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GOATS ON THE BORDER

A Rapid Assessment of the Pir Panjal Markhor in Jammu and Kashmir: Distribution, Status and Threats

Wildlife Trust of India

DEPARTMENT OF WILDLIFE PROTECTION J&K GOVT.

Nature Conservation Foundation

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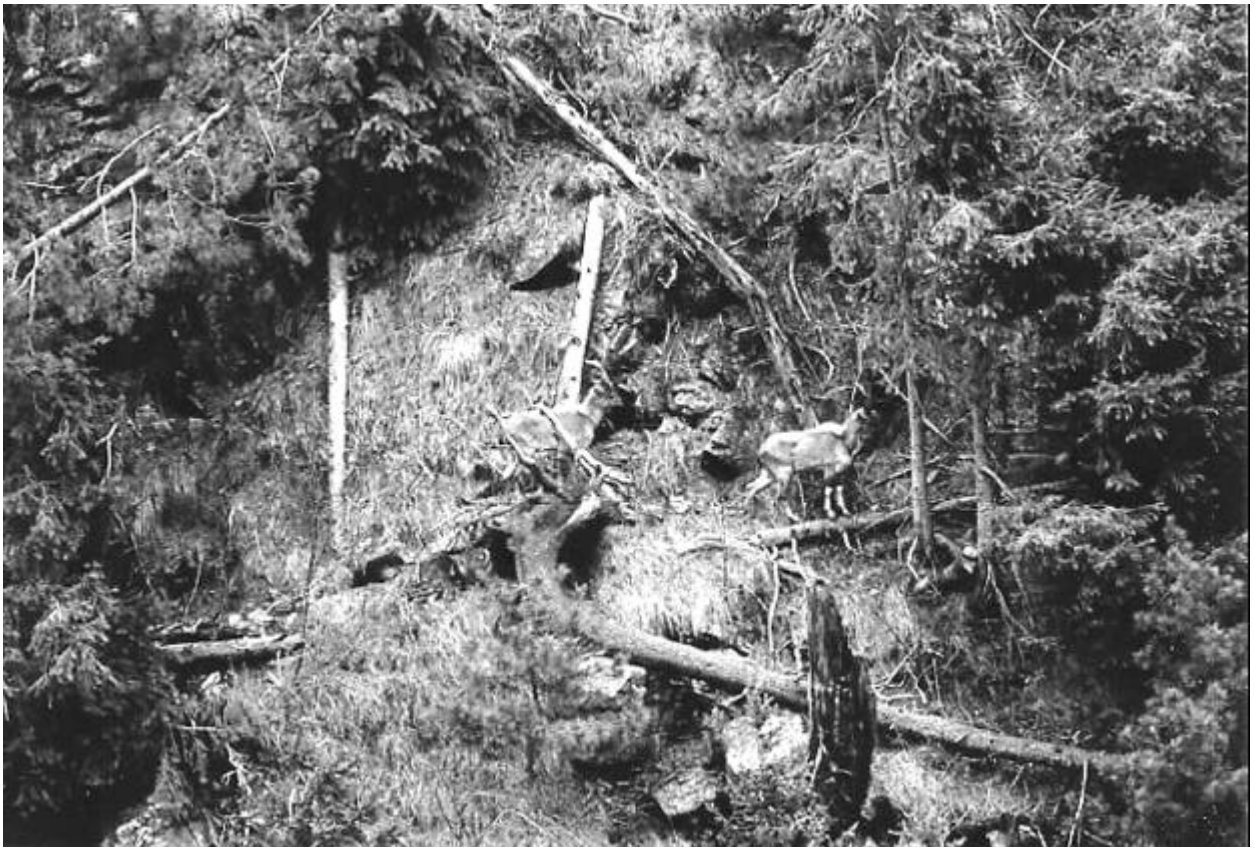

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CONTENTS

PREFACE

The markhor is the largest wild goat in the world. It is also one of the most elusive large mammals in India. Not only has it never been studied rigorously but even a good photograph of the animal is not available. This realization dawned on me while I was writing the *Field Guide to Indian Mammals* when the final photo options were three photographs, all taken in Pakistan. Luckily, we found one of the Pir Panjal markhor, the animal that occurs within our limits as well. This elusiveness was the same when I tried to research census data or distribution. The most I could find was an old shikar map of Kashmir Valley, sixty years old, that tried to block-shade areas that had the markhor.

It is, therefore, a personal thrill for me to have overseen the conduct of the first-ever markhor survey for the country in conjunction with the Jammu and Kashmir Wildlife Department. It was equally a high as this survey formally launched the Schaller Conservation Surveys, a dedication to the foremost wildlife biologist of the world, Dr George Schaller who has been a personal inspiration to me. This survey was made possible in part by the money that Dr Schaller gave so spontaneously to the Wildlife Trust of India over a year ago when he was given an international award by the Bombay Natural History Society at its gala centenary celebrations for its journal. Dr.Schaller wanted the money to remain in India and do some good for Indian wildlife. I hope this survey has proved equal to his aspirations.

There is a third, less obvious reason for celebration. This survey was conducted through the collaboration of four institutions–WTI, The Jammu and Kashmir Wildlife Department (under the vigorous and inspiring leadership of Mr. C.M.Seth), the Indian Army's Ecology Cell and the Nature Conservation Foundation (and our scientific leader Yash Veer Bhatnagar). While the former chief of Army General Malik was an Advisor to the project, eminent conservationist and WTI Trustee Dr M.K.Ranjitsinh conceptualized the whole project. Our two wonderfully tough field officers, Riyaz and Sunil, then carried out the most demanding project that WTI has undertaken this year–a two and a half month trek along the LoC. The area is known for conflicts, disputes, shelling and casualty and not for counting goats. This survey has shown that this too is possible–for those who will.

June 15, 2005
New Delhi

Vivek Menon
Executive Director
Wildlife Trust of India

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Col. Prakash Tewari

Col. Sandhu, Col. Roy

All Army and B.S.F. units in Jammu and Kashmir

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EXECUTIVE SUMMARY

The markhor is the largest goat in the world. It has a limited geographical distribution in the moist to semi-arid mountain tracts of Pakistan, India, Afghanistan, Uzbekistan, Turkmenistan and Tajikistan.

Within India, Markhor is found only in Jammu and Kashmir. The state is one of the important areas for markhor globally, and the primary area for the 'Pir Panjal type'. The historical distribution of the markhor in Jammu and Kashmir (J&K) was continuous from Banihal pass to Shamshabari area of the Pir Panjal range.However, no recent information existed on their status and distribution within the state. Wildlife Trust of India (WTI) therefore undertook surveys within the past distribution range of markhor in Jammu and Kashmir to know their current status and distribution and threats to these populations. These surveys were conducted from 26 October to 20 January 2004 and repeated in the spring of 2005 from 23 April to 31 May. During the surveys the team covered areas in the vast stretch of Himalaya from Padder-Kishtwar to Poonch in Jammu region and Hirpura (in south Kashmir) to Kaj-i-nag and Shamshabari (in north Kashmir) in the Kashmir region. The areas of Bhadarwa-Kishtwar were included after getting information of markhor in these areas from some experienced people.

The survey confirmed the presence of markhor in Kaj-i-nag and Hirpura blocks through direct sightings.
Thirty-five markhor groups comprising 155 individuals were sighted. All sightings were confined to the two survey blocks of Hirpura and Kaj-i-nag.

Poaching, over-grazing and constant conflict at the border seem to be major threats to markhor conservation in Jammu and Kashmir.
Although the main markhor populations fall within the Protected Areas network, yet problems of poaching, over-grazing by flocks of migrant graziers continue to pose threats to their populations.

Hirpura and Kaj-i-nag are priority sites for Markhor conservation.
At present, the two sites of Hirpura WLS and Kaj-i-nag range have the best possibility of population recovery and are potential 'source populations' for conservation and restocking of the markhor in the rest of its range. Any conservation program should concentrate on these areas as a priority.

Lachipora WLS, Limber WLS and Naganari CA should be amalgamated into Kaj-i-nag NP and WLS.
The Kaj-i-nag range consists of three contiguous PAs– Lacchipora WLS (c. 114km^2), Limber WLS (c. 44km^2) and the Naganari Conservation Area (c. 20km^2). All the three have markhor at present, and should be merged into one unit and should be zoned into areas to incorporate inviolate core zones within these.

Collaborative management of Markhor areas with the Indian Army should be worked out:
The army provided invaluable support during these surveys, and can play an extremely important role in working jointly with the Wildlife Department and other interested agencies in conserving this species. Although a joint comprehensive conservation program needs to be developed, support is needed primarily in curbing poaching.

Capacity building of the local wildlife department in terms of manpower, resources and training to conserve the markhor needs to be carried out:
The Wildlife Department in general, especially in markhor areas has very few equipped and trained staff. Capacity building is needed in enforcement, wildlife law, wildlife monitoring and management planning. There is an urgent need for high- altitude clothing and camping gear for the staff. Patrolling huts inside the wildlife sanctuaries, at least in Limber and Hirpura, should be provided to encourage regular patrolling of the area.

Livestock grazing should be controlled in Hirpura WLS:
In the Hirpura WLS there seems to be heavy summer grazing by the migrant gujjars and bakerwals in markhor areas that has pushed markhor to sub-optimal regions of the protected area. This needs to be urgently controlled so that markhor populations can recover in the region.

A more detailed understanding of the ecology of the species is needed:
This is a step that will greatly help in understanding the population dynamics, specific habitat requirements, food habits and also in mapping other potential areas of markhor in Jammu and Kashmir, where animals can be re-introduced (after negating the threats that caused its extinction).

CHAPTER 1

SEARCH FOR THE ENIGMATIC MARKHOR

1.1 Introduction

The words 'mar' and 'khor' in Persian mean 'snake' and 'eater'. This is doubtful etymology as snake-eating has not been recorded in the markhor (Schaller 1977, Roberts 1997). The name markhor probably arose as a corruption of the Pushto words 'mar' (meaning snake) and 'akhur' (meaning horn)–an apt description of the serpentine shape of its horns. Four distinct subspecies of markhor have been recognized on the basis of horn shape (Roberts, 1997). The spiraling horns of markhor have three basic shapes, with variations thereto, including intermittent horn-types.

These are:

(i) **The straight-horn shape**, e.g (a) the Sulaiman markhor (*Capra falconeri jerdoni*), having tight multi-spiral horns and (b) The Kabul markhor (*Capra falconeri megaceros*) with two or three almost straight spirals

(ii) **The open-spiral shape** e.g. (a) the Pir Panjal markhor (*Capra falconeri cashmiriensis*) (b) the western Hindu Kush, Hunza, Kafer Khan, Chitral, Chilas markhor, all having corkscrew shape and

(iii) **The out-flaring shape**, represented by the Astor markhor (*Capra falconeri falconeri*) with a very spectacular, one and a half twist, out-flaring horn.

In Kashmir, outside PoK, the Pir Panjal markhor is found only in the Pir Panjal Range, the Kaj-i-nag and the Shamshabari Keran mountains of northwestern Himalaya, extending into the Greater Himalayan range in PoK near Nanga Parbat

Schaller (1977) reviewed markhor classification in detail after his studies in Pakistan and came to the conclusion that there were really only two distinct subspecies; a larger flare-horned northern population (*C. f. falconeri*, Wagner, 1839) inhabiting colder mountains and a smaller variety having straight-horns (*C. f. jerdoni*, Hutton, 1842) with a tighter twist inhabiting southern, warmer parts of their range. The IUCN Caprinae Action Plan (Shackleton, 1997), however, accepts a third subspecies as the Tadjik markhor (*C. f. heptneri*, Zalkin, 1945) that also has flared horns.

In Kashmir, outside Pakistan Occupied Kashmir (PoK), the Pir Panjal markhor is found only in the Pir Panjal Range, the Kaj-i-nag and the Shamshabari Keran mountains of northwestern Himalaya, extending into the Greater Himalayan range in PoK near Nanga Parbat (Burrard, 1925; Stockley, 1936; Schaller, 1977). Poaching has been identified as a major threat to the markhor population since the 19th Century (Lydekker, 1898; Burrard, 1925; Stockley, 1936).

Markhor is endangered (EN - C2A) as per the IUCN Red List (2000). In India, the markhor is included in Schedule I of the Wildlife (Protection) Act, 1972 (Anon., 2002) and Jammu and Kashmir Wildlife (Protection) Act,1978; 2002 amendment (Anon., 2002a). In Jammu and Kashmir, markhor occur in three wildlife

sanctuaries and one conservation reserve, in all covering an area of 251.7 km^2. Further details on markhor taxonomy, distribution, status, and biology are given in Appendix I.

Schaller (1977), quoting the Jammu and Kashmir State Wildlife (Protection) Department sources, estimated that the total population of markhor may be 250–300 in the state. Roberts (1997) speculated that markhor in the Pir Panjal on both sides of the Line of Control (LoC) have been practically exterminated by troops stationed in the border region. However, occasional departmental surveys such as by Suhail and Baba (2002) confirmed their presence in Limber Wildlife Sanctuary (WLS) in the Kaj-i-nag Range.

Since the time India got her independence, there has been no published record about markhor in India detailing its distribution, status and ecology. This is partly due to the turmoil in the state that began about fifteen years ago, when even scanty information on the species ceased. However, it was certainly known that there are a few markhor distributed over a fragmented, turmoil-affected area. During the late eighties, a few areas with markhor were notified as PAs, but the wildlife department could not start conservation efforts there and hunting licenses continued to be issued. Markhor primarily occur along the LoC in the state and the prevailing army presence and shelling might have affected them adversely. Roberts (1997) even conjectured that they were extinct within the Indian territory. The situation in Kashmir is currently improving and it has become possible to know at the very least where markhor exist, how many there are and what threats they are facing. Without any information, it would have been impossible to initiate any conservation initiatives. For this purpose, a survey was conducted from the end of October 2004 to mid January, 2005 for a period for 45 days and a repeat survey was conducted between 18 April and 24 May 2005 with the objectives to assess the following:

1. The distribution of the Pir Panjal markhor in Jammu & Kashmir
2. The current status of the markhor in the state
3. Extant threats to the population in the areas surveyed

1.2 Survey areas

The survey was conducted in Jammu and Kashmir that has three geo-political regions – the southern Jammu, the northwestern Kashmir and the northeastern Ladakh region. Our survey sites consisted of a vast stretch of Himalaya from Padder-Kishtwar to Poonch in the Jammu region and Hirpura (in south Kashmir) to Kaj-i-nag and Shamshabari (in north Kashmir) in the Kashmir region (Figure 1). This region lies in the North-West Himalayan Bio-geographic zone (2A) (Rodgers & Panwar 1988). The vegetation in general is Temperate Coniferous and Sub-alpine Forest (Champion & Seth 1968).

Dr. Rahul Kaul/WTI

A view of the survey area in Jammu and Kashmir

The selection of the survey blocks was based on the old distribution records of markhor (Burrard, 1925; Stockley, 1936) and an old Kashmir shikar map (Survey of India, 1947). Further, with the experience of the Principal and Associate Investigators, six blocks to survey were identified in the vast Pir Panjal range of the state covering c. 400 km from east to west. The blocks were Poonch, Hirpura, Gulmarg-Bonyar, Kaj-i-nag, Shamshabari and Bhaderwah-Kishtwar (Figure 1). The last mentioned area did not have any published record of markhor occurrence but departmental records of the Kishtwar National Park suggested that they were present there and the area was thus included in the survey.

The Pir Panjal range runs roughly from south to north Kashmir and separates Poonch and Rajouri in the Jammu region from the Kashmir region. All the six blocks are in the Pir Panjal range. Poonch and Bhaderwah-Kishtwar lie on the southern slopes of this range in the Poonch and Doda districts respectively, while the other areas are in the Kashmir region on the northern slopes of the Pir Panjal. Kaj-i-nag and Shamshabari are on the northern banks of the Jhelum. At one end Poonch is connected with Hirpura of district Pulwama in south Kashmir through the Mughal road that passes over the Pir Panjal, and at the other end it is connected with Gulmarg in district Baramullah of north Kashmir.

1.2.1 Climate

The temperature in the region varies from a minimum of –10°C in winter to a maximum of 30°C in summer. Precipitation is mainly brought by westerly disturbances during winter and falls largely as snow, and is undoubtedly a

factor of importance in determining the type of forest met with. The four distinct seasons in the region are: Spring (March to May), Summer (June to August), Autumn (September to November) and Winter (December to February).

1.2.2 The Survey Blocks

Some information on topography and vegetation of each survey block (Figure 1) is given below:

Poonch Survey Block

Poonch district of Jammu and Kashmir is situated at about 250 km to the northwest of Jammu town. Poonch was a separate state till the 1940s. The team surveyed Loren, Mandi, Sawjian, Surankote and Chandimad areas of Poonch– areas that are situated in the foothills on the south of the Pir Panjal. The prominent vegetation types found here are Low Level Blue Pine Forests (12/cIf), Western Mixed Coniferous Forests (12/c1d), West Himalayan Upper Oak-Fir (12/C2b), West Himalayan Sub-alpine Birch/Fir Forests (14/c1b) and Sub-alpine Pastures (14/DS) (Champion & Seth, 1968). The Low Level Blue Pine Forests are dominated by kail pine (*Pinus wallichiana*) and the associated species are fir (*Abies pindrow*), spruce (*Picea smithiana*) and oak (*Quercus semecarpifolia*). Western Mixed Coniferous Forests have fir and spruce as the main species mixed with deodar (*Cedrus deodara*) and kail. By interacting with people, we came to know that most of the people in these areas along with their livestock migrate to the sub-alpine and alpine pastures of Pir Panjal during summer. They have established sites called *dhoks* where they stay in summer. The famous Mughal road passes through Chandimud and goes through the Hirpura Wildlife Sanctuary in south Kashmir to the state capital in Srinagar. This is the main route used by *bakerwals* of Poonch and Rajouri to reach Kashmir to graze their livestock in different alpine pastures. Loren is also connected with Kashmir through a different trail.

Bhaderwah-Kishtwar Survey Block

Bhaderwah and Kishtwar fall in the Doda district of Jammu. Bhaderwah is about 180 km to the east of Jammu and is surrounded by rolling mountains covered with coniferous forests. Bhaderwah shares its eastern border with the Chamba district of Himachal Pradesh and south and south west with Kathua and Udhampur districts. Kishtwar is about 200 km to the southeast of Jammu along the Chenab River. Here, the team concentrated more on the Padder area, about 60 km from Kishtwar.

The region up to the Gulabgarh village in Padder block was surveyed. This village has been named after Maharaja Gulab Singh. Unlike Bhaderwah, this area is covered with steep and moderately steep mountains. It is contiguous with the Zanskar range in the northeast. The vegetation is similar to that of the Poonch survey block.

Hirpura Survey Block

This block was within the Hirpura WLS (c. 114 km^2), which was notified in 1987 and lies in the Pir Panjal Range 70 km south of Srinagar. It is bounded to the north by Lake Gumsar, northeast by Hirpura village, east by Rupri, south by Saransar and to the west by the Pir Panjal pass. The Old Mughal road crosses the sanctuary from west to east covering c. 30 km, starting at Poonch and ending at the Hirpura village. The road cuts the sanctuary into two almost equal parts with distinct habitats. The slopes are gentle to moderately steep on the eastern aspect and very steep with many cliffs on the higher northern and western aspect. The southern and southeastern portions are moderately steep.

The vegetation types present here include Western Mixed Coniferous Forests (12/c1d), Deciduous Sub-alpine Scrub (14/1s2) and Sub-alpine Pastures (14/DS1) (Champion & Seth 1968). Western Mixed coniferous forest is dominated by kail pine with spruce and fir as its primary associates. In Hirpura, the West Himalayan Sub-alpine Forests are dominated by fir (*Abies pindrow*), while the Deciduous Sub-alpine Scrub is dominated by Birch (*Betula utilis*) and juniper (*Juniperus communis*) with *Rosa spp.* as an associate.

The southeastern part has moderately open coniferous vegetation dominated by kail pine and associated with fir and spruce. The vegetation of the more rocky and open northwestern portion is predominantly sub-alpine scrub forest dominated by Juniper and the kail pine as an associated species. Man-made sub-alpine pastures also occur in both northwestern and southeastern parts of the sanctuary.

Gulmarg- Boniyar survey Block

This block occupies the southern bank of the River Jhelum. The western boundary of the block is under LoC fencing and the topography is moderately steep to steep at places. The area looks moderately open with different forest types including Western Mixed Coniferous Forest (12/C1d), West Himalayan Sub-alpine Birch/Fir Forests (14/C1b) and Sub-alpine Pastures (14/DS1) (Champion & Seth 1968).

Kaj-i-nag Survey Block
Kaj-i-nag occupies the north bank of the Jhelum and has three Protected Areas viz. the Limber WLS, Lachipora WLS and Naganari Conservation Reserve (Fig 1), that served as three separate sub-blocks during our survey. The Kaj-i-nag ridge separates these sanctuaries from the Hundwara-Shamshabari area (see below). The area is approximately 70 km to the west of Srinagar along the Jhelum River.

Limber Wildlife Sanctuary
Limber WLS was notified in 1987 and encompasses an area of about 44 km^2. It is bounded to the north by Bhurji forest in Langet Forest Division to the south by the River Jhelum, east by Katha Forest and west by Islamabad nala. Along the west, it is connected with the Lachipora WLS and along the east with Naganari Conservation Reserve. Limber WLS is fed by two main nallahs, Mithwani and Gamalitter, which drain into the Limber nallah, which in turn drains into River Jhelum (Figure 1). The area consists of steep and moderately steep slopes broken by rocky cliffs at many places.

Lachipora Wildlife Sanctuary
Lachipora WLS, which is about 93 km^2 in extent was also notified in 1987 and lies immediately west of the Limber WLS. It is bounded in the north by Kakua Forest in Langet forest division, south by Maidan Forest, southeast by the River Jhelum, west by the LoC and east by Bagna and Limber forests. Three main nalas, from east to west, that drain this sanctuary are the Gujjar nallah, Malangan nallah and Ghoretal nallah. These encompass the catchment of Katha Nilang, which flows into the River Jhelum. The entire area is steep and broken by precipitous cliffs.

Naganari Conservation Reserve
Naganari Conservation Reserve is about 20 km^2 and lies to the east of the Limber WLS and the topography is similar to that of Limber.

The vegetation types in Kaj-i-nag covering the three sub-blocks are Western Mixed Coniferous Forests (12/C1d), West Himalayan Sub-alpine Birch/Fir Forests (14/C1b), Deciduous Sub-alpine Scrub Forests (14/1s2) and Sub-alpine Pastures (14/DS1) (Champion & Seth 1968). The dominant species in temperate coniferous forest are spruce, fir and kail pine with occasional deodar in lower slopes. Birch is the dominant species in the sub-alpine forest and juniper in the sub-alpine scrub. Other plant species include *Juglans regia*, *Rosa macrofolia*, and *Viburnum grandiflorum*. Lachipora was however more open compared to Naganari and Limber.

Shamshabari Survey block
This block lies approximately 150 km north of Srinagar in the Tangdar area of district Kupwara. This area is just north of the Kaj-i-nag range (Fig 1) and consists of rugged mountains with rocky cliffs. The vegetation types found here are Western Mixed Coniferous Forests (12/c1d), West Himalayan Sub-alpine Forests (14/C1b), Deciduous Sub-alpine scrub (14/1s2) and Sub-alpine Pastures (14/DS1) (Champion & Seth 1968).

1.2.3 People
The people of Kashmir are primarily Muslims. In Padder, the majority are Hindus and in Poonch there is a mixed population of Hindus, Muslims and Sikhs. Most of them are agriculturists and the main crop is maize. Paddy is also cultivated in the lower hills and plains. Livestock consisting of sheep and goats, buffalos, horses, oxen and cows are reared as an important source of income. Walnut is one of the main cash crops grown here, while apple is also important in some places. There are numerous *gujjars* and *bakerwals*, traditional pastoralists, who come into various parts of the area with their livestock during summer. The *gujjars* primarily herd buffaloes and the *gaddis* and *bakerwals* herd sheep and goats.

Kashmir has a human population of 5,441,341 and the Jammu region 3,976,395 based on the recent census (Anon. 2003). In the districts we surveyed, the population totals 3,517,532 (Baramulla-1,166,722, Pulwama-648,762, Kupwara-640,013, Poonch-371,561, and Doda-690,474). There is no clear estimate of the number of families or the population of migratory herders coming into the area.

1.3 Methods

The primary goal of the survey was to identify the current distribution and the status of markhor in Jammu and Kashmir. The survey was also to identify the key threats to markhor and wildlife in general in the surveyed areas. The team also studied habitat utilization, population structure and composition of markhor but due to the vast and scattered nature of the survey area and limited time, only preliminary information on these aspects could be obtained.

As per old records,markhor were distributed over a large stretch of area from Poonch in the southern aspect of the Pir

Panjal in Jammu, to Uri and Tangdar in Kashmir covering an area of approximately 300km^2 (Figure 2a). There has been no comprehensive survey of the markhor so far, and therefore identifying the potential blocks for survey was difficult. However, the team first compiled information based on personal experiences (the PIs in particular) and other key informants such as some local wildlife officials. An old Shikar map of Kashmir (Survey of India, 1947) was used to identify the blocks to survey. The six blocks identified were Hirpura, Gulmarg-Boniyar, Shamshabari, Kaj-i-nag, Pooch, and Kishtwar-Bhaderwah. Areas were covered in this order in November and December 2004 and January, 2005. In the repeat survey during the spring of 2005, the team surveyed Hirpura WLS between 23 and 30 April, Limber WLS between 4 and 15 May and Nagnari Conservation Reserve between 26 and 29 May 2005.

After identification of the survey blocks, both the primary surveys and secondary sources of information were used to obtain data on markhor in a given block. In the secondary surveys, local people, especially the *shikaris* (hunters) were interviewed for information about the occurrence of markhor. In the primary surveys, areas reported to hold markhor were visited to obtain direct sightings and also indirect evidences like footprints and pellets. However, due to inclement weather, the team relied only on secondary sources of information to gather data on markhor occurrence in Poonch and Bhaderwah-Kishtwar areas of Jammu. Surveys were conducted in two phases, once in the autumn and winter of year 2004 and thereafter, based on recommendations of this survey, in spring 2005.

1.3.1 Secondary sources - interviews with hunters, villagers and defense personnel

After reaching the survey block, enquiries were made about local shikaris and other people knowledgeable about wildlife in the region. Presenting themselves as researchers, the survey took adequate precaution not to intimidate the local people. Once a person was ready to give details, he/she was shown pictures of other wild goats, sheep and deer (Menon 2003) and asked to name the ones that they knew. If found knowledgeable, the subject was queried further on the distribution and range of markhor in that area. This information was used to plan surveys within the location.

In all the team covered approximately 418 km on foot, and interviewed 78 people for information on markhor in the six survey blocks. Of these, 40 people gave relevant information about markhor.

1.3.2 Primary surveys - walks (indirect & direct evidences)

After the initial exercise of finding out the areas in a block to be surveyed, two teams comprising of two to three persons were formed. Since markhor occurred in moderate to dense and steep pine forests in many areas, it was not possible to scan for them and the team had to traverse through the forests to look for them. Besides, the teams also looked for markhor by walking on trails along the valleys and ridges. Because of the relatively dense nature of the markhor habitat, the team adopted the 'silent drive count method' (Rodgers 1991) to flush out markhor. In this, two to three beaters would spread out near cliffs and other potential markhor sites to beat through the slopes and drive any markhor towards observers sitting at vantage points.

Since the sightings of the markhor were made mostly in the mornings and evenings, the team tried to be in the field during this period. Binoculars and a spotting scope were used to scan the areas. Once a markhor was sighted, the time of sighting, location name (pasture, etc), coordinates (if possible), number of markhor in the group, their sex and age composition (based on Schaller 1977), position on slope, elevation, vegetation type, slope-steepness, aspect, land-surface ruggedness, distance to cliff, distance to livestock and distance to settlements were recorded. Besides, other details such as the starting time and end time and survey block name were also recorded. Since the animals were quite rare in some areas, indirect evidences like the presence of pellets and footprints were also noted (especially in areas where sheep & goats were absent). Similar information was also recorded for other wild ungulates in the area.

1.3.3 Mapping the distribution

An important output of the survey is the current spatial distribution of markhor in Jammu and Kashmir making it possible for comparison with the past known distribution. This was a challenge given the difficult access to the maps of these restricted areas. Vector Maps from the Digital Chart of the world were used to generate Digital Elevation Models of the state on 1:1,000,000 scale. The Shikar map was geo-referenced based on known locations of five places and distribution of markhor was digitized. Using the field notes, the present distribution of markhor was then digitised. The Geographical Information System softwares Manifold and Mapinfo were used for the purpose.

CHAPTER 2

MARKHOR IN JAMMU AND KASHMIR: THE PRESENT SCENARIO

2.1 Occurrence in Kashmir

Markhor was seen only in the Kaj-i-nag range and the Hirpura wildlife sanctuary, while confirmed evidences of their presence were obtained from the Boniyar and Poonch survey blocks (Figure 2b). No recent evidence of markhor was found in the entire Shamshabari range. The populations here are either extinct or near extinction. In the Baderwah-Kishtwar block the team did not find any evidence of their presence, even in the recent past.

Thirty-five markhor groups comprising 155 individuals were sighted. All sightings were confined to the two survey blocks of Hirpura and Kaj-i-nag

Within the Kashmir Valley, markhor were present in approximately 300 km^2 in 1947 in eight almost isolated populations (Figure 2a, Table 1). One population in Shamshabari (No.2) and one in Gulmarg-Boniyar (No.6) are now in the Pakistan Occupied Kashmir (SOI map-1947). The maximum distribution range of markhor was in the Kaj-i-nag range (125 km^2), while most others were much smaller areas (Table 1). In the year 2004 also markhor had the largest occurrence in Kaj-i-nag. However, the range had shrunk dramatically in Kaj-i-nag, Boniyar, Gulmarg and Poonch. The populations in Shamshabari may be restricted to very small pockets (see 2.1.4), if at all and the Banihal Pass population and eastwards is extinct.

S.No	Area/Survey Block	Area	
		1947 (km^2)	2004 (km^2)
1	Shamshabari N	25.3	?
2	Shamshabari Across LoC	28.0	-
3	Shamshabari S	27.3	?
4	Kaj-i-nag	125.6	43.5
5	Boniyar	17.6	10.0
6	Boniyar (across LoC)	32.2	-
7	Gulmarg (Nilkanth area)	12.1	10.0
8	Hirpura	0	13.0
9	Poonch	30.0	25.0
10	Banihal pass	6.0	?
11	Baderwah-Kisthwar	NA	X
	Grand Total	**304.06**	**101.5**

Table 1: Markhor in Jammu and Kashmir: their past and present range of occurrence. Past range was calculated from the 1947 Survey of India Shikar map

?: Population most probably extinct, but there is insufficient information
X: Population certainly extinct or never occurred in the recent past
- : Site outside the survey area in PoK

(Note: For Boniyar & Gulmarg, where direct evidences of markhor were not present, estimates were based on local interviews and checking the area concerned in the field. The area for Poonch is estimated from Departmental records and local shikaris.)

2.1.1 Markhor in Hirpura

The team surveyed about five km of the Rupri nala and the Hathi Pahad area; in all covering about 25 km of the lower portion of the known markhor range of the sanctuary (Figure 3a). The upper slopes of the Begum Pathri from Dobchen to Zaznar covering about 20 km were trekked. Further, camping at Zaznar, the areas of Sotsal Pathri and Sathran of about 15 km were covered. Then the Pir Panjal nala for six km was covered till the Aliabad Sarai, close to the Pir Panjal pass that leads into Poonch.

All the six sightings (25 markhor) were in the northeastern part of the sanctuary. Two groups were seen in Zaznar area, two in Dunali near Zaznar, one group in Teli and another in Rata Teli (Figure 3a). The search in southeastern part of Rupri nala could not yield any sighting. However, enquiries with locals suggested the presence of markhor in the areas of Kamal Kot, Sotchal Pathri, Begampathri, Lacut Sathran, Bod Sathran and Yangenad. According to locals, most of these were sighted during the spring season. It is estimated that the total range of markhor in Hirpura is c. 13 km2. Interestingly, none of the areas in Hirpura are marked in the 1947 Shikar map (Survey of India 1947). Burrard (1925) and Stockley (1936) also do not mention Hirpura specifically for markhor though the latter suggested that markhor occurred almost continuously from Banihal pass till Shamsabari which would include Hirpura.

The south and northeast portions of the sanctuary are contiguous with the Poonch area of Jammu where there is a small population of markhor and some amount of exchange in populations cannot be ruled out. While 25 markhor were sighted in Hirpura, at least three were probably animals sighted on two consecutive days, making 22 as the actual number of animals counted. Based on local reports it could be guessed that the area may be home to at the most 50 markhor with most of them confined to the upper Zaznar area. As is true for all other areas, a more detailed survey in the spring season when markhor are confined to the lower snow -free areas can yield better population estimates (see Chapter 4).

Hirpura Survey area

In the spring of 2005, 25 markhor in eight groups were once again sighted (after eliminating double counts) in this region.

2.1.2 Markhor in Boniyar-Gulmarg

The team started from Gulmarg covering the Bhuta Pathri area and then walking into the Boniyar catchment over the Naobalan ridge (Figure 1, Figure 3b). The plan to directly descend into the Chotali village and Somali via Sallar, areas known to have potential for markhor, had to be changed since deep and hard snow on the ridge made it impassable without specialized equipment. Hence, a diversion of about 20 km was taken via Benali to Gagerhill village in order to reach our survey sites. Most of the potential areas of Sallar and Noori could be only scanned from the opposite slope using binoculars and a spotting scope.

Covering a distance of over 30 km, no direct or indirect evidences were seen in Noabalan, Sallar and Noori areas of the block. However, interviews with poachers in the nearby villages of Somali and Chotali did suggest the presence of markhor in Sallar and Noori. These poachers also admitted shooting markhor in Sallar some years back. Sallar was known to be a favoured site for the Rajas of Nambla to hunt markhor during the sixties (Mohd and Beigh, *pers. com*.). A horn of a female markhor was seen in one of the houses of a poacher. The animals are present in this area, but appear to be extremely rare at present. They are confined to the southeastern part of Sallar and the total range here may be merely 10 km^2. Though no clear idea of their numbers could be obtained, they are almost certainly less than 30.

While the Gulmarg WLS could not be covered, confirmed reports indicate a small population of markhor in the vicinity of the Nilkanth peak, information that was corroborated in the Poonch survey.

2.1.3 Markhor in Kaj-i-nag

Limber WLS

Some members of the survey team reached one day before the start of the survey and camped at Babagail. The areas of Rambra, Geer pajja and Kalanwali were surveyed on the first day covering about 15 km. Other members arrived a day later and camped at Babegail and the team surveyed the areas of Rambra, Hoobal, Kalamund, Malnav Nad, Pahal Pathri and Burzakut Top in all covering about 25 km in the markhor range in Limber. Subsequently, camping in

Rambra caves in Methwani nala, the areas of Safed Fresh, Dadda covering about five km in the markhor range were surveyed. On the second day, the team walked along the nala for about five km. and surveyed the areas of Kalan Wali, Chemb, Methwani Bahak, Kandi Nala and Shetlu covering about 12 km. On the final day, the team again went across the Safed Fresh and surveyed Kotherpal and Dadda covering about five km. Subsequently the team camped at Gammalitter and surveyed the Hokhyan, Lacut Kothenal, Bod Kothenal, Wanten Dekke, Bapal, and Thulthulun areas covering about 20 km (Figure 3b).

The largest population of markhor among the surveyed sites was in the Limber WLS of the Kaj-i-nag survey block where 113 markhor were sighted in 24 groups (without any double count). Thus, this is the minimum number of markhor seen in Limber. Of the 24 groups, three groups each were seen in Rambra, Safed Fresh and Hoobal, two groups each in Kotherpal, Lacut Kothnal and Geer Pajja and one group each in Kalamund, Pahal Pathri, Malnav Nad, Dadda, Kalan Wali, Kandi Nala, Shetlu, Wanten Deke and Hokyan. Based on local reports and sightings, the estimated number of markhor in the area may be close to 150.

All of the 24 groups sighted except one in Rambra were seen in moderately vegetated steep forests consisting of blue pine, spruce, and fir. Most markhor were sighted on mid to upper slopes.

During the repeat survey in spring, 154 sightings of markhor in 32 groups were recorded in the Limber area. However, after eliminating double counts, an estimated 92 markhor individuals were seen. About half of the markhor sightings occurred in Hoobal area of Methwani nalla. Other sightings occurred in Safed Fresh Pud, Kalamund, Wanten Pud, Semiken, Hokhyan, Maven Nad, Kothrpul, Pahal Nala and Shatlu.

Lacchipora WLS

In the adjoining Lachipora WLS, only three groups with five individuals were seen. About five km was covered in the Malangan nala (Fig 3b) and about 10 km in the Ana Dub and Pir ki Jaga slopes. The team could not move further in this nala due to security reasons. In the Gujjar nala, the camp was at the outskirts of the Lachipora village and the team walked through Jalanmari bahak and Eidnad covering the slopes of Danga pijja and Dadda. Then the Trinadi and Bun bahak were covered for about 15 km in the markhor range. The team then moved to Mainya to survey the Ghoretal nala. This nala is right on the LoC and the team could survey a few areas in Kothharan, and Shiddi covering merely about six km in the markhor range

Three groups of markhor with five individuals were seen in Lachipora WLS in Gukki, Ana Dub and Dadda in rugged slopes with open to moderate cover of pine and spruce.

Enquiries with locals did suggest the presence of markor in Malangan base, Pir ki Jagah, S.P. Nala, Socerwali, Nadi Matha, Gocha Wali, Kothharan, Khanda Nala, Shiddi, GMG Nala, Trinardi and Eidnad.

Based on the interviews, the estimate of the population of markhor is about 50 in the three nalas of the Lacchipora WLS.

Naganari Conservation Area

In Naganari, the Lundmari area was surveyed for about 10 km and the slopes of Tragen and its opposite slope were also surveyed in all covering approximately 15 km. Fifteen markhor were seen in two groups. One group of six animals was sighted at Lundmari in open pine and spruce forest with moderate cover and the other comprising nine animals at Tragen in open deodar forest and moderate cover. Based on the observations and discussions with local hunters and an informed source, Dr Francis in Baramullah, around 25 markhor could still be present here.

Burrard (1925) and Stockley (1936) had both talked highly about the Kaj-I nag range for hunting and obtaining large heads. However, even in those days they had shown concern about the declining markhor populations. The range of occurrence may be merely 45 km^2 having reduced drastically from the range of 125 km^2 recorded in 1947.

2.1.4 Markhor in Shamshabari

As the team trekked along the dense Kail forest to Patni (immediately north of Kaj-i-nag) from the Hundwara side of the Shamshabari Range, it started encountering signs of ungulates. Foot prints were seen on the snow resembling that of markhor but despite the guide identifying these foot prints as that of markhor the team was not convinced. Some army personnel were interviewed, who denied markhor presence in these parts. About 15 km was covered searching for markhor. After this, the team went to Keran, which is above the Kishenganga River. The poachers, herders and locals were not familiar with markhor. Hence, it is concluded that this is not perhaps among the present markhor range. The team moved on to Tangdhar in the main Shamshabari range. Further, camping at Pathri, the areas of Kunni

Rawal, Ricchi Nala and Yaha Dori, covering about 25 km of markhor range, in Tangdhar area were surveyed.

No markhor or indirect evidence was seen in the Shamshabari survey block. Further, bad weather also hindered the work to some extent. The information about the markhor presence here is relatively old as most informants accepted that they had not visited the potential areas for a long time.

Burrard (1925) ranked the Shamshabari among one of the best places to secure a good Pir Panjal markhor. However Stockley (1936) reported that markhor in Shamshabari had been exterminated at the hands of local poachers. According to local reports, markhor may still be surviving in Yahadori, Kunni Rawal, Gagadori, Shamshabri and Tootmari areas.

2.2 Occurrence in Jammu

2.2.1 Markhor in Bhaderwah-Kishtwar

Only secondary information was collected by interviewing 15 people including shikaris and old forest officials in Bhaderwah, Sartangal, Basti, Halian, Shashu, Shrekhi, Athai and Kishtwar. The secondary information collected indicated that the markhor was not present in the area and probably was never present here. Enquiries, however, confirmed the presence of ibex and Himalayan tahr (Appendix 2).

Markhor in its habitat

2.2.2 Markhor in Poonch

Twenty-five people including poachers, herders and forest officials were interviewed for secondary information regarding markhor distribution in Poonch, Loren, Skidio, Sawjian, Surankot, and Chandimud. Enquiries with these informants confirmed the presence of markhor in different areas in Poonch on the southern slopes of the Pir Panjal. The interviews with poachers indicated that Kalamund, Tatta Kuti, Nilkant, Khara Gali, Chote Gali, Chatta Pani, Noor Pur Naza and the Pattan Kore areas are among the most potential markhor areas. The Nilkant, Chote Gali and Kalamund were preserved by Maharaja of Poonch as Game Reserves and it is said that people were directed to walk bare footed into these areas to protect the grass for markhor (Bashir, Skido Poonch, pers. com.). The other areas where the markhor presence was confirmed are Godenuk, Noorpur Naza, Knada, Pathra, Wansi Doke, Nan Sukh Doke, Easa Wali, 12890 pass, Loren, Dorian, Sarian-nadan, Jemia, Jabdi, Chote Wali, Gazain Wali, Chabba Katha, Baglain, OC Doke, Khun Wali Doke, Poshana, Goda Bun, Kadu, Baila, Pajja, Kiren and Ander Wala. Informed local sources claimed that there are at least 60-70 markhor in this area.

Stockley (1936) reported the markhor distribution in the northeastern part of Pir Panjal near Poonch, which had suffered severely and were reduced almost to the point of vanishing when the Maharajas of Poonch began preserving them strictly. He, however, felt that *gujjars* and *bakerwals* continued poaching in these parts.

2.2.3 Markhor in Bani and Sarthal Block, Kathua

Presence of Markhor in the areas adjoining Himachal Pradesh state in Sarthal, Sandran and Bani have been reported. Sarpnalla on south east end of Sarthal meadow was a famous haunt of shikaris for markhor hunting. The area shall be covered in subsequent surveys in 2005-06 for an evaluation of the present status.

2.3. Status of Pir Panjal markhor in Jammu and Kashmir (other than PoK)

There has not been any earlier range-wide survey of the markhor in Jammu and Kashmir and most of the reports were confined to parts of their range in the state. Comparisons become more difficult as now the LoC divides the populations reported in some earlier texts (Burrard 1925, Stockley 1936). According to Burrard (1925), markhor was found in Pir Panjal, but only where that system lies in the Kashmir Valley. Stockley (1936) reported markhor in Poonch, Hirpura, Boniyar-Gulmarg, Moji nala (on the north flanks of the Kaj-i-nag), and Shamshabari. As per existing records markhor survives in a few small populations in the Shamshabari, Kaj-i-nag and the remaining part of the Pir Panjal range (Schaller 1977). Based on coarse information from the Wildlife Department, Schaller (1977) estimated the number of markhor to be 250-300 in Jammu and Kashmir. Roberts (1997) reported that markhor has been exterminated in J&K by the troops stationed in this region. Suhail and Baba (2002) however, confirmed that they still

occurred in the Limber WLS where they sighted 142 markhor in March 2002.

The following population estimates are mainly based on the data collected during the autumn survey as more areas could be covered then. Thirty-five markhor groups comprising 155 individuals were sighted. All sightings were confined to the two survey blocks of Hirpura and Kaj-i-nag. The largest population of markhor among the survey sites appears to be surviving in the Kaj-i-nag where the team sighted 133 markhor (Table 2). A minimum of 155 markhor were seen during this survey and it is estimated that approximately 280-330 markhor may still survive in the four blocks where their presence has been confirmed in Jammu and Kashmir (Table 2). This figure is more than all previously published records that stated 200-300 as the population (Schaller & Khan 1975; Schaller 1977; Menon 2003). This does not imply any increase in markhor numbers, but is primarily due to the fact that all earlier reports were coarse guesses and not based on surveys, and often only included portions in the Kashmir valley and not the species' range in the Jammu region of the state.

The populations can be roughly divided into two–the 'north of Jhelum' consisting of almost contiguous Shamsabari-Kajinag populations and south of Jhelum consisting of the Boniyar-Poonch-Hirpura populations. While these two populations may have limited exchanges within themselves, it was clear that numerous possibility to do so are also closed due to habitat fragmentation and, importantly, the LoC fencing.

In all, 154 individuals could be classified according to their age and sex. On the whole, more adult males were seen compared to adult females–for every 100 adult females, 134 adult males and 19 young (kids and yearlings) were spotted. The adult female:young ratio appears to be on the lower side compared with other populations of markhor in Chitral that had a ratio favouring young (100 adult females to 104 to 130 young)(Schaller, 1977). Other caprinae such as ibex in Pin Valley NP (100:120) and bharal in Kibber WLS (100:43 to 78 young) also had ratios with proportionately more young (Mishra, 1997). This could indicate relatively high mortality of the young, a factor that needs further investigation.

Area/Survey Block	Number of Markhor Seen	Estimated Population
Shamshabari	0	?
Kaj-i-nag	133	180 - 200
Boniyar	0	20-30
Gulmarg	0	?
Hirpura	22	40-50
Poonch	0	40-50
Bhaderwah -Kisthwar	0	?
Grand Total	**155**	**280-330**

Table 2: Number of markhor seen during the survey and the estimated population for each survey block.

?: Population most probably extinct, but there is insufficient information

Note: The numbers reported here have been arrived at after removing possible duplications. Estimates are primarily guesses based on numerous local interviews as well as the minimum numbers seen in the area.

CHAPTER 3

MAJOR THREATS TO MARKHOR IN JAMMU & KASHMIR

The survey team identified a variety of threats that could endanger the markhor in Jammu and Kashmir. Most of these relate to the proximity to conflict zones between India and Pakistan along the LoC. There are others related to traditional hunting practices in the region. Details of these are given below:

3.1 Poaching

Markhor is generally considered to be the stalker's greatest prize by sportsmen. "As a trophy when well set up, with his long flowing beard and magnificent spiral horns and as a stalker's achievement, he deserves to rank first" (Burrard, 1925). Poaching has been the main threat to markhor throughout its range for centuries. Lydekker (1898) already considered markhor in the Pir Panjal in imminent danger of extermination due to excessive hunting. The shooting ethics were crude, which practically amounted to "shoot what you can, where you can and how you can". The markhor suffered severely and were reduced to near extermination. Burrard (1925) reported that permits for shooting in Kaj-i-nag and Shamshabari were in demand as they used to provide magnificent heads. Most of these areas were remote and were cut off during winter due to heavy snowfall. The locals used to ambush markhor in the snow and catch them and then kill for meat. Markhor meat is locally regarded as the tastiest wild meat.

Apart from the fact that access for the wildlife department staff is restricted in many areas due to security reasons, the long-notified Lachipora WLS has not yet been handed over to Wildlife Department and is still under the control of Forest Department

Markhor was killed and its meat sold in the local markets till recently. The *gujjars* and *bakerwals* in Hirpura have been killing markhor and selling in the market till the area was handed over to Wildlife Department (Ahmad & local wildlife guard *pers. com.*). Markhor in Kaj-i-nag was also facing the same problem before it was brought under the PA network (Rath *pers. com.*).

The excessive poaching of markhor in Jammu and Kashmir came down in areas that were brought under the PA network during the late eighties. However, it continued in the non-protected areas like Poonch, Gulmarg-Bonyar and Shamshabari till the early nineties. In the early years of militancy (1990-92), modern arms were easily available and there was not much army movement or any effective law enforcement and this took heavy toll on the wildlife at most places. The situation did seem to change with greater control over the areas. However, poaching continued in pockets. In Lachipora, notified in 1987, but not handed over to the wildlife department, poaching seems to be occurring. Poaching is also reported from Poonch. The locals are mostly herders who with their livestock go to the sub-alpine and alpine pastures and get involved in poaching. These herders and the *bakerwals* possess guns to protect themselves and their livestock from the wild animals. But they reportedly misuse their guns for poaching.

Alpine pastures where the *gujjars* and *bakerwals* migrate with their livestock

3.2 Grazing

The *gujjars* and *bakerwals* possess a large number of livestock, which is their main source of livelihood. To take advantage of seasonal variations in forage availability across the Pir Panjal range, they traditionally migrate to alpine and sub- alpine pastures during summer from the month of June to September. The *gujjars* with their livestock migrate mostly locally but *bakerwals* of Poonch and Rajouri migrate with their livestock to Kashmir. The *gujjars*, *bakerwals* and local shepherds at many places establish their summer grazing camps in the existing PAs or have their route through the PAs. The Hirpura WLS is dotted throughout with permanent bakerwal huts which are used during summers. This sanctuary is also one of the main routes to Kashmir for the migratory *bakerwals* of Poonch and Rajouri. The sanctuary and most of the area appeared to be overgrazed. The Limber, Lachipora, Naganari and Gulmarg-Boniyar primarily cater to local grazers. There are few reports of *bakerwals* visiting the upper parts of the Limber WLS .The level of grazing in these areas appears to be highly restricted due to changing lifestyles and also restricted access to some pastures due to security reasons.

3.3 Deforestation, fuel wood extraction and collection of non-timber forest produce

Deforestation: The demand for timber in Kashmir is very high as it is heavily used in construction. Deforestation occurs mainly in areas that are not under the control of wildlife department, though in the PAs the herders may be responsible for some deforestation for construction and fuel. The team observed tree felling inside the Lachipora WLS, which has not been handed over to the Wildlife Department by the Forest Department.

Fuel wood extraction: Local people, migratory herders as well as the defense forces mainly do this to cook and to keep warm in winters. In some areas, this seemed to be unregulated.

Non-timber forest produce collection: The local people at some places go inside the PAs to collect the highly valued mushroom (*gucchi*) and medicinal plants. While this is unregulated at all places, the team could not get any idea of the extent to which this is taking place. This, however, has a potential to be a major threat to the general biodiversity of the region.

3.4 Turmoil

Nilkant-Poonch, Gulmarg-Bonyar, Lachipora WLS, Shamshabari are all adjacent to the LoC and have experienced shelling for many years. Thus, animals close to the LoC would always be prone to being killed or injured in the shelling and cross-firing.

The fencing on border to control the infiltration of militants has created permanent barriers for the wild animals also. Markhor populations seem to have been divided permanently by the fencing.

To combat the cross border shelling and control the infiltration, security forces have been deployed on the Indo-Pak border. Their presence in the area, especially when their supplies come in may be potential sources of disturbance. However, army presence can also have its advantages because being remote, very often army patrols can be meaningfully used to monitor areas with Markhor.

3.5 Lack of infrastructure

There is a general lack of field staff throughout the Markhor range and those who are there, are ill-equipped, largely untrained and lack basic infrastructure for patrolling the area.

3.6 Lack of control over some areas by the Wildlife Department

Apart from the fact that access for the wildlife department staff is restricted in many areas due to security reasons, the long-notified Lachipora WLS has not yet been handed over to Wildlife Department and is still under the control of Forest Department. Though there are potential sites, no PA exists in Poonch, which had a game reserve even in the Maharaja's time during the 1940s.

3.7 Lack of awareness

There are numerous stakeholders in the region, such as the local villagers, migratory herders from outside, the defense forces and staff of the other Government departments. The team found that there was considerable ignorance about wildlife in general and markhor in particular and its precarious status among them. Some Army officers, for example, were very surprised to learn that there were probably only 300 to 400 markhor in India. Some informed sources felt that while the hangul (*Cervus elaphus hanglu*) has attracted considerable heritage value in the state, the same is not true for the equally deserving markhor. They felt that this was also probably due to ignorance about this species at the policy level.

3.8 Disease transmission

There is every possibility of disease spreading from the livestock to markhor. Diseases like foot and mouth are reportedly common in livestock and can pass to markhor. In Kaigah, a part of PoK, not far from the LoC, Nawaz (2002) reported an outbreak of enterotoxaemia in domestic goats that could spread to the markhor too.

CHAPTER 4

RECOMMENDATIONS

The rapid survey gave insights about markhor occurrence and threats, hitherto unknown. Based on these, some preliminary, but pertinent recommendations are presented here that will enhance conservation of the species in Jammu & Kashmir. The recommendations based on the survey are:

1. **Hirpura and Kaj-i-nag are priority sites for Markhor conservation.**
   At present, the two sites of Hirpura WLS and Kaj-i-nag range have the best possibility of population recovery and are being potential 'source populations' for conservation and restocking of the markhor in the rest of its range. Any conservation program should concentrate on these areas on a priority.

2. **Lachipora WLS, Limber WLS and Naganari CA should be amalgamated into Kaj-i-nag NP and WLS.**
   The Kaj-i-nag range consists of three contiguous PAs–Lacchipora WLS (c. 114 km^2), Limber WLS (c. 44 km^2) and the Naganari Conservation Area (c. 20 km^2), which have markhor at present. The Lacchipora WLS is still controlled by the Forest Department, and the Wildlife department does not have any say in the management of this area. It is important that the notified PA is handed over to the Wildlife Department for management. Further, there is an urgent and important need of merging the three PAs into one unit and zoning the area to incorporate inviolate core zones within these. The boundaries of the three combined PAs need to be extended and redefined to cover the summer and winter habitats of markhor and other critically endangered species like the western tragopan. The core inviolate area should become a National Park and could be designated as the Kaj-i-nag National Park. The other contiguous areas, which have resident human population or usage, could be designated, as a wildlife sanctuary and act as a buffer to the National Park. An attempt should be made to define the limits of both the proposed National Park and the adjacent Sanctuary and record it on the map as accurately as possible.

   There are other markhor sites with potential of inclusion under the PA network in the state, which can be designated after further surveys. One such area identified during the survey is in the Poonch district (including the Tattakutti, Kalamund and Neelkunth areas). These areas also should be surveyed for markhor and other wildlife and recommended for inclusion within an appropriate PA.

There is an urgent and important need of merging the three PAs into one unit, the Kaj-i-nag National Park and zoning the area to incorporate inviolate core zones within these

3. **Collaborative management of Markhor areas with the Indian Army should be worked out.**
   The army provided invaluable support during these surveys, and can play an extremely important role in working jointly with the Wildlife Department and other interested agencies in conserving this species. Although a joint comprehensive conservation program needs to be developed, support is needed primarily in curbing poaching. A more tricky issue is that of the LoC

fencing that has fragmented the meager markhor habitat. A solution to this issue seems difficult, but is possible in places if the fencing is moved up further towards the ridge and closer to the actual LoC to add the critical habitats to the area under army control. Some such sites can be suggested based on the present survey as well as any further survey for this specific issue.

4. **Conservation education and awareness must be carried out.**
All stakeholders including local villagers, *gujjars, bakerwals*, Forest Department personnel, other Government staff, and the Armed Forces must be educated about conservation issues in general and markhor in particular. Well-directed programmes targeting these groups with emphasis on markhor as a unique part of local heritage can help in changing attitudes. Locals, especially hunters need to be motivated to conserve markhor and other wildlife.

5. **Capacity building of the local wildlife department in terms of manpower, resources and training to conserve the markhor needs to be carried out.**
The Wildlife Department in general, especially in markhor areas has very few equipped and trained staff. Capacity building is needed in enforcement, wildlife law, wildlife monitoring and management planning. There is an urgent need for high- altitude clothing and camping gear for the staff. Patrolling huts inside the wildlife sanctuaries, at least in Limber and Hirpura, should be provided to encourage regular patrolling of the area.

6. **Rescue and rehabilitation of markhor needs to be managed.**
A rescue and rehabilitation center could be established for the animals rescued from illegal captivity or in an injured condition. Since most of the distribution of the Pir Panjal markhor is along the border, there are chances of injuries due to shelling. Moreover, the habitat is very rugged and in winter landslides can also hurt the markhor. It was recorded that a markhor got trapped in LoC fencing and died whereas a brown bear had a narrow escape. A Markhor was also reported killed due to landslides. Such injured animals can be rescued and rehabilitated considering its endangered status. A good scientifically managed facility where such a population is carefully built up, through rescued animals is needed. This facility can be established in the Kaj-i-nag area and not in any town. This matter needs specialized input and should be based on a long term conservation plan for the species.

7. **Livestock grazing should be controlled in Hirpura WLS.**
In the Hirpura WLS there seems to be heavy summer grazing by the migrant *gujjars* and *bakerwals* in markhor areas that has pushed markhor to sub-optimal regions of the PA. This needs to be urgently controlled so that markhor populations can recover in the region. To begin with, a good inventory of herders, their livestock holding, areas used and duration of stay is needed from these areas.

8. **A more detailed understanding of the ecology of the species is needed.**
This step will greatly help in understanding the population dynamics, specific habitat requirements, food habits and also in mapping other potential areas of markhor in Jammu and Kashmir, where animals can be re-introduced (after negating the threats that caused its extinction).

9. **Wildlife tourism needs to be developed to provide viewing of markhor and other wildlife.**
There needs to be a special eco-tourism plan evolved for Limber WLS and Hirpura WLS. This has to keep the conservation interests of the habitat and wildlife species, especially endangered species such as the markhor. This recommendation might help the need to conserve wildlife, especially endangered ones such as the western tragopan, brown bear, musk deer, etc. using markhor as a flagship species as was done in the case of theTiger.

10. **Non wildlife agencies should be empowered under the Wildlife Protection Act.**
There is a need to empower field commanders of the army in these areas with legal powers as provided to the Chief Wildlife Warden. By virtue of their task and deployment, once conferred with legal powers, these field commanders will be able to assist the concerned authorities in ensuring protection of wildlife. Details of this arrangement have to be worked out in consultation with concerned agencies.

11. **An intelligence network needs to be formed.**
Illegal trade in animal products and timber is highly lucrative wherein the efforts to curb them have not been successful due to lack of a effective and comprehensive intelligence mechanism. There is a need to create a functional intelligence network to facilitate enforcement. Ex-servicemen, old poachers and knowledgeable locals could be co-opted in such an intelligence network. Since the army is operating along the borders, legal powers if given to the local army field commanders in these remote areas with a sound intelligence network will enable the field commanders to contribute to the protection of wildlife.

APPENDIX I
DISTRIBUTION, STATUS, MORPHOLOGY AND BIOLOGY OF THE MARKHOR

The Kashmir Markhor

(*Capra falconeri falconeri* Wagner 1839)

Systematic position

Markhor (*Capra falconeri*) belongs to the Family Bovidae, Subfamily: Caprinae, Tribe: Caprini, Genus: *Capra* and Species: *falconeri.*

Simpson (1945, in Schaller, 1977) divided the subfamily Caprinae into 4 tribes and 14 genera.

Status: Markhor is endangered (EN - C2A) in the IUCN Red List (2000). In India markhor is included in the Schedule 1 of the Indian Wildlife Protection Act (1972) and also the J&K Wildlife Protection Act (1978). It is included under the Appendix I of the CITES (2000). Markhor occur in three Wildlife Sanctuaries and one Conservation Reserve, in all covering an area of 251.7sq.km in J&K.

Schaller (1977) estimated that the total population of markhor to be 250-300 in Jammu and Kashmir. Roberts (1997) reported that markhor in Pirpanjal have been practically exterminated by troops stationed in the border region. However Suhail and Baba (2002) confirmed markhor in Limber Wildlife Sanctuary of Kaj-i-nag range

There may be only c. 2,000 Kashmir markhor in the entire range, while the Astor markhor may number close to 4,000. The Sulaiman and Kabul markhor may also number close to 2,000. Hess (1993) estimated the population of the Flare-horned markhors in Pakistan to be less than 2,500 whilst the straight horned total population was estimated to be around 2,000 (Schaller 1977). Poaching has been identified as the major cause for the decline of markhor populations range-wide (Stockley, 1936; Schaller 1977, Roberts, 1997).

Distribution: Markhor have limited geographical distribution in the moist to semi-arid mountain tracts of Pakistan, India, Afghanistan and Russia (the Commonwealth of Independent States - CIS) (Schaller, 1977, Shackleton 1997).

According to Schaller (1977), the Kashmir type markhor extends from Laghman Province and the Bashgul River area of Afghanistan into Pakistan. The flare horned markhor further extends into the CIS as the Tadjik markhor (C. f. heptneri) and is reported from Tadjikistan (Dastidjum district), Turkmenistan and Uzbekistan. In India, markhor is practically confined to the extreme eastern limit of its range and occurs only in the Pir Panjal range in J&K where they still survive in a few small populations in the Shamshabari, Kajinag and Pir Panjal ranges (Schaller 1977). Burrard (1925) had reported that the Kaj-i-nag and Shamshabari mountains are the best places for Pir Panjal markhor and are found even in some of the nallas which run down into the lower part of the Kishengunga valley on the left bank of the river. According to Stockley (1936), after passing one valley of the mountain west of Banihal pass, begins distribution of markhor and continues north and west many hundreds of miles. The same type persists to the north in Kaj-i-nag but has been almost exterminated by local poachers in Shamshabari range north of Kaj-i-nag. Suhail and Baba (2002) reported a minimum of 138 markhor in Limber WLS in the Kaj-i-nag mountains based on their survey repeated over two days.

Kashmir markhor in its habitat

In Pakistan markhor occur in many valleys bordering the Kunar River in the Chitral district, from Shogore to Aranduon the west bank and to Drosh on the east bank, penetrating up the Mastuj River, a tributary of the Kunar, as far as the village of Barenis. In Dir District the markhor occurs along the upper Panjkore River, and in Swat district on the cliffs east of Mankial (Burrard, 1925, Schaller, 1977). The main concentration of this subspecies is in Chitral Gol sanctuary and near the Nanga Parvat (Schaller 1977, Hess 1993, Roberts 1997). The markhor, in many other tributaries such as the Neelum valley close to the ceasefire line, have been exterminated in recent years (Khan 1972, in Roberts 1997).

The Astor markhor: The valley of Astor River is its stronghold, but is also found farther north in Baltistan, as well as in two or three valleys to the south of Astor, all of which join the Indus (Burrard 1925, Stockley 1936). It also occurs in almost all the other nallas running into the Indus from Rondu in Baltistan down to Chilas but in lesser numbers (Burrard 1925). However Stockley (1936) reported that the left bank markhor populations from Rondu to Bulachi have been almost cleared out by poachers but may still be found in Mushkin, Mayadas and Domel. The real stronghold of Astor markhor is considered to be the slopes of the Nanga Parbat massif (Burrard 1925, Roberts 1997).

Astor markhor has colonized northern Pakistan by penetrating up the Indus and its tributaries among them the Astor, Gilgit and Hunza rivers. The animals inhabit both banks of the Indus from Jalkot upstream to about the village of Tungas near Skardu. Gakuch now represents the limit of their distribution along the Gilgit River, Chalt along the Hunza River, and the Parashing valley along the Astor River (Schaller 1977). The markhor population in Chilas district is now precariously small (Roberts 1997).

Straight-horned markhor have a highly discontinuous distribution. This is partly due the erratic location of cliffs and isolated massifs and partly to indiscriminate hunting which has brought the subspecies to the verge of extinction. The Kabul markhor once ranged in a westerly arc from the Indus into Afghanistan to the vicinity of Kabul and southward mainly in Pakistan as far as the Gumul River, which was generally considered its southern boundary (Burrard 1925). Five small populations persist in Afghanistan, mainly in the Kohi Safi area northeast of Kabul. Scattered herds are also found along the Pakistan border in vicinity of the Khyber pass and the northern flanks of the Safed Koh and near Pezu. The Surghar population as well as those in the lower mountain ranges in the North West Frontier Province have been exterminated. It was believed to be extinct in the Shaikh Badin hills but a herd of about twenty was reliably reported in this range south of Banu in 1973 by Schaller (1977).

The Sulaiman makhor is more widespread but also severely restricted in numbers. It occurs in scattered isolated populations on all the major mountain ranges immediately to the north and east of Quetta i.e., Murdar, Takatu, Zarghun, Kaliphat and Phil Gharh (Schallar, 1977; Roberts, 1997). The greatest concentration of this subspecies is in

the Toba Kakar range north of Hindu bagh and on the borders with Afghanistan, including the Tor Ghar Hills west of Fort Zhob. Nasser Tareen (in Roberts 1997) states that by encouraging the local tribes to protect wildlife and create a sanctuary in the Torghar Range, the Sulaiman markhor population there has now reached about 400 using the Takht-e-Sulaiman and on the cliffs north and south of that peak.

Morphology

In appearance markhor are sturdy animals with strong, relatively short thick legs and broad hooves. Both sexes are a reddish-grey colour with more yellowish buff tones in summer coat and more grey in the winter coat. The tail, which is naked in its ventral surface, is short and sparsely covered with longer black hair. Adult bucks develop much white and grey in their pelage in winter coat and they also have a very extensive black beard followed by a shaggy mane of long hair extending down the chest and from the front part of neck.

There is considerable variation in size between the northern Himalayan population and those inhabiting the hotter drier mountain ranges to the south. Thus the northern races stand 99-101.5cm (39 - 40 inches) at the shoulders with an adult male from Astor being 186cm (73.5 inches) in head and body length (Ward 1924, in Roberts 1997). Weights have been variously estimated as varying from 100 to 109 kg for an adult male from Astor (Roberts 1997). Schaller (1980) gives the average weight of females from the similar smaller Russian population as 36.5 kg, and for males from the same population, as 83 kg.

The horns in the nominate subspecies are very massive in good specimens with a basal girth of 28 cm (11 inches) and a length measured along one keel, of up to 114.35 cm (45 inches) (Stockley 1936). Specimens of the subspecies Kashmir (Pir Panjal) markhor have massive horns with an even greater horn length, 165 cm (65 inches) measured along the curve (Prater 1965, Roberts 1997). Horns of the Sulaiman markhor are smaller and rarely grow longer than 91.4 cm (36 inches) measured straight (Roberts 1997).

Biology

Markhor is gregarious and the females with their young and sub adult males regularly associate in small herds averaging eight to nine; however, sometimes the herd size may be larger (Schaller 1977, Roberts 1997). They are diurnal animals with greatest activity in early morning and late evening but in mid winter they have been observed in Chitral feeding intermittently during the day (Schaller 1997). Markhor migrate to lower altitudes during peak-winter (Burrard 1925, Stockley 1936). The rut starts in late October in the southern part of their range and lasts about a month. In the northern or the Himalayan tracts the rut starts in early December and is generally over by the end of that month (Schaller 1977, Roberts 1997). Gestation lasts 135-170 days and young are born in May-June.

A FACT SHEET ON THE KASHMIR MARKHOR

REPRODUCED FROM BHATNAGAR, Y.V. (2001)

FLARE HORNED OR KASHMIR MARKHOR

Capra falconeri falconeri, Wagner 1839 Vernacular Names: markhor (Punjab and Kashmir), raphoche (male) rawache (female) - Baltistan

Taxonomy
Family: Bovidae
Sub family: Caprinae
Tribe: Caprini

Conservation Status
IUCN: Endangered
CAMP: Critical
WPA: Schedule I
CITES: Appendix I
US ESA: Endangered

C.E.E.

Distribution & Habitat: Sparsely wooded mountainous regions in the western Himalayan Pir Panjal range at an elevation of 600-3,600 m. In India, they occur only in a few pockets of the Jammu & Kashmir along the Pir Panjal range from Poonch District, to the Kajinag range. Bulk of the distribution is however in the Trans-Himalayan areas, now in the PoK. Other subspecies of markhor occur in the Salt, Safed Koh, Hindu Kush and Kirthar ranges in Pakistan, in eastern Afghanistan and southern Tajikistan.

Description : The grizzled light brown to black coat is smooth and short in summer, growing longer and thicker in winter. Males have long hair on the chin, throat, chest, and shanks, while females have smaller fringes. The lower legs have a black and white pattern. Males have loosely curled, corkscrew-like horns, starting close together at the head, but spreading towards the tips. In males, they can grow up to 160 cm, and up to 25 cm in females. Female horns are also slightly twisted. A dark lateral stripe is present in males and is usually fainter in females.

Size
Body Length: 132-186cm
Shoulder Height: 102cm (65 -115cm)
Weight: 104 kg; Male 100-110kg ; Female 32-50kg
Horn length: Male: 143cm, Female 25-30cm

Reproduction & Life Cycle

Gestation Period: 135-170 days.
Rutting: Mid-Dec to early Jan (varies between years and regions)
Young per Birth: 1 or 2, rarely 3.
Weaning: At 5-6 months
Sexual Maturity: At 1.5-2.5 years, although males do not reach their full potential before age 5-7
Life span: 12-13 years. Males rarely survive beyond their 7-8th year

Behaviour: Occurs in low to mid elevation, open and slightly wooded arid tracts in the Trans-Himalaya and parts of the Greater Himalaya. May migrate up to 4,000m in summer, but essentially remain in areas where rugged valleys and mountains are available at mid-elevations. Distinctly avoid areas with high snow cover. Lack underwool and thus avoid excessively cold areas. The markhor's alarm call resembles the nasal "a" not very different from the common domestic goat. The primary natural predators are leopard, Tibetan wolf, snow leopard, and lynx. Markhor, a wild goat species, are efficient negotiators of steep cliffs and use this to escape predators The markhor is mainly active in the early morning and late afternoon. An intermediate forager, it consumes primarily grasses and forbs during spring and summer months, while in the winter it turns primarily to browse for nourishment. Markhor often stand on their hind legs in order to reach high vegetation; they are known to climb the gnarled trees for foraging. During the rut, males fight for breeding rights. These competitions involve lunging and locking the horns, followed by the combatants twisting and pushing in an attempt to make the other lose his balance. Females and young live in herds of around 8-9 animals; adult males are often solitary.

APPENDIX II

SUMMARY OF MARKHOR DISTRIBUTION, LEVEL OF DISTURBANCE AND THREATS.

Survey Block	Valleys	Areas surveyed	Broad habitat classification	Disturbance level	Markhor presence/ absence	Primary threats
Hirpura	Rupri	Hathi pahad	Moderate pine & fir. Moderately rugged	Moderate	(+)	Grazing, occasional poaching
		Hustvunz	Open pine. Moderately rugged	High	(+)	Grazing, occasional poaching
		Bela	Mixed moderate pine & fir. Moderately rugged	High	(+)	Grazing, occasional poaching
		Ganjteli	Mixed moderate pine & fir. Moderately rugged	Moderate	(+)	Grazing, occasional poaching
		Kamal kot	Mixed moderate pine & fir. Moderately rugged	Moderate	(+)	Grazing, occasional poaching
		Matha tekka	Mixed moderate pine & fir. Moderately rugged	Moderate	(+)	Grazing, occasional poaching
		Sokhsarai	Open pine with moderate cover, moderate ruggedness	High	(+)	Grazing, occasional poaching
		Sarthan	Open pine with moderate cover, moderate ruggedness	High	(+)	Grazing, occasional poaching
		Razdan	Mix moderate pine & fir. Moderately rugged	Moderate	(+)	Grazing, occasional poaching
	Yanga nar	Sotsal pathri	Open scrub dominated by juniper. highly rugged	High	(+)*	Grazing, occasional poaching
		Dunari	Open scrub dominated by rosa, moderately rugged	High	(+)*	Grazing, occasional poaching
	Begampathri	Jabud	Open scrub dominated by juniper. Moderately rugged	High	(+)*	Grazing, occasional poaching
		Lacut sathran	Open scrub dominated by juniper. Moderately rugged	High	(+)	Grazing, occasional poaching
		Bod sathran	open scrub dominated by juniper. Moderately rugged	High	(+)	Grazing, occasional poaching
	Zaznar	Teli	Open scrub dominated by juniper. High ruggedness		(+)*	Grazing, occasional poaching
	Pirpanjal nallah	Rata teli	Open scrub dominated by juniper. Highly rugged		(+)*	Grazing, occasional poaching
		Lalgulam	Open pine with low cover rocky, high ruggedness	High	(+)	Grazing, occasional poaching
		Aliabad sarai	Open meadow	High	(+)	Grazing, occasional poaching

Survey Block	Valleys	Areas surveyed	Broad habitat classification	Disturbance level	Markhor presence/ absence	Primary threats
Gulmarg-Bonyar	Botapathri	Butapathri	Moderate pine with moderate ruggedness	High	?	Grazing, occasional poaching
	Hapat khai N	Noabaln	Open scrub	High	?	Grazing, occasional poaching
		Sallar	Mixed moderate pine, moderately rugged	High	(+)	Grazing, occasional poaching
		Noori	Mixed moderate pine, moderately rugged	High	(+)	Grazing, occasional poaching
		Kandi	Mixed moderate pine, moderately rugged	High	?	Grazing, occasional poaching
		Jabdi	Mixed moderate pine, moderately rugged	High	_	Poaching
		Gagger hill	Mixed moderate pine, moderately rugged	High	_	Poaching
		Chotali	Mixed moderate pine,moderately rugged	High	_	Poaching
		Somali	Mix moderate pine,moderately rugged	High	_	Poaching
Shamshabari	Kunni rawal	Pathra	Mixed pine and deodar, moderately rugged	High	_	Shelling, poaching
		Richhini nar	Mixed pine and deodar, highly rugged	Moderate	?	
		Gagadori	Mixed pine and deodar, highly rugged and rocky	Moderate	?	
	Patni	Dibri	Moderate pine with moderate ruggedness	Moderate	(+)	
		Lakha	Moderate pine with moderate ruggedness	Moderate	(+)	
	Karen	Karen	Pine, moderately rugged	High	_	Poaching, grazing
Limber		Hoobal	Open pine with moderate cover, moderate ruggedness	Low	(+)*	Occasional poaching and fuel wood collection
		Kalamund	Open pine with moderate cover, moderate ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Pahal pathri	Open pine with moderate cover	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
	Methwani	Rambra	Grassland surrounded by pine with low ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Safed fresh	Pine and spruce with moderate cover,low ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Dadda	Open pine and spruce with moderate cover, moderate ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Kalan wali	Chestnut	Low	(+)*	Occasional poaching, grazing and fuel wood coll.

Survey Block	Valleys	Areas surveyed	Broad habitat classification	Disturbance level	Markhor presence/ absence	Primary threats
		Kotherpal	Pine and spruce with moderate cover,low ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Kandi nallah	Pine and spruce with moderate cover, moderate ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Chemb	Open pine with moderate cover, low ruggedness	Low	(+)	Occasional poaching, grazing and fuel wood coll.
		Shetlu	Pine and spruce with moderate cover, moderate ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Methwani bahak	Pine and spruce with moderate cover, moderate ruggedness	Low	(+)	Occasional poaching, grazing and fuel wood coll.
		Geer pajja	Open pine with moderate cover, moderate ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
	Gammalitter	Wanten	Open pine withmoderate cover, moderate ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Lacut kothnal	Pine and spruce with moderate cover.high ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Bod kothnal	Pine and spruce with moderate cover, high ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Bapal	0pen surrounded by birch, low ruggedness	Low	(+)	Occasional poaching, grazing and fuel wood coll.
		Hokhyan	Pine and spruce with moderate cover, moderate ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
		Seme ken	Pine and spruce with moderat cover, moderate ruggedness	Low	(+)*	Occasional poaching, grazing and fuel wood coll.
Lachipora	Gujjar nallah	Paiyan bahak	Open pine with low cover, low ruggedness	High	_	Poaching, grazing and deforestation
		Jhalmari bahak	Open pine with low cover, low ruggedness	High	(+)	Poaching, grazing and deforestation
		Dinga pajja	Mixed pine and spruce with moderate cover, moderate ruggedness	High	(+)	Poaching, grazing and deforestation
		Dadda	Mixed pine and spruce with moderate cover, moderate ruggedness	High	(+)*	Poaching, grazing and deforestation
		Eidanard	Mixed pine and spruce with moderate cover, moderate ruggedness	High	(+)	Poaching, grazing and deforestation
		Trinardi	Mixed pine and spruce with moderate cover, moderate ruggedness	High	(+)	Poaching, grazing and deforestation
		Bun bahak	Open scrub, moderate ruggedness	High	(+)	Poaching, grazing and deforestation
	Malangan	Noozidar	Pine and spruce with moderate cover, high ruggedness	High	(+)*	Poaching
		Gulki	Pine and spruce with moderate cover, high ruggedness	High	(+)*	Poaching
		Pir ki jagga	Pine and spruce with moderate cover, high ruggedness	High	(+)	Poaching

Survey Block	Valleys	Areas surveyed	Broad habitat classification	Disturbance level	Markhor presence/ absence	Primary threats
		Anadeb	Pine and spruce with moderate cover, high ruggedness	High	(+)*	Poaching
		S.P nallah	Pine and spruce with moderate cover, high ruggedness	High	(+)	Poaching
	Ghoretal	Kotharan	Pine and spruce with moderate cover, high ruggedness	High	(+)	Shelling, poaching,
		Shiddi	Pine and spruce with moderate cover, high ruggedness	High	(+)	Shelling, poaching,
		Dadda	Pine and spruce with moderate cover, high ruggedness	High	(+)	Shelling, poaching,
Naganari	Tragen	Tragen	Deodar moderate cover, high ruggedness	High	(+)	Poaching, grazing, fuel wood collection
	Kafar mohri	Kafar mohri	Deodar moderate cover, low ruggedness	High	(+)	Poaching, grazing, fuel wood collection
	Jabi nali	Jabi nali	Open pine with moderate cover, moderate ruggedness	High	_	Poaching, grazing, fuel wood collection
	Londmari	Lundmari	Pine with moderate cover, high ruggedness	High	(+)*	Poaching, grazing, fuel wood collection
	Manidub	Hapat pal	Open pine with moderate cover, low ruggedness	High	_	Poaching, grazing, fuel wood collection
	Gabewar	Haid pal	Open rocky with juniper shrub thinly interspersed with conifer	Moderate	(+)	Poaching, disturbance through collection of NTFP.
Secondary data collected in Poonch and Bhaderwah-Kishtwar						
Poonch	Poonch, Loren, Adigam,Sawjian,Surankot, Chandimud	Khara gali	Not surveyed	High	(+)	Poaching, grazing
		Dorian	Not surveyed	High	(+)	Poaching, grazing
		Sarian-nadian	Not surveyed	High	(+)	Poaching, grazing
		Godenuk	Not surveyed	High	(+)	Poaching, grazing
		Baila	Not surveyed	High		Poaching, grazing,
		Paja	Not surveyed	High	(+)	Poaching, grazing
		Kiren	Not surveyed	High	(+)	Poaching, grazing
		Sampa wala pud	Not surveyed	High	(+)	Poaching, grazing
		Pattan kor	Not surveyed	High	(+)	Poaching, grazing
		Gazan wali	Not surveyed	High	(+)	Poaching, grazing

Survey Block	Valleys	Areas surveyed	Broad habitat classification	Disturbance level	Markhor presence/ absence	Primary threats
		Chabba katha	Not surveyed	High	(+)	Poaching, grazing
		Kadu	Not surveyed	High	(+)	Poaching, grazing
		Jemia	Not surveyed	High	(+)	Poaching, grazing
		Jaboli	Not surveyed	High	(+)	Poaching, grazing
		Jemia		High	(+)	Poaching, grazing
		Nilkant	Not surveyed	High	(+)	Poaching, grazing
		Tatta kuti	Not surveyed	High	(+)	Poaching, grazing
		Anderwala	Not surveyed	High	(+)	Poaching, grazing
		Kalamund	Not surveyed	High	(+)	Poaching, grazing
		Hill kaka	Not surveyed	High	(+)	Poaching, grazing
		Poshana	Not surveyed	High	(+)	Poaching, grazing
		Chatta pani	Not surveyed	High	(+)	Poaching, grazing
		Chote wali	Not surveyed	High	(+)	Poaching, grazing
		O.C. doke	Not surveyed	High	(+)	Poaching, grazing
		Khun wali	Not surveyed	High	(+)	Poaching, grazing
		Baglain	Not surveyed	High	(+)	Poaching, grazing
		Goda bun	Not surveyed	High	(+)	Poaching, grazing
Bhaderwah	Bhaderwah	Basti	Not surveyed	High	_	poaching,grazing
		Halian	Not surveyed	High	_	poaching,grazing
Kishtwar-Padder	Padder	Shashu	Not surveyed	High	_	poaching,grazing
		Sheriki	Not surveyed	High	_	Poaching, grazing
		Sartangal	Not surveyed	High	_	Poaching, grazing

(+)*: indicates markhor presence confirmed by the direct or indirect evidences during this survey
(+): indicates markhor presence confirmed by Shikaris, herders or the wildlife staff
_: indicates the absence of markhor
* : indicates markhor presence, but not confirmed

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The elusive and endangered Pir Panjal markhor inhabits an area exposed to conflicts, disputes, shelling and casualties. Between 280 and 330 markhor were estimated in an area covering three wildlife sanctuaries and one conservation reserve during a rapid survey carried out in hostile terrain over two and a half months. This first ever survey of the markhor conducted in collaboration with the J&K Wildlife Department and the Nature Conservation Foundation with support from the Environment and Ecology Cell of the Indian Army also marks the launch of the Schaller Conservation Surveys by the Wildlife Trust of India.