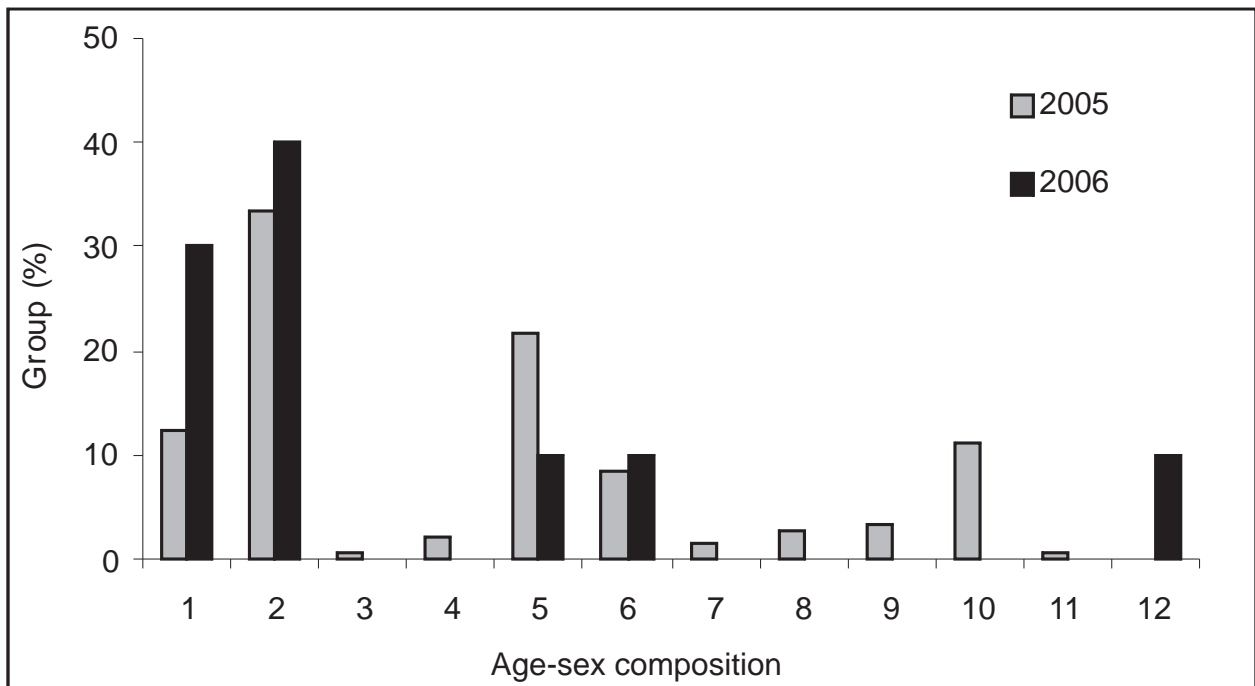


Fig 8 : Different social groups in chiru in Karakoram during 2005 and 2006

- 1 : Adult females
- 2 : Adult female and Kids
- 3 : Adult females, adult males, sub-adult females and kids
- 4 : Adult females and sub-adult females
- 5 : Adult females, sub-adult females and kids
- 6 : Adult males
- 7 : Adult males and kids
- 8 : Adult males and sub-adult males
- 9 : Kids
- 10 : Sub-adult females
- 11 : Sub-adult females and kids
- 12 : Adult females, adult male and kids

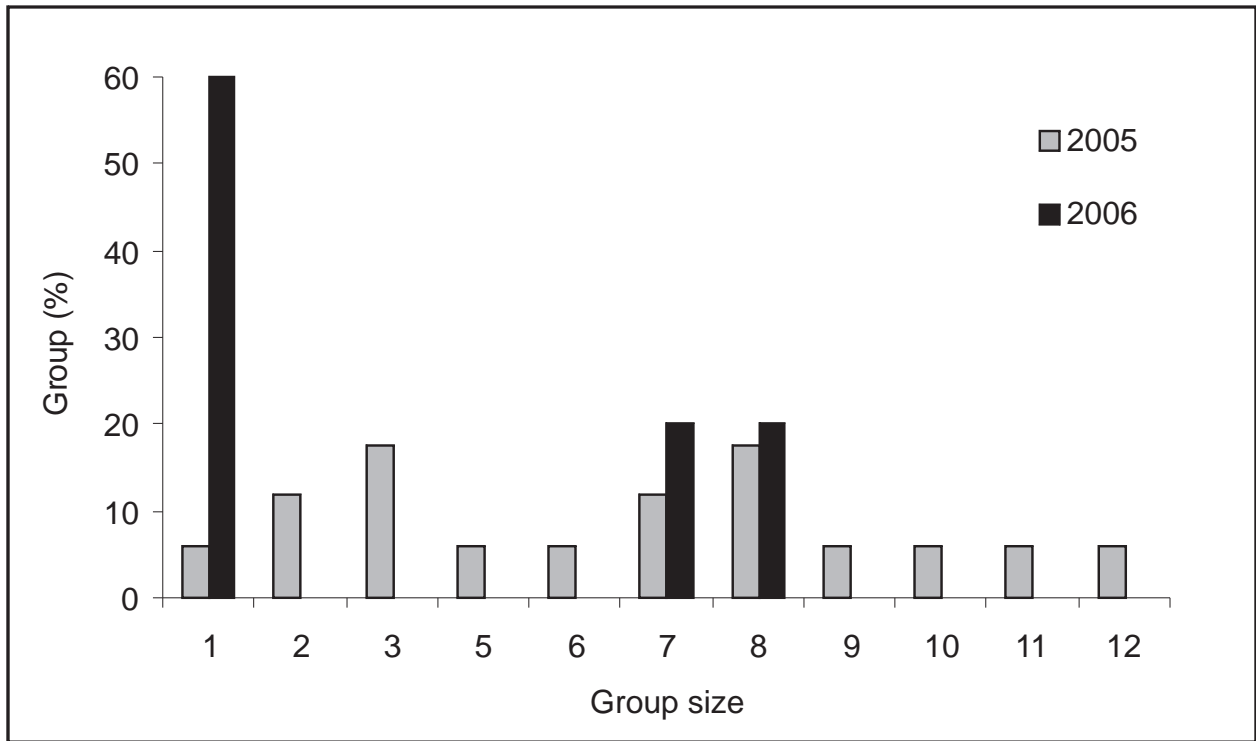


Fig 9 : Group size of chiru sighted in Chang Chenmo during 2005 and 2006

The mean group size in Karakoram was 4.66 ± 0.435 of which a majority were found to be either adult females or adult females with kids. These figures agree with those published for August/September earlier (Schaller and Gen, 1994). The comparisons for male groups (in Chang Chenmo) too agree with earlier observations of the mean group size of 6.6 individuals (Schaller and Gen, 1994). Our observations in Chang Chenmo indicate a mean group size of 6.67.

The young to adult female ratios in Karakoram were 27 to 70 females (38 to 100 females) which is lower than that of 50-58 to 100 adult females, reported in earlier studies in Tibetan Autonomous Region (Schaller, 1998). The reason for this could be that observations of this study were from August onwards where as those of earlier studies were made in June, the time young ones were born. The reduced ratios could indicate mortality of the young ones.



A view of vegetation of the Chang Chenmo valley

3. Vegetation profile and habitat utilization

Fifty three species of plants were identified from different habitats in Chang Chenmo area (Annexure: I) while 103 species of plants were identified from the Karakoram Wildlife Sanctuary.

Table 1 provides details of the plant diversity found in the three habitats surveyed during 2005 in Chang Chenmo and Karakoram area. It is clear that vegetation was most abundant (both in terms of the number of species and number of individuals) in valley bottoms and beside streams in both areas. The diversity in plant communities, therefore, seemed to be dependent on the moisture being lowest on the ridge tops and highest in valleys.

Table 1 : Diversity of plant species encountered in different habitat types in the surveyed area

Survey area	Rolling hill sides	Ridge tops/ Plateau	Streams sides/ valley bottoms
	Shanon diversity index		
Karakoram WLS	0.518	0.329	1.62
Chang Chenmo	0.522	0.432	0.980

4. Habitat utilization

In the Karakoram WLS, although the majority of chiru (60%) were sighted on rolling hill slopes, statistically

there was no association between the habitat types and its usage by groups ($X^2 = 14.48$, $df = 14$, NS) during 2005 (Fig 10). It is possible that effort was directed more in the rolling hills leading to more sightings or that other habitats were present in a smaller proportion. In 2006, however the highest number (54.76%) of chiru were sighted on ridges and high ground. This probably was due to the outward migration observed during the second year of the survey.

In Chang Chenmo, majority of chiru groups (73%) were sighted in valley bottoms as compared to slopes and plateaus during 2005 (Fig. 11), possibly because of the better food availability prevalent in the area. However, during 2006, most of the chiru were sighted on plateaus/ ridge tops (53.33%), possibly because the survey period coincided with the outward migration of chiru.

5. Food and feeding

Earlier studies conducted by Miller (1997) and Schaller and Gu (1994) reported that chiru is a mixed feeder and favoured graminoids and forb plant species. Studies conducted by Harris and Muller (1995) also reported chiru as a mixed feeder, with males primarily feeding on *Kobresia* sp. and forbs (both legumens and non-legumes), and females and young exclusively depending upon forbs, especially *Potentilla bifurca*. They also reported that chiru avoided both grasses and sedges during summer.

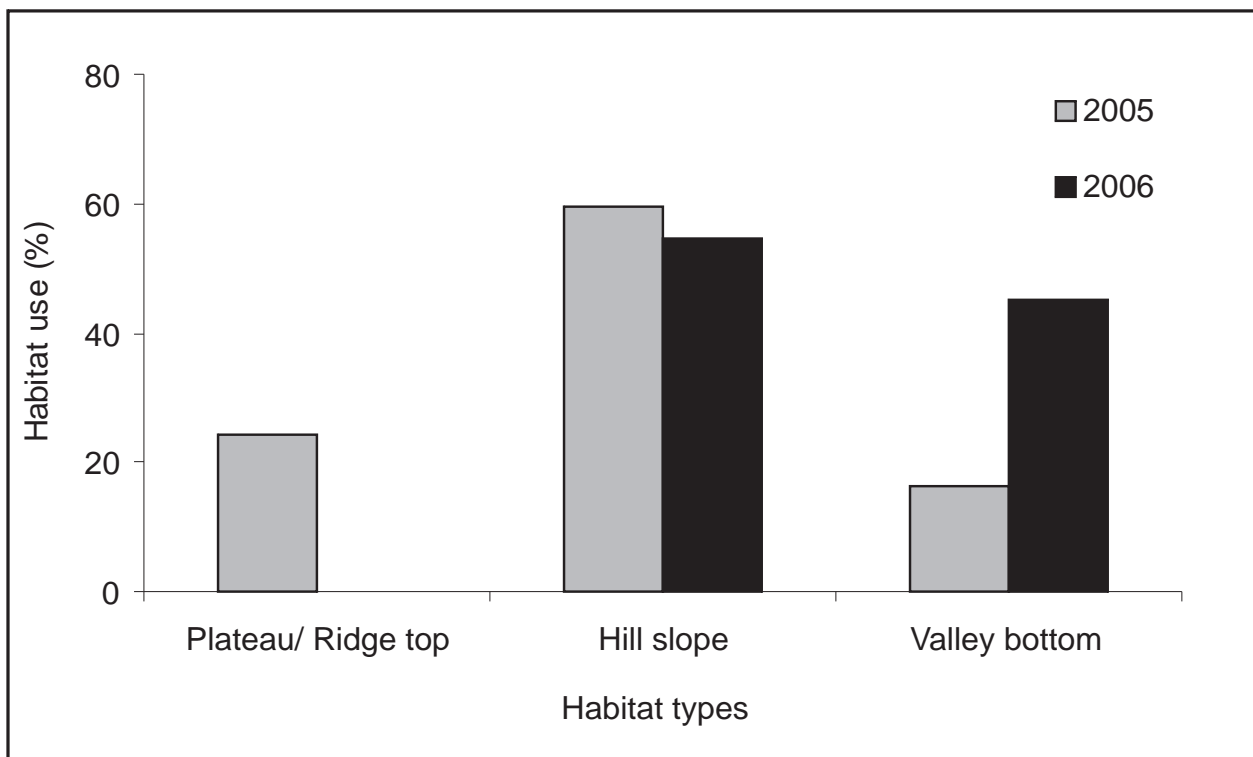


Fig 10: Utilization of different habitat types by chiru in Karakoram during 2005 and 2006

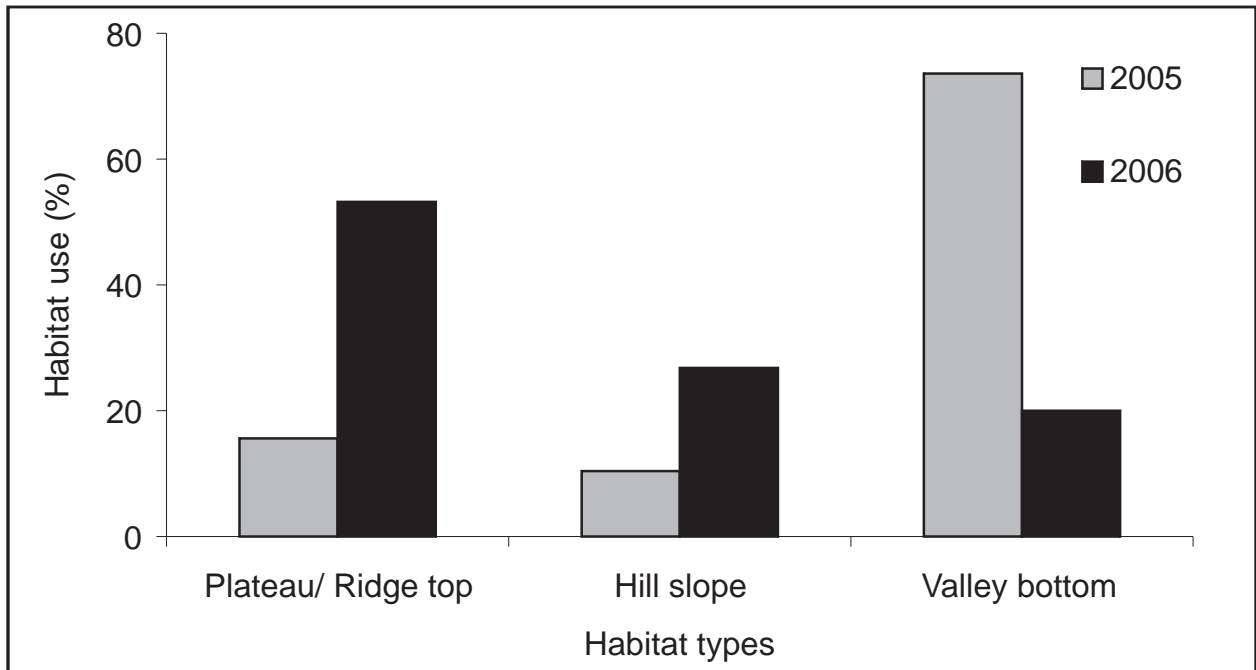


Fig 11 : Utilization of different habitat types by chiru in Chang Chenmo during 2005 and 2006

Schaller (1994) observed that chiru preferred graminoids including *Carex moorcroftii*, *Kobresia* sp., *Poa* sp. and *Stipa* sp. and forbs like *Oxytropis* sp., *Potentilla bifurca* and *Loentopodium pussillum*, with the percentage of plant species in the diet changing seasonally. All the above mentioned plant species were also found in the Karakoram WLS and chiru were observed feeding on *Oxytropis*, *Leontopodium*, *Poa* sp., *Stipa* sp. and *Corydalis*. However, in the Chang Chenmo area, only *Kobresia* sp., *Stipa* sp., *Carex* sp., *Oxytropis* sp., and *Potentilla* sp. of the recorded food plant species of chiru were found.

6. Predation

During the survey, no cases of predation of chiru were

recorded from either of the survey areas. However, a number of predator species were recorded in the two areas. Among them, the Tibetan wolf (*Canis lupus chanco*) was recorded from both the survey sites. The snow leopard (*Uncia uncia*) (indirect evidence) was found in the Karakoram area. Predators have been reported from other chiru habitats by Schaller (1998) where wolves, snow leopard, lynx and brown bear have been recorded to prey on chiru. He has also reported killing of chiru by dogs owned by pastoralists. There were no pastoralists in the chiru bearing areas, however, a healthy population of feral dogs was found in Karakoram, mainly feeding on the refuse generated by the security forces.



Karakoram survey team climbing the mountain ridge

Distribution of Wild Yak

Available literature records that wild yak in China is often found in small herds of about 10 animals. However, occasional large aggregations of up to several hundred individuals may be found. The survey team sighted four herds of wild yak with a lowest number of two and highest of 57 animals during 2005, and 22 animals, once solitary but usually in groups during 2006.

1. Distribution

Information on the distribution of wild yak in Ladakh is sparse and not too recent (Gupta and Kumar, 1994; Bedi, 1984). It mainly points to the presence of wild yak in the Cheng Chenmo area. Survey found no evidences of wild yak in the Karakoram area (DBO, Gaptian and Depsang). In Chang Chenmo, the team spotted wild yak on the high ground near Setlung Yogma nullah and Kugrung River and in river beds of Chang Chenmo (Fig. 12). The team sighted wild yak at 4,705 - 5,300 m in 2005 and 2006, well within their established altitudinal range of 4000-6000 m (Hedges, 2000).

2. Population size

A total of 79 wild yak in four herds were recorded from Chang Chenmo Valley during 2005. In 2006, 22 wild yak in seven herds were recorded. On the basis of indirect evidences obtained from other parts of Cheng Chenmo and on the estimates provided by local herders, about 200-225 wild yak may be present in this area.

3. Herd size

Available literature records that wild yak in China is often found in small herds of about 10 animals. However, occasional large aggregations of up to several



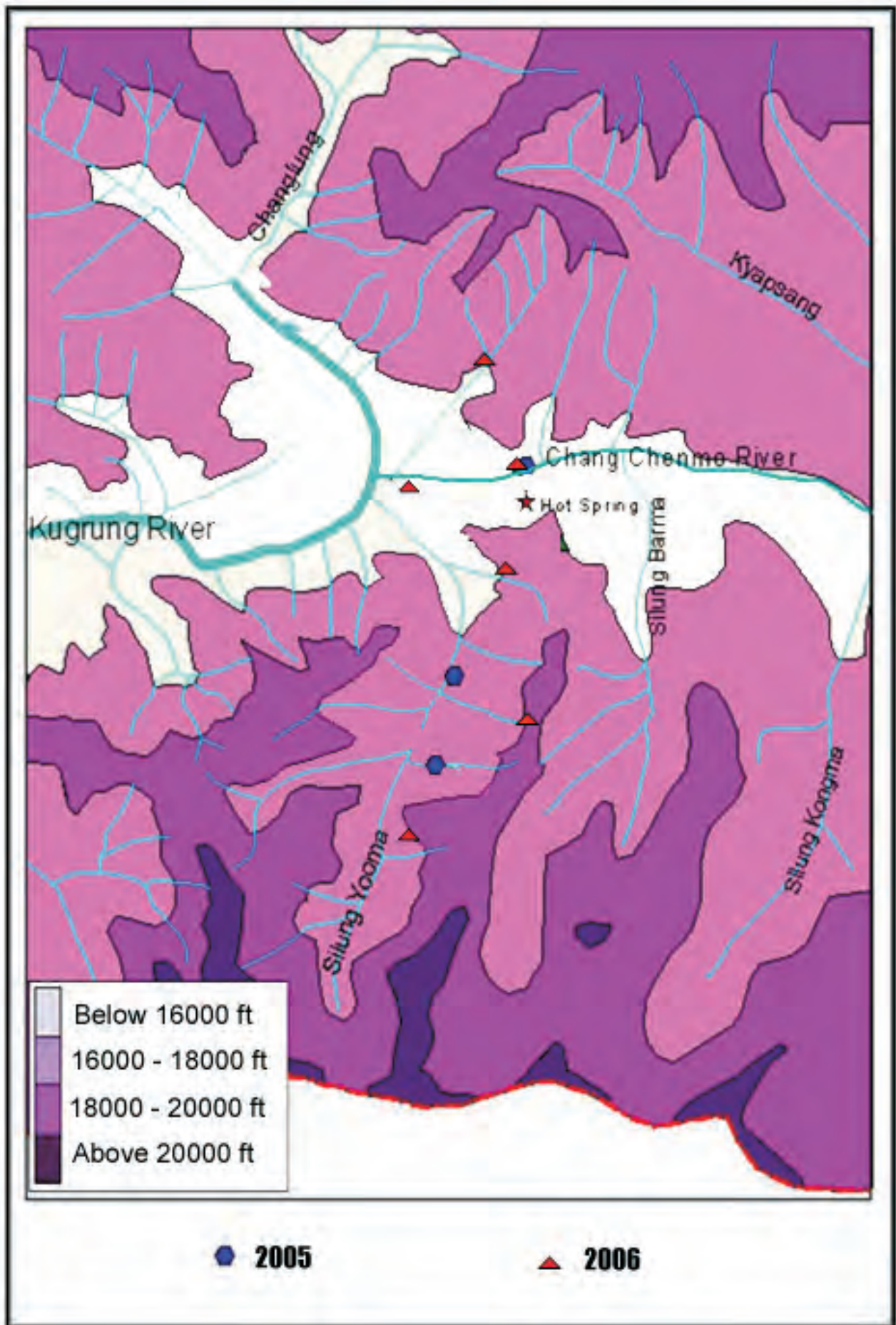


Fig. 12 : Map of Chang Chenmo Valley showing sightings of wild yak.



Wild yak on Hill top near Setlung Yogma river

hundred individuals may be found. The survey team sighted four herds of wild yak with the lowest grouping of two individuals and highest of 57 animals (mean herd size 19.75 ± 12.9 S.E.) during 2005, and 22 animals, once solitary but usually in groups (highest of seven individuals, mean herd size 3.14 ± 0.96 S.E.) during 2006 in the Chang Chenmo area of Ladakh.

4. Herd composition

No detailed information exists on age-sex composition

of wild yak in earlier reports. It was found that the herds were mainly composed of the adults (86%) yearlings (9%) and calves (5%) during 2005 (Fig 13). However, sex composition within the herd could not be determined because of the long distance between the observers and the wild yak. During 2006, most of the individuals seen were adult males.

Wild yak were generally found on ridge tops or high ground, higher than areas occupied by chiru in the Chang Chenmo area. Only on one occasion was it seen near the Chang Chenmo river bed.

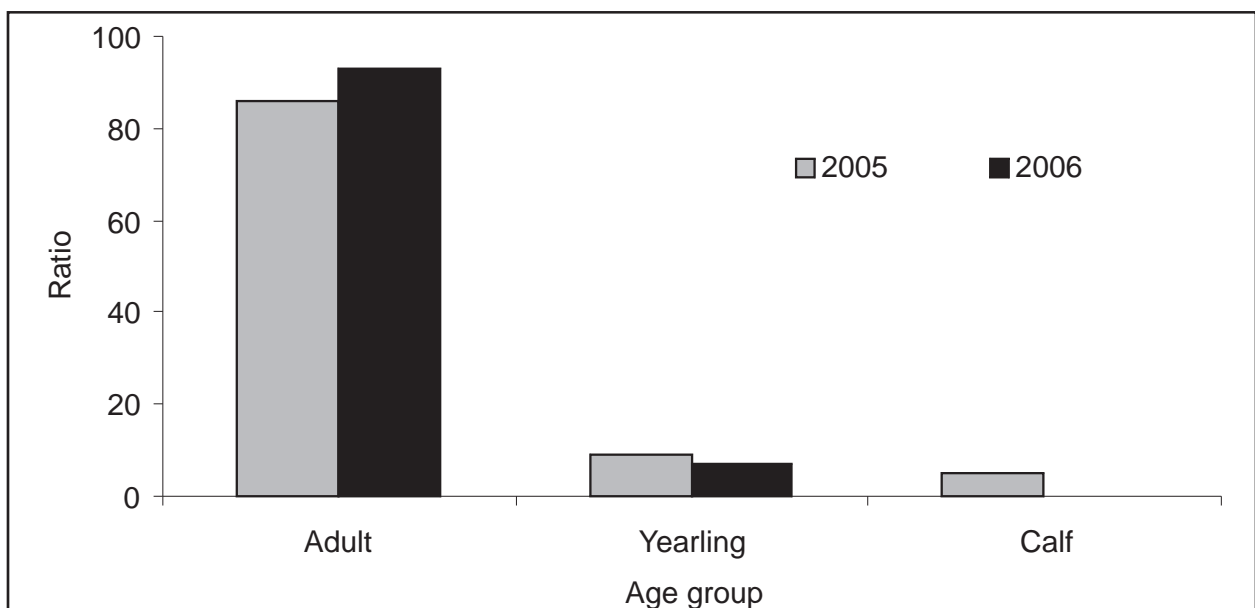


Fig 13 : Different age group of wild yak sighted in Chang Chenmo during 2005 and 2006

Distribution and Status of Other Wildlife in the Survey Area

1. Mammals

In addition to chiru and wild yak, evidence of 16 other mammal species were recorded from the two survey areas (Table 2; Fig. 14 & 15; Annexure-III).



Wild ass (*Equus kiang*)



Mountain weasel (*Mustela altaica*)

Table 2 : Mammals other than chiru and wild yak seen during the survey in Ladakh.

SL No.	Species		Nature of evidence	Distribution	
	Common name	Scientific name		Karakoram	Chang Chenmo
1	Tibetan Wolf	<i>Canis lupus chanco</i>	Sighting	√	√
2	Red Fox	<i>Vulpes vulpes</i>	Sighting	√	
3	Pale or Mountain Weasel	<i>Mustela altaica</i>	Sighting	√	
4	Snow Leopard	<i>Uncia uncia</i>	Scats	√	
5	Wild Ass	<i>Equus kiang</i>	Sighting		√
6	Ladakh Urial	<i>Ovis vignei</i>	Horn	√	
7	Blue Sheep	<i>Pseudois nayaur</i>	Sighting	√	√
8	Argali or Nayan	<i>Ovis ammon</i>	Horns		√
9	Woolly Hare	<i>Lepus oiostolus</i>	Sighting	√	√
10	Ladakh Pika	<i>Ochotona ladacensis</i>	Sighting	√	
11	Royle's Pika	<i>Ochotona roylei</i>	Sighting	√	
12	Nubra Pika	<i>Ochotona nubrica</i>	Sighting	√	
13	Plateau Pika	<i>Ochotona curzoniae</i>	Sighting	√	
14	Stoliczka's Mountain Vole	<i>Alticola stoliczkanus</i>	Sighting	√	
15	Silvery Mountain Vole	<i>Alticola argentatus</i>	Sighting	√	
16	Long tailed marmot	<i>Marmota caudata</i>	Sighting		√



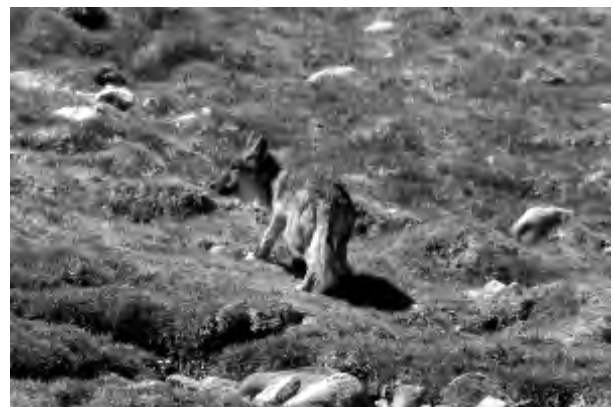
Long tailed marmot (*Marmota caudata*)



Blue sheep (*Pseudois nayaur*)



Woolly hare (*Lepus oiostolus*)



Tibetan wolf (*Canis lupus chanco*)

2. Birds

A total of 59 species of birds belonging to 19 families were recorded from the two survey areas. A full bird list of both the areas is provided in Annexure-II

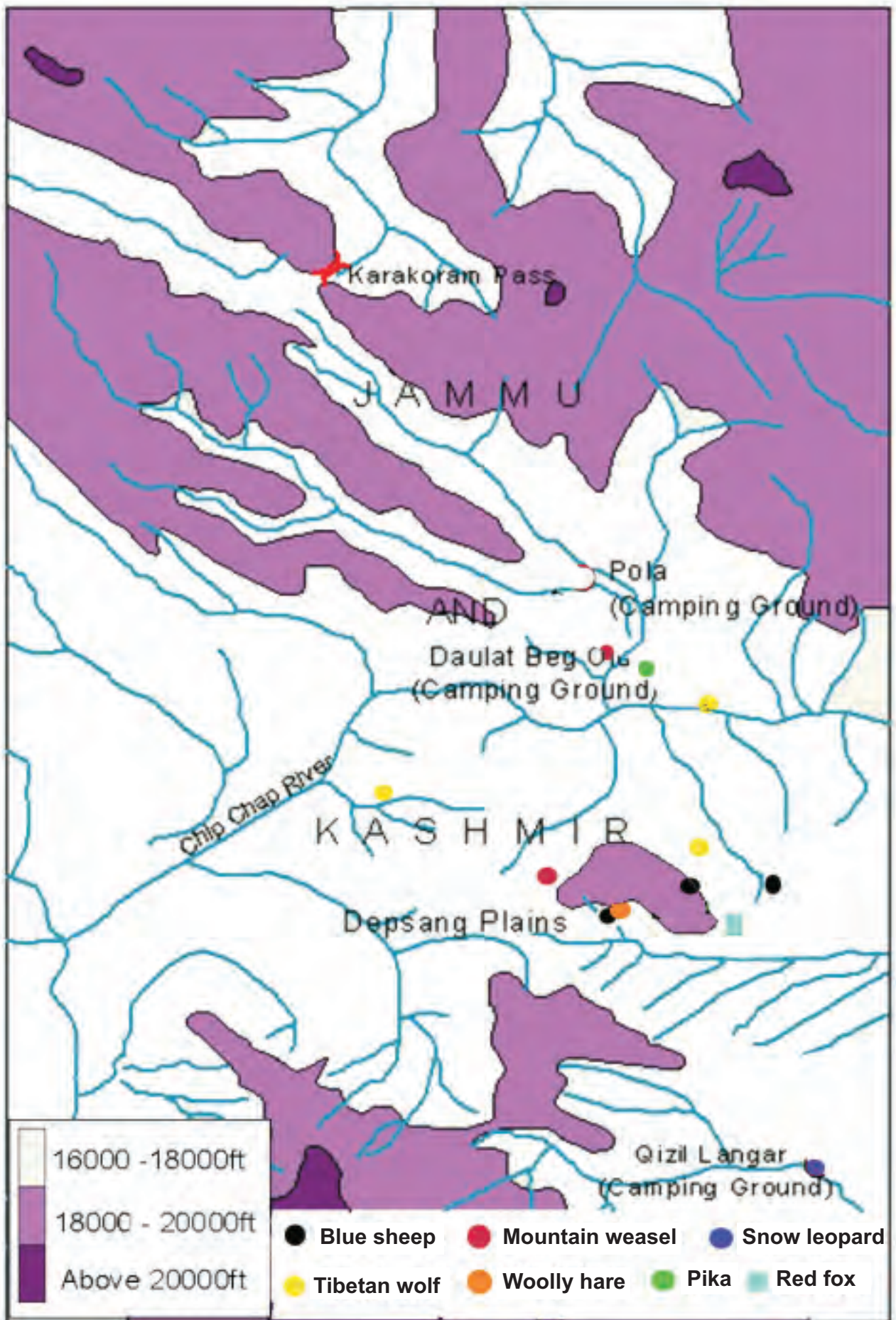


Fig. 14 : Map of Karakoram area showing sighting of other major animals

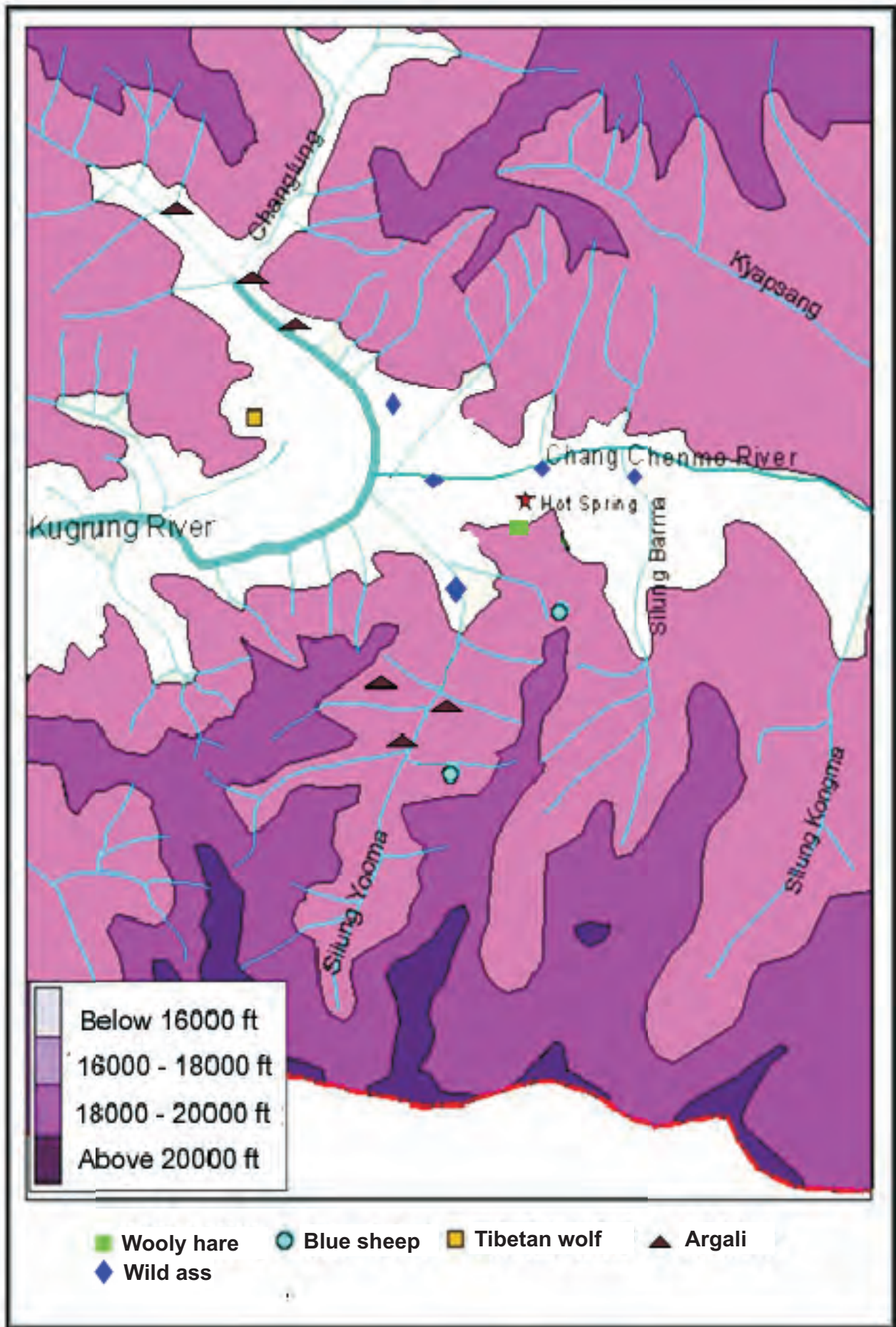


Fig. 15 : Map of Chang Chenmo Valley showing sighting of other major animals

Threats To Wildlife & Recommendations

1. Threats

Feral dogs

There are many feral dogs in both the survey areas which are potential threats to both the young and adult chiru. On many occasions, the dogs were seen chasing the chiru preventing them from using the valley bottoms for grazing. Dogs have been cited as threats to chiru in China also (Schaller and Gen, 1994) and it is fair to assume that they would pose threats here also.

Grazing competition

Some nomadic grazers from Phobrang village close to the Chang Chenmo Valley graze their livestock (about 1500 sheep and 200 domestic yak) in areas occupied by chiru and wild yak. This has potential for competition for the wild yak in addition to risks of interbreeding and disease transmission.

Some nomadic grazers from Phobrang village close to the Chang Chenmo Valley graze their livestock (about 1500 sheep and 200 domestic yak) in areas occupied by chiru and wild yak. This has potential for competition for the wild yak in addition to risks of interbreeding and disease transmission.



Sheeps grazing in Chang Thang

2. Recommendations

1. Further surveys to be conducted between June and October.

The survey recommends that the time of movement of chiru into the Chang Chenmo Valley and the DBO area within the national borders be documented, so that the physical and biological environment at the time of inbound and outbound movements of this animal is studied. This implies that surveys should be conducted from the end of May or early June through to October. Due to the fact that it may be difficult to access these areas at the beginning and end of the season, appropriate means of transport (helicopter drops) may be required for the team which can be done with the support of the Indian Army and ITBP. Within the study area, the availability of horse/yak riding animals would also be a great help.

2. Grazing by local yak and livestock may be regulated in the Chang Chenmo area.

Approximately 1500 sheep and goat and about 200

domestic yak belonging to the residents of Phobrang village are grazed in the area, leading to a potential situation where wild yak may become hybridized with the domestic form. Grazing grounds for the domestic and the wild yak may be identified and segregated.

3. Sensitize security forces stationed in chiru habitat.

The Army and the ITBP should be sensitized about issues pertaining to wildlife, especially of the areas where chiru and wild yak occur. They could help in generating location maps and also check illegal trade in wildlife. These forces must be made custodians of the wildlife of these areas and made responsible for their safety.

4. Feral dog population in DBO and Chang Chenmo areas need to be controlled.

The two areas of survey have a substantial population of feral dogs, which at times attack both the adults and young of chiru. The population of these feral dogs needs to be controlled.



Awareness material on chiru conservation

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ANNEXURE I

List of plants recorded from Karakoram and Chang Chenmo Area

Species Name	Karakoram	Chang Chenmo
<i>Acantholimon lycopodioides</i>	√	-
<i>Alyssum canescens</i>	√	√
<i>Androsace robusta</i>	-	√
<i>Arenaria bryophylla</i>	-	√
<i>Arnebia euchroma</i>	√	-
<i>Arnebia guttata</i>	√	√
<i>Artemisia brevifolia</i>	√	-
<i>Artemisia macrocephala</i>	√	√
<i>Artemisia salsoloides</i>	√	√
<i>Artemisia gmelinii</i> var. (<i>Artemisia santolinifolia</i>)	√	-
<i>Artemisia</i> sp.4	√	-
<i>Aster flaccidus</i>	√	-
<i>Astragalus confertus</i>	√	-
<i>Astragalus heydei</i>	√	-
<i>Astragalus nivalis</i>	√	-
<i>Astragalus</i> sp.	√	-
<i>Astragalus strictus</i>	√	√
(<i>Astragalus thomsonianum</i>)	√	-
<i>Axyris</i> sp.	-	√
<i>Beibersteinia odora</i>	√	-
<i>Brassicaceae</i>	√	-
<i>Calamagrostis holciformis</i>	-	√
<i>Carex moorcroftiana</i>	-	√
<i>Carex</i> sp.	-	√
<i>Carex</i> sp2	-	√
<i>Carex stenophylla</i>	-	√
<i>Chenopodium faminicum</i>	√	-
<i>Chenopodium</i> sp.	-	√
<i>Christolea crassifolia</i>	√	√
<i>Christolea</i> sp.1	√	-
<i>Chrysanthemum pyrethroides</i>	√	-
<i>Comarum salesovianum</i>	√	-
<i>Corydalis hendersonii</i>	√	-
<i>Corydalis moorcroftiana</i>	√	√
<i>Cremanthodium nanum</i>	√	-
<i>Crepis flexuosa</i>	√	√
<i>Delphinium brunonianum</i>	√	-
<i>Dilophila salsa</i>	-	√
<i>Desideria</i> sp (<i>Christolea</i> sp.)	√	-

Species Name	Karakoram	Chang Chenmo
<i>Draba altaica</i>	√	-
<i>Draba sp. 1</i>	√	-
<i>Draba sp. 2</i>	√	-
<i>Draba stenobotrys</i>	√	-
<i>Dracocephalum heterophyllum</i>	√	-
<i>Dracocephalum stamineum</i>	√	-
<i>Elsholtzia eriostachya</i>	-	√
<i>Elymus jacquemontii</i>	√	-
<i>Elymus schrenkianus</i>	-	√
<i>Ephedra gerardiana</i>	-	√
<i>Erigeron sp.</i>	√	-
<i>Erodium tibeticum</i>	-	√
<i>Festuca sp.</i>	√	-
<i>Gentiana sp.</i>	√	-
<i>Gentiana leucolaena</i>	-	√
<i>Gentiana prostrate</i>	-	√
<i>Heracleum pinnatum</i>	√	-
<i>Hippophae tibetana</i>	-	√
<i>Kraschennikovia pungens (Eurotia ceratoides)</i>	√	√
<i>Kobresia schoenoides</i>	-	√
<i>Lagotis decumbens</i>	√	-
<i>Leiospora pamirica</i>	√	-
<i>Leontopodium pusillum</i>	√	-
<i>Leontopodium sp.</i>	√	√
<i>Leontopodium sp.</i>	√	-
<i>Leymus secalinus</i>	-	
<i>Lloydia serotina</i>	√	-
<i>Lonicera semenovii</i>	√	-
<i>Lonicera spinosa</i>	√	-
<i>Marrubium lanatum (Marrubium marrubiastrum)</i>	√	√
<i>Microgynaecum tibeticum</i>	-	√
<i>Myricaria prostrate</i>	-	√
<i>Nepeta discolor</i>	√	-
<i>Nepeta longibracteata</i>	√	-
<i>Oxyria digyna</i>	√	-
<i>Oxyria digyna</i>	√	-
<i>Oxytropis humifusa</i>	√	-
<i>Oxytropis microphylla</i>	√	√
<i>Oxytropis platysema</i>	√	-
<i>Oxytropis pusilla</i>	-	√
<i>Oxytropis sp.</i>	√	-
<i>Oxytropis tatarica</i>	√	√
<i>Papaver nudicaule</i>	√	-
<i>Pedicularis cheilanthifolia</i>	√	√
<i>Pedicularis cheilanthoides</i>	√	-
<i>Pedicularis rhinanthoides</i>	-	√
<i>Pegaeophyton scapiflorum</i>	√	-

Species Name	Karakoram	Chang Chenmo
<i>Physoclaina praealta</i>	√	-
<i>Pleurospermum hookerii</i>	-	√
<i>Poa attenuate</i>	√	-
<i>Polygonum cognatum</i>	√	-
<i>Polygonum molliaeforme</i>	√	-
<i>Polygonum pamiricum</i>	√	√
<i>Potentilla agrimonioides</i>	√	-
<i>Potentilla biflora</i>	√	√
<i>Dryadenthe dryandenthoides</i>	√	-
<i>Potentilla multifida</i>	√	√
<i>Potentilla sp. 1</i>	√	-
<i>Potentilla sp. 2</i>	√	-
<i>Primula nutans</i>	-	√
<i>Pucciniella himalaica</i>	√	-
<i>Ranunculus involucratus</i>	√	-
<i>Rheum sp.</i>	√	-
<i>Rhodiola fastigiata</i>	√	-
<i>Rhodiola sp.</i>	√	-
<i>Rhodiola tibetica</i>	√	√
<i>Salix caesia</i>	-	√
<i>Salsola jacquemontii</i>	-	√
<i>Saussurea bracteata</i>	-	-
<i>Saussurea glacialis</i>	√	-
<i>Saussurea glanduligera</i>	-	-
<i>Saussurea gnaphaloides</i>	-	-
<i>Saussurea hypsipeta</i>	√	-
<i>Saussurea sp.</i>	√	-
<i>Saussurea sp.</i>	√	-
<i>Saussurea subulata</i>	√	-
<i>Saussurea thomsonii</i>	√	-
<i>Saussurea werneroides</i>	-	-
<i>Saxifraga stenophylla</i>	√	-
<i>Saxifraga stenophylla ssp. Crassiflagellata</i>	√	-
<i>Scrophularia dentate</i>	√	√
<i>Sibbaldia tetrandra</i>	√	-
<i>Silene gonosperma</i>	√	-
<i>Silene himalaics</i>	-	√
<i>Silene sp.</i>	√	-
<i>Stellaria depressa</i>	√	-
<i>Stellaria Fontana</i>	√	√
<i>Stellaria alsine</i>	√	-
<i>Stipa cuacasiana</i>	√	-
<i>Stipa mongholica</i>	-	√
<i>Stipa sp.</i>	-	√
<i>Suaeda oleifera</i>	√	-
<i>Sueda sp</i>	√	-
<i>Tanacetum sp.</i>	√	-



Species Name	Karakoram	Chang Chenmo
<i>Tanacetum sp.2</i>	√	-
<i>Tanacetum stoliczkae</i>	√	-
<i>Tanacetum tibeticum</i>	√	√
<i>Taraxacum sp.</i>	√	√
<i>Taraxacum sect. leucantha</i>	-	√
<i>Thermopsis inflata</i>	√	√
<i>Thylacospermum caespitosum</i>	-	-
<i>Triglochin maritime</i>	-	√
<i>Waldhemia glabra</i>	√	√
<i>Waldhemia tridactyloides</i>	√	-
<i>Waldhemia nivea</i>	√	-
<i>Waldhemia tomentosa</i>	√	-
<i>Waldhemia vestita</i>	√	-

ANNEXURE II

Birds sighted in Karakoram and Chang Chenmo valley during survey

S.No	Species	Scientific Name	Family	Distribution	
				Karakoram	Chang Chenmo
1	Himalayan Snowcock	<i>Tetragalus himalayensis</i>	Phasianidae	√	
2	Brahminy Duck	<i>Tadorna ferruginea</i>	Anatidae	√	
3	Common Teal	<i>Anus creca</i>	Anatidae	√	
4	Common Hoopoe	<i>Upopa epops</i>	Upupidae	√	√
5	Fork-tailed Swift	<i>Apus pacificus</i>	Apodidae	√	
6	Alpine Swift	<i>Tachymarptis melba</i>	Apodidae	√	
7	Snow pigeon	<i>Columbia leuconota</i>	Columbidae	√	√
8	Hill Pigeon	<i>Columbia rupustris</i>	Columbidae		
9	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	Columbidae		√
10	Tibetan Sandgrouse	<i>Syrrhaptes tibetanus</i>	Pterocelidae	√	
11	Pin-tailed Sandgrouse (?)	<i>Pterocles alchata</i>	Pterocelidae	√	
12	Little Stint	<i>Calidris minuta</i>	Scolopacidae		√
13	Wood Sandpiper	<i>Tringa glareola</i>	Scolopacidae	√	
14	Lesser sand plover	<i>Charadius mongolus</i>	Charadriidae		√
15	Black-winged Stilt	<i>Himantopus himantopus</i>	Charadriidae	√	
16	Black Kite	<i>Milvus migrans</i>	Accipitridae	√	
17	Golden Eagle	<i>Aquila Chrysaetus</i>	Accipitridae	√	√
18	Lammergeier	<i>Gypaetus barbatus</i>	Accipitridae	√	√
19	Pallid Harrier (?)	<i>Cicus macrourus</i>	Accipitridae	√	
20	Kestrel	<i>Falco tinnunculus</i>	Falconidae	√	
21	Common Raven	<i>Corvus corax</i>	Corvidae	√	√
22	Eurasian Jackdaw	<i>Corvus monedula</i>	Corvidae	√	
23	Jungle Crow	<i>Corvus macrorhyncus</i>	Corvidae	√	
24	Large billed crow	<i>Corvus machrohinchos</i>	Corvidae		√
25	Red billed chough	<i>Pyrrhocorax pyrrhocorax</i>	Corvidae	√	√
26	Yellow-billed Chough	<i>Pyrrhocorax graculus</i>	Corvidae	√	
27	Black Redstart	<i>Phoenicurus ochruros</i>	Muscicapidae	√	
28	Blue Rock Thrush	<i>Monticola solitarius</i>	Muscicapidae	√	
29	Desert Wheatear	<i>Oenanthe deserti</i>	Muscicapidae	√	√
30	Rufous-backed Redstart (?)	<i>Prunella erythonota</i>	Muscicapidae	√	
31	Rufous-tailed Thrush	<i>Monticola saxitilis</i>	Muscicapidae	√	
32	Rufous-tailed Wheatear (?)	<i>Oenanthe finschii</i>	Muscicapidae	√	
33	White-throated Dipper	<i>Cinclus cinclus</i>	Cinclidae	√	
34	White-throated Redstart (?)	<i>Phoenicurus shisticeps</i>	Muscicapidae	√	
35	White-winged Redstart	<i>Phoenicurus aureus</i>	Muscicapidae	√	
36	Barn Swallow	<i>Hirunda rustica</i>	Hirundinidae	√	
37	Dusky Crag Martin	<i>Hirunda concolor</i>	Hirundinidae	√	
38	Greenish Warbler	<i>Phylloscopus inornatus</i>	Sylviidae	√	

S.No	Species	Scientific Name	Family	Distribution	
				Karakoram	Chang Chenmo
39	Tickell's Warbler	<i>Phylloscopus sp.</i>	Sylviidae	√	
40	Horned Lark	<i>Eremophila alpestris</i>	Alaudidae	√	√
41	Oriental Skylark	<i>Alauda gulgula</i>	Alaudidae		√
42	Brown Accentor	<i>Prunella fulvescense</i>	Passeridae	√	
43	Citrine Wagtail	<i>Motacilla citreola</i>	Passeridae	√	
44	Forest Wagtail	<i>Dendronanthus indicus</i>	Passeridae	√	
45	Grey Wagtail	<i>Motacilla cinerea</i>	Passeridae	√	
46	House Sparrow	<i>Passer domesticus</i>	Passeridae	√	
47	Rufous-breasted Accentor	<i>Prunella strophiatea</i>	Passeridae	√	
48	Tres pipit	<i>Anthus trivialis</i>	Passeridae		√
49	White Wagtail	<i>Motacilla alba</i>	Passeridae	√	
50	Yellow Wagtail	<i>Motacilla flava</i>	Passeridae	√	
51	Beautiful Rosefinch	<i>Capradacus pulcherrimus</i>	Fringillidae	√	
52	Brandt's Mountain Finch	<i>Leocostict brandti</i>	Fringillidae	√	√
53	Common Rosefinch	<i>Capradacus erythrinus</i>	Fringillidae	√	
54	Robin Accentor	<i>Prunella rubeculoides</i>	Fringillidae	√	
55	Streaked rosefinch	<i>Caprodacus rubicilloides</i>	Fringillidae		√
56	Little Bunting	<i>Emberiza pusilla</i>	Fringillidae		√
57	Red-headed bunting	<i>Emberzina bruniceps</i>	Fringillidae		√
58	Yellow Hammer	<i>Emberiza citronella</i>	Fringillidae	√	
59	Fire-fronted Serin	<i>Serinus pusillus</i>	Fringillidae	√	

ANNEXURE III

Some mammal sightings at additional sites

A follow up visit was made from 14-19 October, 2006 covering Chang Chenmo, Chishul and Hanle areas. A summary of the animal sightings is presented below:

- a) 12 October: Kargil – Leh: Two groups of Urial, one of 4 individuals near Rumbek monastery and the other, a larger (50+) across the Indus on the way to the monastery.
- b) 13 October: Leh- Phobrang: A group of Bharal (8) across the Changla Pass. A group of Kiang (4) and two tibetan wolves just before Pangong Tso
- c) 14 October: Tsogtsalu camp: A group of eight Argali across and above the Chang Chenmo River, to the north of the camp.
- d) 15 October: Chang Chenmo nullah: Three groups of Argali in the Kugrung nullah in addition to some Kiang.
- e) 16 October: Cheng chenmo nullah: Three groups of Argali in the Solung Yogma nullah of 11, 4 and 8 individuals.
- f) 17 October: Tsogtsalu-Chushul via Phobrang and Pangong: One group of Argali and one Tibetan wolf sighted before the Marsemik La. Several groups of Kiang seen between Pangong Tso and Chushul.
- g) 18 October Chushul-Hanle: Seven black-necked cranes seen in Chushul and eight more flew past. Four groups of Kiang seen between Chushul and Hanle adding to over 1000 individuals. Two Tibetan Gazelle sighted about 5 km short of Hanle. One wolf seen in Kalaktatar.
- h) 19 October Hanle-Leh: Five black necked cranes seen in Hanle. Tibetan gazelles seen again in roughly the same area where they had been seen the previous evening. Some Kiang also sighted.
- I) 20 October: Bharal seen in Shang nullah in Hemis NP.

OTHER PUBLICATIONS

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Elephant in Exile:

A rapid assessment of the human-elephant conflict in Chhattisgarh

Against the Current:

Otters in the river Cauvery, Karnataka

Silent Stranglers:

Eradication of mimosa in Kaziranga National Park, Assam

Living at the Edge:

Rapid survey for the endangered Ladakh urial (*Ovis vignei vignei*) in Leh district of Ladakh Trans-Himalaya

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A conservation survey of the Phayre's leaf monkey (*Trachypithecus phayrei*) in Assam and Mizoram

Awaiting Arribadda:

Protection of Olive Ridley turtles (*Lepidochelys olivacea*) and their nesting habitats at Rushikuliya rookery, Orissa

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Understanding human-elephant conflict in Maharashtra and adjoining areas

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Support provided to leopards involved in conflict related cases in Maharashtra

India at the International Whaling commission:

A policy document on India's involvement in the IWC 1981-2003

Sighting Storks:

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Responding to poisoning in Asian elephants – A field guide

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Ecology and conservation of Asian elephants in Kameng elephant reserve, Arunachal Pradesh

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Conserving the forest and wildlife of the Bodoland Territorial Council

Canopies and Corridors:

Conserving the forest of Garo Hills with elephant and gibbon as flagships

D. OTHERS

Wrap up the trade:

An international campaign to save the endangered Tibetan Antelope

Tiger Bridge:

Nine days on a bend of the Nauranala

Emergency Relief Network Digest 2005 – 2006

Emergency Relief Network Digest 2006 – 2007

Action Tiger:

Tiger action plans of 12 tiger range countries



Survey team in Chang chenmo area



Survey team in Karakoram area

CONSERVATION ACTION SERIES

The Tibetan antelope (*Pantholops hodgsonii*), locally known as chiru is an endangered antelope which is confined to the Tibetan plateau.

The chiru have been killed in large numbers for their fine underwool - *Shahtoosh* from which high grade shawls are made. This killing has resulted in a massive decline in its numbers throughout its range.

The wild yak (*Bos grunniens*), progenitor of our domestic yak is also confined to roughly the same area as the chiru are found, albeit in the higher ridges.

Its numbers have also declined because of hunting for meat.

A joint survey undertaken primarily by the Department of Wildlife Protection, Jammu and Kashmir and the Wildlife Trust of India, has established the presence of chiru and wild yak in two areas of Ladakh and also estimated their numbers.

Recommendations for their conservation have also been made in this report.

