AGA KHAN RURAL SUPPORT PROGRAMME
BALTISTAN

NLH
AGRICULTURAL
UNIVERSITY OF NORWAY

HIGH ALTITUDE INTEGRATED NATURAL RESOURCE MANAGEMENT

REPORT NO. 3

PASTURE, LIVESTOCK AND BIODIVERSITY

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IQBAL HUSSAIN
ÅGE NYBORG
VERONIKA SEIM
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AKRSP - NLH, DECEMBER 1998

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HIGH ALTITUDE INTEGRATED NATURAL RESOURCE MANAGEMENT: This is Report No 3 of seven reports presenting the activities and preliminary findings of joint research under an institutional cooperation programme between the Aga Khan Rural Support Programme, Pakistan, and the Agricultural University of Norway. The report addresses the sub-theme, *Pasture, livestock and biodiversity*

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PROJECT REPORTS 1998

Report No. 1:	Summary report
Report No. 2:	Institutions and organisations in pasture and forestry management
Report No. 3:	Pasture, livestock and biodiversity
Report No. 4:	Natural forest inventory
Report No. 5:	Gender, resource management and livelihood security
Report No. 6:	Information and documentation
Report No. 7:	Socio-economic survey of Basho (project site)

More copies of the reports may be obtained from AKRSP, Regional Programme Office, Skardu or Noragric's Library.

Preface

The Aga Khan Rural Support Programme (AKRSP) and the Agricultural University of Norway (NLH) have initiated a cooperation programme on alpine resource management. The programme was planned during mutual visits in 1997, and implementation started in March 1998. The programme is funded by the Norwegian Agency for Development Cooperation (NORAD) as an integrated part of Norwegian support to AKRSP's natural resource management programme in Baltistan. In 1998 the main activity was an integrated study of alpine resource management systems (pasture and natural forest) in the Basho watershed of Skardu district. Appendix 14 lists the main components and AKRSP - NLH counterparts.

The project was initiated in Spring 1998, primarily through joint field research by visiting NLH staff and AKRSP counterparts. This field report briefly presents preliminary findings of the team working on pasture, livestock and biodiversity. Professor Per Wegge and Associate Professor Øystein Holand are responsible for this component. Kathrin C. Hofmann, Research Biologist, conducted fieldwork in Skardu and Basho from 24.04. to 15.06., together with field assistant William Bjørn Sveinsson (24.04. to 25.05.). Åge Nyborg, Soil Scientist, stayed in Skardu and Basho from late April to late July; the research on soils by Åge Nyborg was generously sponsored by the Norwegian Institute of Land Inventory (NIJOS), Ås. Øystein Holand visited Skardu and Basho from 09.06 - 15.06. The students Veronika Seim and Thor Sigurd Thorsen stayed in Basho from 09.06. - 25.07.. Dr. Iqbal Hussain, Programme Manager Livestock is the AKRSP team leader for this component and coordinated the activities. Dr. Mohammad Abbas, Veterinarian and Project Field Coordinator took care of all practical field arrangements, arranged and interpreted meetings and participated in field activities. Jawad Ali, Programme Manager Forest, Ulrik Motzfeldt, NRM consultant and Shabir Hussain from AKRSP Skardu participated in field activities and meetings during June, September and October 1998. Ghulam Abas, Mohammad Diin and Mohammad Ashraf were our local field guides during the summer and autumn 1998.

Acknowledgements

During the first year of implementation, participants have enjoyed the opportunity of carrying out field research in the Basho watershed of Skardu District. We thank the people of Basho, including their representative, the Basho Development Organisation (BDO), for a warm reception and permission to work in the area. Men and women of the eight villages of the watershed have contributed of their valuable time and knowledge to joint activities, such as participatory learning exercises, field trips, village meetings and interviews. Local people also made their school available for a researcher and her family. The village organisations and the Basho Development Organisation have shown exceptional hospitality and support. It has been agreed that all maps, reports and other documentation should be made available to the BDO as they are completed, when appropriate for display in local schools.

We thank the District Commissioner, Skardu, Haji Sanaullah, and other government officials, for their interest in the collaborative programme and for offering useful recommendations and advice, and in some cases active participation in the programme. The practical implementation of the field programme was made a lot easier by the generous offer from the Divisional Forest Officer, Skardu, Mr Sharif, that AKRSP and visiting researchers could use the Forest Department Guest House in Basho.

We thank NORAD for the continued support, and the Royal Norwegian Embassy, Islamabad, for the consistent good-will towards the cooperating institutions, as well as active interest in the challenges and development potential of Baltistan.

AKRSP made excellent arrangements for field research. All Norwegian participants sincerely appreciate the many efforts without which we would not have been able to carry out research in Baltistan.

Support by local people, government authorities and the donor agency will remain a condition of the project achieving its goals. The partners appreciate with humility the good relations and many contributions they have enjoyed so far. We hope that the linkage programme may continue and grow to the benefit of local people, the co-operating institutions and relevant government authorities.

The project component «Pasture, livestock and biodiversity« would like to give a special thank to all participating team members and field guides for contributing with excellent field effort, stimulating discussions and positive working environment. We thank our local field guides Ghulam Abas, Mohammad Diin and Mohammad Ashraf for leading us safely through the high pastures and mountains of Basho and for passing on valuable knowledge about the valley. In addition, we want to thank IUCN (The World Conservation Union) by the Director of the National Biodiversity Unit, Islamabad, Kent Jingfors, Ph.D student and project coordinator at the Gilgit office Amjad Virk, and the IUCN office in Skardu, for fruitful collaboration on the wildlife component.

Ås/Skardu,

Executive summary

The dynamic seasonal multi-species grazing system is a complex and integrated part of the agro-pastoral system where the households try to optimise the total outcome taking into account vegetation phenology, species composition, stocking density and other biotic and abiotic factors, as well as social and cultural factors such as allocation of labour force in relation to seasonal demands, grazing rights, tradition and social relations between households and villages. During the first season of the project a study on rangeland availability, livestock and ibex distribution and habitat use as well as animal production and grazing behaviour was carried out in Basho valley, Baltistan during May - October 1998. The main emphasis was put on identifying, mapping and classifying the distribution of main habitat classes and pastures used by livestock and ibex.

The main findings of the study are:

1. Animal husbandry is an important component of the agro-pastoral farming system with about 7 000 domestic ruminants belonging to about 280 households. Average composition of livestock per household was 7 large ruminants (cattle, zomo and zo) and 19 small ruminants (sheep and goat). Only few yak (<10 animals) are herded in the valley. The livestock utilise a total summer pasture area of roughly 33 km^2.

2. A total of 24 *broqs* are spread out over the whole valley between 3,000 m and 4,000 m elevation. *The lower broqs* have a multipurpose function, mainly by increasing the area of land under cultivation and for utilising surrounding pastures for lactating animals and raising calves, lambs and kids. *The higher broqs* are mainly animal production units making it possible to utilise the more remote higher pastures for milk, wool, live animal and meat production. Most of the households practise this two-step summer farming movement.

3. The small ruminants are herded strictly together and guarded all through the day, whereas the *lactating cows and crossbreeds* are taken to the grazing area in the morning and gathered in the evening. *Free ranging animals (*yak, zo, male cattle and dry cows and zomos) are free ranging from early spring to late autumn, probably following the snow-melt on the pastures and only taken down to the broqs and villages when needed for ploughing and harvesting.

4. Nine main habitat classes were described based on ecological factors such as geo-morphological parameters, topography and dominant vegetation, and 13 km^2 were mapped between the village Sultanabad at 3,100 m elevation and 4,000 m elevation. This provides a basis for further investigations on habitat use, pasture quality and biomass productivity of these functional units.

5. A total of 6 soil types were identified and described on selected broqs and grazing areas. Surface crusting and platy structure was pronounced in the silty Cambisols and have a negative effect on plant growth. This form of soil degradation may be the result of climatic factors and/or compaction by grazing animals. Another 'negative' soil property concerning the Basho Cambisols, is their high erodibility.

6. A total of 38 and 45 ibexes were counted during two different surveys in May within an area of roughly 100 km^2, giving a crude density estimate of about 0.38/km^2 and 0.45/km^2 respectively. The number is most probably an underestimate due to quite difficult field conditions, animals being dispersed, and limited sampling effort. Among adults, between 39.2 and 48.5 percent were males. Number of recorded kids varied markedly between the two surveys, indicating the need for a more intensive and complete census for reliable population assessment. Little spatial and no temporal overlap in habitat use between ibex and livestock was observed during June and in September/early October, indicating minor interaction between ibex and domestic ungulates during these times of the year.

The following sub-projects are recommended for the coming seasons:

A. Livestock and grazing dynamics

1. Movement pattern of livestock in relation to pasture quality. Methodology: measurement of quality and quantity of forage at fixed locations along a gradient from the lower-most broqs to alpine pasture throughout the summer grazing season.

2. Determination of grazing pressure. Methodology: measurement of forage production and changes in floristic composition within and outside permanent enclosures distributed along an altitudenal gradient on main pastures, stratified according to distance from khlas.

3. Foraging behaviour on pastures of different quality. Methodology: quantifying behaviour of selected small ruminants within selected flocks while grazing on presumably poor and good quality pastures. Simultaneous collection of plant material for quantity and quality analyses.

4. Productivity of livestock related to pasture quality. Methodology: measurement of weight gain and milk production of selected groups of small ruminants during the summer grazing season. Comparative study where two groups receive supplemental food and another two groups receive no such supplement. The study could be extended to include the winter season in order to assess the effect of the currently practised stall feeding program.

B. Wildlife

1. Intensive census of the ibex population (for management plan for consumptive and non-consumptive uses). Methodology: systematic search of ibex habitat in the whole Basho watershed and recording number and composition (sex and age) of all animals sighted, during the rutting season in December. Census to be coordinated with IUCN/Pakistan.

2. Predation on domestic and wild ungulates (by wolves and snow leopard). Methodology: a combination of systematic searches for carcasses and a reporting system in cooperation with local villagers. Assessment of the number of predators using the watershed by camera trapping and pugmark tracking in late autumn and early spring.

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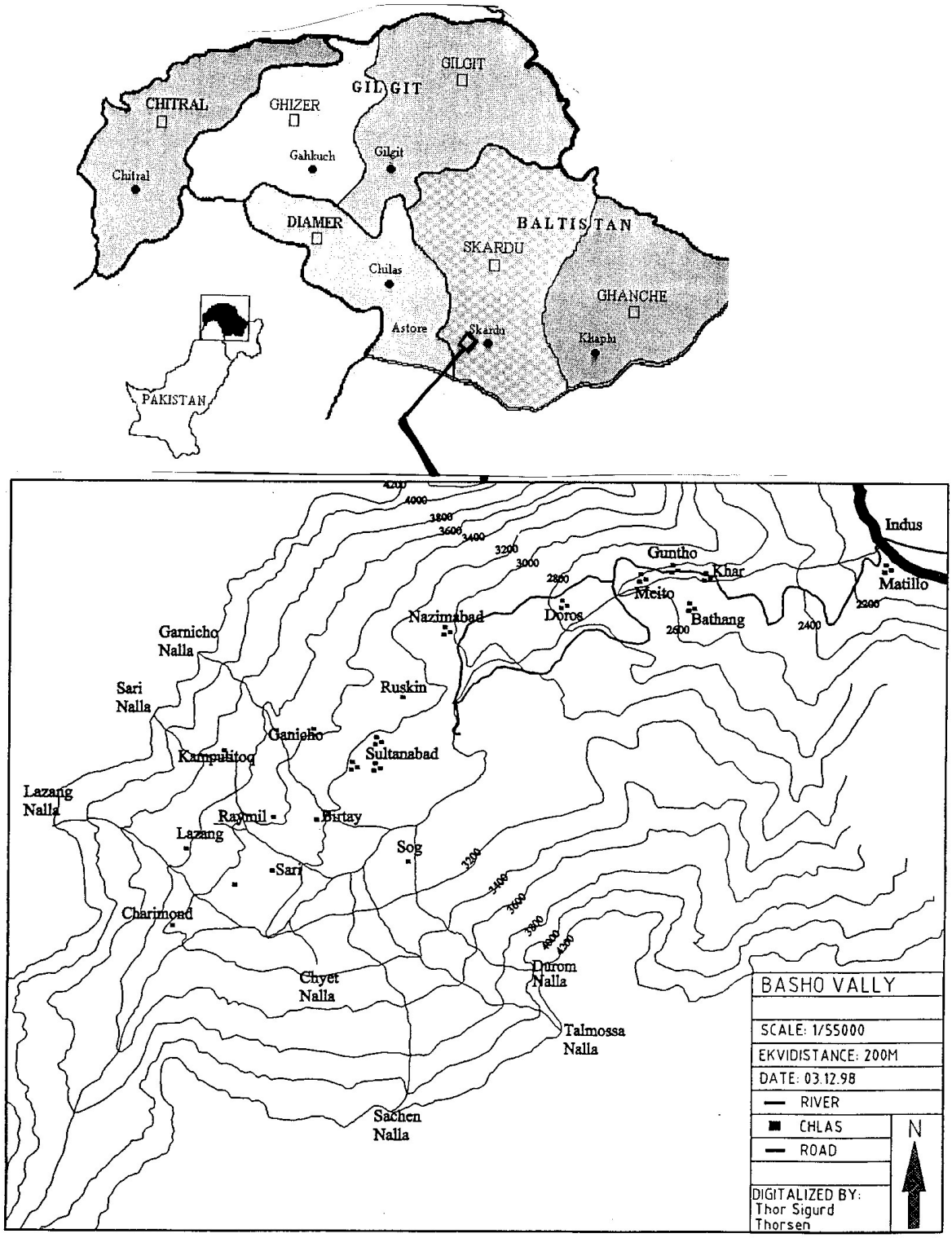
Map of the Basho Watershed and its location within Pakistan



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1. INTRODUCTION

1.1 *Background: AKRSP - NLH institutional cooperation*

The context of this report is the agreement between AKRSP and NLH to cooperate on a combined programme of competence building and applied research on High Altitude Integrated Natural resource Management (Project document: NLH - AKRSP, 1997). It is stated here that:

> *The aim of the institutional cooperation programme is to gain further insights into pasture and forest resources and their role in farmers' livelihood systems. Participatory, applied research shall enhance the capacity of AKRSP to work with village organisations and partner institutions for sustainable management of pasture and forestry resources, through providing knowledge which may be used in developing management and conservation strategies, initially at project sites.*

The specific objectives relating to AKRSP are:

- to expand the knowledge of the resource systems of Baltistan through a joint research project in order to enhance the capabilities of project staff to respond to the challenges of integrated resource management in high-altitude areas.
- to improve AKRSP documentation and extension systems with respect to forestry and pasture
- to improve AKRSP's links with national and international research institutions

The specific objectives relating to NLH are:

- to strengthen its knowledge-base for development-oriented research in the region and within fields where NLH are already working
- to gain the opportunity for carrying out applied, participatory research together with an implementing NGO and farmer-based organisations
- to provide an opportunity for staff, students and ex-students to gain field level working experience in Baltistan, Pakistan

The main **activities** in the programme will be:

- planning and conducting joint, participatory field research/documentation
- training and capacity building for AKRSP staff, primarily through joint research/documentation
- disseminating and sharing knowledge gained through workshops, training sessions, networking and publications
- exchanging information, references and literature through a library link for improved networking and information management
- technical advice for field-level application of the knowledge generated through research

1.2 *The high pastures*

High pastures play an important role in the subsistence economy of people in Basho. During the summer, livestock are taken to the high pastures, primarily for dairy, meat and wool production. This

cycling migration pattern influences vegetation succession and vegetation patterns and is a major driving force in the Basho watershed ecosystem. There is little information about the wildlife in the area, but it is known to include a resident population of Asiatic ibex (*Capra ibex sibirica*), a few snow leopards (*Panthera uncia*) and wolf (*Canis lupus*). The latter are perceived as a problem for the livestock herding practices in the area. Information about livestock numbers, production volume and utilisation of high pastures is sparse. Knowledge about livestock and targeted wildlife species distribution, numbers and range utilisation, combined with information about habitat attributes, provides the basic foundation for implementing sound livestock grazing management strategies.

1.3 ***Focus and aim of the study***

The focus of this study was the main pastures and local people`s management strategies in relation to these. The Basho watershed delineates the study area. Based on the original document (AKRSP-NLH, 1997) we have focused on the following sub-objectives:

- Mapping the distribution of the main high pastures
- Gathering material on the herding practice, animal production and foraging behaviour
- Classifying the main habitat classes used by wild ungulates and domestic animals
- Assessing the distribution and total abundance of Asiatic ibex in the area before and after livestock reach the high pastures
- Studying the interaction between wildlife and domestic animals in the grazing season
- Mapping the distribution of pasture soils, providing data on soil properties and assessing the risk of soil degradation

1.4 ***General description of the study area***

1.4.1 *Selection of study area*

As a part of the NRM programme of AKRSP-Baltistan, the cooperation project focuses on Baltistan, the eastern-most region of the Northern Areas, covering the districts of Ghanche (District centre: Khaplu) and Skardu (District centre: Skardu Town). During the NLH-AKRSP Field Planning Workshop in Baltistan in September 1997, the Basho watershed was suggested by AKRSP as the site for a joint case study. After visiting both Hoshe (Ghanche District) and Basho (Skardu District), Basho was chosen as the main study area in 1998. Some of the criteria were:

- The presence and importance of alpine resources, including natural forest assumed to be among the largest patches left in Baltistan
- Local people's active interest in the alpine commons, partly expressed through the recent formation of a cluster organisation (the BDO)
- Accessibility (less than two hours driving distance from Skardu)

Basho was selected, therefore, as an interesting and illustrative case for both AKRSP and NLH, given the interest in the high alpine zone. Alpine natural resource management in Basho is probably similar to that of many other watersheds in Northern Areas or Baltistan, but in a strict scientific sense it was not selected to be representative of a certain larger area.

1.4.2 *Location*

The Basho watershed (75°15' E, 35°25' N) on the Khar Nullah is located about 45 km west of Skardu Town in the District of Skardu, Baltistan, and is surrounded by the Deosai Plains to the south, Kachura valley to the east and Skoyo-Karabathang-Basingo Catchment to the west. The watershed is a side-valley to the Indus valley, and the river Indus outlines the northern boundary of Basho. The total area of the Basho watershed system is about 120 km^2. It ascends from the southern side of river Indus at an altitude of approx. 2,150 m elevation. to the Banak La mountain at 5,520 m elevation. The uppermost village of Sultanabad is situated at approx. 3,200 m. elevation. A jeep road runs from the Indus river all the way up to and across the last end moraine step at 3,100 m , almost reaching the village of Sultanabad.

1.4.3 *Climate, geology and physical characteristics*

Situated in the western-most arm of the Himalayan range, Basho is found within a semi-arid and rugged mountain landscape "mountain desert"). It falls within the "rain shadow" of the Himalayas, and average rainfall in the valley bottoms is estimated to be between 100 and 200 mm, but rising with elevation to create a moist environment at the extensive, high-altitude rangelands. Because of the altitude, the area has a marked seasonal climate comparable to that of the temperate zone. The mean maximum temperature during summer revolves between +30 - 35° C, while the mercury drops to -15° C in winter.

The bedrock in Basho Valley is mainly igneous (plutonic) and metamorphic with a granittic composition. This bedrock can only be seen as shear cliffs and peaks high above the valley floor. The valley sides and bottom are covered by sediments, in places with a thickness of several hundred meters.

Big and small end moraines cut across the valley and mark the terminal point of several periods of glaciation. The biggest one, located between Nazimabad and Sultanabad, marks a dramatic change in the landscape. The moraine has functioned as a sediment trap, which has resulted in the formation of a wide river plain with meandering stream channels.

The valley sides are covered with thick layers of glacial deposits that have been reworked by the action of water and gravity to form steep slopes, gullies and fans. A thin layer of wind blown silt (loess) covers large areas on the valley sides and gives the surface a smooth appearance.

As in the rest of the Northern Areas, all human cultivation in agriculture and plantation forestry is based on irrigation. A major geographical distinction is therefore between areas *above the channel* and *below*

the channel. The distinction here is primarily a functional one: between the areas that receive irrigation and those that do not (i.e. an area may be below one or several channels in terms of altitude, but *above the channel* because it is still out of reach by irrigation due to other constraints of landscape or infrastructure. Past and on-going channel construction and cultivation projects are changing the mountain sides and cultivated lands. Channels bringing snow melt from the glaciers to the fields are the blood veins of agriculture in Basho. Channels create a distinct line between the deserted grey colours above and the fresh greenness of afforestation sites (dominated by alfalfa and poplar) and cultivated fields beneath.

1.4.4 *Vegetation*

The area falls under three major vegetation types (Schweinfurth, 1957). The lower north-eastern part from the river Indus to about 2,500 m elevation is described as ***subtropical semi-desert.*** This area is dominated by dry, steep slopes with outcrop of rocks. The average annual rainfall ranges between 130 - 160 mm, lacking a defined rainy season. People practice double-cropping agriculture and sub-tropic horticulture depending on irrigation channels leading the glacial water from higher up the valley. The area above the sub-tropical semi-desert is classified as ***steppe of Artemisia***, dominated by scrubs such as *Artemisia maritima, Eurotia ceratoides* and *Kochia*. The average rainfall may approach 400 - 500 mm, depending on location, and most of the precipitation is received as snow during winter.

This upper-most part of Basho is shaped as a cup with alluvial plain, cultivated areas, houses and patches of trees covering the valley bottom. High snow-covered mountain peaks surround the valley and slides into moraine slopes form the valley sides. Vegetation varies greatly from the drier south-eastern facing slopes to the moister north -western slopes. Natural blue pine forest covers the north-western facing moraine slopes above Sultanabad. The forested moraine slopes are led by deep gulches and glacifluvial gravel fans sparsely vegetated by pine trees, willow (*Salix sp*.) and shrubs. Grassy slopes and juniper (*Juniper macropoda*) cover areas where the forest has been cut down. Above the pine forest patches of birch (*Betula utilis*) delineates the upper forest line at about 3,800 m. Steep slopes with artimisia (*Artemisia maretima*) covers the south-eastern facing parts of the valley up to 3,600 m. Patches of blue pine (*Pinus wallichiana*) and juniper are found around the lower broqs at about 3,300 m. Average rainfall is 400 - 500 mm, depending on location and precipitation is received primarily as snow during winter. The altitude limits cultivation to single cropping favouring alpine species such as barley.

The vegetation described as moist alpine scrub and meadows borders the ***steppe of artemisia*** at about 3,600m. This type is dominated by glacifluvial gravel fans and deposits along streams, scree slopes and precipitous cliffs. Signs of avalanches and landslides are frequent on higher slopes.

1.4.5 *Wildlife*

No complete inventory has been done in the area. Wildlife known to be found in Basho is Asiatic ibex (*Capra ibex sibirica*), snow leopard (*Panthera uncia*), wolf (*Canis lupus*), red fox (*Vulpus vulpus*), marmot (*Marmota caudata*) and mouse hare (*Ochotona sp*.). Musk deer (*Moschus moshiferus*) is known to be found in the area, but has been hunted for its musk. Common birds include chukor partridge (*Alectoris chukar*), jungle crow (*Corvus machrohynchos*) and Himalayan snowcock or ram chukor *(Tetraogallus himalayensis*). Asiatic ibex is probably the most abundant Caprinae in Pakistan, in terms of relative numbers (Schaller 1977). Distribution of Asiatic ibex is restricted to the relatively dry mountains of Northern Pakistan which include the inner Himalayas, Hindukush and Karakoram. Population numbers for the Northern Areas (District Gilgit, Diamer and Baltistan) were estimated to be between 9,000 and 10,000 ibex in 1993 (Hess et al. 1997). Other mammals known to be found in the study area are listed in appendix 12.

1.4.6 *Socio-economic characteristics*

People in Basho live in eight different villages distributed from top to bottom of the zone of permanent habitation along the Khar Nullah: Sultanabad, Nazimabad, Doros, Meito, Guntho, Khar, Bathang and Matillo (ref. map on page vii). Agriculture and livestock production are the major sources of livelihood; the pastoralist system involves a seasonal transhumance between villages and temporary settlement in the high alpine zone. Off-farm employment play an increasing role. Most visitors would find the natural scenery of Basho unusually attractive, but so far trekking or other forms of tourism are not developed in the watershed.

The majority of people are *Balti* speakers, while a minority are *Shina* speakers (immigrants from the Astore Valley) (AKRSP 1997, PRA at Village Basho). *Shina*-speakers are also termed *Broqba* (mountain people, sometimes used derogatorily) and make up the majority of inhabitants in Sultanabad.

The total number of households in Basho is estimated at 297 and approximate number of inhabitants at 2,400, based on an average household size of eight (Socio-economic survey by Aurang Zeb Zia, AKRSP, 1998).

AKRSP has worked in Basho since 1987. Today, seven of the villages have a Village Organisation (VO) and 4/5 have a Women's Organisation (WO). A cluster organisation, Basho Development Organisation (BDO) was established in January 1997, but as with the VOs, it grew out of a long-standing tradition of cooperating within the watershed. Villagers refer to a tradition of shared ownership and use of alpine resources.

Already during field visits in September 1997, the Basho watershed was found to represent a dynamic social situation with respect to institutions and organisations in management of forest and pastures.

People depend on scarce natural resources and on creativity in reshaping natural conditions through terracing, irrigation etc. Their capacity for physical reshaping of nature is crucial for their survival and heavily dependent on institutional arrangements. While it is true that villagers claim that the sharing and distribution of rights in forest and pasture are based on generations old traditions, dynamic processes of change may also be observed. There are examples of institutional changes in response to changes in pasture and forest conditions (for instance limiting access to a certain pasture, when land degradation is observed).

1.5 ***Key terms***

Terms	Description of terms
High pasture	Upland pastures above the channel, not irrigated
Alpine pastures	Free grazing access at the uppermost grazing areas in the valley
Common pastures	Pastures not connected to any broq, free grazing access
Pastures with rights	Pastures with rights connected to several broqs or villages
Harvested meadows	Hay harvesting, grazed in early spring, late autumn and winter. Usually located close to lower broq and village
Khlas	Temporarily used summer farm house or shed, may also be a cave with fences of stone or logs
Broq	Temporarily used summer farm with khlas/shed on high pastures
Lower broq	Temporarily used summer farm with khlas, cultivated areas and harvested meadows on high pastures
Higher broq	Temporarily used summer farm with khlas on high pastures without cultivated areas and harvested meadows s
Norais system	Grazing system at lower broqs where animals from several households are herded together and the workload is shared by the owners

2. MAPPING THE DISTRIBUTION OF THE BROQS AND MAIN HIGH PASTURES

2.1 *Methods*

AKRSP staff and researchers from NLH conducted a meeting with the members of the Basho Developing Organisation (BDO) on the 13th of May, where all villages except Matillo were represented (Figure 1).

Figure 1: BDO members mapping the main pastures of Basho.

The villagers lined up a map on the ground showing the main broqs and high pastures of Basho valley. The overview was copied on to a piece of paper (Appendix 1) and was used as a baseline for gathering further information concerning grazing areas, grazing practice, users rights, pasture quality, livestock species and grazing period during a participatory learning exercise on the 30th and 31st of May 1998 (Appendix 2). The quality of broqs was ranked on a scale from 1 to 5, the latter number being the best considering grazing quality, accessibility, topographical features, size of the broq, availability of water and fire-wood and predation risk.

During May and June the name and location of most of the broqs and grazing areas were confirmed by visits and interviews with local people. In addition, a geographical map, 1:5 000 scale, was made of the lower broqs and pastures surrounding Sultanabad using a GPS. Parts of the original map over Jammu and Kashmir were digitalised.

2.2 *Main findings and discussion*

A total of 24 broqs and 31 high pastures were found to be distributed from the north-eastern part of Basho valley up to the glacier in the south-west (Appendix 1). Broqs and high pastures are listed in Appendix 2, based on a participatory learning exercises with the local people. The Balti word *broq* is normally used for «high pastures» in general. In Basho, people make a clear distinction between *broq* (temporarily used summer farm with *khlas*/shed on high pastures) and pastures without a *khlas.*

The Indus facing broqs were located at about 3,000 - 3,200 m, while the broqs of the upper part of Basho ranged from Soq[32] at 3,100 m to Moskinnemond[39] at 4,000 m. The lower situated broqs consisted of temporarily used summer farm houses or *khlases* with night-pens for herded animals, small cultivated areas and harvested meadows. Barley was the major crop and the terraced, cultivated fields depended on irrigation. Cultivated areas and harvested pastures were divided between households from one or several villages. The khlases and cultivated areas at lower broqs could vary in number and size. For instance, Sari[27] broq was divided between the two villages of Sultanabad and Meito. Ten households from Sultanabad were using 9 khlases and 17 households from Maito were sharing 9 khlases. Sari[27] broq was one of the larger lower broqs, compared to the smaller Birtay broq[24] where only three households would stay[1].

Elevation limits cultivation at the higher broqs, which thus mainly consisted of a khlas with a pen for animals surrounded by pastures. Depending on elevation, these broqs were located at a greater distance from the villages and were used for grazing during late summer when the vegetation growth was more vigorous than lower down the valley.

The description of the high pastures were rough inventories and must be regarded as a starting point for further research in Basho valley. However, the inventory reveals a large number of broqs spread out over the whole valley utilising the natural resources in different ways. The lower broqs have a multipurpose function, mainly by increasing area of land under cultivation and by utilising surrounding pastures for lactating animals and raising calves, lambs and kids. The higher broqs are mainly milk processing units making it possible to utilise the more remote higher pastures of the valley for milk and meat production.

Most of the pastures have exclusive grazing rights and the rights are connected to household, broqs and/or village affinity. However, some grazing areas may be defined as commons i.e., pastures with open grazing access. For example the uppermost pastures of the valley are used for fattening and growth of free ranging animals. The geographical positioning of broqs and delineating their grazing

[1] Numbers after broq names refer to those in Appendix 1 and 2

areas and grazing rights are baseline data for understanding the grazing management regime of the high pasture as an integrated part of the agro-pastoral system of the valley and have to be refined and completed during further research.

3. HERDING PRACTICE, ANIMAL PRODUCTION AND FORAGING BEHAVIOUR

3.1 *Methods*

3.1.1 *Herding practice*

Herding practice and grazing dynamics in general were documented by observations and interviews with local people of Basho during May, June and July.

3.1.2 *Foraging behaviour*

Behaviour, diet choice and habitat use of domestic animals at high pastures were studied between the 10th of June to 19th of July. The grazing areas that belong to a lower broq, Sari, were chosen for this study. The animals selected were 12 small ruminant (6 goats and 6 sheep), 6 cows of the original local breed and 4 zomos (female crossbreed between yak and cattle). All of the households owning these animals belonged to the village of Sultanabad and also participated in the same Norais-system (see section 1.4 Key words). The animals were milk producing adults. All 22 animals were individually marked with neck collars.

Focal sampling was used to study diet choice. Every 10 seconds, plant species group eaten by the animal was recorded until 30 observations were gathered. Within any species, a marked animal was randomly chosen. The following factors were recorded: animal species and individual, date, time, weather, temperature, herder, vegetation-type and total observation time.

By scanning the herd; each marked animal's behaviour and position was recorded every 30 min throughout the day. Date, time, weather, temperature, vegetation, location, activity, category of behaviour and distance to nearest animal of same species and distance to nearest animal of another species were recorded.

Samples of the most important plants eaten by each animal species were collected. The plant samples were picked in a way simulating the grazing behaviour of the species concerned. The samples will be analysed chemically for fibre (Van Soest, crude protein (Kjeldal-N) and minerals (Na, Ca, K, Mg, P). These analyses will show the nutritional value of forage which the animals are able to obtain while grazing. Material from the same plant species at fixed locations was also collected two or three times during the grazing season. Chemical analyses of these samples will give valuable information on seasonal changes of pasture quality.

3.2 ***Main findings and discussion***

3.2.1 *Herding practice and grazing dynamics*

Animal husbandry is an important component of the agro-pastoral farming system for the people from the upper villages of Basho. A livestock census conducted by AKRSP staff among VO members in Basho in June 1997 (Table 1) reported 7,099 domestic ruminants belonging to 278 households of the 7 upper villages (Abbas et al., 1997). This amounted to about 7 large ruminants and 19 small ruminants per household. The lowest village of Matillo is not included in this census, since livestock production was of minor significance in this village.

Table 1. **Summary of results from livestock census**

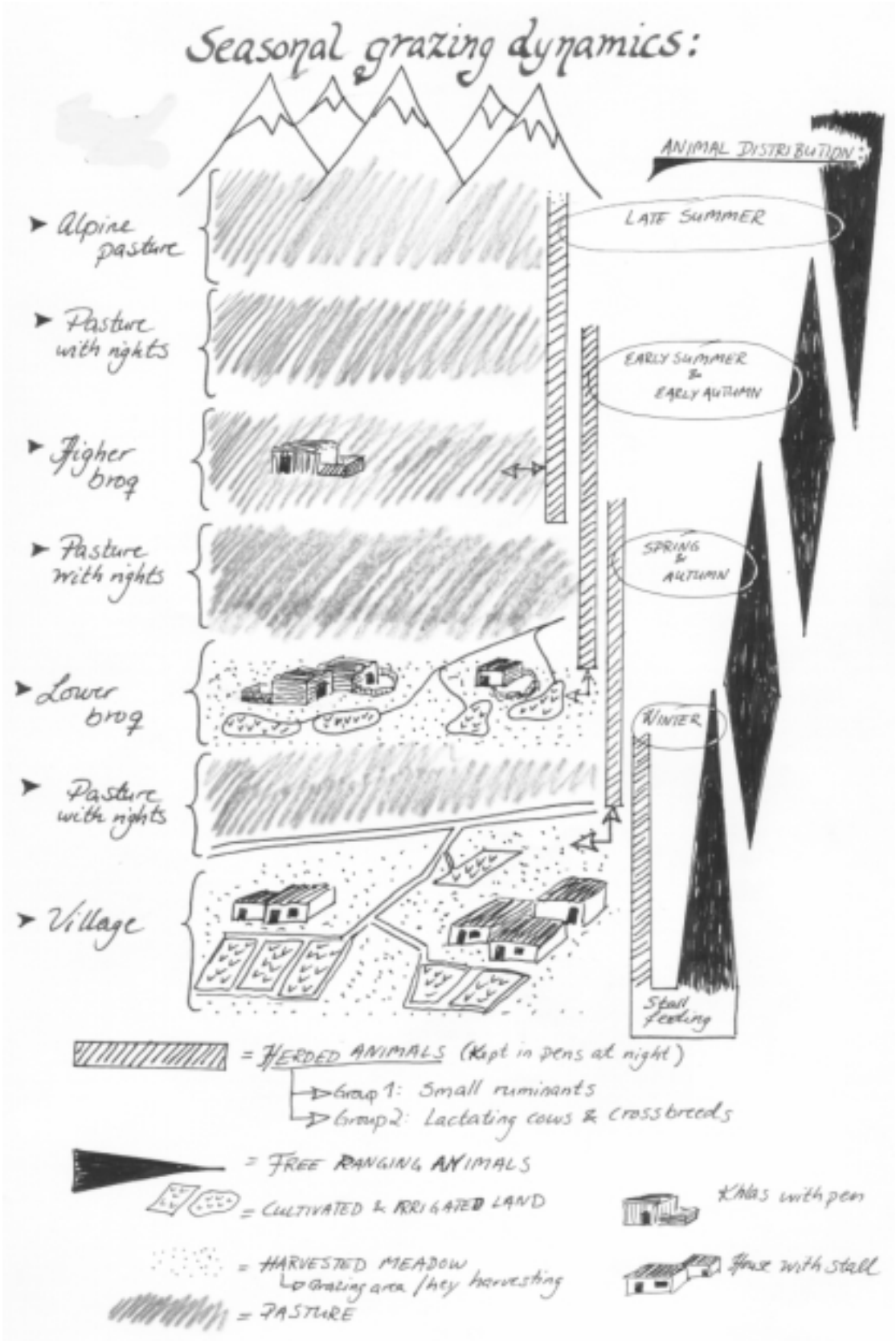
Cattle			Yak	Cross breed		Sheep			Goat		
Cow	Bull	Calf		Zomo	Zo	Ewe	Ram	Lamb	Goat	He-goat	Kid
717	234	424		245	196	974	844	514	1153	1047	747
1375			4	441		2332			2947		

Source: Census conducted among VO members in Basho (from Abbas et. al. 1997)

In Basho, small ruminants outnumbered the larger ruminants, while cattle were 3 times more common than crossbreed zomo (female) and zo (male). Only 4 yaks were reported, although we have reason to believe that the number is around 10. The census also indicated that the importance of animal husbandry in the household economy increased with altitude in the valley.

Livestock are taken to different pastures through the season as described in the seasonal grazing dynamic model in Figure 2. Households from one or two villages may move to a lower broq in early summer, and then continue to a higher broq later in summer, either by physically staying over night or taking the lactating animals and their young there for grazing during daytime. Later in August they move back to the lower broq for harvesting the crop and return to the villages in September / October. Not all households perform this two-step summer farming movement: due to good grazing condition in the lower area, lack of rights to the higher broqs or heavy workload (or may be lack of labour force) at the lower broq, they stay at one broq during the whole summer grazing season.

Figure 2: Preliminary model describing the seasonal grazing dynamics.



Pastures around the central villages are at lower elevation and thus new growth appears earlier in the grazing season and the snow condition in winter is more favourable than at higher elevation. These pastures are protected for most of the growing season and only used by the animals during winter, in early spring and late autumn. In winter, depending on snow conditions, the animals roam around the villages or are taken inside and fed straw (and other crop residues), hay and harvested leaves and branches.

Most of the pastures surrounding the broqs were «occupied» by holders of rights connected to village(s) and/or broq(s). Common pastures were alpine pastures situated above 3,800 m in the upper-most part of the valley close to the glacier, or small patches grazed on the way to/from one of the higher broqs. The river plain of Rana[23] was a special common pasture used by dry and sick cattle through the whole grazing season. The river plain also functioned as a «waiting area» for the herded, larger animals in early spring and autumn before and after they are taken to/from the broqs and higher pastures.

Herded animals

Small ruminants and dairy cows (groups 1 and 2, Figure 2) are herded throughout the summer season, starting using grazing areas close to the village initially and moving on to the higher pastures and broqs. In late summer, this group of animals are herded at the higher pastures and commons until early autumn, when they are taken down to the pastures at the lower broqs again. During winter animals are stall fed, free ranging or herded on the pastures at and surrounding the village.

Free ranging animals

In general, yak, zo, male cattle, dry cows and zomos are free ranging from early spring to late autumn and only taken down to the broqs and villages when needed for ploughing and harvesting. These free ranging animals follow the snow melt on the pastures, using pastures at the lower broqs in the early grazing season and successively grazing up towards the commons in late summer. In late autumn, when temperature and grazing quality drop, the animals move down towards the lower broqs and villages again. Movement of the free ranging animals may also be a result of people and herded animals «pushing» them up from the lower broqs when cultivation starts, and later on from the higher broqs to the common pastures above. Most probably the movement of the free ranging animals is a combination of both seasonal changes in forage quality and farming activity.

Herding practice

Common herding practice is to bring the herded animals to the pasture at daytime, and to keep them in a pen by the khlas at night. Herded animals are divided into two groups, depending on the herding practice. Group one, the small ruminants (rams, ewes and goats, see figure 2) are herded strictly together and guarded all through the day (from 6*am* to 7*pm*). Group two consists of lactating cows and crossbreeds and a few dry cows (figure 2). These are taken to the grazing area in the morning (around 6

am) and gathered in the evening (around 7*pm*). In the meantime they are allowed to spread out while grazing without herding supervision.

It is common to herd animals from several households together, and the owners share the workload. This is called the "Norais-system". Each day a different household provides a shepherd for the herding, and this responsibility circulates in a fixed order.

Grazing dynamics

The multi-species grazing practice of the area is a complex and dynamic seasonal system worked out over the years. The natural environment combined with traditions, land tenure and social relations play an important role in forming this grazing system. A description of the general grazing practice and grazing dynamics is required in order to understand the factors influencing livestock production and pasture quality. It will also provide a sound basis for a common perception of the grazing dynamics and socio-economic mechanisms involved. To reveal the diversity of grazing and production practice within the broq, an in-depth study of selected broqs is required. This will enable us to link the livestock management at the village/household level to the broq or khlas level.

3.2.2 *Foraging behaviour*

Statistical analyses of the data and the writing of the M.Sc thesis «Behaviour, diet choice and habitat use of domestic animals at high pastures» will be finished in May 1999. However, some general comments can be made:

Small ruminants used a larger part of the available grazing area than cattle and crossbreeds. At Sari broq, the herders led sheep and goat to all parts of the upper area between Bundopiri and Magalistrang, while the cattle and crossbreed were left at Lazang in the morning and collected in the nearby area in the evening. After moving to the higher Daminimona broq, cattle and crossbreeds were using the pastures located higher up.

According to local people, the small ruminants are led to higher pastures later in the season after the snow melt. Cattle and crossbreeds are then herded to the pastures previously used by sheep and goats. This multi-species grazing regime may increase the production output per area unit because the small ruminants (sheep and goats) are able to utilise the high quality, low biomass pasture early in the season. As the quality drops and the biomass increases, they are herded to higher elevations and the lower pastures are left to the large roughage feeders like cattle and crossbreeds which can utilise the more fibre rich but bulky vegetation more effectively.

There were individual differences in the strategies used by the shepherds herding small ruminants. Herders chose different grazing areas, had specific habits of leading the flock and spent different amounts of time moving the animals around the areas. The variation among herders probably

influenced food intake per animal during the day. Sometimes the shepherd and herd walked most of the day, and the main part of the animals' diet was snatched while moving along. Hence, the amount of food obtained by the animals was sparse on these occasions.

The sheep breed in Basho is small in size, and the crowding instinct was strong. The sheep had problems with overheating in direct sunshine and often stopped grazing to find shade during warm periods. Goats moved around much more individually and appeared to cope well in warm weather. On the other hand, goats tried to find shelter much faster than sheep in rain, hail or snow. The fact that playing behaviour seemed to be more common among goats than among sheep, especially in the afternoon, gave the impression that goats were more satisfied with the quantity of food obtained during the day than sheep. It also seemed that sheep were less willing to go back to the pen/khlas in the afternoon than goats, especially on days with a lot of walking or when they had been grazing in sparsely vegetated areas. Rams were herded together with the ewes while he-goats were kept at home. The rams often disturbed the ewes from grazing. Cows from local breed and zomo grazed on their own during daytime, and tended not to disperse. Zomo tended to graze in more difficult terrain than the local cow.

4. CLASSIFICATION AND DESCRIPTION OF THE MAIN HABITAT CLASSES USED BY WILD UNGULATES AND DOMESTIC LIVESTOCK.

4.1 *Methods*

Habitat mapping and vegetation analyses of the upper Basho valley were conducted from the 1st to the 20th of June 1998. During the field work, Mr. Javad Ali, Mr. Wazir Shabir Hussain and Ulrik Motzfeldt from the AKRSP-staff were trained in collecting the floristic data. The dominant habitat classes were roughly described based on ecological factors such as geomorphological parameters, topography and dominant vegetation.

Each habitat class was given a general description regarding: general aspect, elevation, slope, vegetation and human / livestock activity. The different habitat classes were then delineated on a topographic map, scale 1:25 000 (Appendix 3).

Floristic analysis

Each habitat class was described by stratified quadrat sampling. About 20 quadrats (1 m x 1 m) were placed at random along transects in homogenous areas of plant communities. The transects were placed along the contour elevation to avoid differences due to variation in soil types. A floristic record sheet was used to gather information from each square metre (Appendix 4). Tracks and faeces of livestock were recorded within a 5 m radius of the centre in the quadrat. Each plant species was collected and pressed in 3 sets, containing 2 samples each. One set was sent to Rubina Rafiq in

Islamabad for identification, one was dedicated to the school of Basho by the school teacher Mr. Hassan and one was taken to Norway.

Cultivated, irrigated and forested areas were not described, only mapped.

Snow condition was documented by photographic slides taken at 10 fixed points 2-3 times during the field season. Appendix 10 shows the fixed points where photos of snow condition were taken.

4.2 ***Main findings and discussion***

Nine main habitat classes (Table 2) were defined, mapped and described from the village Sultanabad at 3,100 m elevation up to 4,800 m elevation. This covers an area of about 13 km^2 and falls within the vegetation types ***steppe of artemisia*** and ***moist alpine scrub and meadows*** as described by Schweinfurth (1957). Each habitat class is described in Appendix 5. The habitat map in Appendix 3 shows the geographical distribution of the main habitat classes in the upper Basho valley.

Table 2. **The main habitat classes defined in Basho**

Habitat class no.	Habitat classes:	Location of the habitat classes	Main altitude, aspect and slope	Area		Vegetation types defined by Schweinfurth (1957)
				km^2	%	
1	Cultivated areas	Raskin broq, Sari broq and Ganicho.	3 100 - 3 500 m South-east facing.	2,1	16,2	Steppe of artemisia
2a	Steep artemisia slopes	Above Sultanabad	2800 -3 600 m South facing slopes, >40° slope	1,6	12,2	
2b	Juniper and Blue Pine slopes	Between Sari and Lazang broq	3 100 - 3 600 m S, SE, NE facing 20 - 40° slope	0,7	5,4	
2c	Artemisia and Juniper slopes	Above Sultanabad	3 100 - 3 600 m S and SE facing <40° slope	1,4	10,93	
2d	Moraine slopes above 3 600 m	Above Sultanabad	Above 3 600m N, NE and S, SE facing, 20 - 30° slope	3,2	24,9	
3	End moraine	North of Sultanabad	2 800 - 3 200 m Slope varies	2,0	15,7	
4	Forested areas	Eastern hillside	NW facing	*	*	
5	Rocky alluvial and colluvial fans, and river wash	Along valley bottom and hillsides	Mapped up to 4 000 m, S, SE facing	1,1	8,7	
6	River plain (Rana).	In the valley bottom between Sultanabad and Forest Hut	Flat area at 3 100 m	0,8	6,0	
7	Scree slopes	Upper part of valley	> 3 400 m 35 - 50° slope	*	*	Moist alpine scrub and meadows
8	High alpine scrub and meadows	Upper part of valley	Above 3 800m	*	*	
9	Cliff		> 4 000 m, > 50° slope, not mapped	*	*	
Total				12,7	100	

* Extent of these areas are not calculated.

Classification of the main habitat types gives a rough description of the area and a basis for further investigation of habitat use, pasture quality and biomass productivity of important plant communities / grazing plants. The habitat map has therefore to be refined and completed during next years' field seasons.

Due to the unusually late spring of 1998, most of the vegetation in the higher parts of the mountain slopes had not set flowers at the time when the floristic analyses were conducted. This made

identification of plant species difficult. It is recommended that further floristic analyses/description should be made later in the growing season.

The class high alpine scrub and meadows (**8**) covers all area above 3800 m and contains different habitats such as scree slopes, boulder areas, meadows etc. Due to time constraints and weather conditions, the upper part of the valley from Charimond to Mangalistrang was just recorded under this class.

Based on observation (grazing signs on plants, faeces and trampling frequency) during the floristic analyses in June and studies of grazing behaviour in June and July, the grazing areas above Sari, Birtay and Rashkin (steppe of artemisia on moraine slopes **2a, 2c, 2d**) appear to be heavily grazed. A more in depth study measuring grazing pressure, biomass production and animal performance on selected broqs and habitat classes is therefore necessary in order to be able to approach the complex issue of managing grazing pressure.

5. THE DISTRIBUTION AND NUMBER OF ASIATIC IBEX IN THE AREA BEFORE AND AFTER LIVESTOCK REACH THE HIGH PASTURES

5.1 *Methods*

The ibex population was censused between 12. - 22. May 1998 before the livestock were taken to the higher pastures. Only some free ranging domestic large ruminants were then at the higher pastures. The survey team consisted of Kathrin C. Hofmann and William Sveinsson from NLH, Dr Abbas and Ulrik Motzfeldt from AKRSP and the local field guides Ghulam Abas, Mohammad Diin and Ali Hussain.

A similar survey was conducted later in the autumn from September 1 to October 9, 1998 by Ulrik Motzfeldt, Gitte Simonsen, Ghulam Abas and Mohammad Diin. At that time, free roaming and non-milking zo/zomo were at the higher pastures, while the smaller ruminants and lactating zo and cows were herded out from the lower broqs of Sari, Raymil, Rushkin and Birtay.

In addition, a joint survey was conducted by AKRSP/NLH and IUCN between 21st and 22nd May 1998. The IUCN team was lead by Mohammad Jaffar and Arif from the Skardu office. Observation groups were spread out at fixed vantage points in the same area, monitoring the ibex population simultaneously.

Sampling for total animal number and population composition of ibex was done by searching the mountain slopes with 8″ x 30″ (10″ x 40″) binoculars. Tributary valleys and drainages of the main valley were also searched. When a herd was observed, a spotting scope was used to determine age and

sex composition. Asiatic ibex were classified in the following age and sex classes based on modified criteria presented by Schaller (1977) and Amjad Virk (pers comm.) (Appendix 6). Animal activity and habitat parameters were recorded for each group of ibex observed (see «Mountain ungulate survey form» in Appendix 7 and defined habitat classes in Appendix 5).

Samples of faeces and dominant plants from places were groups of ibex were observed were collected whenever feasible.

5.2 *Main findings and discussion*

Spring survey

A total number of 38 ibex in four groups were counted in May inhabiting an area of about 100 km^2. Group size varied between 3 and 21. Results given in Table 3 show age and sex composition.

Table 3. Number and composition of ibex groups recorded in Basho valley

Group no./ age and sex composition	1	2	3	4	**Total**	Per cent
Adult females	6	5	1	2	**14**	36.8
Kids	7	2	2	1	**12**	31.6
Yearlings	3				**3**	7.9
Adult males	5	2		2	**9**	23.7
class I (2-5 years)	4	1		1	**6**	(15.8)
class II (5-7 years)	1	1		1	**3**	(7.9)
class III (7-10 years)						-
class IV (>10 years)						-
Total count	**21**	**9**	**3**	**5**	**38**	**100.0**

Source: AKRSP/NLH survey May 1998.

The joint AKRSP/NLH survey also in May counted 45 ibex in 9 groups in the same area. Group size varied between 2 and 9 (Table 4).

Table 4. Number and composition of ibex groups recorded in Basho valley

Group no./ age and sex composition	1	2	3	4	5	6	7	8	9	**Total**	Per cent
Adult females	1	2	3		2	2	3	2	2	**17**	37.8
Kids	2	1							1	**4**	8.9
Yearlings					3		3	1	1	**8**	17.8
Adult males		2		2	3	4	3	2		**16**	35.6
class I (2-5 years)		1			2	2	2	1		**8**	(17.8)
class II (5-7 years)		1		1	1	1	1	1		**6**	(13.3)
class III (7-10 years)				1		1				**2**	(4.4)
class IV (>10 years)											-
Total count	**3**	**5**	**3**	**2**	**8**	**6**	**9**	**5**	**4**	**45**	**100.1**

Source: joint survey AKRSP/NLH and IUCN May 1998.

Population structure

Population structure (based on ratio to 100 females, Table 3) was be 64 males: 21 yearlings : 86 kids : 100 females (n= 38).

Habitat type

All groups of ibex recorded by the AKRSP/NLH team were observed in cliff habitat, mostly steep or broken at elevation estimated between 3400 m - 4800 m. Steep and rugged terrain with 50 -80° inclination were used by the ibex at this time of year.

General aspect of site

During May ibex were predominantly found on the south, south-east and east facing mountain slopes in the upper part of Basho. Ibex found in the part of Basho facing the Indus river tended to use north facing parts of the mountain. Appendix 8 shows locations where groups of ibex were observed, while Appendix 9 gives an overview of areas searched during the AKRSP/NLH survey in spring.

Autumn survey

A total of 67 ibex were counted during 15 days based on 5 different visits to Basho valley between September 1 and October 9, 1998 (Table 5). Most of the ibex groups were observed in cliff habitat at elevation estimated at 3,900 m - 4,900 m. During September/October ibex were predominantly found on the south, south-east and east facing mountain slopes in the upper part of Basho. Ibex found in the part of Basho facing the Indus river tended to use north-west facing parts of the mountain. Little difference in aspect and elevation used by ibex during spring and autumn was found.

Table 5. Number and composition of the ibex counted in Basho valley

Group no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	**Total**	Per cent
Adult females	1	3	2		4	3	1	2	5		2	2		3	**28**	40.5
Kids		1			1	1	1		4		1	2		2	**13**	18.8
Yearlings			2		1						1	3			**7**	10.1
Adult males		2	3	2	5	3	2*			1			3		**21**	30.4
class I		1	2		2	3							1		**9**	*
class II		1	1		2								2		**6**	*
class III				2	1					1					**4**	*
class IV																
Total count	1	6	7	2	11	7	2	2	9	1	4	7	3	5	**69**	100

* One group of males not classified.

Source: AKRSP team September - October 1998.

Comparison of the surveys

The number of ibex counted during early spring is probably an underestimate due to the difficult terrain with landslides and avalanches making it impossible to cover the upper alpine part of the area. During the survey in September/October larger areas were available. However, the higher number of ibex monitored during this survey was probably biased by the fact that the survey was conducted over a longer time span increasing the possibility of double counts.

Figures from the AKRSP/NLH and the joint IUCN surveys in the spring show similar results regarding numbers of ibex in the valley. Variation in age and sex composition may be due to small sample size. To distinguish between yearlings and females in a nursery group from a distance is difficult and may cause mis-judgement. However, the big discrepancy in number of kids is difficult to explain, since they are rather easy to distinguish.

Composition of female-male-yearling/kids ibex recorded for Basho valley is similar to what IUCN recorded in April in the adjacent S-K-B (Skoyo-Karabathang-Basingo) valley during Mountain Ungulate Survey (Jingfors, pers comm).

The fact that the first survey was conducted in early spring when the ibex population starts to segregate into male and female/nursery groups, may explain the low numbers of older males observed. Trophy sized males tend to stay at a high altitude at this time of year (pers. comm. Ghulam Abas). Former hunting in the area, which has now been stopped due to national and local bans, may also have affected the population composition of the area. Seasonal trend towards male segregation during summer has been reported in Asiatic ibex in other parts of Himalayas (Fox et al. 1992). A total count of the ibex population at a time when there is less segregation of the sexes is thus necessary for a more precise estimate of abundance and composition.

During the rutting season (November - December) ibex form larger groups of mixed age and sex composition (Fox et al. 1992). A total count of the population at that is thus necessary.

Population density

The ibex observed in Basho are most likely part of a larger population that ranges throughout the Deosai Mountains in the south. During a Mountain Ungulate Survey conducted by IUCN in the neighbouring S-K-B valley (Jingfors, pers comm), a total of 232 ibex were observed in an area of about 360 km^2. This gives a density of 0.6 ibex/ km^2, as compared to a density in the Basho watershed area of 0,35 - 0,45 ibex/ km^2 (AKRSP/NLH and joint IUCN survey). The density figure of Basho is based on the whole watershed area, including villages, cultivated areas, roads and pastures. The highest ibex density recorded from the Northern Areas, Barpu Glacier area, is 1.2 to 1.6 ibex/ km^2 (Hess et al. 1997)

6. INTERACTION BETWEEN WILDLIFE AND LIVESTOCK.

One of the main objectives of this part of the study was to investigate the spatial and temporal distribution, habitat and vegetation type use by livestock and Asiatic ibex in the early and later grazing season. Basic information on presence of other wildlife in the area is also needed for implementing a sound natural resource management strategy.

6.1 *Methods*

Free ranging livestock (described in 3.2.1) was recorded in the early grazing season. Sampling methods used for spatial distribution of livestock in this season were similar to those used for ibex, and was conducted simultaneously with the ibex survey 12. - 22. May. The same registration form was used, but herd composition data were not collected for livestock.

Tracks and direct observation of wildlife in general were noted throughout the field season.

Wildlife in general was discussed during a participatory learning exercise with the VO members of Basho, and wildlife known to be found in Basho is listed in Appendix 12.

6.2 *Main findings and discussion*

Interaction between ibex and livestock

During May, free ranging cattle were observed mainly in **steep artemisia slope** and **artemisia and juniper slopes** (habitat class **2a** and **2c**, see Appendix 5) up to 3,700 m elevation. Herders took groups of milking cattle and zo/zomo to «Rana» **river plain (6)** habitat daily, whilst small ruminants were taken to **end moraine (3)**, **rocky alluvial and colluvial fans, and river wash (5)** and **abandoned cultivated areas (1b).**

During the early grazing season, ibex were recorded in **cliff (9)** habitat at elevation estimated between 3400 - 4800 m. In autumn, groups of ibex were observed in cliff habitat at elevation estimated at 3900 m - 4900 m. No livestock were observed in this habitat during the survey period.

Fresh tracks of ibex and zo side by side were found in **high alpine scrub and meadows (8)** at 3800 m elevation in mid June. Even after the livestock had abandoned the area in September, no ibex were observed in these areas. In September, fresh ibex faeces and tracks were found in areas above 4200 m previously grazed by cattle earlier in the season.

No temporal overlap between ibex and livestock was observed. However, fresh tracks and faeces indicates some spatial and temporal overlap in habitat use during early and late grazing seasons. Little is known about the spatial distribution of ibex compared to livestock during the summer when the

livestock are taken to the higher pastures. Most likely, ibex will keep away from the high pastures when people appear with the livestock herds. According to our local ibex guide, Ghulam Abas, interactions between ibex and livestock are more spatial than temporal. Ibex tend to come down in the valleys and gullies for feeding during winter time.

Predation

Tracks of wolf and snow leopard were found in the vicinity of the village and broqs. Especially wolf tracks were recorded in most parts of the valley throughout the field season and were particularly common around the river plain, Rana, and Forest hut. Wolf was observed by team members less than 200 m from the village of Sultanabad in July. Field guide Ghulam Abas observed snow leopard at the highest broq, Moskinimon at 4 000 m, in the upper part of the valley in August.

During the first two weeks of June, six carcasses of cattle and zo were reported by the local people. Four of these were found 1-2 days after the animals' death. This made it difficult to determine the cause of death. According to local people and some marks and evidence of broken ribs, the animals were most probably depredated by wolf. Livestock attacked by wolf was also reported during the last survey in September, among these a calf and two sheep.

Observation of wolf tracks indicates a fair number of wolves in the area. Loss of livestock due to predation is perceived as a problem for the livestock herding practice in the valley. Thus, to enhance a sound grazing practice it is essential to know the extent of depredation on livestock during the summer grazing season and in winter.

7. DISTRIBUTION OF PASTURE SOILS AND SOIL PROPERTIES.

7.1 *Methods*

The soil investigations were carried out in selected broqs and grazing areas. The selection was done together with other NLH team members and persons from the AKRSP staff. The selected areas were:

- Rana
- Rushkin, Bondopiri and Satcho
- Ganicho
- Sari, Lazang, Raymil and Kamputitoq
- Chalabat and Salchen
- Soq, Siachan, Tangmosa and Drakhmochomik
- Dorum (forest area)

Typical sites were chosen for description and sampling of soils. Within each pasture area, the soil investigation sites represent the variations in parent material, slope, vegetation and human influence, as well as being representative of a relatively large area. For each site, parameters describing the location, terrain, and soil were recorded. The parameters were chosen from 'Guidelines for Soil Profile

Description' (FAO, 1990), and adjusted to serve the purpose of the investigation. The following is a brief overview of important parameters:

Site parameters

- Identification number
- Date of description
- Geographical location
- Landscape description
- Elevation, slope and aspect
- Land use
- Human influence
- Vegetation (dominating species)
- % plant cover

Soil parameters

- Parent material
- Rooting depth, soil depth and groundwater depth
- Surface features (stoniness, crusting, cracks and other features)
- Internal drainage and runoff
- Soil moisture status
- Penetration resistance
- Morphological description of soil horizons (horizon thickness, texture, structure, color, consistence, root distribution, organic matter a.o.).

Slopes were measured using a pocket clinometer and aspects were registered using a 400-degree compass. Penetration resistance was measured using a pocket penetrometer (5 replications). The soil profile pits were dug using spade and pickaxe. Soil samples were taken from the A-horizons, or the A-horizon plus underlying horizon when the A-horizons were less than 3 cm thick. The samples represent the part of the soil profile with highest root density.

Analyses of the soil samples are carried out by Pakistan Agricultural Research Center in Islamabad. About 20 samples, representing the dominating soil types on the the different broqs or grazing areas, underwent a detailed analyses program including pH, organic C, total N, exchangeable cations (Ca, Mg, K, Na and acidity), selected nutrients/micro nutrients and particle size distribution.

7.2 ***Main findings***

7.2.1 *Soil types and their distribution*

60 soil profiles were described in the period 25 May to 18 July. The profiles are tentatively classified according to the FAO-UNESCO Soil Map of the World Legend (FAO, 1988). Six of the 28 soil groups are represented in this study. These are Anthrosols, Arenosols, Cambisols, Fluvisols, Leptosols and Regosols. Their distribution is shown in Table 6.

There is a close relation between soil group and parent material and some relation between soil group and topography. This can be seen in the following table (Table 6) where the six soil groups and their characteristics are presented together with the parent material from which they are formed in Basho, the topography, and the habitat class, where they commonly occur.

Table 6. Soil Groups (FAO, 1988) and their main characteristics in Basho Valley.

Soil Group	Characteristics	Parent Material	Topography	Habitat class[2]
Anthrosol	Man-made soils, sandy and loamy textures.	Mixture of loess and glacial material.	On terraces (less than 30 % slope).	1a, b
Arenosol[1]	Homogenous sandy texture.	Lacustrine (lake)	Flat	-
Cambisol	Well developed B-horizon, silt loam texture.	Loess (30 cm to more than 1 m thickness) over glacial deposits.	Steep to extremely steep (more than 30 % slope)	2b, c, d 4
Fluvisol	No B-horizon, sandy textures, stratified with buried organic horizons, high water table.	Fluvial (river) and lacustrine (lake) sediments.	Flat to gently sloping (less than 5 % slope)	7
Leptosol	Texture dominated by gravel and coarser fragments.	Alluvial and colluvial material as river wash, on fans and scree slopes, heavily eroded glacial deposits.	Gently sloping to extremely steep	2a 3 5 6
Regosol	Loamy textures with high gravel/stone content.	Colluvial material, eroded glacial deposits	Steep to extremely steep (more than 30 % slope)	2(a),b, c, d (4)

[1] only one profile

[2] see appendix 5, 'Habitat classification of Basho Valley'

Anthrosols

Anthrosols are man-made soils, and are found on the agricultural terraces. The terraces in the soil investigation area that are currently in cultivated agricultural use are located in Sultanabad village and on Ruskin, Sari, Birtay and Raymil broqs. The soil investigations include only the abandoned terraces that are used as pasture. They are located at Satcho, Ganicho, Lazang and Soq in addition to the broqs already mentioned.

Arenosols

Arenosols, which are characterised by a homogenous well sorted sandy texture, are represented by only one soil profile in this investigation. Arenosols are rarely found in this part of Basho. Most sandy soils are either too coarse or stratified, and do not qualify as Arenosols.

Fluvisols

Fluvisols cover most of the Rana grazing area. They are stratified, have little or no B-horizon development and show evidence of several episodes in the past when the area was covered by a lake.

Rana consists of natural river terraces that are dissected by several stream channels of the Basho River. The main variation in soil properties is due to varying depth to the groundwater table. The lower terraces, which are covered by grass or scrub vegetation, are dominated by very poorly drained soils. The soils have an organic surface horizon that stayed water saturated the whole study period. Similar soils are also found where tributary streams (on the surface or under ground) meet the river plain and raise the groundwater level. An example is the forest and pasture area on the river plain north of Soq broq.

The soils on the intermediate terraces are poorly or imperfectly drained. The water table is sufficiently high, that the capillary fringe reaches up to the root zone and supplies the plants with moisture most of the growing season.

The higher terraces are mainly covered with forest. The soils are well drained and show some B-horizon development. A comparison of a forest soil and a previously cultivated soil on the same terrace showed that the forest soil retained soil moisture for a longer time and supported a denser grass cover than the cultivated soil. This is probably due to lesser exposure to the sun, higher organic matter content and better (finer and more developed) soil structure.

Fluvisols on levees (along stream channels) and in the northern part of the river plain (old polo ground) are more sandy than soils elsewhere on the river plain. Sand layers close to the surface restrict root growth because of lack of soil moisture. Sand layers at the surface may cause wind erosion problems.

The valley bottom at Selchen, which is a high pasture (about 3900 m elevation) upriver from Chalabat, is also dominated by Fluvisols. These soils are similar to the Fluvisols on the intermediate terraces in Rana.

Cambisols

Cambisols are mainly formed in loess in this part of Basho, and can therefore be found in the areas where the loess layer is still present. In the study area between Raskin Nullah and Lazang Nullah, Cambisols occur as patches where the loess cover has not been eroded away. They can be found on east-facing slopes on Bundopiri and Satcho, east-facing slopes below Raymil and above Sari and on the non-terraced part of Ganicho. Deep loess cover is the dominating parent material (Cambisols?) on Kamputitoq, and Cambisols formed in a mixture of loess and colluvial material (mainly gravel) dominate the lower slopes on the pastures above Sari and Raymil, and the valley slopes at Chalabat.

A continuous loess layer with well-developed Cambisols dominates Dorum, including the grazing areas above Drakhmochomik and Soq. These Cambisols have darker surface horizons (higher organic matter

content), redder B-horizons and a more favorable soil structure for plant growth compared to the Cambisols on the other side of the valley.

Cambisols formed in loess have a silt loam texture with no coarse fragments. Soils with this texture have a good water holding capacity, which means they have a better ability to retain plant available water than soils with higher sand content. On the other hand, wet silty soils are more subjected to soil compaction than sandy soils.

Leptosols

Leptosols in Basho contain more than 80 % (by volume) gravel and coarser fragments. They are formed in extremely stony alluvial material, which can be seen in sloping stream- and riverbeds, on alluvial fans and as river wash. Examples are the alluvial fans around Tangmosa and Siachan broqs.

Leptosols are also found on steep slopes where the fine particles have been washed away leaving coarse sand, gravel, stones and boulders. These soils have very low organic matter content and are lacking a visible A-horizon except under scattered bushes and Artemisia plants. The slope from Rashkin broq down to Rana is dominated by this special kind of Leptosol.

A third kind of Leptosol is found in connection with the end moraine north of Rana. The parent material is probably of glacio-fluvial origin. It consists of well-rounded rocks covered by a thin (less than 25 cm thick) loess layer.

Most Leptosols in Basho show little soil development. An exception is the loess covered Leptosols which have well-developed B-horizons with strong platy and prismatic structure in the loess layer. The water holding capacity is very low due to the coarse textures. An eventual loess layer is too thin to afflict the availability of water to plants. The strong structure probably accelerates the water loss from this soil.

Regosols

Regosols are most frequently developed in colluvial material, or in glacial material where the loess layer has been eroded away. The common textures are loam and sandy loam with varying gravel and stone content. They have little or no profile development, thin or missing A-horizons and are often found on treeless slopes and on ridge tops where soil erosion is most likely to occur. A special kind of Regosol can be found between the agricultural terraces where soil material has been removed and used in building the terraces. Regosols has been described on Rushkin, Bondopiri, Satcho and above Raymil and Sari. The properties regarding water availability to plants are intermediate between Cambisols and Leptosols.

7.2.2 *Comparisons of plant cover and selected soil properties*

The % plant cover on the described sites varies between 1 % and 100%. Differences can be seen between soil groups, between locations with different aspects and between open pastures and forest sites (Table 7).

Fluvisol sites have the highest average % plant cover. The main reason is a high water table with a capillary fringe that reaches the root zone. The few Fluvisol profiles with low plant cover percentage had a sand layer at or close to the soil surface.

Cambisol sites have relatively high % plant cover on the southern side of the valley, but the opposite side of the valley shows far less estimates with an average of 44 %. The same difference can be seen between forest sites and open pasture sites. This difference can be explained by site factors like aspect and exposition (shade), but also by soil factors like surface crusting and soil structure. 9 of the 19 (47 %) Cambisol sites on the north side of the valley have a hard surface crust, and 11 of the same sites (58 %) have a more or less unpenetrable platy structure in the surface horizon. Looking at the Cambisol sites on the south side, we see surface crust in 1 of 13 sites (8 %) and platy structure in the surface horizon on 3 of 13 sites (23 %).

Leptosol and Regosol sites have the lowest average % plant cover. They are not described on the south side of the valley or in forest. They are all very exposed to the sun and most of them have unfavourable soil properties like coarse texture, surface crusting and platy structure.

Table 7. Distribution of soil groups by location

	North side		**South side**		**Valley floor**		**Open pasture**		**Forest**		**Total**	
Soil Group	No. of obs	Ave. % plant cov.	No. of obs	Ave. % plant cov.	No. of obs	Ave. % plant cov.	No. of obs	Ave. % plant cov.	No. of obs	Ave. % plant cov.	No. of obs	Ave. % plant cov.
Anthrosol	2	-	0	-	0	-	2	-	0	-	2	-
Arenosol	1	-	0	-	0	-	1	-	0	-	1	-
Cambisol	19	44	13	80	0	-	25	53	7	84	32	60
Fluvisol	0	-	0	-	13	83	8	75	5	96	13	83
Leptosol	4	6	2	-	2	-	8	10	0	-	8	10
Regosol	4	19	0	-	0	-	4	19	0	-	4	19
Total	30	34	15	72	15	73	48	45	12	89	60	54

Physical and chemical soil analyses

(Results from the soil sample analyses are not available yet).

7.3 ***Discussion and conclusions***

Surface crusting and the formation of platy structure in the surface horizon restricts plant growth. Surface crusts may form when wet soil dries rapidly, for example during snow melt. Freeze-thaw action may also result in crusting. Silty soils low in organic matter are probably more subjected to crusting than soils rich in organic matter and sandy soils. Most soils in Basho Valley, with the exception of some Fluvisols, are low in organic matter content. The climate is normally hot and dry in the spring and early summer, so surface crusting is a natural process in Basho soils.

Platy surface structure may also be the result of rapid change in moisture status in the soil (water compaction). Mechanical compaction is often seen in agricultural soils where the use of heavy machinery leads to the formation of a plow pan. Mechanical compaction in the soil surface may also result from traffic by grazing animals. This might especially be a problem on wet silty soils. This study showed that the soil surface on most of the Cambisol sites on the northern side of the valley was covered with animal tracks.

Another 'negative' soil property concerning the Basho Cambisols, is their high erodibility. Silt loam texture, low organic matter content, low infiltration rate and poor structure give these soil a high K-value (erodibility) according to the Universal Soil Loss Equation (USLE). This factor, combined with steep slopes and poor soil cover, result in a high risk of soil erosion. Active soil erosion was not observed during the field investigations (except on irrigated land), but a low hummocky microrelief was common in the loess areas on the north side of the valley. This microrelief may be the result of soil loss. From a climatic point of view, soil erosion may not be a problem in this area, except during heavy snowmelt, but the potential soil erosion hazard should be in mind when these areas are irrigated.

Soil erosion seems to be a minimal problem on the south side of the valley due to a more or less continuous soil cover.

So far, the following preliminary conclusions can be drawn (these conclusions are based on field observations. Statistical analyses of the data, as well as results from analyses of the soil samples will be available at a later stage):

- Surface crusting and platy structure in the surface horizon have a negative effect on plant growth. Development of platy structure is more pronounced in the silty Cambisols. This form of soil degradation may be the result of climatic factors and/or compaction by grazing animals.
- Loss of topsoil through erosion has a negative effect on plant growth. Silt loam textured soils (Cambisols) are more susceptible to soil erosion than other soils in Basho (assuming constant relief and soil cover factors).

- Coarse texture with high gravel and stone content, and an excessively well internal drainage has a negative effect on plant growth. These soil properties are characteristic of Leptosols and Regosols in Basho. The limiting factor for plant growth in these soils is a very low water holding capacity.
- High water table has a positive effect on plant growth in the Basho Fluvisols as long as the capillary fringe is within reach of the plant roots. Water saturation in the topsoil limits plant growth. Sandy layers close to or at the soil surface reduce the rooting depth and are therefor limiting for plant growth.
- Shading from trees (mulching effect) reduces water loss through surface evaporation and has a positive effect on plant growth.

Soil degradation risk

A continuation of the soil investigation may focus on what effect heavy grazing has on the soil quality, as well as the effect of shading (from trees). Data collected during the fieldwork support a relationship between poor soil structure due to compaction and observations of tracks on the soil surface from grazing animals. A detailed investigation of soils within fenced enclosures, compared with an investigation of 'grazed soils', may document the effect of grazing on soil structure deterioration on selected Basho soils. A similar study could be conducted on 'shaded' soils and sun exposed soils, to determine the effect shading from trees has on the soil quality in Basho. The soil investigations should include measurement of physical parameters, such as bulk density and penetration resistance, and a monitoring of soil moisture and soil temperature.

8. GENERAL RECOMMENDATIONS

Thanks to excellent logistics and assistance from local people in the valley, this first field season has provided valuable information on the pastoral system, grazing dynamics, wildlife and soils in Basho. We now have a sound basis for planning and prioritising next years' work within the Project component «Pasture, livestock and biodiversity». Because substantial time and resources are required for collecting adequate research data on the ecology and the highly dynamic pastoral system prevailing in Basho, and limited resources are available within this component of the Project, we recommend the following themes to be researched during the remainder of the Project:

Livestock and grazing dynamics

Under this sub-component we suggest that the field research should focus on the following four topics, which are all related and thus is a time and cost-effective approach:

1. Movement pattern of livestock in relation to pasture quality. The hypothesis to be tested is whether livestock are moved or herded along a gradient of optimum quality and quantity of natural forage. The

methodology will consist of measuring quality and quantity of forage at fixed locations from the lower-most broqs to the alpine pastures during the whole grazing season, and mapping the spatial distribution and altitudinal movement of livestock during the same time period. A number of small plots need to be fenced throughout the altitudinal range of pastures for measuring quality and quantity of un-grazed vegetation.

2. Determination of grazing pressure. To determine whether pastures are overgrazed or not (or the relative grazing pressure) is quite complicated. In order to assess the condition of the main pastures we propose to establish small fenced enclosures at selected broqs/pastures. Because grazing pressure is expected to vary with access and distance from khlas, site selection needs to be stratified according to vegetation type, elevation and distance from broq/khlas. Biomass production will be determined by clipping vegetation at intervals both inside and outside the enclosures. Floristic composition and changes in vegetative cover (relative coverage of «increasers» and «decreasers») will be recorded.

3. Foraging behaviour on pastures of different quality. Preliminary observations during this field season indicate that foraging behaviour of small ruminants may serve as an indicator of pasture quality. Presumably, animals on poor pasture are less selective and spend more time walking between feeding patches than animals on good quality range which can afford to be more selective while grazing. We propose to continue the field study on foraging behaviour by selecting four groups and monitor their foraging behaviour: Two groups will be herded to pastures believed to be of good quality and two groups to poor quality pastures. Their foraging behaviour will be recorded quantitatively. Quality and quantity of forage biomass will be measured simultaneously.

4. Productivity of livestock related to pasture quality. Little information is yet available on the productivity of the livestock in Basho. Weight gain and milk production are two indices of productivity which can be recorded and used as indicators of pasture quality. We propose that such measurements be collected during the summer grazing season from selected animals within selected flocks of small ruminants. In order to determine the extent to which pasture quality affects the productivity, some animals should receive supplemental forage or concentrates twice during the day (morning and evening). Similar comparative feeding trials may also be conducted during the winter season in order to detect quality of the current stall feeding practices in the valley.

Wildlife

Ibex is an important wildlife resource in Basho. Interviews with the local inhabitants disclosed that people have a deep-rooted affection for wildlife, including ibex, and that they are concerned about the apparent decline in number of ibex during the last decades. The decline is most probably due to previous legal and illegal hunting. Furthermore, there are interests in Basho for developing eco-tourism and possibly a trophy hunting program for generating revenues to the communities.

Livestock depredation by wolves and snow leopard has negative effects on the pastoral system in the valley. Over the years, the «costly» system of herding and keeping small stock within stone-walled corrals has evolved as a means of protecting animals against predators. At the same time, the snow leopard is now classified as an internationally threatened species, and the presence of predators enhances the potential and value of Basho for eco-tourism.

The information collected on wildlife during the first field season was preliminary. The ibex surveys probably underestimated the population size and gave very inconsistent results on recruitment of young animals. The information on interaction between ibex and livestock indicated that competition for forage is probably insignificant, as the two groups of herbivores were spatially separated. Temporal overlap of habitat use may occur, but probably also only to a minimal extent. Because field work to disclose the precise extent of overlap and potential competition is very time-consuming and difficult, we propose that the research on wildlife be changed to focus on the two following themes:

1. Intensive census of the ibex population. Such a census should be carried out during the rutting season in December when the two sexes are mixed and animals occur in more readily observable groups. Reliable data on population size and composition from December inventories will indicate recruitment rate and, hence, the extent of kid and yearling survival. Such data are basic requirements for making management plans for sustainable harvesting (Wegge, 1997). Any census work in Basho should be coordinated with IUCNs similar programs in the adjacent S-K-B valley and elsewhere in Pakistan.

2. Predation on domestic and wild ungulates. The extent of predation by wolves and snow leopards on domestic stock should be quantified in order to assess the relative importance of these predators in the pastoral system in Basho. Ideally, the losses incurred by predators on the ibex population should also be quantified in order to determine safe hunting quotas for hunting. The methods to obtain these data should be a combination of systematic searches for carcasses and a reporting system in cooperation with the local villages. An attempt should also be made to quantify the number of predators which regularly use the Basho watershed. Although a difficult task, such information may be generated through a combined method of remote camera trapping and pugmark tracking, probably in late autumn and early spring when the ground is snow-covered.

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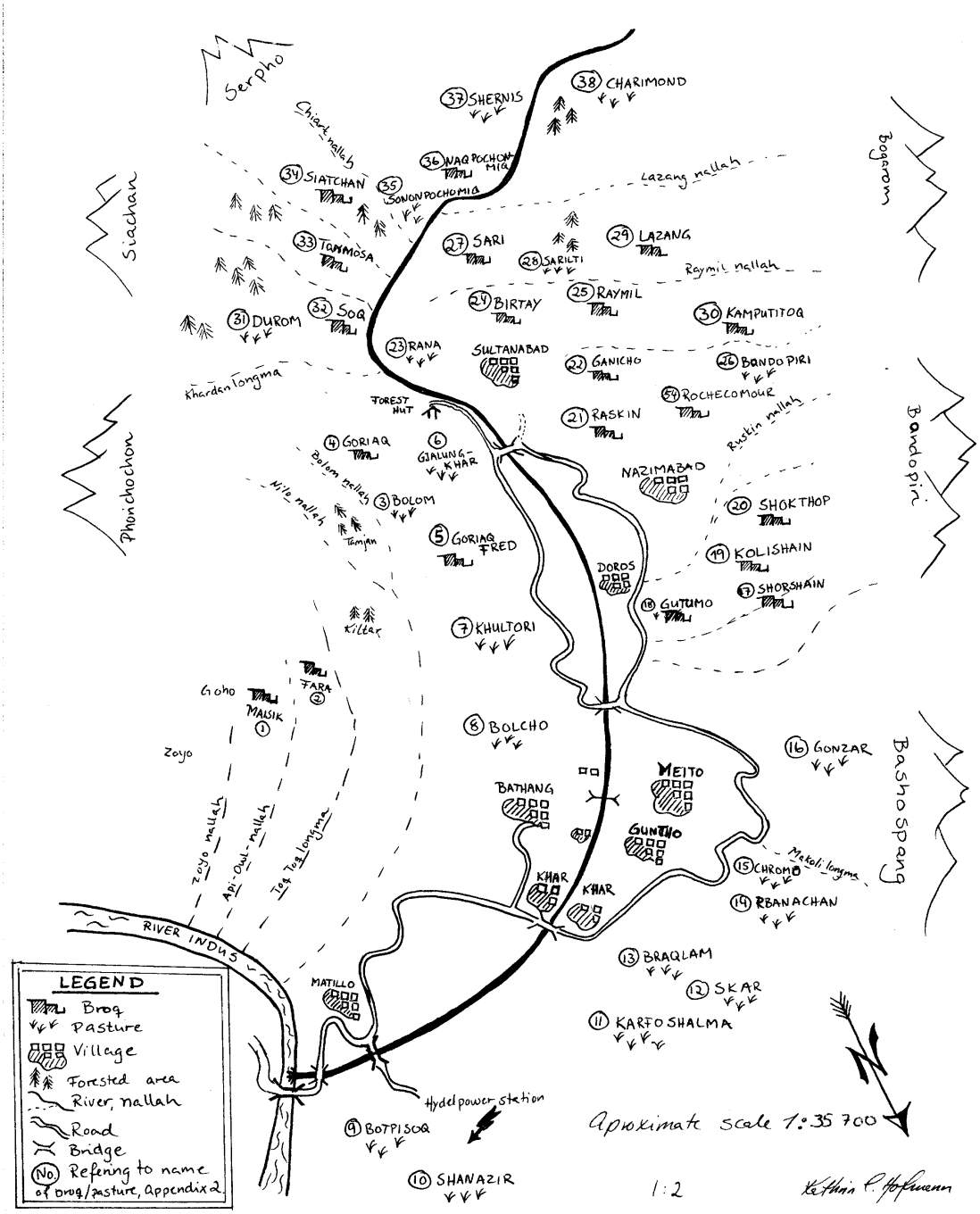
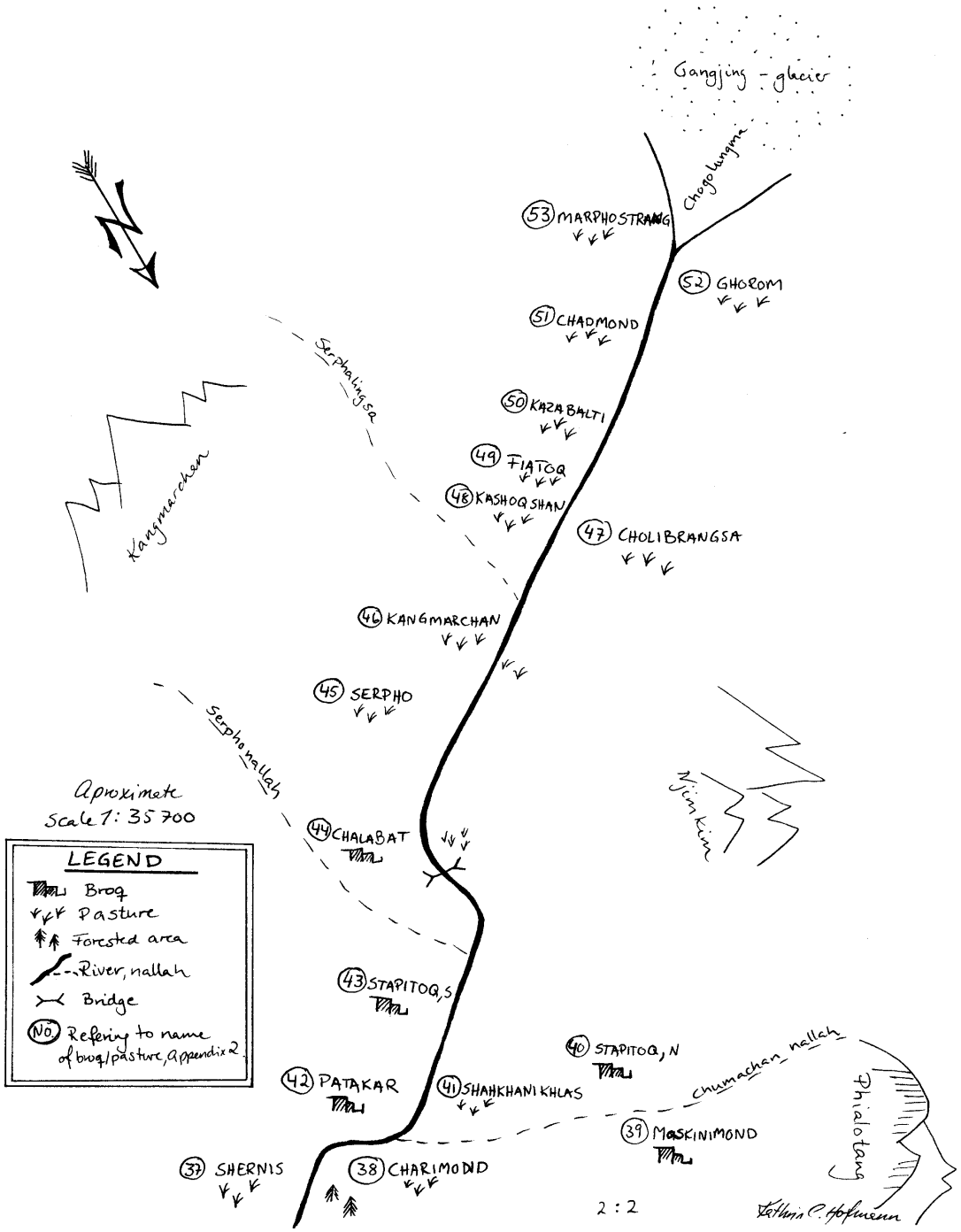
APPENDIX 1: DISTRIBUTION OF BROQS AND HIGH PASTURES IN BASHO WATERSHED

Based on participatory learning exercise with the BDO members of Basho (Basho Development Organisation), AKRSP- staff (Dr. Abbas) and NLH-team (Kathrin C. Hofmann, Ingrid Nyborg and Åge Nyborg) on 13th of May 1998. This map is a copy of the BDO`s presentation of the high pastures of Basho and has no juridical rights. Made by Kathrin C. Hofmann.



Based on participatory learning exercise with the BDO members of Basho (Basho Development Organisation), AKRSP- staff (Dr. Abbas) and NLH-team (Kathrin C. Hofmann, Ingrid Nyborg and Åge Nyborg) on 13th of May 1998. This map is a copy of the BDO`s presentation of the high pastures of Basho and has no juridical rights. Made by Kathrin C. Hofmann.



APPENDIX 2: OVERVIEW OF ALPINE PASTURES IN THE BASHO WATERSHED

Research team: NLH: Kathrin Hofmann, Håvard Steinsholt. AKRSP: Dr Abbas, Dr Iqbal, Ulrik Motzfeldt, Jawad Ali. Partly based on participatory learning exercises with local people on 30.05 and 31.05.1998. The overview presents the understanding gained by the research team on the days of the participatory learning exercises; the state of resource use and rights is flexible and continuously undergoes change. The documentation should not be used to support legal claims.

No.	Name	Broq	Grazing area	Pasture rights	Grazing period	Livestock species	Other uses	Broq quality	Notes
1	Maisik	**X**		Matillo	June	All livestock		5	Only used by Matillo
2	Fara	**X**		Matillo	July-Aug	All livestock		5	Only used by Matillo, good milking prod. and fodder quality
3	Bolom		**X**	Bahtang, Khar, Guntho	Aug	Zo/Zomo, small anim.		5	Low accessibility, danger, forested area, some snow leopard, less wolf
4	Goriaq	**X**		Khar, Bahtang, Guntho	May- late Aug	All livestock	Some cultiv. barly	1	Dry area, predation by wolf b.c. passing by. Lowe milk prod., but high fat contence. Stay from August, but take small ruminants up daily from May.
5	Goriaq Fred	**X**		Khar, Bahtang, Guntho	Bef. 15 June and in august	Zo, Zomo	Cultivating barley, June-Aug	1	No irrigation, only rainfed
6	Gjalungkhar		**X**	Guntho, Meito, Nazimabad, Sultanabad	June - August	Sheep and goats			Boulder area
7	Kholtori		**X**	Guntho, Meito (shared)			Fodder harvesting	5	Mostly for fodder harvesting; partly irrigated
8	Bolcho		**X**	Guntho	Winter-autumn	All livestock	Fuel wood collected, fodder harvested	5	
9	Botpisoq		**X**	Guntho, Khar	Winter-autumn	All livestock	Cultivation (1/2 area)	3	Stony, no water channel
10	Shahnazir		**X**	Guntho, Khar, Bahtang	Winter-autumn	All livestock	Cultivation (1/2 area - named Harmasko)	3	
11	Karfoshalma		**X**	Guntho, Khar		All livestock		3	Khar Nallah
12	Skar		**X**	Guntho, Khar	March-April and Sept-Dec	Goats, Sheep		2	Water shortage, good soil
13	Braqlam		**X**	Guntho, Khar	March-April and Sept-Dec	Goats, Sheep		1	Route to Skar, steep, dangerous
14	Rbanachan		**X**	Guntho, Meito	Winter	All livestock		1	Dry area, landslides
15	Charomo		**X**	Meito	Winter	All livestock		1	Dry area, landslides

No.	Name	Broq	Grazing area	Pasture rights	Grazing period	Livestock species	Other uses	Broq quality	Notes
16	Gonzar		**X**	Meito, Doros, Nazim.	Winter	All livestock		4	Some dry periods
17	Shorisain	**X**		Meito, Doros, Nazim.	Mid June-July	All livestock	Junipers, fuel wood	3	Hot, dry, Anim. go from here to Chalabat
18	Gutumo	**X**		Meito (4 households)	August	All livestock	Cultivation most important	4	Khlas only for men, water shortage.
19	Kolishain	**X**		Doros, Nazim., Sult.	Mid June-Aug/Sept	All livestock		4	Cold, moving dependent on temperature. Water shortage, used in connection with Raskin.
20	Shokthop	**X**		Sult., Naz., Doros (?)	May-Oct	All anim.	Cultivation	5	Part of Raskin
21	Raskin	**X**		Sult., Naz., Doros	May-Oct	All anim.	Cultivation	5	Khlas inhab. June - Aug. Gentle, wide, water, firewood, good grass quality, no pred. Good milk and butter quality.
22	Ganicho		**X**	Doros, Sultanabad			Cultivation		Raja land. Partly irrigated. Cult. by 10-12-hh. (Or: 2 hh in Doros and 3 hh in Sult.)
23	Rana		**X**	All villages	May-Sept	All animals		5	Important grazing area for drie/week animals all summer, and for dairy cows in early spring and autumn. "Waiting area" and grazing area for sick animals.
24	Birtay	**X**		Sultanabad	May-Oct	All animals (incl. hens)	Cultivation	5	Cultivation by 3 households, grazing for all.
25	Raymil	**X**		Doros, Nazimabad	End June - end Aug	All animals		5	Inhabited end June - first Aug. Easy accass, close to water, good grazing quality.
26	Bondopiri		**X**						
27	Sari	**X**		Meito, Naz., Sult.	End June - mid Aug	All animals	Cultivation	3	Too many households, overgrazed. Used by dried animals before June. Meito h.h. moves on to Lazang and then back. Predation by wolf and snow leopard.
28	Sarilti		**X**						
29	Lazang	**X**		Meito + Nazimabad	Mid. Aug- end Sept	Dry anim., sheep and goats		4	Sometimes cultivation, fuel wood
30	Komputi Toq	**X**		Doros, Nazimabad	Late Aug - end Sept	Dry anim., sheep and goats, yak		4	Livestock taken from Raymil and then back later in autumn. Good grazing quality.

No.	Name	Broq	Grazing area	Pasture rights	Grazing period	Livestock species	Other uses	Broq quality	Notes
31	Dorum		**X**	All villages	June, free grazing area	All	Forested area, fuel collected	3	Wider area (includes 32, 33, 34, 39) where all Basho has rights. Water shortage in September.
32	Soq	**X**		Khar, Bahtang, Guntho	June - Aug	All		3	Small place
33	Tangmosa	**X**		Guntho	June - Aug	All		3	
34	Siachan	**X**		Guntho	June - Aug	All		3	
35	Sononpochomiq		**X**	Sultanabad	June - Aug	All		3	
36	Naqpochonmiq	**X**		Meito	June - Aug	All		3	
37	Shernis		**X**	All villages	June - Aug	All		2	Narrow pathway to other areas
38	Sharimond		**X**	All villages	June - Aug	Dry and big animals		2	High alt., dry area, dangerous terrain, predation.
39	Moskinimond	**X**		All villages (Naz. khlas)	June - Aug	Dry and big animals		2	High alt., dry area, dangerous terrain, predation.
40	Staqpitoq (northern)	**X**		Nazimabad	July - end Aug	All		3	
41	Shahkani khlas		**X**	All (former Khar khlas)	July-Aug	All		3	Small passage-area
42	Patakar	**X**		Guntho	July-Aug	All		4	
43	Staqpitoq (southern)	**X**		Guntho	August	All		4	Only one month.
44	Chalabat	**X**		All villages (2 Sultanabad. khlas)	August	All		4	Good pasture, only rain water, no firewood, lynx.
45	Serpho		**X**	All villages	June	All		3	Little patch of grass.
46	Kangmarchan		**X**	All villages	June- until snow	Dry and big animals		3	Rocky, Dangerous, free ranging animals
47	Choli Brangsa		**X**	All villages	June- until snow	Dry and big animals		1	Cold, boulders, slides, no firewood
48	Kashoqchan		**X**	All villages	June- until snow	Dry and big animals		1	Excellent pasture, but cold, boulders, slides, no firewood
49	Fiatoq		**X**	All villages	June- until snow	Dry and big animals		1	Excellent pasture, but cold, boulders, slides, no firewood
50	Kaza Balti		**X**	All villages	June- until snow	Dry and big animals		1	Excellent pasture, but cold, boulders, slides, no firewood

No.	Name	Broq	Grazing area	Pasture rights	Grazing period	Livestock species	Other uses	Broq quality	Notes
51	Chadmond		**X**	All villages	June- until snow	Dry and big animals		1	Excellent pasture, but cold, boulders, slides, no firewood
52	Ghorom		**X**	All villages	June- until snow	Zo only		1	
53	Marphostang		**X**	All villages					
54	Rochecomour	**X**		Sultanabad	End June	All animals		Not yet known	Newly established khlas based on new water channel.
55	Phialotang		**X**	All villages	June-Sept	All except milking anim.		3	Hot area, plain, good grass, water supply, no predators

APPENDIX 3: DISTRIBUTION OF HABITAT CLASSES IN BASHO VALLEY

Classified and mapped by Kathrin C. Hofmann, digitalised by Thor Sigurd Thorsen.

APPENDIX 4: FLORISTIC RECORD SHEET

Date:			Register No:
Location:			
Habitat type:			Distance to water:
Elevation:	Aspect:	slope:	% of barren ground (1 m, 5m radius):

Plant no:	Plant species	Local name	No. of blocks covering 50%.	Lifeform class	Phenological stage	Visual grazing sign	Plant hight cm	Perennial / annual

Human/livestock activity:

Presence of pellets in a 5 m radius.

Presence of tracks in a 5 m radius:

Bushes - name and % cover:

Trees - name and % cover:

APPENDIX 5: HABITAT CLASSIFICATION OF BASHO VALLEY

by Kathrin C. Hofmann

Forested and cultivated areas are classified, but not described. The numbers referred to is used on the habitat map in appendix 3.

1 Cultivated areas

1a) Cultivated areas at high altitude

-Cultivated terraces adjacent to broqs above village level, situated between 3100 - 3500 m, mainly barley and pea crops.

-Grassy edges or zones in between cultivated fields.

- south - east aspect

No floristic description or analyses has been done

1b) Abandoned cultivated areas

- terraced slopes 18 to 25°, dominated by forbs and bushes.

No floristic description or analyses have been done

2 Steppe of Artemisia on moraine slopes

This habitat class is related to the vegetation type described as **Steppe of Artemisia** by Schweinfurth (1957). Depending on edaphic and topographical variation, species of vegetation varies. By dividing this general habitat class into 4 subgroups, vegetational variation are more closely described

2a) Steep artemisia slopes

This was the most dominant habitat class, covering X % of the lower valley around Sultanabad.

- In general > 40° slope, facing south and south-east, elevation ranging from < 3000 m up to 3600 m, constituting X % of the habitat mapped area.

-Rocks, pebbles and rocky outcrops covering about 10 % of the ground.

- Vegetation at this time of year covering 40 - 60 % of the ground

- Vegetation dominated by *Artemisia sp*., grasses and small forbs. Scattered occurrence of juniper (*Juniper macropoda*) covering <10%, some wild rose *Rosa webbiana, Spirea sp.* and forbs related to outcrop of rocks and water streams.

Human and livestock impact: Steep artemisia slopes are located close to Nazimabad and nearby broqs. Artemisia plants having low growth form with grazing signs probably from last year. Grasses and *Tulipa sp.* grazed in early spring. Pellets and tracks from small ruminants and cattle present.

2b) Juniper and Blue Pine slopes

-Sparsely distributed individual trees of juniper and blue pine (*Pinus wallichiana*).

Ground cover dominated by grasses and small forbs, some mosses and shrubs. Presence of humus due to tree stands varying the composition of forbs and grasses compared to habitat class 2a.

-30 to 40 % of barren ground, outcrops of rocks and boulder.

-General slope 20 to 40 ° facing S, SE and NE, elevation ranging from 3300 - 3600 m.

Human and livestock impact: Presence of tracks and pellets from domestic ruminants are found. Moraine slopes with juniper and blue pine are located close to Sari and Birtay broq. Some grazing signs from early spring on grasses found. In this habitat class trees are cut down.

Some of the area on Raskin defined as 2b, has been irrigated and planted with poplar, willow and alfalfa. These are not floristic described, but mapped as 2b*.

2c) Artemisia and Juniper slopes.

Slopes with artemisia and juniper having an inclination < 40° was found on S and SE aspects lower than 3600 m elevation. This habitat class is covering X % of the mapped areas. Some of the areas were terraced and probably cultivated earlier.

In this habitat class rocks were patchy distributed, top soil (silt) washed away with rocks and pebbles. The vegetation was dominated by grasses («2c-1-8 sølvbunke»), forbs («biarchachu», *Tulipa sp*., artemisia*)* and individual juniper trees . Mosses were also found.

Human and livestock impact: Located close to village Sultanabad and nearby broqs. Presence of pellets and tracks were found. Height of ground cover was measured to be between 1-10 cm. Grazing signs on following plants were found: *Tulipa sp.*, »biartchatchu, sølvbunke, 0-1-2, 0-1-3».

2d) Moraine slopes above 3 600 m.

This habitat class was bordering 2a, 2b, 2c and 4 at 3600 m and continue up to >4000 m depending on aspect. The ground was carpeted by creeping *Juniper communis utilis*, covering 30 to 60 % of the ground. General aspect facing N, NW, and S, SE with an inclination of 20-30°. Typical plants found in these higher elevated moraine slopes were: «lamai, onga mendoc», artemisia, *Tulipa sp.*, *Thyme sp.*, grasses and some low growing individual stands of juniper. Rocky outcrops and rockslide deposit was comprising 20% of the ground surface. The root zone were deep in silty soil.

Human and livestock impact: Tracks and pellets from ruminants are present. Grazing sign on *Tulipa sp.* and grasses were found.

3 End moraine

The characteristic end moraine located on the north side of Sultanabad at the last step was dominated by big rocks and boulders (> 1m radius) up to 3120 m elevation. Patches of flat areas vegetated by graminoides and forbs in-between rocks, covering 60-80% of the ground. Dominant species found were: artemisia, «biarchatchu, orobo», *Tulipa sp.* and *Efedra sp.* Along edges and rocks, trees and bigger shrubs like: blue pine, juniper, *Riebes sp., Rosa webbiana, Barberis sp.,* and «zed».

Human and livestock impact: Stumps of juniper burnt down were found, while «Zed, *Tulipa sp.* and artemisia were heavily grazed by small ruminants. Pellets and tracks from small ruminants and some cattle were present.

4 Forested areas

4a) Blue pine slopes.

4b) Blue pine forest cut down, Juniper and ground cover dominated.

4c) Birch forest and patches.

The forested areas were having dominantly north facing aspect.

No floristic description or analyses has been done. Described by Velle (1998) Report No. 4: Natural forest inventory.

5 Rocky alluvial and colluvial fans, and river wash.

Along the rivers and streams, rocky alluvial and colluvial fans were found at various elevation, aspect and slope. River wash was found down in the valley bottom along the main river. This habitat class was dominated by huge rocks and boulders with vegetation patchy distributed. Vegetation consisted mainly by forbs like: *Thyme sp*., *artemisia sp.*, «purina, shichal, biartchatchu» and shrubs: «ombo», sea buck thorn, wild rose, *Berberis sp. and Ribes sp.*. Stands of willow, juniper and blue pine shoots were scattered along the river.

Above 3600 m. elevation small depressions were vegetated by *J. c. utilis*, willow, *Ribs sp.* and «zed». Forbs found in this class were «lamay», *Rosa webbiana*, »zed, kharan mendok», *Bergenia sp.* and the flower *Primula sp.*.

No floristic description or analyses has been done

Human and livestock impact: Tracks and pellets from ruminants were present.

Herders were observed using this habitat class for small ruminants early in the grazing season.

6 River plain.

Heterogeneous vegetation consisted of grassy plains, shrubs and stands of juniper and blue pine. Vegetation varied with groundwater level. Grassy plains as well as sea buck thorne, juniper and blue pine - dominated areas. Forbs and grasses covered almost 100 % of the ground.

Human and livestock impact: Heavily grazed. Very important grazing area for milking cattle and zo/zomo early in the grazing season and used for sick animals during the whole grazing season.

7 Scree slope

Scree slope were found on both sides of the higher part of the valley above 3400 m. The slopes had between 35 - 50° inclination and consisted of coarse, angular and some fine material produced by mechanical weathering of rock due to frost action. Vegetation of scree slopes covers less than 50% where species of grasses and forbs (artemisia, *Thyme sp., oanmendok, ze`*) dominate.
No floristic analyses has been done

Human and livestock impact: Tracks and pellets from larger ruminants were present.
Used by free ranging zo and zomos early in the grazing season.

8 High alpine scrub and meadows

This habitat class is related to the vegetation class described as **Moist alpine scrub and meadows** by Schweinfurth (1957).
In Basho there were found **High alpine scrub and meadows** at elevations higher than 3800 m, usually with more than 30° inclination. Rocks and boulders with vegetation dominated by «lamay», artemisia (10-20 cm high), «soleie, oanmendok», *Primal sp.*, grasses and *J. c. utilis*. The latter covering 30-50%. Aspect facing NE, E, SE.
At elevation **above 4000 m** dominantly rocks and boulders were found, and thus less organic matter. Vegetated by «biarchachu», *Rosa webbiana* and *willow*.

No floristic analyses has been done

Human and livestock impact: Tracks and pellets from larger ruminants are present.
Used by free ranging zo and zomos early in the grazing season. Grazed by all domestic livestock later in the season when the animals are taken to the higher broqs.

9 Cliff.

Precipitous terrain with more than 50° inclination and mainly above 4000 m. Small patches of vegetation (forbs, grasses, birch and *J. c. utilis)* are found on cliff shelves
Divided into 3 sub-groups:

9a) Steep, only few cracks and shelves
9b) Broken by rocky outcrops
9c) With grassy shelves

No floristic description or analyses has been done

Human and livestock impact: No human and livestock activity were observed in this habitat class.

APPENDIX 6: SEX AND AGE CLASSIFICATION OF ASIATIC IBEX (CAPRA IBEX SIBIRICA)

Kid (less than 1 year) - mostly found in female or nursery groups.

Yearlings (1-2 years) - resemble females, but have darker pelage, especially under the neck and over the shoulder. They are unlike adult males since they lack the saddle patch, their beard is small and hornlength is 18 - 30 cm. Female yearlings are small with short, thin horns.

Adult females - have backward curved horns measuring up to 29 cm in length in average, which have closely spaced rings. Like males, females also have a thick, woollen beard. They have a grey-brown appearance in winter due to a mixture of white hairs. Ibex female stands 67 - 81 cm at the shoulder and weights 40 - 56 kg.

Adult males - usually having dark, brown colour. During winter there is considerable variation in overall colour of males. Some are completely dark brown while others have creamy hairs in the mid-dorsal and rump region. Males have a distinctive beard and a silvery saddle. An adult male stands 92 cm high and weighs about 70 kg with arc shaped horns up to 140 cm long. Average hornlength is around 70 cm. A rough method for determining age of adult ibex from a distance (when annual rings cannot be distinguished) is to count the number of rounded, horizontal ridges on the front of the horns. According to Schaller (1980), two such ridges are formed per year in the first 9 years of age and thereafter only about one ridge per year. Animals of 2-3 years old have only five ridges. Adult males have 14-21 such ridges. Males were divided into the following four classes (table 1):

Classification of adult males	Description:
Class I (2-5 years old)	larger than females. Age between 24-59 months (5.0-6.6 ridges)
Class II (5-7 years old)	larger with longer horns of about half arc. Age between 60-83 months (8.3-12.2 ridges)
Class III (7-10 years old)	exhibit full-grown pelage. Age between 84-119 months (13.4-17.7 ridges)
Class IV (10 years and older)	trophy sized male, hornlength is at least 80 cm. Age 120 months or older (>17.8 ridges)

APPENDIX 7: MOUNTAIN UNGULATE SURVEY FORM, BASHO VALLEY

Page ___ of ____

Species: _____ Date: _____

Observers: _____ Survey time: start_____ stop _____

Weather conditions:	Bright sunny day	Clouds	Precipitation	Temperature	Windy	Wind Direction
	_____	_____	_____	_____	_____	_____

Time:_____ Time:_____ Time:_____ Time:_____

ANIMALS Row No. and Item	Search Site: _____ O.V.Point: _____ Elev. of observer _____ Group No. _____	Search Site: _____ O.V.Point: _____ Elev. of observer _____ Group No. _____	Search Site: _____ O.V.Point: _____ Elev. of observer _____ Group No. _____	Search Site: _____ O.V.Point: _____ Elev. of observer _____ Group No. _____
1. Group size				
2. Distance to Group				
3. Distance between Groups				
4. Sex and Age Composition				
Adult females				
Kids				
Yearlings				
Adult males				
Class I (2-5 years)				
Class II (5-7 years)				
Class III (7-10 years)				
Class IV (≤ 10 years)				
Unidentified				
Animal activity				

HABITAT

Habitat Type (defined)				
Topographic feature				
% Vegetation Cover				
% Snow Cover				
Animal Position on slope (U, M, L)				
Animal elevation est.				
Slope				
General aspect of site				
Distance to:				
Escape cover				
Live stock herd				
Human settlement				
Water source				
Notes:				

APPENDIX 8: AREAS SEARCHED FOR IBEX AND LOCATION OF IBEX FOUND DURING THE AKRSP/NLH MAY SURVEY OF BASHO

APPENDIX 9: TIME/AREA SEARCHED FOR IBEX DURING THE AKRSP/NLH MAY SURVEY OF BASHO

Date	Time	Hours	Overwiev point	Search sites	Field team
12.05.98	9.00-17.00	8	Donsekar	Goho, Matsik, Fada, Bashospang	W, A
13.05.98	11.00-17.00	6	Sterritangatjung	Goho, Metsik, Fada, Katsellung, Dongsenalla, Blqnaq	W, A
14.05.98	14.00-15.30	1,5	Bahtang, Metsik	Goho, Metsik, Blqnaq, Fada	W, Dr. A, A. M.D, Hu, K
14.05.98	16.00-18.30	2,5	Bahtang, Metsik	Goho, Metsik, Blqnaq, Fada	W, Dr. A, A. M.D, Hu, K
15.05.98	6.00-12.00	6	Metsik	Goho, Metsik, Blqnaq	K, Hu, Dr.A
15.05.98	8.30-14.00	5,5	Goho	Bolum Nalah	W, A
16.05.98	7.00-10.00	3	Goleaq	Bashospang, Phorichochon	W,
16.05.98	10.00-13.00	3	Goleaq	Bashospang, Phorichochon	K, A
16.05.98	16.00-19.00	3	Goleaq	Bashospang, Phorichochon	W, M.D
16.05.98	6.00-8.00	2	Ruanpistrang	Bolum, Nilu Nallah	K, A
16.05.98	15.30-18.30	3	Ruanpistrang, Korisko	Bolum, Nilu Nallah, Korisko	K, A
17.05.98	7.30-9.00	1,5	Goleaq	Bashospang, Phorichochon	W, K, A
18.05.98	16.00-18.30	2,5	Rushkin, Kamputitoq	Rushkin, Kamputitoq	W, B
	16.00-18.30	2,5	Rushkin, Kamputitoq	Rushkin, Kamputitoq	K, A, U
	18.30-19.30	1	Kamputitoq	Suchilotto, Mangalistrang	A, K,U
	17.00-18.30	1,5	Lazang, Kamputitoq	Mangalistrang, Bogarom	W, B,
19.05.98	5.30-7.00	1,5	Kamputitoq	Raymil, Bogarom,Mangalistrang	K, A, B
	7.00-11.00	4	Lazang, Mangalistrang	Lazang, Suchilotto, Phialotang	K, A,U
	14.00-17.00	3	Mangalistrang varden, Schurten	Lazang, Suchilotto, Phialotang	K, A,U
	17.00-18.30	1,5	Upp Lazang Nallah (Kangerscha)	Lazang Nallah	K, A,U
	7.00-12.00	5	Kamputitoq to Ruskin	South side of walley	W, B
	15.00-18.30	3,5	Kamputitoq, Bogarum	Kamputitoq, Bogarum	W, B
20.05.98	6.00-7.00	1	Kamputitoq	Lazang, Bogarum, Mangalistrang	W, A, B
	7.30-9.00	1,5	Lazang	Lazang, Bogarum, Mangalistrang	W, A, B
	9.00-10.00	1,5	Cherimon	Phialotang, Serpho	W, A, U, B
	11.00-14.00	3	Chagadekhlas	Phialotang, Serpho	K, A
	15.00-16.00	1	Stapitoq,S	Serpho	K, A
	15.00-18.00	3	Stapitoq,N	Philaotang, Serpho	W, U, B
21.05.98	5.00-6.00	1	Chagadekhlas	Philaotang, Serpho	K, A
	7.30-9.00	1,5	Walking to Chalabat		K, A, W, U
	10.00-12.00	2	Chaltianspang	Kalmatchan	K, A, W, U
	15.00-17.00	3	Chalabat	Philaotang, Serpho	K, A, W, U
22.05.98	5.00-7.00	2	Chagadekhlas	Philaotang, Serpho	A, K
	7.00-12.00	5	Stapitoq,N	Mangalistrang	A, K
	13.00-15.00	2	Cherimon to Ruskin	On the Way	A, K

Field team: A - Abas, B - Bakar, Dr. A - Dr. Abbas, Hu- Ali Hussain, K - Kathrin C. Hofmann, M.D. - Muhammad Diin, U - Ulrik Motzfelt, W - William Sveinsson,

APPENDIX 10: FIXED POINTS WHERE PHOTOS OF SNOW CONDITIONS WERE TAKEN

APPENDIX 11: MAJOR VEGETATION TYPES (SCHWEINFURTH, 1957)

APPENDIX 12: LIST OF WILDLIFE KNOWN TO BE FOUND IN BASHO

Based on participatory learning exercises, May 1998. Translated by Jawad Ali, AKRSP Skardu.

English name	**Balti name**	**Urdu**	***Latin name***
Ibex	Redach, skin	Kill or Kil	*Capra ibex sibirica*
Snow leopard	1. Kachan 2. Chan	Cheeta	*Panthera uncia*
Red fox	Wah	Lombrei	*Vulpes vulpes*
Wolf	1. Spiangko 2. Shanko	Bharia or Bahdia	*Canis lupus*
Lynx	Soglo	Seaa gosh	*Felis lynx*
Rabbit	Reong	Khargosh	*Lepus ssp.*
Muskdeer	Khala	Heran	*Mochus mochiferus*
maramot	Phia	1. Barfani choha (barf means snow and shoha means rat) 2. Tershoon (ter-shoon)	*Maramota caudata*
Flying squirel or Wooly flying squirrel (not confirmed found in Basho, but claimed to been seen)	Rhatong	Gilhari	*Eupetaurus cinereus*
Alpine weasel	1. Manthong 2. Marpho Api	Gilhari	*Mustela altacia*
Musk rat	Pockpock	Chachondar	*
Himalayan snowkock	Gongma	Ramchackur	*Tetraogallus himalayencis*
Chukor	Straqpa	Chukor	*Alectoris chukor*
Eagle	Biakhar	Shaheen	*Aquila chrysaetos*
Hawk	Bandak	Gid	*
Falcone	Khra or cha	Uqab or Ooqab	*
Pie	Kachup	Jample	*Urocissa eryphrohyncha*
Hopoe	Hohop	Hodhodh	*Upopa epops*
Pigeon	Thang furgone	Kabotar	*

* Latin name not known

APPENDIX 13: : OVERVIEW OF PROJECT COMPONENTS AND COUNTERPARTS

Project	NLH	AKRSP
Institutions and organisations in pasture and forestry management (property rights and other formal and informal institutions interpreted as the rules for behaviour; organisations/actors within the institutional framework)	**Hans Sevatdal**, Håvard Steinsholt, Poul Wisborg	**M. Akbar Raza**, Dr Abbas; Wazir Ghulam Haider
Pasture, livestock and biodiversity (the dynamics of high pasture management, fodder demand and fodder production, quality assessment for land use planning and conservation of soil and vegetation	**Øystein Holand, Per Wegge**, Kathrin C. Hofmann, Åge Nyborg, Veronika Seim	**Iqbal Hussain**, Dr Abbas, Jawad Ali, Ulrik Motzfeldt
Farm forestry and natural forest assessment (forest and tree resources assessment, regeneration evaluation, and analysis of the supply and demand of forest products and linkages between farm-forestry practices and natural forest)	**Knut Velle,** Johnny Valen	**Jawad Ali**,
Gender in natural resource management (dynamics of changes in women's and men's use, access to and control over resources, and the effects of changes on household food security)	**Ingrid Nyborg**	**Nazir Ahmed**, Gulcheen Aquil
Information and documentation (creating a common information resource base relevant to all project sub-themes, facilitating exchange of information between project counterparts in Baltistan and Norway and supporting AKRSP Baltistan's efforts in networking for information access)	**Liv Ellingsen**	**M. Maqsood Khan/ Nazir Ahmed**
Coordination	**Poul Wisborg**	**Khaleel Tetlay**

APPENDIX 14: FIELD RESEARCH (ACTIVITIES AND PEOPLE MET)

Applied for Kathrin C. Hofmann

Date	Activity and People met
21.04 - 22.04	Travel Ås - Islamabad - Gilgitt Meeting with Kent Jingfors, IUCN.
23.04	Meeting with Mr. Ali Gohar, AKRSP Gilgitt. Meeting Mr. Amjad Virk, IUCN, Gilgitt.
24.04	Travel Gilgitt - Skardu.
25.04	Meeting with AKRSP Skardu: Dr. Iqbal, Dr. Abbas and NLH team Åge Nyborg, William Sveinsson, field assistent, and Kathrin C. Hofmann. Meeting IUCN Skardu Fida Hassan, Amjad Virk with AKRSP Skardu: Moh. Akbar Raza, Dr. Iqbal, Kathrin C. Hofmann, William Sveinsson.
27.04 - 30.04	Joining Ibex survey in S-K-B valley with IUCN Skardu team and local people from S-K-B valley.
01.05	Meeting with Dr. Iqbal and Dr. Abbas planning travel to Basho. William and Dr. Abbas visited Basho and prepared starting resurge from Forest Hut.
02.05	Meeting with AKRSP Skardu: Mr. Khaleel Teatley, Dr. Abbas, William Sveinsson, Kathrin C. Hofmann and IUCN Skardu: Fida Hassan.
03.05	Travel to Basho, Forest hut.
04.05 - 06.05	Field trips to Cherimond, Sari, Lasang, and Rushkin with Ghulam Abas, field guide, Dr. Abbas, William Sveinsson and Kathrin C. Hofmann.
08.05 - 10.05	Field trips to Goleaq, Bolom, Cherimond and Stapitoq with Ghulam Abbas, field guide, William Sveinsson and Kathrin C. Hofmann.
11.05	Meeting with local ibex guides.
12.05 - 13.05	Ibex survey road side from Bathang, Donsekar and Sterridengatjun, nothr side of Indus river with Ghulam Abbas and William Sveinsson. Preparing BDO meeting.
13.05	Meeting with BDO representatives: Ghulam Rasool, president, BDO; Younus Shezad, G. Secr.., Dr. Abbas, AKRSP staff, Ingrid Nyborg, Åge Nyborg, Gulshen and Kathrin C. Hofmann.
14.05 - 17.05	Ibex survey from Bathang, Metsik, Bolom and Goleaq with Ghulam Abbas, Dr. Abbas, Mohammad Diin, Ali Hussain, local field assistents, William and Kathrin.
18.05 - 22.05	Ibex survey from Forest hut, Rushkin, Bundopiri, Kamputitoq, Cherimond, Stapitoq, Kangmarchan, Fiatoq with Ghulam Abbas, Mohammad Diin, Baker, local field assistents, William and Kathrin.
24.05	Meeting with AKRSP Skardu: Dr. Iqbal, Dr. Abbas, William and Kathrin discussing ended ibex survey and further work.
25.05 - 26.05	Tracing 1:50 000 map. Departure for William to Islamabad.
27.05	Meeting with IUCN: Jingfors, Virk, Hassan and Kathrin. Meeting the newly arrived NLH team members: Poul Wisborg, Project coordinator, Hans Sevatdal, Håvard Stensholt.
29.05	Travel to Basho. NLH - AKRSP meeting. Dr. Iqbal, Moh. Akbar Raza, Dr. Abbas, Ingrid, Åge, Ulrik, Poul, Håvard, Hans and Kathrin.
30.05	Participatory learning exercise: Grazing systems and broqs.
31.05	Participatory learning exercise: Meeting with former Ibex hunters: Mohammad Khan, Sultanabad; Dolat Ali, Sultanabad; Baqar, Bathang; Guhlam Rasool, Meto; Ghulam Abas, Nazimabad, Jawad Ali, translator from AKRSP staff. Meeting with Mr. Sharif, divisional Forest Officer, Skardu.
01.06 - 08.06	Mapping and classification of habitat in the lower part of Basho valley with Ghulam Abbas, Ulrik, Shabir Hussain, Jawad Ali. Team meeting .
09.06	09.00 - 13.00: Seminar in Skardu, presentation of preliminary findings. 14.00 : 18.00: Discution of progress, problems and furure cooperation. Evening: Meeting with Øystein Holand and students Veronica Sein and Thor Sigurd Thorsen.
10.06 - 12.06	Floristic analyses of habitat classes, training: Ghulam Abas, Shabir Hussain, Jawad Ali, Ulrik and Kathrin.
13.06 - 14.06	Field trip to the upper valley Merphostrang with Ghulam Abas, Mohammad Diin, Ulrik, Thor.
15.06 - 16.06	Travel Skardu - Islamabad
17. 06	Travel Islamabad - London - Ås