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Integrating wildlife conservation with community -based development in Northern Areas Pakistan

Amjad Tahir Virk
The University of Montana

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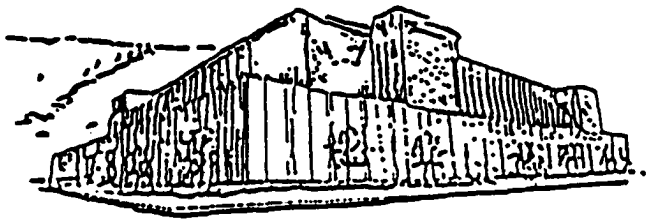

INTEGRATING WILDLIFE CONSERVATION WITH COMMUNITY-BASED DEVELOPMENT IN NORTHERN AREAS, PAKISTAN

by

Amjad Tahir Virk

B.S., University of Punjab, Lahore, Pakistan, 1981
M.L.S., University of Balochistan, Quetta, Pakistan, 1985
M.S. University of Montana, USA, 1991

Presented in partial fulfillment of the requirements
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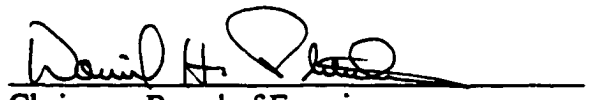
University of Montana
1999

Approved by



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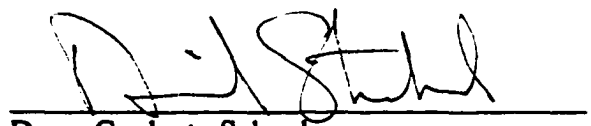

Dean, Graduate School

11-1-99

Date

Dedicated to My Beloved Deceased Father
Muhammad Bashir Virk
(1931 – 1978)

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The Northern Areas (NAs) of Pakistan are considered a biodiversity hot spot, particularly for species adapted to rugged, high mountains. Many large mammal populations have been depleted, primarily by over-hunting. Recent community-based conservation and development initiatives may provide some hope for these species.

The Government of Pakistan and IUCN-The World Conservation Union implemented a project to demonstrate the Community-based Conservation (CBC) approach for conservation of biodiversity. I examined whether incentive measures used by the CBC had any impact on attitudes and perceptions of local people in the project areas towards wildlife and the CBC approach. Field research was conducted by using participant observations, key informant interviews, and questionnaire surveys methods. Mountain ungulate populations were monitored by involving community guides/former hunters to see whether CBC had any effect on these populations.

I found that local people's attitudes and perceptions toward wildlife and its conservation were largely supportive. The villagers perceived village development, collective income, and beauty of their villages as the primary benefit of wildlife, while predation and competition with domestic stock were mentioned as the main disadvantages. Most people supported CBC because they received benefits. Most frequently sought advantages of the CBC were village development, village unity, and reduction in poaching, whereas only 14% perceived any disadvantages of CBC. The villagers linked conservation with development of their villages and believed the sustainable use of wild species had the potential to pay for both the local costs of village-based conservation as well as socio-economic development.

Mountain ungulate populations were monitored with Group Composition Counts (GCCs) and Repeated Group Counts (RGCs). Sightings of Himalayan ibex (*Capra ibex siberica*) and flared-horned markhor (*Capra falconeri falconeri*) increased considerably both in Khyber and SKB following the initiation of the CBC program. For example, the number of ibex observed in Khyber increased from 63 in 1996 to 152 in 1998. The juvenile per 100 female ratios suggested healthy recruitment into these populations. RGCs were found more suitable than GCCs for monitoring ungulate populations in the community conservation areas.

Incentives were largely effective for inducing local community involvement in CBC efforts. However, it is too early to predict whether CBC will be successful in the long run in solving conservation problems facing NAs of Pakistan, but it has provided a new and cost-effective way of conserving biodiversity. A combination of incentives and disincentives will be needed to maintain the biological diversity of Pakistan.

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Chapter - 1

1. Introduction

Many developing countries created national parks and protected areas in the second half of the twentieth century. These parks and protected areas often had adverse effects on the food security and livelihood of people living in and around them (West and Brechin 1991, Wells et al. 1992, IIED 1994, Pimbert and Pretty 1995). The protected area management approach was based on centralized-regulatory control and in many cases, the exclusion of local communities from their ancestral lands without providing them alternative sources of livelihood (Colehester 1996, Kothari et al. 1998). For example, around 30,000 people were forced out from their homes to create a wildlife reserve in Burma (Panos 1997). The creation of parks and reserves has indeed helped save some endangered species from extinction (McNeely 1989, Heinen and Youzon 1994), but it has often alienated resident peoples and created material and spiritual hardship for them, as their access to park resources, which they traditionally depended on to meet their material needs, was denied or restricted (Hough 1989, Ghimire and Pimbert 1997). The situation has been further aggravated by the fact that local communities frequently suffered livestock depredation and crop damage by wildlife enhanced by parks without any or very little compensation (Hough and Sherpa 1989, Mishra 1997). All these factors have led to park and local people conflicts, which undermine long-term viability of biodiversity conservation (Pimbert and Pretty 1998).

No doubt, more than 8000 protected areas, covering approximately 10% of the earth's surface, serve as natural warehouses for biodiversity. But even if their areas are doubled, these warehouses would never be able to prevent mass extinction; habitat fragmentation, ecological isolation, edge effects, poaching, and other forces that will greatly impoverish these isolated biological islands (Western and Wright 1994). Conservationists have recently realized that most of the world's biological diversity still lies outside of parks and protected areas. Hence, the fate of many wild species and their habitat lies in the hands of rural peoples who share land with them and who have

managed these habitats for food and other material as well as spiritual values. Furthermore, developing countries have neither the technical nor financial resources to rely totally on a centralized-regulatory model to manage their wildlife resources in the wake of increasing human populations and associated resource needs of people living in and around the parks and reserves (Wells et al.1992, Keiter 1995). Hence, the recognition that local communities must be actively involved in conservation has grown, and the needs and aspirations of people considered, if biodiversity is to be conserved (Gadgil 1992, Kothari et al. 1998).

Concern over the continuous loss of biological diversity and the impracticality of the preservationists' philosophy for developing countries has led to the evolution of a new conservation approach known as Community-Based Conservation (CBC)(Western and Wright 1994, Kothari et al. 1998). This approach has recently received attention from conservation organizations. Several examples of projects from around the world involve local communities and seek to use economic incentives for conservation and sustainable use of wildlife (McNeely 1988, Kiss 1990, Wells et al. 1992; Robinson and Redford 1994, Gibson and Marks 1995, Child 1996, Mehta and Kellert 1998).

Following the preservation approach, an extensive system of parks and protected areas was established in Pakistan between 1950 and 1990 (14 national parks, 99 wildlife sanctuaries, and 96 game reserves). Collectively, these areas cover about 10% of the country's landmass (GOP/IUCN/WWF 1998). In Northern Areas (NAs) alone, 4 national parks, 5 wildlife sanctuaries, and 9 game reserves were created between 1975 and 1996. Several Wildlife Acts were also enacted during the 1970s. Similar to other developing nations, the focus on preservation strategy alone has contributed little to save Pakistan's biological diversity. Most of the protected areas of the country have no management plans, very limited protective staff, and are subject to continued human use. The provincial wildlife agencies are under funded, lack technical expertise, are under staffed and ill equipped, and simply cannot carry out the task of conservation alone. Despite the

existence of legislation and wildlife laws, enforcement remains weak. Hence, much of the country's flora and fauna have been depleted (Virk 1991, UNDP/GOP/GEF 1999).

The Government of Pakistan, with the help of international and national conservation Non-Government Organizations (NGOs), have taken a number of initiatives, including development of a national Biodiversity Action Plan and field-testing of the CBC approach. Started in January 1995 under the Global Environment Facility (GEF) Pre-Investment Fund (PRIF), the project "Maintaining Biodiversity in Pakistan with Rural Community Development" (commonly called Biodiversity Conservation Project) was implemented jointly by the Government of Pakistan, the United Nation's Development Program (UNDP) and IUCN-The World Conservation Union. The main objective of this project was to test the efficacy of the CBC approach to conservation at an ecosystem level, focusing on the mountainous areas of northern Pakistan.

I was part of the project implementation team based in NAs. This gave me an opportunity to work very closely with the project communities and to evaluate the CBC approach. I completed most of my dissertation research while implementing the project as Project Coordinator from January 1996 to December 1998. My research focused on both biological and social aspects of conservation. I looked into current land use practices and studied knowledge, attitudes, and perceptions of the local communities toward wildlife and the CBC approach. At the same time, I monitored populations of mountain ungulates in the Community Conservation Areas to see whether this new conservation approach affected their populations. In addition, I evaluated whether community-based incentive measures introduced by the project were effective in encouraging villagers' participation in the conservation of wild species. More specifically, the objectives of my study were to:

1. describe the community-based incentive measures adopted by the Biodiversity Conservation Project;

2. determine historic development in village-based resource management, particularly:
   a) local economic base,
   b) local institutions,
   c) land tenure and usufruct rights;

3. examine knowledge, attitudes and perceptions of local people towards wildlife and the community based conservation approach;
4. estimate changes in mountain ungulate populations in Community Conservation Areas; and
5. examine the effectiveness of community-based incentive measures for conserving wild species.

1.1 Structure of the dissertation

This dissertation addresses a variety of social, economic, and biological issues concerning conservation in Pakistan in general and NAs in particular. Therefore, it might be useful to describe the format of this document. The dissertation consists of 5 chapters and each chapter stands alone. However, I have provided cross-references for clarity.

Chapter 1 describes the problem and provides an overview of the CBC paradigm. It also gives an analytical view on the integration of conservation and development and briefly describes the recent CBC initiatives in NAs of Pakistan.

Chapter 2 describes the community-based incentive measures introduced under the Biodiversity Conservation Project for the conservation of wildlife and other natural resources in NAs of Pakistan and to promote CBC.

Chapter 3 depicts the current land use practices and livelihood sources available to the local communities. It also presents local peoples' knowledge, attitudes, and perceptions concerning wildlife and the CBC approach.

Chapter 4 presents data on wildlife surveys and looks at the variability among repeated counts to document any change in mountain ungulate populations. It also evaluates the suitability of ground survey techniques for monitoring ungulate numbers in community conservation areas in steep and rugged landscape such as of NAs of Pakistan.

In Chapter 5, I provide a summary on effectiveness of the community-based incentive measures approach based on findings of my field studies (Chapters 3 and 4) and evaluate whether or not such incentive measures encouraged conservation of rare and endangered wildlife species among rural communities.

1.2. Community-Based Conservation: an Evolving Approach

The descriptions of CBC are as diverse as the approach itself. Several authors have described this phenomenon: CBC arises from within or outside a community. It reverses top-down, center-driven conservation by focusing on the people who bear the costs of conservation. It includes natural resources or biodiversity protection by, for, and with the local communities, and makes nature and natural products meaningful to rural communities (Western and Wright 1994, Murphree 1994, and Gibson and Marks 1995). Kothari et al. (1998: 25) describe it as "conservation of biological diversity (or wildlife) based on involvement of local communities in decision-making. This ... includes ... from one extreme in which government/private agencies predominantly retain control but consult with local communities in planning or implementation; to the other extreme in which communities are completely in control." These descriptions of the CBC paradigm have a common denominator: biodiversity conservation will succeed only if local communities receive sufficient benefits and participate in management (Gibson and Marks 1995).

The CBC approach is relatively new and is still evolving. It is moving forward in many parts of the world spontaneously in a highly diverse fashion under historic,

political, social, economic, cultural, legal, and institutional environments as well as the ecological landscape of a country. Approaches that work in one area may not necessarily work in another, even within the same country. However, some of the basic ingredients like benefits to local people, conservation of natural resources, sustainable use, and decentralization of management are the same. The level of participation by the local communities and benefits accruing to them vary from one project to another. A variety of efforts that evaluate CBC initiatives document some degree of success in terms of decline in poaching through employment of village scouts (Lewis et al. 1990), an increase in household income (Child 1995), increased support of local people (Garratt et al. 1997), and an increase in wildlife numbers (Getz et al. 1999).

The CBC is also becoming increasingly popular as an approach to the management of protected areas (Brandon and Wells 1992, Pimbert and Pretty 1995; Borrni-Feyerabend 1997). Despite its popularity, some contradictions persist. CBC programs often are initiated on the illusion of: local social dynamics; competing interest groups both within and outside the local community; and the political and economic structures that generate local competition and conflict. An improved understanding of different social, political, and historical contexts under which local conservation takes place will help to demystify the false notion that all communities, if left alone, are able to defend and conserve their resources sustainably (Little 1994). The approach seems promising by addressing the concerns of social justice and environmental degradation, but legal, political, and cultural complexities involved can be problematic (Brosius et al. 1998). Belsky (1999) suggested that CBC may be a viable alternative particularly in places where local institutions and a history of local resource management are still intact, but in many places this has never been the case or may no longer exist. CBC practitioners have to consider local political and economic realities in which local people and they themselves operate. Carpenter (1998) cautioned that implementers of conservation projects often advocate community participation and involvement in the projects, but are less interested in who participates and how they participate. Very often, no community sociologists or others with skills to work with local people are part of the implementation

team (Belsky 1999). Such projects often highlight community-based and bottom-up approaches, but often the basis of the projects really is not the communities themselves, but rather regional and national organizations with values and goals of their own. Moreover, the use of a species by the local people will usually lower its population density and may decrease overall biodiversity, which contradicts the aims of biological conservation. The approach only meets conservation criteria if exploited species are used sustainably (Robinson 1993).

Williams et al. (1998) stated that a high degree of success in CBC programs in Zanzibar (Kenya) has not yet been achieved due to the time required to reform government policy, power structure, and practices and to transform a range of institutions, attitudes, structures, and processes for this new approach. Such changes are essential for any CBC program to succeed in the long run, whether for protection of wildlife or forest. Accordingly, developmental agencies and conservation organizations are encouraging governments in developing countries to implement community development programs, promote sustainable use and income generating activities, and to empower local communities so they can have greater say in decision-making and the management of natural resources. The CBC paradigm considers "conservation and development" to be compatible. CBC theoretically combines conservation and rural development by considering the needs of both wildlife populations and human communities. Its success in several southern African countries has been attributed to -- (1) devolution of authority to local communities to manage their wildlife, and (2) recognition of significant values from wildlife through consumptive and non-consumptive use (e.g. Zimbabwe's CAMPFIRE program) (Getz et al. 1999). Murphree (1994) suggested that CBC must adapt a strategy of "adaptive management" because initial planning and design cannot incorporate all the relevant variables or anticipate all the consequences or complexities of natural resource management and local community development.

The CBC approach opens up the rural landscape of the earth to biological conservation. These areas have often been considered ecologically sterile and valueless to

conservation. Conservationists and ecologists have just started paying attention to rural landscapes and to seriously examining options for coexistence of people and wildlife. If these efforts succeed, biological losses will be minimized, and completely relying on protected areas for conserving biological diversity will become less important (Western 1989; Western and Wright 1994).

1.3 Community-based conservation initiatives in Northern Areas of Pakistan

The Northern Areas of Pakistan are well known for their cultural and ecological diversity and are considered biodiversity hotspots. International and national NGOs such as the Aga Khan Rural Support Program (AKRSP), The World Conservation Union (IUCN), and World Wide Fund for Nature (WWF) have played a significant role in introducing conservation of natural resources with the involvement of local communities since the mid 1980s. Some locally-based organizations, e.g. Khunjerab Village Organization (KVO), have been active conserving wildlife resources with little assistance from the outside. Several CBC initiatives have occurred during the last decade or so. These initiatives have had varying degree of success in terms of winning the support of local communities and enhancing the status of wildlife resources.

AKRSP was the pioneer in mobilizing local communities and implementing an Integrated Rural Development Program. The program started in 1982 to improve the lives of the mountain people of this remote region. Presently, it covers the entire NAs (except 3 sub-divisions of Diamer District) and District Chitral of North West Frontier Province (NWFP). The program has established more than 2000 Village Organizations (VOs) and around 1150 Women's Organizations (WOs). AKRSP builds managerial and technical skills of the villagers, provides "Productive Infrastructure and Engineering" projects, and runs a credit and savings program. It also enhances agricultural productivity through natural resource management activities focusing on agriculture, livestock, and forestry sectors and develops human resources leading to enterprise development in the region (AKRSP 1997). Though the focus of AKRSP's program is sustainable development, it

contributes to raising environmental conservation awareness among the masses and enhancing biological diversity in the area. For example, development of land, agriculture, and irrigation systems below the irrigation channels contribute to the diversity of fauna and flora by providing new ecological niches for the species associated with farming, particularly insects, fruit and seed-eating birds, and small mammals (Driver 1991).

Recently, other NGOs have built upon the social infrastructure (VOs) created by the AKRSP and have launched CBC projects. Most of these initiatives began at the demand of active VOs who were inspired by the AKRSP's approach of collective actions or community organization. A few prominent examples include:

1. WWF-Pakistan started the Bar Valley CBC project in 1991. The principle objective of the project was conservation of Himalayan ibex (*Capra ibex sibirica*) and other associated species and their habitat. The plan was to protect ibex and generate revenue through a sustainable trophy hunting program and to cover conservation costs and benefit local communities. The results of this project were positive and survey data show an increase in the ibex population due to protection by the local people (Jamali 1998). Banking upon this initial success, WWF expanded its program in NAs and started working with 4 other communities at different locations to replicate the Bar Valley model (Jamali 1998).
2. Khunjerab Village Organization (KVO): Wildlife conservation and sustainable use project operated by the KVO in the buffer zone of Khunjerab National Park was internally motivated and totally managed by this local organization. An association of 7 VOs near the southern boundary of Khunjerab National Park initiated this program on self-help basis. KVO employed its own community guards, established wildlife check posts, and conducted several wildlife surveys with the technical assistance of WWF. The project received some funding from the GEF/UNDP small grants program and a donation from the President of Pakistan. In addition, KVO generated its own funds by offering trophy ibex to sport hunters. The community receives 75% of the trophy-hunting fee and 25%

goes to the government exchequer. The number of poaching incidents declined substantially and the community has earned so far US$3250 and Rs.75000 (US$1500) from one American and 5 Pakistani hunters, respectively, since 1995.

(3) Biodiversity Conservation Project: IUCN implemented a pilot project "Maintaining Biodiversity in Pakistan with Rural Community Development" funded by the GEF/UNDP. The full-scale phase of this project titled "Mountain Areas Conservancy Project" will be launched soon covering the larger ecological landscape of the Hindu Kush, Karakoram, and the Western Himalayan ranges in Northern Pakistan. My dissertation research work revolved around the implementation of the Biodiversity Conservation Project; I describe the project in detail under Chapter-2.

1.4. Conservation and Development

The World Conservation Strategy was the first document that advocated the sustainable development approach by incorporating both social and ecological factors into development. Conservation was then linked with development by defining sustainable development as development that meets the needs of present generations while maintaining the potential to meet the needs and aspirations of future generation (IUCN/UNEP/WWF 1980). Following this concept, many rural-development projects were transformed into integrated conservation and development projects during the early 1980s, providing a new opportunity for conservationists and policy-makers to integrate conservation and development (for example: McNeely and Miller 1984, Brundtland 1987, IUCN/UNEP/WWF 1992). However, Robinson (1993) argued that sustainable development "while improving human life ... will inevitably decrease the diversity of life." Recognizing that development will occur at some cost to biodiversity, an adequate landscape, therefore, must be protected as unmodified habitat (Noss 1991) and it should be given consideration while establishing Integrated Conservation and Development Projects (ICDPs) (Kremen et al. 1994).

The ICDPs initiated during the 1980s sought linkages between conservation and development by emphasizing local economic and spiritual well-being and its connection to the maintenance of biological diversity. The stated goal of these projects was to facilitate participation of local people in planning and decision-making processes for the management of protected areas, while addressing the social and economic needs of participating communities (Stocking and Perkin 1992). Wildlife conservation may be ensured through sustainable use and the integration of conservation and economic development (Murphree 1998). Integrating wildlife conservation into human development activities raises 2 important management challenges: (1) reducing impacts of various human activities on biological resources, which considers how human-dominated landscapes can provide habitat for wildlife while still meeting human needs for land and natural resources. (2) Adapting conservation programs to reduce the extent to which they impede the livelihood of resident people, e.g. conflict between people and wildlife over crop damage, livestock depredation, or wildlife pest species. Integration of conservation into development through such initiatives can provide significant benefits for the individuals and communities involved (Shaw 1995). Kremen et al. (1994) put conservation and development projects under 2 general categories: (1) those that provide direct economic incentives through generating revenue from sustainable use of wildlife resources (CBC incentive), and (2) those that provide access to alternative or better resources outside the protected areas (e.g. intensified agriculture production and infrastructure facilities) (ICDPs). These 2 development strategies operate on different principles to promote conservation of biodiversity. The natural habitats, available resources, and human cultural attributes together determine the appropriate strategy for integrated conservation and development programs. Such programs are complex and difficult to implement due to the inherent problem of reconciling the fundamentally different goals of conservation and development.

Although ICDPs provide benefits and small development and infrastructure projects to rural communities to compensate for the loss of access to protected areas and resources, the approach has numerous inherent and well-documented problems (IIED

1994; Barrett and Arcese 1995). ICDPs do not include long-term economic strategies, do not give enough attention to local institutions, or fail to encourage the emergence of such institutions where they no longer exist. The visions of local populations and their relations to nature are rarely taken into account in the management of conservation and development projects (Weber 1998). Indeed, the link between conservation and development was often weak (Gartlan 1998). One of the inherent assumptions and problems is the notion that well planned rural development will automatically lead to conservation success (Robinson 1993). Several authors have suggested that most of the earlier ICDPs failed to protect biodiversity. Of 36 ICDPs reviewed by Kremen et al. (1994) and Wells et al. (1992), only 5 achieved their stated conservation goals.

As the world struggles to reconcile human development with maintenance of the natural environment, new models of rural development that rely on the sustainable use of natural resources are being tried (for example, the CAMPFIRE program in Zimbabwe and Biodiversity Conservation Project in Pakistan). These models must remain focused on their primary objectives of identifying particular human needs and meeting them through sustainable resource use. Such support must be legally protected and derived by community involvement in management efforts (Lewis and Phiri 1998).

Conservation and development should be sufficiently flexible to adopt local conditions. Management of wildlife resources for sustainable development can make a substantial contribution to rural community development. A holistic approach recognizes that conservation cannot ignore the needs of human beings and that development cannot ignore conservation priorities. Approaches that build on and seek to learn from existing local systems of resource management are more likely to succeed than activities proposed and sometimes imposed from the outside (Makombe 1994). Both CBC and ICDPs have some common ingredients. The major differences are that ICDPs often are linked to parks and protected area management putting greater emphasis on rural development than conservation of renewable resources outside the protected boundaries; whereas CBC transfers the natural resource management responsibility to the community in rural

landscapes and seeks a balance between conservation and development through sustainable use of biological diversity.

1.5 Literature Cited

AKRSP. 1997. Fifth Annual Review, 1997, Aga Khan Rural Support Program (AKRSP), Babar Road, Golgit, Pakitan: 84pp.

Barrett, C.B., and P. Arcese. 1995. Are integrated conservation-development projects (ICDPs) sustainable? On the conservation of large mammals in Sub-Saharan Africa. World Development, 23(7): 1073-1084.

Belsky, J. M. 1999. Misrepresenting Communities: The politics of Community-Based Rural Ecotourism in Gales Point Manatee, Belize. Rural Sociology, 64(4): 641-666.

Bormi-Feyerabend, G. (ed.). 1997. Beyond Fences: Seeking Social Sustainability in Conservation. IUCN, Gland (Switzerland), Vol. 1 and 2: 129 and 283.

Brandon, K. E. and M. Wells. 1992. Planning for People and Parks: Design Dilemma. World Development, 20: 557-570.

Brosius, J. P., A. L. Tsing, and C. Zerner. 1998. Representing communities: histories and politics of community-based resource Management. Society and Natural Resources 11: 157-168.

Brundtland, H. 1987. Our Common Future. The Report of World Commission on Environment and Development. Oxford University Press, London.

Carpenter, J. F. 1998. Internally Motivated Development Projects: A potential tool for biodiversity conservation outside of protected areas. Ambio, 27 (3): 211-216

Child, G. 1995. Wildlife and People: the Zimbabwean Success, Wisdom Foundation, Harare and New York: 267pp.

Child, G. 1996. The practice and principles of community-based wildlife management in Zimbabwe: the CAMPFIRE programme. Biodiversity and Conservation, 5: 369-398.

Colehester, M. 1996. Beyond Participation: indigenous people, biological diversity conservation and protected area management. Unasylva, 186 (47): 33-39.

Driver, P. 1991. AKRSP: An Environmental Review. L.G. Mouchel and Partners Ltd., U.K.: 21pp.

Gadgil, M. 1992. Conserving biodiversity as if people matter: A case study from India, Ambio, 21(3): 226-270.

Garratt, K., M. Murphree, and K. Shirzai. 1997. Maintaining Biodiversity in Pakistan with Rural Community Development; Report of the Independent Evaluation Mission: 49pp.

Gartlan, S. 1998. Falling between Two Stools: The False Promise of Sustainable Development. Pages 72-78 in N. Christoffersen, B. Campbell and J. Du Toit, eds., Communities and Sustainable Use; Pan-African Perspectives. Proceedings of the Pan-African Symposium on the Sustainable Use and Community Participation, Harare, Zimbabwe.

Getz, W.M., L. Fortmann, D. Cumming, J du Toit, J. Hilty, R. Martin, M. Murphree, N. Owen-Smith, A.M. Starfield, and M.I. Westphal. 1999. Sustaining Natural and Human Capital: Villagers and Scientists. Science. 283: 1855-1856.

Ghimire, K.B., and M.P. Pimbert 1997. Social Change and Conservation: Environmental Politics and Impacts of National Parks and Protected Areas. UNRISD and Earthscan, London.

Gibson, C. C. and S. A. Marks. 1995. Transforming Rural Hunters into Conservationists; an Assessment of Community-Based Wildlife Management Programs in Africa. World Development, 23 (6): 941-957.

GOP/IUCN/WWF. 1998. Biodiversity Action Plan for Pakistan- Final Draft: 98pp.

Heinen, J. T. and P. Youzon. 1994. A review of conservation issues and programs in Nepal: From a single species focus toward biodiversity protection. Mountain Research and Development, 14(1): 61-76.

Hough, J. L. 1989. National Park - Local People Relationships: Case Studies from Northern Benin, West Africa and the Grand Canyon, USA. Ph.D. Thesis, University of Michigan. 292pp.

_____., and M. N. Sherpa. 1989. Bottom-up vs. basic needs: Integrating conservation and development in the Annapurna and Michiru Mountain Conservation Areas of Nepal and Malawi. Ambio 18(8): 434-441.

IIED. 1994. Whose Eden? An Overview of Community Approaches in Wildlife Management. International Institute for Environment and Development, U.K.: 121pp.

IUCN/UNEP/WWF. 1980. World Conservation Strategy; Living resource conservation for sustainable development. IUCN-ENEP-WWF, Gland, Switzerland. 44pp.

_____. 1992. Caring for the earth: A strategy for sustainable living. Gland, Switzerland: 228pp.

Jamali, S. H. 1998. The Conservation of Biodiversity in the Himalayan Region of Pakistan, In Eco-regional Cooperation for Biodiversity Conservation in the Himalaya, Report on the International Meeting on Himalaya Eco-regional Cooperation, UNDP, New York: 105-154.

Keiter, R. B. 1995. Preserving Nepal's national parks: Law and conservation in the developing world. Ecology Law Quarterly 22(3): 591-675.

Kiss, A. 1990. Living with wildlife: Wildlife resource management with local people participation in Africa. Tech. Paper No. 130. The World Bank, Washington, D.C.: 127pp.

Kothari, A., R.V. Anuradha, and N. Pathak. 1998. Community-based Conservation: Issues and Prospects. Pages 25-57 In A. Kothari, N. Pathak, R. V. Anuradha, and B. Taneja, eds., Communities and Conservation; Natural resource management in south and central Asia, Sage Publications, New Delhi.

Kremen, C., A. M. Merenlender, and D. D. Murphy. 1994. Ecological Monitoring: A Vital Need for Integrated Conservation and Development Programs in the Tropics. Conservation Biology, 8 (2): 388-397.

Lewis, D. M., G. B. Kaweche, and A. N. Mwenya. 1990. Conservation outside protected areas: Lessons from an experiment in Zambia. Conservation Biology, 4 (2): 171-180.

Lewis, D. M. and A. Phiri. 1998. Wildlife snaring- an indicator of community response to a community-based conservation project, Oryx 32 (2): 111-121.

Little, P. D. 1994. The Link between Local Participation and Improved Conservation: A review of issues and Experiences. Pages 347-372 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

Makomble, K. (ed.). 1994. Sharing the Land: Wildlife, People, and Development in Africa. IUCN/ROSA Environmental Issues Series No. 1. Harare, Zimbabwe: 36 pp.

McNeely, J.A. 1988. Economics and Biological Diversity: Developing and using economic incentives to Conserve Biological Resources. IUCN, Gland: 236pp.

_____. 1989. Protected areas and human ecology: How national parks can contribute to sustaining societies of the twenty-first century. Pages 150-157 In D. Western and M. Pearl, eds., Conservation for the Twenty-first Century. Oxford University Press, New York.

_____., and K. R. Miller, eds. 1984. National Parks, Conservation and Development: The role of protected areas in sustaining society. Simthosonian Institute Press, Washington, D.C.: 825pp.

Mishra, C. 1997. Livestock depredation by large carnivores in the trans-Himalaya: Conflict perceptions and conservation prospects. Environmental Conservation, 24(4): 338-343.

Mehta, J. N., and S.R. Kellert. 1998. Local attitude toward community-based conservation policy and programmes in Nepal: A case study in the Makalu-Barun Conservation Area. Environmental Conservation 25(4): 320-333.

Murphree, M. W. 1994. The Role of Institutions in Community-based Conservation. Pages 403-427 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

_____. 1998. Ex Africa Semper Aliquid Novi? Consideration in Linking Environmental Scholarship, Policy and Practice. Pages 3-7 in N. Christoffersen, B. Campbell and J. Du Toit, eds., Communities and Sustainable Use; Pan-African Perspectives. Proceedings of the Pan-African Symposium on the Sustainable Use and Community Participation, Harare, Zimbabwe.

Noss, R. F. 1991. Sustainability and wilderness. Conservation Biology 5: 120-122.

Pimbert, M.P., and J.N. Pretty. 1995. Parks, People and Professionals. Putting 'Participation' into Protected Area Management. UNRISD Discussion Paper No. 57. Geneva: 60pp.

_____. 1998. Diversity and Sustainability in Community-based Conservation. Pages 58-77 In A. Kothari, N. Pathak, R. V. Anuradha, and B. Taneja, eds., Communities and Conservation; natural resource management in South and Central Asia, Sage Publications, New Delhi.

Panos. 1997. Panos media Briefing No.25. London.

Robinson, J. G. 1993. The Limits to Caring: Sustainable living and the loss of Biological Diversity. Conservation Biology, 7: 20-28.

_____., and K. H. Redford. 1994. Community-based Approaches to Wildlife Conservation in Neotropical Forests. Pages 300-319 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

Shaw, W.W. 1995. Incorporating Wildlife into Development. Pages 255-259 In J. A. Bissonette and P.R. Krausman, eds., Integrating People and Wildlife for a Sustainable Future. The Wildlife Society, Bethesda, Maryland.

Stocking, M. and S. Perkin. 1992. Conservation with Development: An application of the concept in the Usambara Mountains, Tanzania. Transaction of the Institute of British Geograhphers N.S. 17: 337-349.

UNDP/GOP/GEF. 1999. Pakistan Mountain Areas Conservancy Project (MACP); A Project Proposal: 122pp

Virk, A. T. 1991. Management plan for wild ungulates in Balochistan, Pakistan. M.S. Thesis, Univ. Mont. Missoula: 158pp.

Weber, J. 1998. Conservation, Development, and Coordination: Can Social Elements be Managed Biologically. Pages 34-44 in N. Christoffersen, B. Campbell and J. Du Toit, eds., Communities and Sustainable Use; Pan-African Perspectives. Proceedings of the Pan-African Symposium on the Sustainable Use and Community Participation, Harare, Zimbabwe.

Wells, M., K. Brandon, and L. Hannah 1992. People and Parks: Linking Protected Areas with Local Communities. World Bank, Washington D. C.: 99pp.

West, P. C. and S. R. Brechin (eds). 1991. Resident peoples and National Parks: Social Dilemmas and Strategies in International Conservation. University of Arizona Press, Tucson.

Western, D. 1989. Conservation without Parks: Wildlife in the Rural Landscape. Pages 158-165 In D. Western and M. Pearl, eds., Conservation for the Twenty-first Century. Oxford University Press, New York.

Western, D. and R. M. Wright. 1994. The Background to community-based conservation. Pages 1-12 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

Williams, A., T.S. Masoud, and W.J. Othman. 1998. Community-Based Conservation: Experience from Zanzibar. Gatekeeper Series No. 80, International Institute for Environment and Development, London: 20pp.

Chapter – 2

2. Community-based incentive measures for conserving wild species in Northern Areas of Pakistan

2.1. Introduction

The ownership of wildlife resources in Pakistan was taken away from rural communities and vested to the government as state property without giving consideration to the importance of traditional management systems for conservation of these renewable resources. This left little incentive for the local people to defend these resources or to make investments that might have ensured sustainable use. This policy of government ownership of wildlife often created incentives for over-exploitation of wild species and in many cases an "open access" situation in which governments did not have resources to control access and exploitation (WRI/IUCN/UNEP 1992). Under such conditions, individuals have no incentive to abstain from harvesting part of a population because remaining animals can be immediately harvested by other individuals (Randall 1981). Incentive measures designed to reverse the effects of this policy can provide the best means for transforming local exploiters into conservationists (McNeely 1993). Child (1996) recommended that incentives be used wherever possible because the approach is financially sustainable and would generate resources to protect wild species. Article 11 of the Convention on Biological Diversity, ratified by more than 158 nations, also called for adopting incentive measures to promote conservation and sustainable use of biological diversity, and emphasized that these incentives should be socially and economically sound (Vorhies 1996). Social and economic incentives are most effective in promoting conservation when they are directed toward those who are most likely to bear the costs of conservation (Heinen 1995a). In a review of community-based wildlife conservation initiatives in Africa, IIED (1994) concluded that community-based wildlife management is likely to be sustainable ecologically, economically, and socially only if wildlife resources are valued by local people.

A variety of incentives the conservation and sustainable use of biological diversity have been experimented with around the world (e.g. Velozo 1987, McNeely 1988, Aylward 1992, Heinen 1996). In the context of Community-Based Conservation (CBC), an incentive is any inducement that motivates local communities to participate in conservation projects (Velozo 1987, McNeely 1993). Incentives that promote desired practices and behaviors toward conservation of wild species may be direct (e.g. development assistance, revolving funds, and access to local resources) or indirect involving fiscal, social, and service oriented incentives (e.g. tax exemptions, building community-level conservation institutions, enhancing land tenure security, providing basic facilities, enhancing local capacities, and promoting education and training) (Velozo 1987, McNeely et al. 1997). Changing human behavior toward sustainable use of wildlife often requires a combination of direct incentives, indirect incentives, and disincentives (inducements designed to discourage over-exploitation of resources e.g. fines, penalties, royalties and taxes) (McNeely 1993). To be effective, incentives require some degree of regulation, enforcement, and monitoring. Hence, they must be used with caution and must adapt to changing conditions if they are to attain their objectives (McNeely et al. 1997). The integrated use of incentives and disincentives is a powerful tool for promoting conservation and sustainable use of wild species, and is increasingly being tested in developing countries (Robinson and Redford 1994, McNeely 1993, Heinen 1995b, Child 1996). Pakistan, however, has only very recently used incentives to encourage local communities in Northern Areas (NAs) for conservation and sustainable use of wildlife resources. Applying incentive measures to ensure that wildlife resources contribute to the social and economic development of local communities will require a long-term strategy by government agencies, conservation NGOs, and the donor community.

In this chapter, I describe the incentive measures introduced under the "Biodiversity Conservation Project." I especially look into social, economic, institutional, and service-oriented incentives used by the project to motivate local communities for conservation and sustainable use of wildlife resources. The case study method was employed to examine the particular incentives used in the project taking a

CBC approach. The information on the incentive introduced by the Biodiversity Conservation Project was gathered by reviewing project documents and reports. These materials were supplemented with my firsthand knowledge of progress in each incentive provided to the people of Khyber and Skoyo-Karabathang-Basingo (SKB) because I was directly involved in the implementation of the program. The effectiveness of these incentives is evaluated in Chapter 5.

2.1.1. Biodiversity Conservation Project

The Biodiversity Conservation Project, implemented between January 1995 and April 1999, was designed as a pilot demonstration of the CBC approach for the conservation of renewable natural resources in northern Pakistan. IUCN provided overall project management and technical support and implemented the project in NAs in collaboration with local communities, the NAs Forestry, Parks and Wildlife Department, and the Aga Khan Rural Support Program (AKRSP). The Wildlife Department of North West Frontier Province implemented the project in the mountainous regions of that Province. The aim of the Biodiversity Conservation Project was to evaluate the effectiveness of rural community management of wild species and their habitat, and demonstrate how government agencies and NGOs can best support CBC efforts. The specific objectives of the project were to: a) demonstrate how conservation of biodiversity can be enhanced by providing rural people with technical skills; b) illustrate how local institutions can manage wild species and their habitat for sustainable use; and c) assess the effectiveness of rural management of natural resources (IUCN-Pakistan 1995).

The project was spread over 15 valleys (7 in NAs and 8 in NWFP) covering more than 6700 km^2 of the Karakoram, Hindu Kush, and Western Himalayan mountain ranges. The ecological zones included permanent snowfields, alpine meadows and dry alpine habitats, dry temperate coniferous forests, alpine scrub, and moist alpine zones described by Roberts (1991). The rural communities involved in this pilot phase of the CBC program included more than 65 villages comprised of 5,800 households and 56,000

people (IUCN- Pakistan 1997). The project mainly focused on wildlife, though conservation of natural forests, medicinal plants, and introduction of ecotourism were also addressed where deemed appropriate. Wildlife conservation was sought by preparing area-specific, species conservation plans that provided local communities with a tool to protect, monitor, and sustainably use the wild species and their habitat. These species include Himalayan ibex, markhor (*Capra falconeri falconeri*), Ladakh urial (*Ovis vignei*) and musk deer (*Moschus chrysogaster*). Makhor and Ladakh urial are listed as endangered and musk deer as a threatened species (IUCN 1996). The Himalayan ibex is the most abundant species of mountain ungulate found in northern Pakistan (Hess et al. 1997). By demonstrating the economic value of species like ibex and markhor through a limited and strictly enforced community-based trophy hunting program, the project has introduced a powerful inducement for the local communities to manage their wildlife resources. The intention was that conservation efforts directed at species of economic importance (e.g. ibex) and their habitats would also benefit a wide range of animals and plant species, thus enhancing the biodiversity of the area.

2.1.1.1. Project Approach

The project established a process of involving local communities in conservation efforts through dialogues and participatory planning techniques as well as identifying local concerns, needs, and priorities while decentralizing the decision-making process at the village level. Enabling, facilitating, and empowering community members encouraged participatory actions. Local people were asked to develop their own conservation and development agenda. The project, however, ensured that these plans were compatible with a conservation objective. The project also assisted Village Organizations (VOs) and Village Conservation Committees (VCCs) in developing Village Management Plans (VMPs) and Wildlife Conservation Plans (WCPs). While working with the project staff, community representatives had an opportunity to enhance their skills in village level planning and management. The VMPs were extensively discussed and approved by the village assemblies. WCPs were prepared jointly by the

VCCs and the project staff and were later approved by the District Conservation Committees (DCCs) constituted to support the community conservation initiatives, to curb poaching, and to coordinate the implementation of the Biodiversity Conservation Project. The respective Deputy Commissioners head the DCCs with membership from local administration, NAFPWD, NGOs, and participating communities. Special attention was paid to the institutional strength of each community. The project initially focused on the VOs created by AKRSP, but later encouraged the communities to establish watershed or valley level organizations in areas where more than one village was involved in the conservation program. This was also necessary because the villagers considered wildlife a common resource belonging to all the villages found in the watershed. The project trained community activists, mostly former hunters, as Village Wildlife Guides (VWGs) and provided them binoculars, hiking shoes, and winter jackets to participate in wildlife surveys. The VWGs reported to the respective VCCs and helped them organize "watch and ward" activities, conduct wildlife surveys, and control poaching. They also assisted the VCCs in monitoring and evaluating the implementation of the WCPs and served as guides during the authorized trophy hunting in the area. Every year, the VWGs are brought together in a workshop/refresher course to exchange experiences among each other and with the project staff on "watch and ward", surveys, and guiding trophy hunts.

To formalize the relationship between the project and the communities, Terms of Partnership (TOP) were drawn to outline the responsibilities of the project and the VOs and VCCS. The project also helped communities establish Village Conservation Funds (VCFs) to help pay for the conservation costs. In most cases, initial investment in these funds consisted of a 25% share from the concerned community and 75% from the project with additional inputs derived from the sustainable use of renewable natural resources. The communities were encouraged to generate income by setting up multiple activities such as limited trophy hunting, marketing of medicinal plants, and developing ecotourism. This initiative ensured sustainability of funding for future activities of the village-based conservation program.

2.2. Study Area

I selected 2 Biodiversity Conservation Project sites as case study areas. These 2 study areas are located in NAs, Pakistan approximately 350 km apart. Khyber Community Conservation Area, a small catchment of about 250 km^2, is located in upper Hunza in District Gilgit at the Karakoram Highway (36° 33'-36° 43' N Latitude and 74° 32'-74° 50'E Longitude). Skoyo-Karabathang-Basingo (SKB) Community Conservation Area, an area of about 186 km^2, is located in the western-most arm of the Himalayan Range west of Skardu in District Skardu (35° 26'-35° 35' N Latitude and 75° 06'-75° 19' E Longitude) (Fig.2.1). This catchment lies south of the Gilgit-Skardu road and the Indus River. The elevation of these catchments varies from 2100 m to above 5000 m a.s.l. The areas are very rugged with precipitous slopes, high ridges, and sheer cliffs. Several small glaciers also occur within these catchments. The climate of these areas is generally dry because of the "rain shadow" of the Himalayas. Average annual rainfall rarely exceeds 200 mm and most precipitation occurs in the form of snow during December - February. The mean maximum temperature in summer is between 30 and 35°C. Temperature often drops to -10°C during winter (WCP 1997). The areas fall within alpine and sub-alpine scrub zones of the mountain desert ecosystem (Roberts 1997). The mountain slopes are mostly barren with varying degrees of sparse vegetation. The large vertebrates in the areas include snow leopard (*Uncia uncia*), wolf (*Canis lupus*), Himalayan ibex (*Capra ibex siberica*), flared-horned markhor, Himalayan musk deer, red fox (*Vulpes vulpes*), Kashmir flying squirrel (*Hylopetes fimbriatus*), and golden marmot (*Marmot caudata*). Himalayan snow cock (*Tetraogallus himalayensis*) and chukar partridge (*Alectoris chukar*) are common game birds in the area.

2.3. Community-based Incentive Measures Introduced

The project followed an adaptive approach to achieve conservation and sustainable use of wild species. The incentive measures introduced were primarily

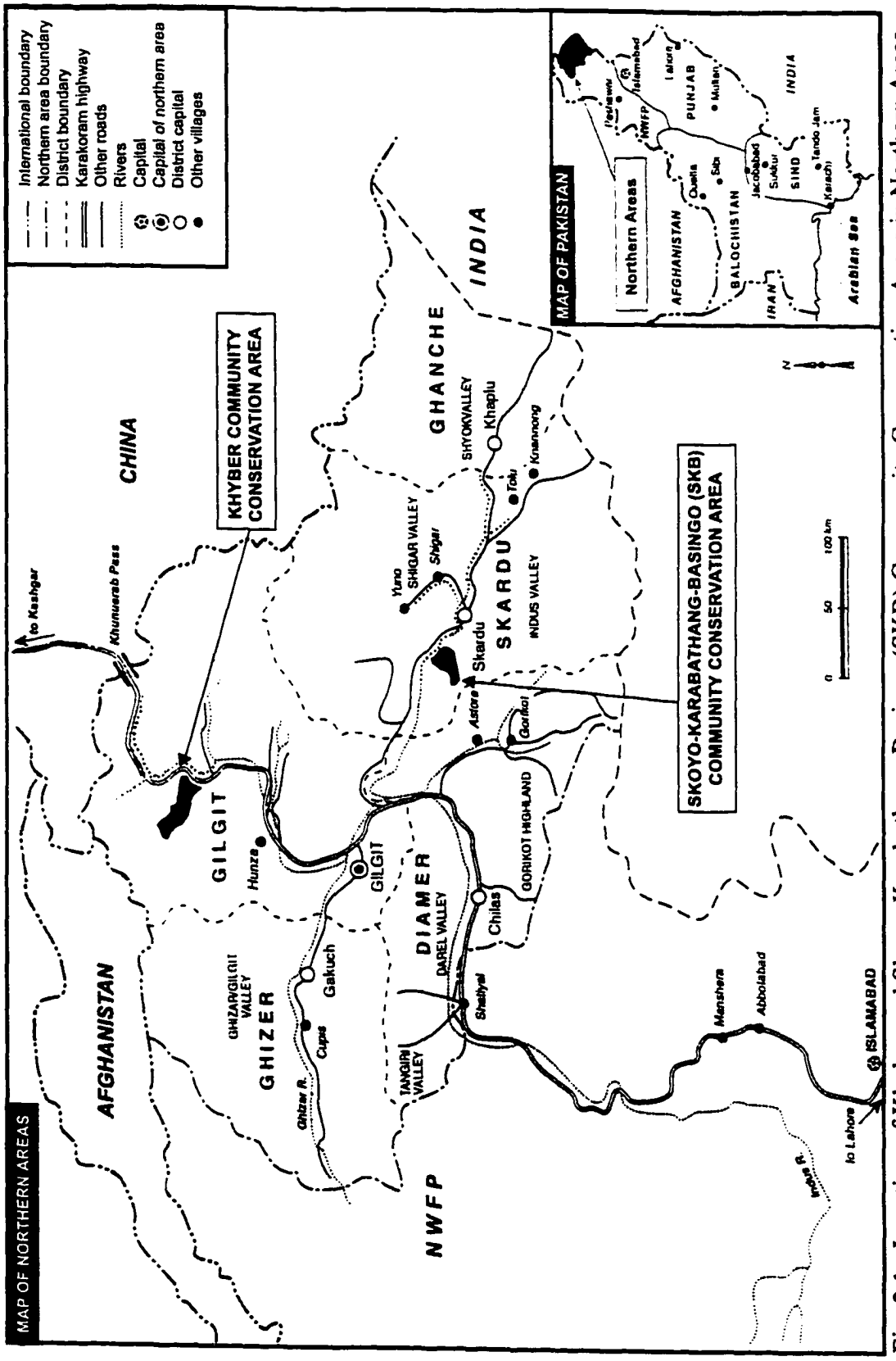

Fig. 2.1. Location of Khyber and Skoyo-Karabathang-Basingo (SKB) Community Conservation Areas in Northern Areas, Pakistan.

designed to enhance local participation, build local capacities for the management of natural resources, and to demonstrate the economic value of wild species for conservation and local development. These incentives fall into the following categories:

1. social development;
2. Economic;
3. Institutional; and
4. Service-oriented.

2.3.1. Social Development Incentives

Social incentives often are directed at improving the quality of life of local communities. These incentives encompass basic services (such as assistance for community buildings, support for community organizations, local peoples' involvement in the planning and decision making process, health and education facilities, provision of a water supply scheme, etc. (Velozo1987, McNeely 1988). The foundation of any incentive measure, whether social or economic, is community support, and such support can only be gained through active involvement and leadership of local people in the planning and decision making process at the early stage of project planning (McNeely 1993). The social incentives provided by the Biodiversity Conservation Project were local peoples' participation in resource appraisals and planning, developing VMPs, signing of TOPs, and developing valley-based WCPs.

2.3.1.1. Villagers' Participation in Resource Appraisal and Planning

A multidisciplinary team, comprised of the partner organizations (IUCN, AKRSP, and NAs Forestry, Parks and Wildlife Department), conducted a Participatory Rural Appraisal (PRA) at the initial stage of the project to establish a relationship with the people of Khyber and SKB. The purpose of this exercise was to ensure the active involvement of community members in planning village level conservation and management activities including assessment of the present state of the natural resource base, socioeconomic condition of the village, historic trend in natural resource uses, and future actions for rehabilitation of the local environment. The PRA provided an incentive

for the villagers to examine and establish their own conservation and development priorities, and was effective in stimulating community participation (Garratt et al. 1997). It gave an opportunity to the villagers to express their views and have a lead role in planning and designing management directions for conservation of village resources. The PRAs were usually followed by joint wildlife resource appraisals (surveys) involving community activists and the project staff. This process assisted in establishing good rapport with the communities, understanding community structure, and other mechanics needed to develop community-based conservation action plans. The PRA exercises generated a great deal of data that were later used for developing VMPs. The Villagers' participation in the planning process made them feel special and prestigious because of the attention they received from government agencies and the conservation NGOs.

2.3.1.2. Village Management Plans

The results of the PRAs and wildlife resource appraisals led to the drafting of VMPs for both areas by the respective VOs with assistance from the project staff. These VMPs provided a social and biological profile of the areas, suggested an action plan, and set priorities for conservation and development needs (IUCN-Pakistan 1997). After initial drafting, the VMPs were reviewed extensively by the VOs, revised and finally adopted with the approval of village assemblies. The drafting of VMPs not only built the capacity of the VOs in village management planning (an incentive), but also accomplished 3 important elements of village-based conservation programs: a framework for activities, a sense of direction for the community, and a set of commitments within the community and between communities and collaborating organizations (Garratt et al. 1997). These plans were developed through an interactive process involving community representatives and the project staff which resulted in a strong sense of ownership of these documents by the community. The villagers felt that because these plans belong to the village, they could contact any development agency to sponsor a particular activity identified in the plan. The VMPs were working plans that were reviewed and updated annually during the course of implementation. The development of VMPs led to signing

of TOPs between the communities and IUCN for joint implementation of some of the components of these plans and drafting of WCPs for both Khyber and SKB.

2.3.1.3. Terms of Partnerships

After approval of the VMPs by village assemblies, the TOPs outlining the responsibilities of the VOs and of IUCN were signed. The signing of TOPs provided a mechanism for the local communities to receive financial assistance for a physical infrastructure project (e.g. irrigation channel). The TOPs also provided a framework for future collaboration between the VOs and the project for development and implementation of the village-based conservation program. The TOPs called for establishment of a VCF by the community and development of a WCP. It also bound the project to provide technical assistance to the communities for the development of the WCPs and to make additional contributions to the VCFs as well as to train community activists as VWGs. One of the terms of the TOPs called upon the VOs to seek linkages with the government and other development agencies for assistance in implementation of the VMPs (IUCN-Pakistan 1996).

2.3.1.4. Wildlife Conservation Plans

The TOPs required VOs to prepare WCPs to plan for conservation and sustainable use of wildlife species, mostly for species of economic importance (e.g. Himalayan ibex and flared-horned markhor). The project authorities presumed that conservation efforts directed at these species and their habitats would also benefit many other animal and plant species found in the ecosystem (WCP 1997). Technical assistance for the preparation of the WCPs, which provided the basis for management and sustainable use of wildlife populations, was the major incentive for the local communities. The WCPs differed significantly from the VMPs described above. The management actions or strategies defined under these plans included: (1) training VWGs, (2) establishing a wildlife monitoring system, (3) ensuring that any hunting of wildlife is sustainable, (4)

promoting sustainable use of high pastures, (5) building capacities for the joint management of wildlife resources, (6) increasing community awareness for conservation, and (7) establishing VCCs and VCFs. The plans also included a detailed work plan for the VCCs and procedures for monitoring and evaluation of implementation of the WCPs at the community and project levels. These plans were approved by the DCCs, which empowered local communities for implementation of the plans. The VCCs reviewed progress on implementation of the WCPs annually with assistance from the project staff and followed an adaptive management approach. If a target was not met during the year, the next year's work plan was revised to achieve that target.

2.3.1.5. Water Supply Scheme

Hauling drinking water was a major problem for women of Basingo (one of the villages in the SKB catchment). The people of Basingo identified drinking water as a primary need for the community because it was a major social issue in the village. The consumption of water from open channels was also a cause of many health problems of the villagers. Though the provision of drinking water to the community was not well-matched with the biodiversity conservation objectives, the project considered it a social incentive for the villagers to participate in the program and provided material and maintenance tools to the community for the scheme. The project cost was Rs.715, 000 or US$14,300 for the material and tools, while the community contributed free labor. The villagers not only completed the project successfully, but also took responsibility for the future maintenance of taps and pipes by forming a Water Committee and levying monthly water charges of Rs.5/- from each household. The villagers believed that provision of clean water would improve the community's health standard and reduce the workload of women. Because women were actively involved in the design of the scheme, the intervention provided a catalyst to organize women into Women's Organizations and to motivate the villagers to participate in the conservation program (IUCN-Pakistan 1998). The whole rationale behind this intervention was to test whether this social

incentive could help in building good rapport with the villagers and encouraging their participation in the CBC program.

2.3.2. Economic Incentives

McNeely (1988) stated that resource utilization is mostly governed by the perceived interests of individuals or groups, so behavior affecting biological resources can be best changed by applying measures that alter the perceptions of people in their self-interest. Because self-interests are often defined in economic terms, conservation should be promoted through the means of economic incentives (McNeely 1988). Recent approaches to conservation of biological resources assume that applying economic incentives is clearly worthwhile when they help conserve biological resources at a lower economic cost than that of the economic benefits received (McNeely 1993). Economic incentives were introduced under the Biodiversity Conservation project to motivate the local communities of Khyber and SKB. These included: (1) financial assistance for productive physical infrastructure projects; (2) establishment of joint VCFs; and (3) introduction of a community-based, sustainable trophy hunting program.

2.3.2.1. Productive Physical Infrastructure Projects

The scarcity of productive land is the main obstacle for economic development of the mountain communities in NAs. The people of Khyber and SKB considered land development a top priority for mitigating use of high pastures and natural forests for conservation of wild species. Hence, they identified construction of new irrigation channels as a priority activity under their VMPs. Irrigation channels provide communities with the opportunity to develop more land for growing fodder and trees close to the villages. This should result in decreased pressure on high pastures, which are important wildlife habitats, and therefore lead to restoration of wildlife populations. The biodiversity project provided about Rs.1.0 million or US$20,000 for the construction of 3 irrigation channels, one each at Khyber, Skoyo, and Karabathang, while communities

contributed labor and committed to actively participate in the village-based conservation activities through signing TOPs with the project (IUCN-Pakistan 1997, 1998). These channels were completed in 1998, but the effects of this intervention will not be seen immediately. However, the benefit accrued by the communities in terms of more land at the household level was an important incentive for the villagers to support project.

2.3.2.2. Village Conservation Funds (VCFs)

The WCPs called for establishment of VCFs to help communities pay for conservation costs. Accordingly, the VCFs for Khyber and SKB were established jointly by the local communities and IUCN. The main objectives of the VCF were to: (1) provide a self-supporting revolving fund for village level conservation activities, (2) develop partnerships between the local communities and the project based on financial commitments from both parties, and (3) create a sense of community ownership of the conservation program. Another agreement was signed between the VCCs and the project for the joint operation of these funds.

The initial capital for the VCFs was invested under joint accounts. Only interest earned from these accounts can be withdrawn annually by the VCCs to pay the VWGs, conduct wildlife surveys, and pay for other conservation activities defined in the agreement and WCPs. Additional funds for this account were derived from the use of wild species (e.g. trophy hunting) and donations given by other agencies or individuals. The decision on how to spend these funds mainly lies with the VCCs. Joint management of the VCF accounts was needed only to guard against misuse of funds by individuals. The initial response to the VCFs from the communities was quite encouraging. By the end of April 1999, the people of Khyber and SKB increased their VCFs to Rs.473, 000 (US$9,460) and 370,000 (US$7,400), respectively. Under the agreement signed by the community with the project, the balance of the VCF should never be less than the initial capital investment. Only interest (16% per annum) can be utilized to payout for the conservation activities. The introduction of the VCF was an innovative approach adopted

by the project and a strong economic incentive for the local communities to develop a self-supporting conservation program at the village level. The VCFs served as a catalyst to encourage local communities to participate and secure long-term benefits from the CBC program.

2.3.2.3. Trophy Hunting

One way to give wildlife an economic value so that local people will have an interest to conserve it is through sport/trophy hunting (Eltringham 1994). Sport hunting is an economically sound form of land use for regions lacking scenic attraction or charismatic species and which are too dry or infertile for efficient farming (Eltringham1994). Moreover, trophy hunting is often considered the ultimate form of ecotourism because very few tourist safari hunters can provide considerable revenue (Harris 1995, Morrill 1995), and it has the potential to provide economic incentives to local people for maintaining certain wildlife areas and their associated wildlife (Decker 1995, Liu 1995, Lewis and Alpert 1997).

Local communities in NAs can earn significant revenues from both foreign and local trophy hunters. The local people believe that the trophy hunting program has the potential to contribute to wildlife conservation and the cost of local development. Trophy hunting could be an effective management tool if applied correctly. It is a low impact and low input activity, but return from this type of wildlife use is often high. The Biodiversity Conservation Project took concrete steps for using trophy hunting as an economic incentive for the local communities to participate in the wildlife conservation program (UNDP/GOP/GEF 1998): (1) development of a population monitoring system for mountain ungulates to determine annual quotas; (2) annual allocation of trophy hunting quotas to the community-managed, controlled hunting areas; (3) drafting of a policy for ibex hunting in NAs; (4) securing the federal government's approval for 15 annual ibex hunting permits exclusively for the community conservation areas; (5) assisting the federal government to seek approval from the 10th Convention of Parties of CITES held

in June 1997 at Harare, Zimbabwe for the export of 6 markhor trophies annually from the community-managed conservation areas in Pakistan; and (6) administrative arrangements for revenue sharing from trophy hunting permit fees between the government (25%) and communities (75%). In addition, efforts were made to link the communities with licensed outfitters connected to the international hunting market who could promote the community-based trophy hunting program and develop a mechanism to ensure the equitable sharing of revenues. Four foreign tourist hunters (mostly American) hunted ibex in Khyber and SKB during the 1997 and 1998 hunting seasons (3 in Khyber and 1 in SKB). In Khyber, the community received US$6750 as its share from the trophy fee plus an additional contribution of US$5300 from the hunters for the village conservation and development program. Altogether, the people of Khyber earned US$12,050 in 2 years by selling only 3 ibex permits. In SKB, where only one permit was issued, the community received US$2250. In addition, the hunters left meat in the villages, which represented an additional benefit for the local communities. The government also generated US$3000 from these 4 permits. Additionally, trophy hunting took place in other community conservation areas in NAs (IUCN-Pakistan 1997, 1998). The economic benefits from trophy hunting could serve as a strong economic incentive for the local communities in northern Pakistan, where per capita annual income is below the national average of US$450.

2.3.3. Institutional Incentives

Local institutions play a key role in managing ecosystems and conserving biological resources (Wells 1998). Community-based conservation is possible in situations where villagers are able to organize and carry out local level management by themselves, including the establishment of use rules and regulations, resolution of disputes, the monitoring of resource use practices, the imposition of sanctions against offenders, and the equitable distribution of benefits (Ostrum 1990). The establishment of strong, village-level institutions can be an effective inducement for behavioral change, which often contributes to conservation of biological resources. In most cases, such

institutions already exist and simply need to be strengthened or rejuvenated (McNeely 1988). Where wildlife exists in areas inhabited by people, successful wildlife management needs empowerment of local institutions that can effectively monitor and sanction behavior (Gibson and Marks 1995). Strengthening local institutions to gain control over local resource management increases local autonomy, decreases their dependency on outside institutions and funding, and increases prospects for effective local participation in the conservation initiatives (Borrini-Feyerabend 1997). Moreover, land tenure regulates the use of land and its resources. When local communities do not have tenurial rights, they have no incentive to make investments that would insure sustainable use of village resources, and such tenurial rights can include common property or collective local decision-making authority. The two main institutional incentives introduced by the project included: (1) strengthening of local institutions, and (2) resource tenure and community empowerment.

2.3.3.1. Strengthening Local Institutions

Initially, the biodiversity project worked with the VOs, the local level institutions created by the AKRSP during the mid 1980s. Soon, the community leadership and the project realized that conservation of wildlife resources needed management institutions at the watershed or valley level, not at the village level, because wildlife moves well beyond the jurisdiction of a village (e.g. SKB). To address this issue, a supra-village level conservation committee was established at the watershed level and built on the existing VO structure in each village. This committee was responsible for development and implementation of the WCP at the valley level. In most cases, the villagers selected members of the committee from the existing VOs. This supra-village level committee coordinated conservation activities at the valley level. The committee not only provided an opportunity for the leadership of several villages to work together for a common cause, but also an incentive to be a local level political force to deal with government agencies and to regain control of their natural resources.

The DCCs were established to provide institutional and administrative backing to the village conservation committees. The main functions of the DCCs were to extend full support to local communities, approve WCPs, coordinate implementation of the WCPs among the government agencies, NGOs and local communities, and provide a forum at the district level for discussing conservation issues. These DCCs offered an effective mechanism for linking government and local communities, ensuring compliance of wildlife laws, and monitoring implementation of the WCPs. Previously, villagers never had a chance to sit with local authorities to discuss their conservation and development issues. This forum was useful for breaking the communication barrier between the government agencies and local people, raising self-esteem, and building self-confidence among the villagers. The approval of the WCPs by the DCCs empowered local communities to manage wildlife resources for sustainable use. It also ensured assistance from the committee for controlling poaching by outsiders, an incentive for the village-based conservation movement.

2.3.3.2. Resource tenure and community empowerment

In 1973, the federal government abolished all the principality states in NAs and declared areas above the water channels as government property and later banned all big game hunting by enacting the NAs Wildlife Preservation Act in 1975. It left little incentive for rural communities of NAs to manage and benefit from wildlife resources found in the rural landscape. This policy did not stop poaching and habitat degradation because law enforcement was weak and, more importantly, the lack of ownership or tenurial rights kept local people from actively participating in conservation activities. Indeed, the problem of wildlife conservation couldn't be solved without empowering local people to protect, manage, and wisely use wildlife resources for the benefit of both wild species and people.

Two basic prerequisites for incentive measures to be effective are: (1) local communities should have secure tenure over the wildlife resource, and (2) communities

are empowered to regulate tenure and rights. There were no such provisions in the existing government policies and laws. Though some provinces recently enacted a few enabling amendments in their existing wildlife laws to enlist participation of local communities in conservation, these changes still fell short of empowering local communities to manage and sustainably use wildlife resources in rural areas. The NAs Administration also took some stopgap measures to promote community-based incentives for wildlife conservation. For example, the establishment of DCCs and approval of WCPs from these DCCs enabled people of Khyber and SKB to manage and use wildlife resources, a de facto empowerment of local communities. The designation of Khyber and SKB Community Conservation Areas by the federal government, along with other sites in NAs, as community-managed Controlled Hunting Areas and appointment of the community representatives as Honorary Wildlife Officers in late 1998 further helped local communities regain control over natural resources that was taken away by the federal government. These measures provided legal authority to the people of Khyber and SKB for management and sustainable use of wildlife resources. The Honorary Wildlife Officers have similar powers to those exercised by the Wildlife/Forest Officers of NAs Forestry, Parks, and Wildlife Department. This empowerment provided local communities an incentive to work with government authorities to control poaching, logging, and other intrusions by outsiders. Basically, the project approach was to facilitate gradual devolution of authority and control over natural resources from government institutions to the local communities. The main logic behind it was that the project must remain apolitical and should not threaten the stakes of all parties (Ahmed, unpublished manuscript).

2.3.4. Service-Oriented Incentives

Service-oriented incentives often are introduced by providing local communities access to services that assist implementation of conservation programs (Velozo1987). The main service incentives include: technical assistance, training, conservation awareness, and assistance in marketing of renewable natural resources. The reason for

providing these incentives is that they act as a catalyst in motivating local communities' involvement in conservation activities and ensure continuity of these activities (McNeely 1993). The service-oriented incentive introduced under the Biodiversity Conservation Project included: (1) training and capacity building, and (2) conservation education and awareness.

2.3.4.1. Training and Capacity Building

One of the objectives of the project was to enhance conservation of biological diversity in Pakistan by providing rural people technical skills. The most important interventions by the project involved community activists and local hunters in village-based wildlife management activities such as "watch and ward", wildlife surveys, guided trophy hunts, and survey and collection of medicinal plants. This served 2 purposes: (1) keeping the community activists engaged with the activities they liked most, and (2) providing them opportunities to supplement their income by working for the community as VWGs and plant experts. The communities were asked to nominate former hunters as potential candidates for the VWGs. Project personnel selected the most experienced of these hunters as VWGs following prescribed criteria. The number of VWGs for each area depended upon the size of the area and the number of entry points in the watershed. For example, 2 VWGs were selected from Khyber and 3 from SKB. The project trained about 30 VWGs from different community-based conservation programs across the NAs (including Khyber and SKB). They received training in a range of subjects such as "watch and ward" strategies, monitoring wildlife populations, basic concepts of conservation and sustainable use, wildlife viewing, recording snow leopard predation incidents, guiding trophy hunts, and skinning and preparation of trophy animals (IUCN-Pakistan 1997). They also received binoculars, winter jackets, and hiking shoes as incentives for their services for the community and wildlife protection.

The VWGs were involved in biannual wildlife surveys, first as guides and subsequently as observers/enumerators. The training helped them to understand their role

and the communities' responsibilities as well as built capacity of the community to run the program with little outside support. Some of the VWGs also were trained as Master Trainers so they could train additional community activists in their villages and in other community conservation areas to strengthen the village wildlife monitoring system. A mechanism for providing them monetary benefits from the community for their services was built into the VCFs.

2.3.4.2. Conservation Education and Awareness Raising Programs

Education and awareness are closely linked to successful conservation. Hence, the biodiversity project took some preliminary initiatives to educate community representatives on the implications of loss of biological diversity and benefits of conservation by inviting them to participatory planning workshops. This provided opportunities for the villagers to share lessons and experiences regarding wildlife management activities with the project staff and their colleagues from other community conservation areas. Additionally, environmental awareness workshops were arranged for teachers and community activists from all project sites (including Khyber and SKB). The main objective of this initiative was to involve teachers in promoting conservation awareness among the villagers and local school children. The teachers who attended the workshops initiated several environmental awareness activities in their schools involving children and local youth (IUCN-Pakistan 1997). In addition, several drawing competitions were held at the local schools, and students from grade 1-8 were asked to draw pictures of their surrounding environment focusing on plants and animals found in the area. The students who drew the best pictures illustrating local biological diversity were given prizes of books, pamphlets, and posters on local wildlife species as an incentive for augmenting their interest in nature and the local environment.

2.4. Literature Cited

Ahmed, J. (Unpublished manuscript). People's Participation in Conservation; A Case Study from Northern, Pakistan: 15pp.

Aylward, B. 1992. Appropriating the value of wildlife and wildlands. Pages 34-64 in T. W. Swanson and E. B. Barbier (eds.), Economics for the wilds; wildlife, diversity, and development. Island Press, Washington D.C.

Borrni-Feyerabend, G. (ed.). 1997. Beyond Fences: Seeking Social Sustainability in Conservation. IUCN, Gland (Switzerland), Vol. 1 and 2.

Child, G. 1996. The practice and principles of community-based wildlife management in Zimbabwe: the CAMPFIRE programme. Biodiversity and Conservation, 5: 369-398.

Decker, E. 1995. The role of trophy hunting in sustainable development. Pages 217-218, in J. A. Bissonette and P.R. Krausman, eds., Integrating people and wildlife conservation for a sustainable future. The Wildlife Society, Bethesda, Maryland.

Eitringham, S. K. 1994. Can wildlife pay it way? Oryx 28(3): 163-168.

Garratt, K., M. Murphree, and K. Shirzai. 1997. Maintaining biodiversity in Pakistan with rural community development; report of the independent evaluation mission: 49pp.

Gibson, C. C. and S. A. Marks. 1995. Transforming rural hunters into conservationists; an assessment of community-based wildlife management programs in Africa. World Development, 23 (6): 941-957.

Harris, R. B. 1995. Ecotourism versus trophy-hunting; incentives toward conservation in Yeniugou, Tibetan Plateau, China. Pages 228-234 in J. A. Bissonette and P.R. Krausman, eds., Integrating people and wildlife conservation for a sustainable future. The Wildlife Society, Bethesda, Maryland.

Heinen, J. T. 1995a. Thoughts and theory on incentive-based endangered species conservation in the United States. Wildlife Society Bulletin 23(3): 338-345.

____. 1995b. Application of human behavior ecology to sustainable wildlife conservation and use programmes in developing countries. Oryx, 29(3): 178-186.

____. 1996. Human behavior, incentives, and protected areas management. Conservation Biology 10(2): 681-684.

Hess, R., K. Bollmann, G. Rasool, A. A. Chaudhry, A. T. Virk and A. Ahmed. 1997. Pakistan Country Report. Pages 239-260, in D. M. Shackleton ed. Wild sheep and goats and their relatives. Status Survey and Conservation Action Plan for Caprinae. IUCN, Gland, Switzerland.

IIED. 1994. Whose Eden? An overview of community approaches in wildlife management. International Institute for Environment and Development, U.K.: 121pp.

IUCN. 1996. IUCN red data list of threatened animals. IUCN, Gland, Switzerland.

IUCN-Pakistan. 1995. Maintaining biodiversity in Pakistan with rural community development; annual progress report, Jan.-Dec., 1995: 74pp.

____. 1996. Maintaining biodiversity in Pakistan with rural community development; annual progress report, Jan.-Dec., 1996: 35pp.

____. 1997. Maintaining biodiversity in Pakistan with rural community development; annual progress report, Jan.-Dec., 1997: 24pp.

____. 1998. Maintaining biodiversity in Pakistan with rural community development; annual progress report, Jan.-Dec., 1998: 26pp.

Lewis, D. M., and P. Alpert 1997. Trophy hunting and wildlife conservation in Zambia. Conservation Biology 11(1): 59-68.

Liu, Y. S. 1995. International hunting and involvement of local people, Dulan, Qinghai, People's Republic of China. Pages 63-67 in J. A. Bissonette and P.R. Krausman, eds., Integrating people and wildlife conservation for a sustainable future. The Wildlife Society, Bethesda, Maryland.

McNeely, J.A. 1988. Economics and biological diversity: developing and using economic incentives to conserve biological resources. IUCN, Gland: 236pp.

____., 1993. Economic incentives for conserving biodiversity: Lessons for Africa. Ambio 22(2-3): 144-150.

____., M. Rojas, F. Vorhies. 1997. Incentives and disincentives to conservation. Pages 100-102 in G. Borrni-Feyerabend (ed.) Beyond Fences: Seeking Social Sustainability in Conservation. IUCN, Gland (Switzerland), Vol. 2.

Morrill, W. I. 1995. The tourist safari hunter's role in conservation. Pages 219-222 in J. A. Bissonette and P.R. Krausman, eds., Integrating people and wildlife conservation for a sustainable future. The Wildlife Society, Bethesda, Maryland.

Ostrum, E. 1990. Governing the commons: The evolution of institutions for collective action. Cambridge University Press, Cambridge, U.K.

Randall, A. 1981. Resource economics; an economic approach to natural resource and environmental policy. Wiley, New York.

Roberts, T. J. 1991. The Birds of Pakistan. Oxford University Press, Karachi: 598pp.

Roberts, T. J. 1997. The mammals of Pakistan. Second Edition. Oxford Univ. Press, Karachi: 525pp.

Robinson, J. G., and K. H. Redford. 1994. Community-based Approaches to Wildlife Conservation in Neotropical Forests. Pages 300-319 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

UNDP/GOP/GEF. 1998. Pakistan Mountain Areas Conservancy Project (MACP); a project proposal: 122pp

Velozo, Ronnie de Camino. 1987. Incentives for community involvement in conservation programmes. FAO Conservation Guide 12: 159pp.

Vorhies, F. 1996. Economics, policy and biodiversity. Paper presented at economics, policy and natural resource management workshop held 11-13 September 1996 at Pretoria, South Africa.

WCP., 1997. Wildlife Conservation Plans, Khyber and SKB Community Conservation Areas; un-published documents, IUCN, Gilgit, Pakistan.

Wells, M. P. 1998. Institutions and incentives for biodiversity conservation. Biodiversity and Conservation 7: 815-835.

WRI/IUCN/UNEP. 1992. Global biodiversity strategy; guidelines for action to save, study, and use earth's biotic wealth sustainably and equitably: 244pp.

Chapter-3

3. Knowledge, Attitudes, and Perceptions of Local People towards Wildlife and Community-Based Conservation Approach, Northern Areas, Pakistan

3.1. Introduction

The fate of many parks and protected areas in developing countries has recently been questioned and is a source of considerable debate (Western 1989, West and Brechin 1991, Brandon and Wells 1992, Wells et al. 1992, IIED 1994, Pimbert and Pretty 1995, Colchester 1996, Ghimire and Pimbert 1997, and Kothari et al. 1998). Most conservationists and scholars now realize that solely relying on strictly managed protected area systems for conservation of biological diversity will not serve conservation objectives in the long-run because most of the world's biological resources exist in the rural landscape (Western and Wright 1994). As a result, alternative approaches have been devised that encourage conservation of wildlife resources, provide tangible benefits to rural communities, and empower local people to manage natural resources. One of the approaches being projected is 'Community-Based Conservation' (CBC). This is a practical approach to reduce losses of biodiversity in developing countries (Kiss 1990, Robinson and Redford 1994, Child 1996, Kothari et al. 1998, Williams et al. 1998, Tsing et al. 1999). The approach encourages sustainable use of wildlife resources (Murphree 1998, Getz et al. 1999) and involvement of local people in the planning and management of conservation areas to make them more acceptable to rural people (Gadgil 1992, Borrini-Feyerabend 1997, Carpenter 1998). A key objective of this new thrust is to improve attitudes of rural communities toward wildlife and conservation (Parry and Campbell 1992).

Because CBC is relatively new approach, no detailed analysis has been conducted to understand values that local people place on wildlife resources and conservation initiatives or on factors that contribute to cooperation for implementation of conservation programs (Fiallo and Jacobson 1995). Such programs require detailed information on local peoples' perceptions and conservation attitudes (Newmark et al. 1993). Attitudes

and perceptions of rural people toward wildlife and conservation must be taken into account if wildlife conservation in the rural landscape is to be viable (Infield 1988). Information on local communities' resource use and attitudes are essential for the success of conservation projects which aim to integrate wildlife conservation with community-based development (Hartup 1994).

Restricted access to natural resources in parks and protected areas has often resulted in negative attitudes towards parks and protected areas by the neighboring communities. In many parts of the world, local communities still fear that government might take over their land for another national park. Local communities (e.g. communities in northern Pakistan) usually react cautiously in embracing CBC projects. Moreover, killing of livestock by predators creates hardship for local people and gives rise to significant conflict between local people and conservation objectives (Oli et al. 1994, Newmark et al. 1994). Such losses can be of economic importance in a subsistence economy and can generate negative attitudes towards wildlife and conservation in general (Upreti 1986, Mishra 1997).

In Pakistan, as in many developing countries, the ownership of wildlife resources was taken away from the rural communities during the colonial era. Since then, control over these resources has been exerted through a centralized management system. As a consequence, the rural people became passive observers, poachers, or more often facilitators for illegal exploitation of these resources. Conservation agencies in Pakistan have recognized that conservation efforts cannot be sustained in the long-term without the support of the local people and are now adopting more judicious policies for conservation of wildlife resources in the rural areas. Attitudinal surveys can provide guidance for management decisions and baseline data to assess effectiveness of a new strategy (Fiallo and Jacobson 1995). Such surveys are extremely effective in assessing the success of new policies and programs and have only recently been used in the conservation field (Parry and Campbell 1992).

In this study, I investigate the knowledge, attitudes, and perceptions of local people in Northern Areas (NAs) of Pakistan towards wildlife and the CBC approach. Questionnaire surveys and key informant interviews were conducted in two Community Conservation Areas to collect socio-economic data, determine current land use, identify knowledge levels, and examine attitudes and perceptions of local people towards wildlife and the CBC approach. These variables were examined with respect to attitudes of local people towards parks and protected areas in several other countries (Tanzania, Newmark et al. 1993; Nepal, Heinen 1993; Malawi, Mkanda and Munthali 1994; Ecuador, Fiallo and Jacobson 1995; South Africa, Boonzair 1996) but only a few studies have looked into local peoples' attitudes toward conservation and CBC in particular (South Africa, Infield 1988; Botswana, Parry and Campbell 1992; Belize, Hartup 1994; India, Badola 1998; Zambia, Lewis and Phiri 1998; Nepal, Mehta and Kellert 1998). My study is the first of its kind in Pakistan and I hope my results will provide the basis for project planners, implementers, and other relevant agencies to design a wildlife conservation policy that incorporates the thoughts and aspirations of rural people for the long-term sustainability of wildlife in Pakistan and elsewhere.

3.2. Objectives of the Study

My primary objective was to describe local people's knowledge, attitudes, and perceptions towards wildlife and the CBC approach and to draw conclusions regarding their implications for community-based wildlife management. My specific objectives were to:

1. determine historic contexts in village based resource management, particularly:
   a) the local economic base,
   b) local institutions,
   c) land tenure and usufruct rights.
2. examine current land use practices of local communities;
3. examine knowledge and attitudes towards wildlife;

4. investigate perceptions on consumptive and non-consumptive uses of wildlife;
5. examine attitudes and perceptions towards the CBC approach.

3.3. Study Area

My study areas are located approximately 350 km apart. Khyber Community Conservation Area, a small catchment of about 250 km^2, is located in the upper Hunza in Gilgit District approximately 165 km northeast of Gilgit in the Karakoram mountains (36° 33'-36° 43' N Latitude and 74° 32'-74° 50'E Longitude). The area stretches for about 19 km along the Karakoram Highway and Hunza River. Its elevation ranges from about 2500 m in the south to about 5708 m in the north. Skoyo-Karabathang-Basingo (SKB) Community Conservation Area is located in the western-most arm of the Himalayan range about 45 km west of Skardu (35° 26'-35° 35' N Latitude and 75° 06'-75° 19' E Longitude) in the District of Skardu, NAs. It lies south of both the Gilgit-Skardu Road and the Indus River. The area of this catchment is about 186 km^2 and its elevation varies from about 2100 m at the Indus River to 5634 m towards Takht-I-Sulaiman and Harpo La. Both areas consist of very rugged mountain landscapes with difficult, precipitous slopes, characterized by innumerable spurs, high ridges, and broken cliffs. Several glaciers and snow-covered peaks occur within these catchments. SKB catchment was formerly part of the Baltistan Wildlife Sanctuary, which was re-designated as a Community-Managed, Controlled Hunting Area (Fig. 2.1).

The climate of these areas is generally dry because they fall within the "rain shadow" of the Himalayas. Average annual rainfall rarely exceeds 200 mm. However, rainfall increases with rising elevation, which creates a moist environment in the high altitude pastures. The areas receive most precipitation in the form of snow between December and February. At 3000 m in SKB, sufficient snow falls (equivalent to 750 mm of rainfall) to support grasses, shrubs, and coniferous forest. The mean maximum temperature in summer is approximately 30-35°C while the mercury level drops down to -10°C in winter (WCP 1997).

3.4. Methods

I conducted this study between January 1996 and December 1998 under the Biodiversity Conservation Project described in Chapter 2 (Section 2.2.). Data were gathered through 3 different methods: participant observations, key informant interviews, and questionnaire surveys. These were supplemented through review of the Participatory Rural Appraisal results, reports, and plans produced for the Biodiversity Conservation Project.

3.4.1. Participant Observations

I visited Khyber and SKB at least once per month and had frequent interactions with community representatives. I participated in community dialogues, village ceremonies and meetings, joint wildlife surveys, annual reviews of conservation and development action plans, and in negotiation of Terms of Partnership. I occasionally held informal discussions with village elders, elites, and former hunters. I gained trust and built a good rapport with the villagers by full participation in the village events. This helped me understand the communities' needs, concerns, structures, livelihood, and local institutions. I used this approach to make a better assessment of local resource use patterns and feelings of local people; this also enabled me to advise community representatives on implementation of their village-based conservation plans and to enhance their understanding of the CBC approach.

3.4.2. Key Informant Interviews

I conducted key informant interviews to explore the historic relationship of the local people with nature and to gather qualitative data on a variety of subjects including community structure, changes in local institutions, community economics, natural resource use, status of wildlife, reasons for decline in wildlife numbers, and perceptions of the villagers toward wildlife and the CBC approach. During my 3 years interaction

with the villagers, I was able to identify knowledgeable persons in each village. Key informants were carefully selected from both study areas based on convenience sampling procedure and my earlier interaction with those knowledgeable persons. Key informants were interviewed both from Khyber (n=6) and SKB (n=9). The sample included village elders, farmers, middle-aged educated men, and former hunters. I used a predetermined interview guide listing all the relevant topics and issues to guide the discussions. The interviews were presented in a conversational and discussion style to establish greater trust and dialogue and to increase opportunities for other information to emerge. When people other than the interviewee were present at the scene, they were asked not to intervene in the discussion. Detailed notes were taken during the course of discussion, keeping in mind that this should not distract from the discussion. The interviewees were encouraged to go into details of the issues by posing questions (who, why, where, and how). Most of the interviews were held in Urdu (the national language). An interpreter was used to assist understanding of the questions by the interviewees in only 2 cases. A tape-recorder was used initially to record the discussion with the permission of interviewees, but this was abandoned after one or two interviews because interviewees did not feel comfortable with recording while discussing sensitive issues such as the government's role and hunting.

3.4.3. Questionnaire Survey

I conducted a questionnaire survey during September and October 1997 in all the 4 villages of the study areas, when half the Biodiversity Conservation Project implementation phase was over. This was important, because it gave time to the villagers to understand some pros and cons of the CBC approach as well as the role of IUCN-The World Conservation Union as an intermediary agency. It also gave me time to get acquainted with the people of Khyber and SKB.

3.4.3.1. Questionnaire Design

The questionnaire consisted of 5 sections: (1) 6 questions about current land use practices; (2) 10 questions on knowledge, attitudes, and perceptions toward wildlife; (3) 5 questions on perceptions about consumptive and non-consumptive uses of wildlife; (4) 9 questions concerning attitudes and perceptions toward the CBC approach; and (5) 12 personal/household questions (Appendix I). The questionnaire contained both open and closed ended questions. Open-ended questions were used to explore several issues in detail. To encourage an open dialogue between interviewer and interviewee, questions related to current land use practices were placed in the beginning, and personal and household questions at the end. The questionnaire was prepared in English and later translated and typed in Urdu. The language of the questionnaire was kept very simple and, wherever possible, technical jargon was avoided.

3.4.3.2. Pre-Testing of Questionnaire

A pre-test of the questionnaire was conducted with 8 villagers from the 4 villages in the study area to detect any inadequacy in wording and effectiveness of the questionnaire. As a result, some questions were deleted and some modified to remove ambiguity and improve clarity. This also helped me to determine the proper timing for administering the survey. The villagers considered late September in SKB and early October in Khyber appropriate times for the survey.

3.4.3.3. Sampling procedure

The study population included all the households within the 4 villages in the study area. A household was defined as a group of several people of very close kinship managing a household together and making their livelihood from the area. A social map of the each village was constructed with the help of community representatives, and each household assigned a sequence number. Accordingly, a separate list of all the households

in each village was prepared and the names of household-heads were recorded. I found 270 households in the study areas--84 in Khyber, 26 in Skoyo, 31 Karabathang, and 129 in Basingo. Using a random number table, 70 households (ca. 26%) were selected -- Khyber (n=25), Skoyo (n=9), Krabathang (n=10), and Basingo (n=26). Religious and cultural norms do not permit an outsider (male) to interview females; therefore, all the respondents were male between 20 and 84 years old. One household in the sample from Skoyo was headed by a female whose husband had died and the only male member of the household was too young to be interviewed. This household was replaced with another household by picking the next number from the random number table. In another case, the head of a household was away from the village in the army; he was replaced by another household using the random number from the table; in a final case, a household-head was ill and was replaced by interviewing his eldest son.

3.4.3.4. Survey Implementation

Conducting a questionnaire survey in developing countries like Pakistan could be frustrating if proper public relations, religious norms, cultural sensitivity, and appropriate timing were not followed. The cooperation of local institutions, community representatives, and local leaders is often critical to conduct any survey in rural areas. Moreover, gaining the trust of villagers and building good rapport with the community is also very important. All these elements were taken into account prior to and while administering the survey. The community representatives were informed about the purpose of the study, its duration, and timing well before the actual surveys. Community leaders informed community members that the project team would be interviewing villagers about wildlife and its conservation. Two research assistants (one project colleague with an M.S. in zoology and one local graduate with an M.A. in anthropology), representing the same ethnic group and local language as the respondents, were engaged and trained to administer the survey. In addition, each community detailed an educated young man to assist in the surveys, particularly to assist me because I was not conversant in the local language. They were also helpful in taking appointments from the

respondents. Each respondent was told that the information collected during the survey was confidential and would never be used against anybody. Most of the respondents were very comfortable during the interviews. The community was enthusiastic about the survey; several villagers questioned why they were not interviewed. I personally administered about 45% of the questionnaires. The research assistants presented the questionnaire to those respondents who could not speak Urdu. The interviews were conducted either by visiting households or farms, wherever respondents felt most convenient. Interviews were presented privately, but in an informal and discursive way. A session with a respondent normally lasted 50-70 minutes. Only four or five questionnaires were administered in a day. Interviewees were encouraged to express their viewpoint openly on certain issues (e.g. predation); additional notes were taken on the margins of the questionnaires. Discussion on these issues continued after completion of the questionnaire on several occasions. At the end of each day, the filled-in questionnaires were thoroughly reviewed with the research assistants to check any error or ambiguity in recording responses.

3.4.3.5. Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 9.0. Independent variables included: household questions, current land use questions, knowledge questions, and benefit questions. Dependent variables mainly included attitude and perception variables. I used simple descriptive statistics to yield number of responses, relative frequencies, valid percentages, means, and standard deviations. To test for differences in mean household firewood consumption in Khyber and SKB, mean log of summer and winter firewood consumption was compared by performing on Independent Samples t-Test. I computed a Spearman Rank-order Correlation to see whether villagers in Khyber and SKB differed in their opinion about ownership of wildlife. I used a Chi-square test to compare differences between people of Khyber and SKB about the government's role in managing wildlife resources. For some of the questions for which multiple responses were possible, relative frequencies were

based upon the total number of responses rather than upon the total number of respondents so that relative frequencies summed to 100.

3.5. Results

3.5.1. Community Profile

Human geography: Khyber village is comprised of 84 households with a population of about 750 people. In fall 1997, the average family size was 8.7 people (SD=2.6, n=25) with on average 4.7 children (SD=1.86, n=25) below the age of 15 years per household. Key informants stated that the number of households increased more than 100% during the last three decades. People settled in three different villages in SKB -- Skoyo, Karabathang and Basingo. The early settlers of these villages came to take advantage of ample opportunities for big game hunting and availability of arable land and spring water. The population of 3 villages totaled 1680. The average family size was about 9.0 people per household (SD=5.0, n=45) with, on average, 4.4 children (SD=3.1, n=45) below the age of 15. The villagers believed the human population had doubled during the last 20 years.

Community structure: The people of Khyber speak Burusheski and Wakhi, and Urdu is also widely spoken. The whole community belongs to the Shia Imami Ismaili sect of Islam. Though people still identify themselves with their clans (Kutz or Khandan), the community has strong secular traditions. The inhabitants of Khyber are descendents of seven distinct groups of migrants who arrived in the area 4 generations ago. Four groups (Ghulam Shah Kutz, Hussan Kutz, Ali Akbar Kutz and Yakhum Kutz) arrived from central Hunza and spoke Burusheski, while the other 3 (Sakhi Kutz, Sabir Kutz, and Bahar Kutz) came from Gulmit and Passu villages of southern Gojal and spoke Wakhi. The Khyber community is dominated by the descendents of the first 2 settler groups: Ghulam Shah Kutz and Sakhi Kutz. The village head (numberdar) has always been selected from one of these 2 clans.

The SKB communities are of different origin, but currently all speak Balti and belong to Shia Isnnashri sect of Islam. Most of the younger generation and some of the older people can speak Urdu. The people of Basingo are descendents of more than 10 different clans that immigrated to the area from Astore, Kharmung, Skardu, and the Kirgil area of Kashmir. People of Karabathang were originally descendents of 4 Shina speaking clans from Astore. They inter-married with Balti women from neighboring villages and in the process forgot their Shina language over the last two generations. The people of Skoyo are the descendents of six Balti clans of different origins. These people mostly came from the nearby villages. The people in SKB generally live in harmony and help each other during difficult times; they do have occasional disputes over the use of some pastures.

3.5.2. Economic, Institutional, and Tenurial Contexts

3.5.2.1. Sources of Livelihood

Khyber: Agriculture and livestock production are the main sources of livelihood for the people of Khyber. However, some villagers are also involved in off-farm economic activities. Five key informants interviewed (n=6) reported that their households received some sort of income other than from agriculture and livestock (e.g. off-farm labor, private job, or government service). Fifty-two percent people reported that one or more of their family members worked outside the village to supplement the household income. When asked about their household annual income 36% said ≥Rs.50000, 20% between 40000-50000, 16% between 30000-40000, 8% between 20000-30000, 4% between 10000-20000, and 16% said they had no idea (1 US$= 50 Rs.). The average land holding (including both cultivated and non-cultivated lands) of the respondents was 3.59 ha per household (SD=3.3), whereas cultivated land was 1.74 ha per household (SD=2.2) (well above the average of 0.124 for NAs). The average livestock holding was about 13 sheep and goats and 3 cows per household. The villagers reported a trend toward keeping fewer sheep and goats. Most young people were no longer interested in the agro-pastoralist lifestyle. Young educated men preferred to work in business and off-

farm employment. The literacy rate in Khyber was very high. Because more than 80% of the children (boys and girls) attended school, they were not available as shepherds for the livestock. Sixty eight percent (68%) of the respondents have formal education (primary school or above), of these, 2 of the respondents (8%) had university degrees. The educated people preferred to earn their livings from non-agrarian jobs and they have only a few opportunities for such jobs in the area.

SKB: The people of SKB are largely dependent on subsistence level agriculture and livestock rearing with few opportunities for non-agrarian jobs. In key informant interviews (n=9) only 4 people reported that their households also receive income from other sources (e.g. off-farm labor or government service). About 42% of people reported that one or more of their family members work outside the village to supplement the household income from non-agrarian work, mostly labor. When asked about their household's annual income 20% said ≥Rs.50000, 27% between 40000-50000, 16% between 30000-40000, 13% between 20000-30000, 13% between 10000-20000, 7% ≤10000, and only 4% said they had no idea (1 US$=Rs.50). The average land holding (including cultivated and non-cultivated) was 1.24 ha per household (SD=1.6), whereas the cultivated land was 0.55 ha per household (SD=0.5). The average livestock holding was 18 sheep and goats and 5 cattle per household. Agriculture is limited by a shortage of irrigated land; therefore people tend to keep large herds of sheep and goats. According to the villagers, people were less dependent on agriculture than livestock. Few opportunities exist for other sources of income in the area, particularly for the people of Basingo who live a 2-3 hrs up hill walk from the paved road. Around 30 people (16% of the total households) in these villages are in the Pakistan army and/or government service, and contribute to their household income in this manner. Only 20% of the respondents had formal education (primary or above). None of the respondents had education above matric (tenth grade). Key informants revealed that a growing number of young people now migrate seasonally to Skardu or down country in search of labor to supplement their household income.

3.5.2.2. Shift Toward Market Economy

Key informants reported that Khyber was extremely isolated prior to the construction of the Karakoram Highway in 1978. Hunza, the capital of the earlier princely state of Hunza, could be reached in 3 days by pony or on foot and Gilgit was 6 days away. Now it takes 3.5 hours by jeep to reach Gilgit. This isolation clearly limited the extent of trade and marketing of local produce. In those days, the village was almost entirely dependent on subsistence production. Only a few individuals could go Hunza and Gilgit to trade livestock, dried fruit, and local wool cloth for salt, sugar, cotton cloth, and other commodities. All types of consumer goods have been coming to the village since the construction of the highway. The opening of the Chinese border through Khunjerab National Park in 1986 made market links possible to Kashgar in Xinjiang Province, China. The Karakoram Highway supports the growing exchange of potatoes, dried fruits, apples, and wool from the area for foodstuffs and consumer goods, and subsistence strategies shifted to market-oriented production. Villagers now put more efforts in production of cash crops such as potato seed, fetching good market prices. Every year potato seed worth hundreds of thousands of rupees is exported to the cities in other parts of the country. Production of cash crop and non-agrarian occupations are growing in importance in Khyber.

The villagers believe that the Karakoram Highway has brought prosperity to the area. The highway facilitated travel to the cities and development of links with the outside world. However, people acknowledged that the highway also brought some negative impacts on the local environment. Both forest and wildlife resources of the village were adversely affected, particularly in the late 1970s during the construction of the highway. Outside poachers came to the area and killed Himalayan ibex (*Capra ibex siberica*). Poachers came from as far as Gilgit with modern firearms. Trees were chopped down and sold to highway contractors. Nonetheless, the villagers felt that the recent shift towards a market economy took some pressure off the natural resources of the village. Most of the young men traveled outside the village and were involved in non-agrarian

occupations; old hunters were busy in production of cash crops on their land. Few people had the time to spend on hunting, collection of fuel wood, and herding livestock. The younger generation did not like to go into the mountains. This shift from traditional practices should have a positive affect on high pastures and wildlife populations.

Like Khyber Valley, the SKB catchment remained isolated until the construction of Gilgit-Skardu Road in the late 1970s. Prior to this, the area was only accessible by pony or on foot. A journey, through the rugged mountains, of 2 weeks to Gilgit and 3 days to Skardu was very difficult. Only a few courageous men could make a trip to Gilgit once or twice a year to trade wool, dried fruits, walnuts, and livestock for foodstuffs and other commodities. The people were totally dependent on subsistence agriculture and livestock production systems. Construction of the road brought past isolation of the Baltistan region to an end, but 2 of the villages (Basingo and Skoyo) are not yet linked to this road and market. The third village (Karabathang) was connected last year through a wooden bridge over the River Indus constructed by AKRSP. Skoyo is reached via basket suspended by wire across the Indus River, while Basingo is about a 2 hour uphill walk from the Gilgit-Skardu road. These villages may be linked to the road and therefore the mainstream economy in a couple of years.

Like people in Khyber, the villagers in SKB believed that the road brought many good things to their lives, including the opportunity to earn income through wage labor, selling of dried fruit, and access to other towns and cities. People now buy many things from the nearby Skardu market including flour (after exhausting their own produce) sugar, vegetable oil, rice, cloths, and other household items. Things are slowly changing. The people of SKB soon will have increased access to the market economy.

The villagers reported that the opening of the Gilgit-Skardu road brought natural resources of the catchment came under heavy exploitation. Mountain ungulates and game birds were poached ruthlessly by outsiders and numbers of these species declined precipitously. Access also made it possible to extract wood from the very limited forests

of the catchment. Though the area was part of the larger Baltistan Wildlife Sanctuary, exploitation of the resources continued. After realizing the deteriorating condition of these resources, villagers finally imposed a communal ban on commercial exploitation of forests and hunting of all wild animals and birds in 1995. The Village Conservation Committee, through a "watch and ward" system developed under the Biodiversity Conservation Project, enforced this ban.

3.5.2.3. Local Institutions

A variety of local institutions exist both in Khyber and SKB. Previously, village leadership centered around the "Numberdar" who was a direct appointee of the Mir or Raja (ruler of the state) and was responsible for collection of taxes and supervising communal development works (e.g. construction of irrigation channels, bridges, and pony trails, mostly through forced labor). The numberdars also performed many other roles including settling of minor disputes over usufruct rights and water access, as well as resolving personal quarrels. The numberdars had an assistant mainly for conveying messages to the villagers. After the abolition of princely states (rajdoms) in 1973, the political powers of numberdars were diminished. They continue to serve as village resource persons for local conflict resolution, however. In addition, each village had a Jirga or village council traditionally comprised of village elders; now, however, other criteria are also considered, including education, wealth, and awareness of local norms and customs. These village councils are responsible for regulating village affairs and making important decisions. Basingo is the only village in my study area that still has an active Jirga. The responsibility of the Jirgas, however, is now limited to resolving personal disputes. Each village also has a religious institution i.e. Imam-Bargah Committee (SKB) or Jamaat Khana Committee (Khyber), but their role is limited to religious affairs. However, religious clergies (Mukhi and Sheikh) often play an important advisory role in female education, family planning, and natural resource use.

Local union councils also emerged in the late 1970s. The union council members are elected at the village level and are responsible for dealing with the government. They can play a key role in bringing funds to their villages for development and consequently are powerful in village politics. However, these councils were dissolved 5 years ago by the federal government.

AKRSP has facilitated formation of Village Organizations (VOs) and Women's Organizations (WOs) since 1983 in most parts of NAs for village level development and management. These organizations helped local communities organize and work towards collective goals. The office bearers of VOs are elected by the village assemblies, who have now taken over all political functions of earlier "Numberdars." All 3 villages in SKB have formed VOs with the assistance of AKRSP and have implemented Productive Physical Infrastructure projects sponsored by the AKRSP and the Biodiversity Conservation Project. In addition, villagers have formed a joint committee for all 3 villages namely "Village Conservation Committee, SKB" and have developed its by-laws. Most of its members are also members of the VOs. The main objective of the Village Conservation Committee is to coordinate wildlife conservation activities at the watershed level and implement a Wildlife Conservation Plan developed by the villagers with the assistance of the BCP.

The people of Khyber formed their first VO/WO in July 1983, but later clan politics and internal disputes led to a split in 1988 into 2 separate VOs and WOs based on each hamlet in the village--Khyber and Imamabad. The VO Imamabad became dominated by the clan of Ghulam Shah Kutz, and VO Khyber by the descendents of Sakhi Kutz. Soon, villagers realized that these individual VOs would not be able to handle village level common issues. So, in 1990 they formed a supra-VO level committee and named it as "Shahi Khyber Imamabad Welfare Organization" (SKIWO). It consisted of village notables and representatives of both VOs and WOs. This institution, inspired by the AKRSP's approach of collective actions, banned all hunting of wildlife and cutting of green trees in 1990. It also defined village rules and regulations for natural resource

use including penalties for violators. The SKIWO, through its Natural Resource Committee, ensure enforcement of these regulations. The SKIWO, with technical assistance from the Biodiversity Conservation Project, developed an Ibex Conservation Plan and started its implementation in 1996 for restoring the ibex population in the area. The people of Khyber continue to strengthen and refine their institutional arrangements. During 1998, they formed "Shahi Khyber Imamabad Development Organization" (SKIDO) and made it responsible for the village conservation and development agenda. They developed its by-laws and registered it under the Companies' Act with the Government of Pakistan, making it eligible for receiving development funds from the government and other development agencies. Now, this organization represents the people of Khyber at the regional level.

3.5.2.4. Land Tenure and Usufruct rights

Land tenure and usufruct rights (rights to utilize or benefit from a resource, but not necessarily ownership of it) in NAs remain poorly defined. Prior to the abolition of princely states, areas above irrigation channels were considered the property of the ruler, whereas cultivated land below the channels belonged to individual families. However, local communities had rights to commonly used natural resources above the channels such as high pasturage and wood collection from forests for firewood and building, but they individually or communally had no ownership status over these. This pattern of tenurial arrangements continued when the government took over these states and declared all the high pastures and forestlands above the irrigation channels as public (state) property. Furthermore, all forested areas were declared Protected Forests with grazing and wood collection (dead fallen) rights accorded to local communities. With enactment of the Northern Areas Wildlife Preservation Act in 1975, all wildlife species became government property and their hunting and trapping was prohibited unless allowed through a valid license by the government. However, enforcement of this statute on the ground remained weak.

The people of both Khyber and SKB were subject to the restrictions imposed by the above laws and tenurial rights. In addition, the SKB catchment was part of the Baltistan Wildlife Sanctuary declared in 1975 under the Wildlife Preservation Act; therefore, local communities in SKB had to live with additional restrictions that govern a wildlife sanctuary. However, both communities had access to grazing lands and firewood collection within their catchments, rights they enjoyed since the era of princely states. They never had legal ownership of the areas above the irrigation channels and thus had little stake or interest in sustainable management of natural resources found there. Nonetheless, local people generally claimed that these lands belonged to the villagers because they have used them for centuries through traditional use regimes.

Since 1996, the people of Khyber and SKB have been managing their watersheds as "Community Conservation Areas" with assistance from BCP and have put considerable effort into conservation and sustainable use. The federal government recently classified both Khyber and SKB catchments as "Controlled Hunting Areas" managed jointly by the government and local communities under the Wildlife Preservation Act of 1975. This action gave authority to local communities to manage and benefit from the sustainable use of wildlife resources found in these catchments.

3.5.3. Current Land Use Practices

Mountain communities in NAs follow a strategy to maximize land use through integration of crop production, animal husbandry, horticulture, and forest use spread vertically from valley-bottom crop fields to high altitude pastures.

3.5.3.1. Agriculture

The people of Khyber and SKB mainly practice mountain agriculture by diverting snowmelt stream water to gravity-fed irrigation channels, making terraces, and erecting stonewalls around terraced fields. Increasing access to market, agricultural tools, and

chemical fertilizers has led to intensive farming. Recent introduction of potatoes as an important cash crop (e.g. in Khyber) in 1985 had a considerable impact on traditional farming by reducing production of cereal crops and fodder in the village, and inducing mono cropping. Faced with relatively small land holdings, the communities now collectively pursue new land development by constructing irrigation channels along the steep mountain slopes whenever financial help is available. All the key informants interviewed mentioned that they would like to see their agricultural land increased (the average size has been reduced due to an increase in number of households over the years). A single crop/year is grown in both areas, though in the lower villages of SKB people sometimes grow a second crop for fodder. Ninety-six percent of respondents from Khyber reported that they grew wheat, barley, and alfalfa, and all the respondents reported that they grow potatoes and earned considerable cash income from this crop. Only one person said that he sold wheat locally. Alfalfa and maize were the main fodder crops. Almost every household grew vegetables. The respondents also mentioned growing other crops including peas (24%), turnip/carrot (24%), and buckwheat (28%). In SKB, 95% of the respondents reported that they grew wheat, 78% turnip/carrot, and 84% alfalfa. Around 50% of the respondents reported that they also grew barley, millet, potatoes, buckwheat, and peas. The majority of households grew vegetables for local consumption. None of the crops or vegetables was mentioned as a cash crop. Ploughing is mainly done with small tractors and bullocks in Khyber; in SKB, bullocks, zo (hybrid between cow and yak), and sometimes shovels are used if the terrace is small. Modern agricultural machinery (tractors, threshers etc.) has not yet reached SKB, mainly due to absence of road access.

The villagers also supplemented their agriculture production by growing fruit trees in and around their crop fields. Eighty-seven percent of the respondents reported that they grew apple, 98% apricot, 64% walnut, 51% mulberry, and 27% said they grew cherry (n=70). Peaches and grapes were grown only in SKB. Fruits were produced almost entirely for local consumption because costs of transportation to the market were high, particularly in SKB. About 34% of respondents (n=70) reported that they sold dried

apricot flesh and kernels locally. Only 7 interviewees (28%) from Khyber (n=25) sold apples in the village. Walnuts and grapes were only sold by a few households in SKB.

Forest trees were cultivated along the irrigation channels and around the agricultural fields. However, some block plantations were created on newly developed land in Khyber under the social forestry program sponsored by the government and facilitated by AKRSP. Forest trees were cultivated for household timber, fuel, and fodder. The primary tree species grown included poplars (*Populus* spp.), willows (*Salix* spp.), mulberry (*Morus* spp.), ailanthus (*Ailanthus altissima*), and robinia (*Robinia pseudoacacia*). Seabuckthorn (*Hippophae rhamnoides*), a native shrubby plant with great medicinal, soil binding, and fuel values, was also grown along the watercourses. Only a few respondents sold surplus poplar trees to other villagers for timber.

3.5.3.2. Livestock

Livestock is the primary source of income for the people of SKB. At the household level, they provide meat, milk, wool, and leather. Livestock provide draught power for ploughing, threshing, and making new fields, and agricultural inputs (farm-yard manure). The villagers maintained herds of zo-zomo, milk cows, draught oxen, goats, and sheep. Traditionally, some people kept horses and donkeys in Khyber, but abandoned them after the construction of Karakoram Highway. Only 2 respondents from Khyber reported that they currently have and intend to keep donkeys. Individual family holdings of livestock were relatively small in both Khyber and SKB. The majority of the livestock were goats and sheep, on average about 14 goats and sheep (combined) per household in Khyber and 17.4 in SKB (Table 3.1). When asked about how many livestock were sold last year (1996), 8 people (32%, n=25) from Khyber said they sold cow/ox, whereas only 2 (8%) said they sold goats. In total, 10 cows/ox and 5 goats were sold in Khyber. In SKB, 10 respondents (22%, n=45) mentioned that they sold zo-zomo/cow and 18 (40%) said they sold goats and sheep. In total, 15 zo-zomo/cow and 221 goats and sheep were sold in SKB. People do not keep zo-zomo in Khyber, probably

due to limited access to high pastures. Most of the key informants from Khyber reported that villagers kept less livestock than they did 10-15 years ago. The key informant reported that about 30 families (36%) gave up high pasturing in Khyber, primarily because no one had time to take livestock to the high pastures. The villagers attributed this to an increase in mobility, education, and off-farm labor opportunities. Interviewees in Khyber referred this gradual decline in animal husbandry to 2 factors-- lack of manpower and opportunities for non-agrarian income sources. In SKB, particularly in Basingo, Key informants reported no significant change in the livestock production system. Nonetheless, interviewees from the lower villages did report a reduction in livestock numbers in recent years.

Table 3.1: The average number of livestock per household[a] during 1997 in Khyber and SKB (standard deviation in parentheses and range in brackets)

Conservation Area	Z0-Zomo	Cow/ox	Goat	Sheep
Khyber	0 (0)	3.0 (1.2)	7.9 (8.7)	5.9 (4.3)
		[1-5]	[0-25]	[0-15]
SKB	2.0 (1.7)	3.0 (2.0)	10.0 (8.8)	7.4 (7.3)
	[0-6]	[0-10]	[0-35]	[0-22]

[a] Number of households surveyed: Khyber, 25 and SKB, 45

3.5.3.3. Pastures

Pastures are an integral part of the rural economy of NAs and play an important role in the mixed mountain agriculture system. Pasturing is based on vertical strategies of land use; a cyclic grazing pattern is followed to allow regeneration of seasonally grazed pastures. Villagers in Khyber and SKB predominantly depend on common pastures for livestock production. Eighty-four percent of respondents from Khyber (n=25) said they took livestock to the high pastures, whereas in SKB about 96% depended on high pastures to produce livestock. The remaining interviewees either had no livestock or only one milk-cow which they preferred to stall-feed. Khyber has only a few high pastures,

which are mainly grazed in summer. The pastures close to the villages are only used for staging livestock during spring and fall when heavy frost and snow in the high pastures make grazing difficult. Most livestock (cows, goats, and sheep) are taken to the high pastures around June 20 and brought back to the pastures close to the village near September 15 and stall fed in the village during winter. High pastures in Shaojerab and Kriligoze (summer habitat of ibex) were in relatively good condition because people have limited access due to difficulty of the terrain. The interviewees also reported that villagers are currently following the rules set by the grazing committee. Free grazing in the village has been banned since the mid 1980s; however, up in the high pastures livestock is grazed freely. After joining the community-based wildlife conservation program in 1996, grazing in high pastures of Kriligoze was banned and now this area is set aside for wildlife until the ibex population recovers to a reasonable size. Previously, every household sent at least one household member with livestock to the pastures during summer; now, 4-5 villagers spend 5-day turns tending flocks from the whole village. This compensated for the shortage of manpower to attend livestock at the household level. This system was developed by the villagers themselves and is enforced by the Village Grazing Committee. The villagers also reported a gradual decline in high pasturing.

In SKB, the respondents from each village named several common pastures where they take their livestock. These pastures (9 in Skoyo, 9 in Krabathang and 23 in Basingo) are spread throughout the conservation area and cover all altitudinal zones ranging from steep slopes close to the villages to gentle grassy slopes in alpine pastures. All types of livestock (zo-zomo, cows, bull-ox, goats, and sheep) were taken to these pastures. The pastures were used extensively by following the seasonal grazing pattern, which is considered important for efficient use of pastures and to ensure availability of forage for the stock. Under the cyclic grazing system illustrated by the interviewees, livestock was initially taken to the pastures near the villages during April and May. Livestock were gradually taken up higher and higher beginning in mid June following growth of vegetation after snowmelt. Livestock reached the alpine pastures below the glaciers by mid August. With the onslaught of heavy frost and snow flurries around September 15,

the animals were gradually taken downwards. Livestock were finally brought to the village in October, mostly for picking fallen twigs and leaves. In late November, stall-feeding began, and only goats were taken to nearby slopes for browsing in the winter. Any violation of the above grazing pattern by a community member was subject to a fine that could be a goat or sheep. The responsibilities for livestock grazing were often shared among close relatives, clans, and even friends, where one person tended the livestock of several households in addition to his own. The villagers believed that this was the result of increasing education and off-farm employment. Two disputes over pastures were reported by the villagers-- one between Skoyo and Basingo-Karabathang over usufruct rights of high pastures in Irk Nullah (stream) and another between Skoyo and Mehndi (an adjacent village), when a traditionally used pasture was closed for Skoyo people in retaliation for the hunting ban enforced by Skoyo under the CBC program. This conflict was prior to the CBC program. Both parties went to civil court for resolution, where it has been under litigation for the last several years. The latter dispute still stands, though the elders of the both villages have discussed it. For the time being, the people of Skoyo have restrained from taking their livestock to that pasture.

3.5.3.4. Firewood Collection

To study firewood collection as one of the land use options, villagers were asked, "Do you use firewood for cooking and heating rooms?" All respondents (100%) from Khyber and SKB reported that they use wood for cooking and heating rooms (n=70). Mostly men collect wood both in Khyber and SKB. Almost half of the respondents (44%) from both areas reported that women also collect firewood, while more children (64%) collect wood in SKB than Khyber. Few respondents (8%) purchased wood from the village (Table 3.2).

Table 3.2: Responses of heads of households regarding collection of firewood during 1997 in Khyber and SKB, NAs, Pakistan.

Who collects wood?	Percentage of Respondents	
	Khyber (n=25)	SKB (n=45)
Men	88	82
Women	44	44
Children	28	64
Purchased	8	0

The villagers reported that they use wood not only from natural forests, but also from the branches of fruit and farm trees to meet demand of firewood in winter. However, most villagers still collect firewood from natural forests (80%) both in Khyber and in SKB (Table 3.3).

Table 3.3: Sources of firewood collection during 1997 in Khyber and SKB, NAs, Pakistan.

Sources of firewood	Percentage of Respondents	
	Khyber (n=25)	SKB (n=45)
Natural forests	80	80
Plantations	52	60
Fruit trees	28	51
Purchased	8	0

The villagers were asked to give an approximate monthly consumption of firewood in their household both during summer and winter. Average monthly consumption of firewood in Khyber (n=25) was 260 kg/household in summer and 568

kg/household in winter, whereas in SKB (n=45), 793 kg/household was consumed in summer and 1453 kg/household in winter. Khyber used less firewood per household than SKB both for summer (t= -6.882, df=67, and P< 0.001) and winter (t= -6.848, df=68, and P< 0.001). Respondents were asked how far they go to collect wood from natural forests and how long it takes. In Khyber, on average the respondents walked 4.5 km (round trip) in the mountains and it took them almost 5 hrs (including the time it took to find the wood) to cover this distance. In SKB, the average distance reported was 4.1 km and it took villagers 4.1 hrs to cover that distance. Several respondents, both from Khyber and SKB, were unable to make a judgment about the distance and time. Seven respondents (28%) from Khyber mentioned that they also use electricity and coal for cooking and heating. Only 2 respondents (8%) said that sometimes they used Liquid Petroleum Gas for cooking. Key informants stated that no shortage of firewood existed in the natural forests during earlier years. With the increase in the human population, the supply of firewood from the slopes close to the villages was exhausted and now people have difficulties collecting firewood. They have to hike deep into the mountains to find a back-load of wood and it takes hours, which most men cannot afford to spare.

3.5.4. Knowledge, Attitudes, and Perceptions of Local People towards Wildlife

3.5.4.1. Knowledge

Respondents were asked, "what types of wild animals are you aware of in your area and how common are they?" The local names of important species were listed on the questionnaire, but not presented to avoid guesses from the respondents. The response was only recorded when the interviewees spoke out the name of a particular species and mentioned its status. Most respondents (80%) were able to report all the large vertebrates and gave their view on the status of each species (Table 3.4).

Table 3.4: Percentages of responses to knowledge towards wildlife species and their status during 1997 in KCCA and SKBCCA, NAs, Pakistan. Respondents from SKB (n=45) and Khyber (n=25) were combined except for markhor, musk deer, wolf (results are only from SKB, where these species are found).

Species	Abundance			
	Common	Rare	Have no idea	Did not mention
Snow cock	84	14	2	-
Chukar partridge	81	17	2	-
Asiatic ibex	80	14	3	3
Red fox	80	6	14	-
Markhor	38	42	13	7
Wolf	36	62	2	-
Golden eagle	14	59	-	27
Snow leopard	10	84	3	3
Musk deer	2	51	31	16

Several interviewees mentioned species which were not listed on the questionnaire. The species rated common by most respondents included Asiatic ibex, red fox, snow cock, and chukar partridge. The species rated as rare included snow leopard, wolf, golden eagle, musk deer, and markhor. Several people did not mention musk deer or golden eagle. The villagers rated the musk deer as the most rare species in SKB (51% rated it rare, 31% had no idea about its status, and 16% did not mention it. Only one respondent during the interviews reported he had recently seen a musk deer, a female with 2 fawns in the birch (*Betula utilis*) forests in Basingo.

Respondents felt that the populations of most species were increasing (except for the musk deer, Table 3.5). The number of wolves, ibex, foxes, snow cocks, chukar partridges, and markhor were reported increasing. About 30% of the respondents felt musk deer and golden eagle were decreasing; others had no idea about the trend in the population of musk deer, snow leopard, and markhor. These results were consistent with

the views of key informants, who also reported population increases for most of species (except the musk deer).

Table 3.5: Percentages of responses to trends in wild animals' population during 1997 in KCCA and SKBCCA, NAs, Pakistan. Respondents from SKB (n=45) and Khyber (n=25) were combined except for markhor, musk deer, wolf (results are only from SKB, where these species are found).

Species	Trend during the last 5 years				
	Increasing	Decreasing	About the same	Have no idea	Did not mentioned
Wolf	87	11	-	2	-
Chukar partridge	83	13	-	4	-
Snow cock	81	11	2	6	-
Red fox	80	3	-	3	14
Asiatic ibex	78	7	2	11	2
Markhor	53	22	-	18	7
Snow leopard	46	27	4	20	3
Golden eagle	33	33	2	5	27
Musk deer	16	31	7	31	15

3.5.4.2. Attitude

Opinion about the ownership of wildlife

Most of the respondents (66%, n=70) said wild animals are a common resource of the village. Only 15 people (22%) said they belong to government, whereas 8 villagers (11%) said they are endowed by Allah (God), hence belong to nobody. When asked to whom they should belong, overwhelmingly people (74%) said that they should belong to the village as a common resource. To see whether there was any relationship between

responses on "who do they belong to and who should they belong to", Spearman Rank-Order Correlation was computed, which shows there is a relationship between these 2 variables (r_s=0.265, N=70 and P<0.05). Most people who thought they belonged to the village believed they should belong to the village.

Benefits of wildlife to households and community

Villagers were asked whether wild animals currently provide any benefit to their household; 57% of the respondents said yes (n=70). Opinion of villagers who mainly depend on agriculture for their household income (n=49) were similar to those who supplement their income from other sources outside the village (n=21); 53% of people who depend on agriculture said wildlife provide benefit, while 67% of those who supplement their income from other sources said wild animals provide benefit to the household (χ^2 = 1.1, df=3, p > 0.75). Similarly, opinions of respondents who lost livestock (n=42) were similar to those who did not (n=28); 50% who lost livestock said yes, while 68% who did not loss livestock said yes (χ^2 = 2.18, df=3, P > 0.50). When asked what types of benefits they receive most, 28% of respondents said more land and income through wildlife conservation and development projects (economic values), 13% said wild animals had aesthetic value, 13% mentioned they can get meat (if allowed), 3% said less depredation of livestock due to increase of prey population, while 43% felt wildlife had no benefit at the household level (n=70).

Interviewees were also asked about benefits the community receives from wildlife resources. Village development was reported by the largest percentage (39%), 27% reported collective income (in cash), and 13 % said wildlife contributes to the beauty of the area (Fig. 3.1). The primary or first mentioned benefit is given in Fig. 3.1; however, respondents did acknowledge additional benefits. These included meat and wildlife viewing.

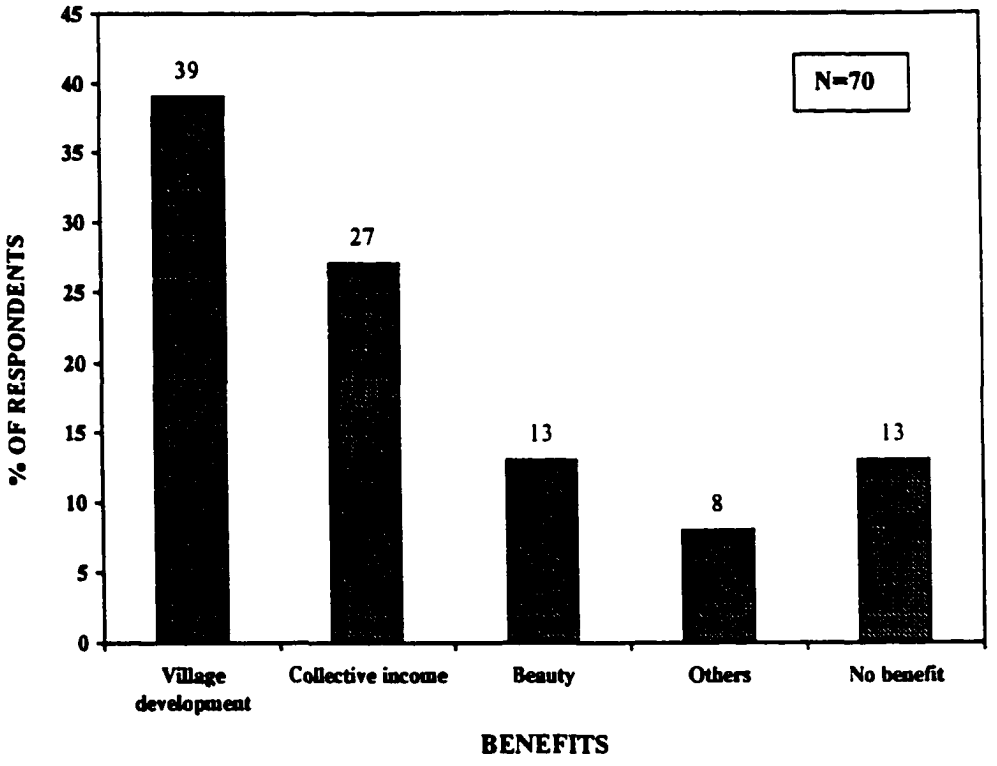

Fig. 3.1: The primary benefit of wildlife for local communities as perceived by the villagers during 1997 in Khyber and SKB, NAs, Pakistan.

Disadvantages of wildlife

Most respondents (76%, n=70) said predation on livestock was the major disadvantage of wildlife, while a few people (11%) said competition for forage with native ungulates was the major disadvantage. Crop damage by seed eating birds (Table 3.6) was also mentioned. Respondents from SKB were more likely to mention livestock depredation as the main disadvantage of wildlife than respondents from Khyber; respondents from Khyber were more likely to mention competition (percentages of respondents are give in table 3.6). Analysis of responses from villagers who lost livestock and of those who did not suffered loss from predation suggested that these people also felt differently. Eighty-eight percent of people who lost livestock said predation was the major problem, whereas 57% people who did not suffer loss said predation was the major

disadvantage. My sample sizes for several responses were too small to perform statistical tests.

Table 3.6: Disadvantages of wildlife as perceived by people during 1997 in Khyber (n=25) and SKB (n=45), NAs, Pakistan

	Percentage	
Responses	**Khyber**	**SKB**
Predation	52	89
Competition	28	2
Crop damage	4	-
None	16	5
No response	-	4

Livestock depredation

Of 70 households (combined SKB and Khyber) surveyed, 42 (60%) reported that they suffered livestock depredation by wild animals during the last 3 years. A total of 23 cattle (cows/zo-zomo) and 197 goats and sheep were reported killed by predators during this period. Most respondents (59%) said they lost goats and sheep and while 19% lost cattle. Some households lost both cattle and goats/sheep. On average 0.59 (range, 1-5) cattle/year/household and 1.6 (range, 1-20) goats and sheep/year/household were lost in both Khyber and SKB. More people suffered from livestock depredation in SKB (73%) than in Khyber (36%). Reported losses in Basingo were higher than in other areas during the last 3 years; 7% of their livestock holdings were lost annually to depredation. In monetary terms, if the average price of a goat or sheep on the current market value is considered Rs.1200 and for cattle Rs.8000, I estimated the total loss to all of respondents in my study areas of Rs.140000 annually (1US$=Rs.50).

Fifty nine percent of interviewees who reported livestock losses said wolves were responsible, 48% blamed snow leopards, 7% eagles, and 5% foxes. Most of the damage to livestock in SKB (76%) was done by the wolves, while snow leopard was mainly (89%) responsible in Khyber (wolves are not found in Khyber). During the course of administering the questionnaire survey in Basingo during fall 1997, I personally examined the carcasses of 4 cattle near the village presumably killed by the wolves.

Measures taken by the villagers to reduce livestock losses

Respondents were asked which steps they took to reduce losses of livestock. Sixty-eight percent (of all responses) guarded their herds in the pastures. Other measures reported included corralling animals at night (6% of all responses), keeping livestock close to the village (5%), and constructing safe corrals (4% of all responses). Seventeen percent (of all responses) did not respond to this question.

Suggestions for preventing livestock losses

All key informants stated that reduction of livestock losses was essential, and that government, conservation NGOs, and local communities should work together to address this problem. Some respondents (10%) were very angry and said that if the government and conservation agencies did not address the problem that they would handle it themselves. Respondents were asked to suggest measures to prevent livestock losses by wild animals. Close guarding of stock was the most common suggestion (41% of all responses) and 32% (of all responses) thought that total eradication of predators was the only solution. Only 6% said construction of safe corrals might work, while 21% (of all responses) said they had no idea how this problem could be handled. Opinions of respondents who lost livestock were similar to those who did not; 36% of those who lost livestock suggested close guarding of livestock and 32% suggested eradication of predators, whereas 47% of those who did not lose livestock suggested close guarding of

stock and 32% suggested eradication of predators. My sample size for some of the responses was too small to perform statistical tests.

Villagers were asked whether any predators had been killed in their village during the last 3 years. The majority of the respondents (91%) said no. Those who said yes (n=6) were asked how many of each predator was killed. A total of 7 wolves, 12 foxes, and 0 snow leopards were reported killed during the last 3 years. Most of these were killed in retaliation for livestock predation. Key informants said that the villagers formerly killed snow leopards whenever they encountered them. Because the community gave their word to conservation agencies and received some monetary benefit from other species e.g. ibex, the villagers now generally tolerated this animal. Some key informants reported that the villagers believed that some day they might get benefits from this species, too. Sentiment against this animal, particularly among those individuals who recently lost livestock to snow leopards, was very high. However, a sense of tolerance towards this animal was noticed in both Khyber and SKB. On several occasions in Khyber, villagers saw snow leopards very close to the village, but they never instigated persecution of the animal. When an outsider fired several shots at a snow leopard in SKB, the villagers reported the matter to the District Conservation Committee. Discussions with key informants in Basingo revealed that they would not accept the presence of more wolves in the area than they have already.

3.5.4.3. Perceptions towards wildlife

Overwhelmingly, respondents (97%) supported conservation of wild animals and plants (n=70). Two respondents (3%) said saving wild animals was good, but excluded wolves because they killed livestock.

Main cause of decline in wildlife numbers

The majority of respondents (84%) said indiscriminate hunting was the primary reason for decrease of wildlife numbers in the past. The other 2 reasons mentioned were retaliatory killing and predation (Fig. 3.2).

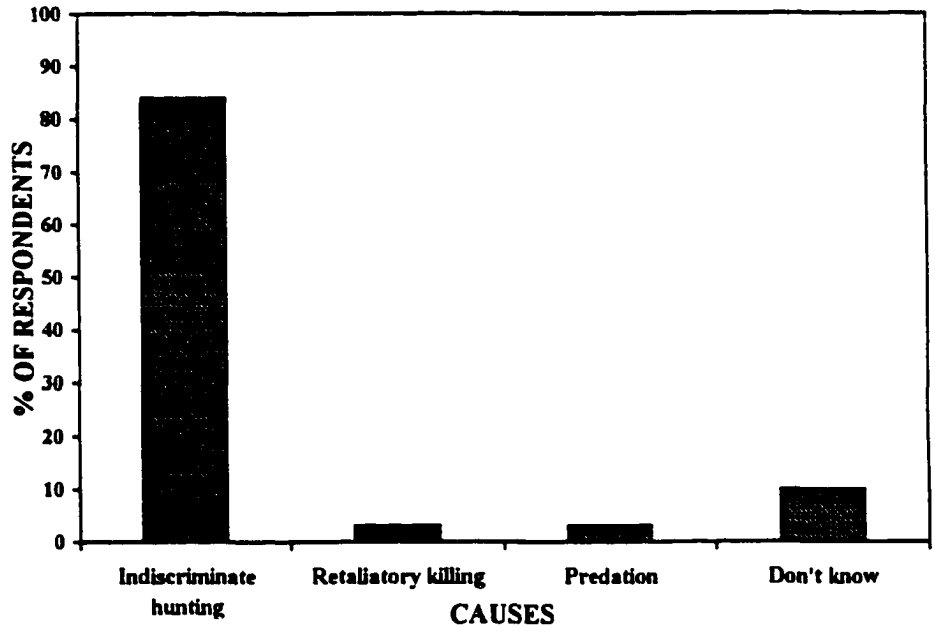

Fig. 3.2: Primary cause of decline in wildlife numbers as perceived by respondents during 1997 in Khyber and SKB, NAs, Pakistan.

Respondents were almost evenly split between outsiders and local people as the cause of the decline: 47% percent (of all responses) said outsiders and almost the same percentage (44% of all responses) mentioned local people. Several interviewees did not respond and only 2 said they didn't know.

3.5.5. Perceptions on consumptive and non-consumptive uses of wildlife

3.5.5.1. Traditional uses of wildlife

Interviews with key informants revealed some traditional uses of wild animals before the road link of these areas to the broader market economy in the region. Each

village had a few skilled hunters, where each hunter could only hunt 2-3 animals annually. These hunters brought meat, skins, and horns to their household each winter. Meat was shared with those who accompanied the hunters during the hunt and/or given to very close relatives. The leftover was dried and stored for consumption over the winter. Communal hunting was only practiced during common chores, e.g. construction of irrigation channels. Only skilled hunters were sent into the mountains to bring meat for the men working on the common chores. In lieu of this, hunters were exempted from the construction work. Hunting for religious ceremonies was rarely practiced. However, some interviewees did report hunters entertaining their guests with ibex or markhor meat at the marriage ceremonies of their children, though such cases were extremely rare. Ibex and markhor skins were used for making winter coats for men, shoes, caps, storage sacs, and to collect wool for making ropes, rugs, and vests. Ibex horns were used for ploughing and excavating soil. One key informant showed me a conventional scissors, part of which was made from ibex horn. Markhor horns were used as a siren for gathering villagers for religious meetings (e.g. maglis). When the government made wildlife public property and banned all hunting in the 1970s, the local hunters became poachers. They secretly continued hunting and brought only meat to the village and left skins and horns concealed in the mountains to avoid detection. Key informants, however, mentioned that after the communal ban on hunting in 1995, local hunters had quit hunting, stored their hunting rifles, and now participated in the village conservation program; some of them even became Village Wildlife Guides. Since this ban, only 1 or 2 reports of poaching by individuals from the nearby villages have occurred.

3.5.5.2. **Current consumptive uses of wildlife**

Only 15 people (21%) said some villagers hunted wild animals during the last 5 years. Those who responded positively were further asked which species were killed and why? The species mentioned were markhor (10), ibex (9), and chukar partridges. Most of the hunting was done for meat. No respondents reported selling of these wildlife products by any of their household members. When asked about the current level of hunting,

almost all the respondents (97%) said that nobody currently hunts in the area.

An indirect question was presented to further probe into this sensitive issue. The respondents were asked when villagers discussed wild animals (if they did), what were the main subjects under discussion. The majority of the respondents (86%) said yes, there were discussions about wildlife. The main subject reported by 60% of respondents was protection of wild animals from poaching. No one mentioned that hunting or selling of wildlife products came under discussion (Table 3.7).

Table 3.7: Most frequently discussed subjects during the village meetings in 1996/97 at Khyber and SKB, NAs, Pakistan.

Subject	N=70	%
Protection	42	60
Benefits from conservation	9	13
Predation	8	11
Wildlife numbers	1	2
No discussion	10	14

3.5.5.3. Non-consumptive uses of wildlife

The most common non-consumptive use of wildlife in NAs could be viewing of wild animals and birds. To see whether local people have any interest in wildlife viewing, the respondents were asked whether anyone from their household enjoyed wildlife viewing; the majority of the interviewees (77%) responded yes. Those who responded positively were asked whether they went outdoors primarily to see wildlife during the last 2 years and, if yes, how many times. Most of the respondents (87%) said yes. Of these, 24 respondents (51%, n=47) said they went outside the village more than 5 times during this period just to watch wild animals and birds (Table 3.8). People who solely depended on agriculture and those who supplement their income from sources outside the village were similar. Seventy-five percent of the villagers who mainly depended on agriculture

said they enjoyed viewing wildlife compared to 81% of respondents who supplemented their income from outside the village ($\chi^2 = 0.242$, df=3, $P > 0.95$).

Table 3.8: Frequency of local people who went outdoors primarily to view wildlife during 1996-97 in Khyber and SKB, NAs, Pakistan.

No. of times	N=70	%
1 time	1	2
2 - 3 times	10	21
4 -5 times	12	26
More than 5 times	24	51
Never	23	33

3.5.6. Attitudes and Perceptions towards the Community-Based Conservation Approach

Government's role in managing wildlife resources

The villagers were asked how well the government managed the wildlife resource. Half of the respondents said well, 19% fairly well, and 31% said that the government managed these resources poorly (n=70). However, there was significance difference in opinion between the people of Khyber and SKB ($\chi^2 = 11.11$, df=2, and $P < .005$). The people of Khyber felt that the government managed wildlife poorly, while villagers from SKB believed the government managed it well. This difference in opinion correlates with a higher literacy rate in Khyber (68%) than in SKB (20%, Section 3.5.2.1). Respondents with $\leq 5^{th}$ Grade education (79%) believed the government managed these resources well and 21% of them said poorly. On the other hand, 35% of the respondents with a $>5^{th}$ Grade education said the government managed wildlife well, while 65% of them believed the government managed it poorly ($\chi^2 = 11.75$, df=3, $P < 0.01$, n=70). The respondents were further asked--can government alone manage wildlife resources? Most (84%) said

no. Of those who said yes, most thought the government had the authority and could manage wildlife well if they employed more guards. Of those who said no, most felt the government needed villagers' cooperation to control poaching (80%), needed the support of NGOs (12%), and felt the government's resources were too limited (8%) (n=59).

Local peoples' participation in wildlife conservation

Overwhelmingly, 88% said participation by local people in planning and management of their wildlife resources was a step in the right direction. Only one person disagreed (because this approach did not create jobs for the local people), while 7 respondents (10%) said they didn't know. Of those who thought this was a good step, most felt the community could get benefits (61%, n=62) and participation by local communities would decrease poaching (39%) of wild animals. There was no major difference in opinion of people who lost livestock from those who did not; 86% of the respondents who lost livestock to predation perceived participation of villagers in CBC project was a good step, while 93% of villagers who had not suffered loss believed it was a good step. Fifty percent of respondents who lost livestock said the community could get benefits and 50% felt it would decrease poaching, while 77% people who had not suffered from predation said the community could get benefits by participating in the program and 23% believed it would decrease poaching. However, this difference was not significant ($\chi^2 = 3.45$, df=3, $P > 0.25$).

The respondents were also asked if participation of local communities in conservation was a good thing, then what type of Community Conservation Area management system would they like to see; the majority of respondents (68%, n=70) said jointly managed by the local community, government, and the conservation NGOs (Table 3.9).

Table 3.9: Local people's (from Khyber and SKB during 1997) perception about management of Community Conservation Areas in NAs, Pakistan.

Management Regime	N=70	%
Community, government, and NGOs	48	68
Community and NGOs	13	19
Government and community	3	4
Community alone	1	2
Don't know	5	7

Advantages and disadvantages of CBC approach

The respondents were asked their opinion of the primary benefits of the CBC approach. The interviewees mentioned several advantages of this approach. The most frequently sought benefits were village development (31%), unity of the village (14%), and reduction in poaching (9%) (n=70). Other benefits reported included collective income and conservation awareness among the villagers. Thirteen people said they had no idea and 9 people did not respond (Table 3.10). Opinion of people who solely depended on agriculture for their household income were similar to those who supplement their income from sources outside the village. Thirty-one percent of the villagers who depended on agriculture said the main advantage of CBC was village development followed by 8% unity of the village, and 10% who said CBC would decrease poaching. Thirty-three percent of those who supplement their income from sources outside the village said village development, 28% unity of the village, and 5% believed that it would decrease poaching. Villagers who lost livestock due to predators had similar attitudes to those who did not; 26% of those who lost livestock believed the CBC approach would lead to development of their village, 12% stated it would enhance unity in the village, and 12% said it would decrease poaching; 39% who did not lose livestock perceived village development as the main benefit of the CBC approach, 18% stated it would enhance unity, and 4 % said it would decrease poaching. My sample size

for these responses was too small to perform statistical tests.

Table 3.10: Advantages and disadvantages of the CBC approach as perceived during 1997 by the respondents from Khyber and SKB Community Conservation Areas in NAs, Pakistan.

Responses	N=70	%
Advantages		
Village development	22	31
Enhance unity in the village	10	14
Decreases poaching	6	9
Others	8	11
Not much	2	3
Have no idea	13	19
No response	9	13
Disadvantages		
None	34	49
Damage of crops and livestock	5	7
Over-exploitation of wildlife by hunting	2	3
Others	3	4
Have no idea	8	11
No response	18	26

The villagers were also asked about the disadvantages of the CBC approach. The largest percentage (49%) said there was no harm in this approach. A number of people (26%) did not respond to this question and several (11%) said they had no idea (Table 3.10). Nevertheless, some respondents mentioned damage of crops and livestock when wildlife populations increase, danger of over-exploitation of wildlife if it does not work, no hunting opportunity for the villagers, harassment by influential poachers, and the approach takes considerable time of the villagers. Opinions of villagers who mainly depended on agriculture for their household income were similar to those who supplemented their income from sources outside the village. Forty-seven percent of those who solely depended on agriculture said no disadvantage and 8% stated damage to crops and livestock when wildlife increases; 52% who supplement their income from sources

outside the village said there is no disadvantage of CBC while 5% mentioned crop and livestock damage. Respondents who lost livestock differed from those who did not; 17 respondents (41%) who lost livestock said there was no disadvantage of CBC and 7 % said damage to crops and livestock (n=42). On the other hand, 17 people (61%) of those who did not suffer from livestock losses said there is no disadvantage of CBC, 7% said damage to crops and livestock, 11% did have any idea, and 14% did respond. My sample size for these responses was too small to perform statistical tests.

Sustainable use of wildlife resources

The respondents were asked: "When the population of mountain ungulates (ibex and markhor) increases, how would you like to see these populations used." The majority of the respondents (94%, n=70) said trophy hunting by foreigners; 54% suggested ecotourism, 41% suggested viewing these animals by local residents, 30% suggested trophy hunting by Pakistanis, and 9% said communal hunting for meat. The first thing mentioned by most interviewees was trophy hunting by foreigners. They were asked: "If trophy hunting by foreigners is the best way to promote sustainable use of wildlife, then what types of facilities are necessary at the village level to establish a successful community-managed trophy hunting program." Forty-three percent said community guides and porters, 34% said lodging for the hunters, while 23% had no idea. The interviewees who thought the sustainable trophy-hunting program was a viable option to pursue were asked how much income they thought this program could bring annually to their village. Most (86%, n=70) said they don't know, 7% said about Rs.300000 annually, whereas the remaining 7% mentioned between Rs.50000 to 200000 annually (US$1=Rs.50).

Utilization of income from sustainable use of wildlife resources

The respondents were asked whether they thought income generated from the sustainable use of wildlife could provide a valuable contribution towards the overall

economic development of the village. Overwhelmingly, 97% said yes and 3% responded that they don't know. The respondents were also asked: "If your community began receiving income from wildlife utilization, what would you like to spend most of the money on?" 35% said economic development of the village, 33% would put the money into the Village Conservation Fund, and 28% said on social works. Despite the prevailing poverty in the area, only 4% of the interviewees said that they would like to see the money divided among the households (Fig. 3.3).

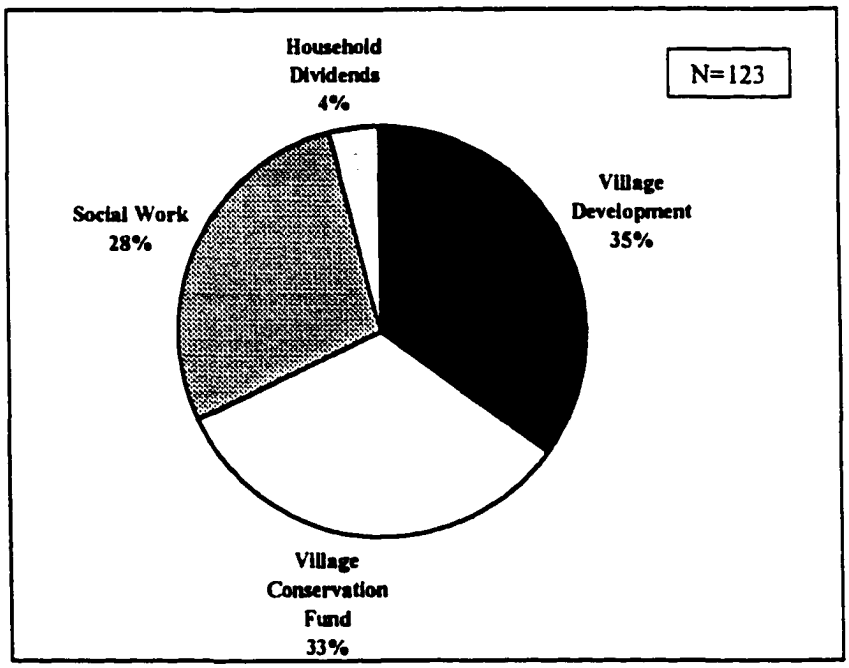

Fig. 3.3: Villagers' perception about use of income generated from sustainable use of wildlife resources from Khyber and SKB Community Conservation Areas, NAs, Pakistan.

3.6. Discussion

Human population

The expanding human population puts more pressure on natural resources (McNeely 1997); more people need more land to grow crops and more wood for fuel and

housing, which could have a great impact on local environment (Borrini-Feyerabend 1997). The human population has increased from 60-70 people in early 1900 to 750 in 1997 in Khyber (Muhammad Sirat, pers. comm.), on average 2.5% growth/year. This increase in human population has increased demand for land to grow more crops. New lands, including even some scree slopes and boulder fields, were brought under agriculture to meet the needs of the growing population. This takeover of previously unoccupied lands by humans may have forced many species to retreat to remote and less productive locations.

Economic, institutional, and tenurial contexts

Agriculture and livestock production remain the main sources of income for many households in Khyber and SKB. However, opportunities for alternative sources to supplement household income are gradually growing. For example, several villagers in Khyber were involved in trade of Chinese goods, off-farm employment, and small enterprises. A few people were employed in the public sector or NGOs. Some of the young males temporarily migrated to urban centers (e.g. Karachi) but still contributed to household income. The sources of livelihood by income were explored during the Participatory Rural Appraisal (PRA) in 1995; 66% of the population derive their income from agriculture and livestock, while the remainder comes from business, labor, marketing fruits, government and NGO jobs, and selling of handicrafts (VMP 1996). Most of the people in SKB were poor and mainly depended on subsistence agriculture and animal husbandry. However, the young people are now increasingly seeking non-agrarian jobs (e.g. in the Army and labor in cities) to supplement the household income. The relationship between wealth and natural resources remains to be explored and will require further investigations.

Though land holding by people of SKB was considerably less than in Khyber, Households in SKB had more sheep and goats than Khyber. Given the small land holdings in SKB, people could only afford subsistence agriculture. Livestock and fruit

marketing, however, were the main income earners in the area. The educational level of Khyber residents was higher than SKB, mainly because of easy access to the area, collective efforts of the Ismaili community, and more input from the Aga Khan Development Network.

The recent increase in market links changed many aspects of life in Khyber and SKB. It brought major development projects to the area and supported a better economic exchange with the cities on the plains (Kreutzmann 1992). Development organizations active in the area such as the Agha Khan Rural Support Program (AKRSP) concentrated on the agrarian sector and aimed at a transformation from subsistence farming to a market-oriented economy (Kreutzmann 1993). Increased mobility and market links may have brought some relief for wildlife populations in the study areas because young men no longer have spare time to chase mountain wildlife for days because they now pursue other economic activities elsewhere, e.g., business and jobs in cities.

Strong local institutions are fundamental to the success of any community-based program whether it is for development or conservation. Indeed, CBC in essence is about sustainable institutions at the local level (Murphree 1994). The VO system introduced by AKRSP reinforced the traditional role of village communities in communal undertakings (Kreutzmann 1993). In most cases, VO managers are young, educated men who are increasingly playing key roles in rural development and conservation issues (Gloekler 1997). The main function of the VOs/WOs is to plan, implement, and sustain village development efforts (AKRSP 1997). The formation of new institutions such as "Village Conservation Committees" under the Biodiversity Conservation Project helped villagers develop and implement village-based conservation action plans with little assistance by outsiders. These committees differed from the VOs because their focus was conservation of natural resources at the watershed level, whereas VOs mainly function at the village or hamlet level.

Local communities make management decisions under CBC. The approval of Wildlife Conservation Plans by the District Conservation Committees (Section 2.2.1) empowered people of Khyber and SKB to take management decisions and implement action plans for conservation of wildlife resources found in their catchments. Furthermore, communities must have tenurial security or usufruct rights to make management decisions. This notion is now considered an essential element for any CBC initiative (Lynch and Alcorn 1994). Clear and definitive tenurial rights create a vested interest in managing resources sustainably. Secure tenure is often needed to establish rules of access to the resources, determine mode of its use, and decide distribution of benefits (Wright 1994). The recent designation of Khyber and SKB catchments as community-managed "Controlled Hunting Areas" and appointment of the villagers as Honorary Wildlife Officers by the federal government may have given de facto tenurial right to the local communities to manage and sustainably use wildlife populations. These steps were taken after my field study. How villagers feel about this devolution of control back to local communities remained to be studied. These actions have, however, generated a great deal of interest among the villagers as well as a powerful incentive for the conservation of wild species.

Current land use practices and their impact on wildlife populations

Changes in land use practices in Khyber and SKB have both positive and negative impacts on wildlife populations. These changes may indirectly benefit species associated with rugged and high mountainous regions (e.g. Himalayan ibex, snow cock and snow leopard) but may be detrimental to those found at the lower elevations (e.g. markhor and chukar partridge). A shift from high pasturing to intensive farming in the valley floor and a growing number of non-agrarian jobs, particularly in Khyber, may have released some pressure from the high pastures, the important summer habitat of ibex. Faced with small land holdings and demand for growing cash crops, fruit orchards and fodder, new land is being brought under cultivation every year. Recent introduction of potatoes as a cash crop had a positive impact on the village economy. Most households in Khyber now face a

shortage of land to raise cereal crops. Everyone in the village now looks for the opportunity to obtain more land. As a result, steep mountain slopes at lower elevations, the winter habitat of ibex and chukar partridges, are gradually brought under cultivation. This raises the probability of wildlife and human conflict as wild herbivores increase. Several villagers in Khyber reported that during the last 2 winters ibex have been seen coming down to agricultural fields and feeding on grass collected by farmers for stall feeding their livestock during the winter. Increased fodder production near the village and stall-feeding livestock mean fewer people take their livestock to high pastures. This will improve range condition and reduce competition between wild herbivores and domestic stock at higher elevations.

The individual livestock holdings are relatively small in Khyber compared to the nearby pastoralist community of Shimshal, where on average 56.7 goats and sheep per household was reported (Butz 1993). The declining trend in animal husbandry in Khyber was mainly due to increasing opportunities for non-agrarian income sources (e.g, trade of Chinese goods) and an increase in education among the villagers. The people of Khyber now face a shortage of manpower for herding livestock. Khan (1996) reported a similar trend among educated and formally employed women in Khyber. In her survey of 25 households, 5% did not have any livestock and it was less likely that they would keep livestock in future. A similar declining trend in high pasturing was reported elsewhere in Hunza (Kreutzmann 1992, 1993). The village economy in SKB was primarily based on pastoralism. Though individual livestock holdings were small (Table 3.1), village-wide livestock numbers were quite high, particularly the number of goats and sheep. The livestock production system is largely dependent on mountain pastures. High pastures were used during summer and pastures close to the villages and along the River Indus are used in spring and fall. The villagers strictly follow this cyclic grazing pattern, which is traditionally in place in both Khyber and SKB. Similar seasonal grazing dynamics were documented elsewhere e.g. in Ruple Valley, Astore (Nusser and Clemens 1996); in Basho Valley adjacent to SKB (Hofmann et al. 1998), and from studies elsewhere in Baltistan (Gloekler 1995). Some of the pastures in SKB were the primary habitats of Ibex

and markhor, which face immense competition from domestic stock and disturbance within their habitats. As a result, wild herbivores were often confined to more rugged and steep terrain, which was difficult to access by livestock and usually low in productivity. The pastures at lower elevations along the River Indus and close to the villages show signs of heavy grazing and some places even lack vegetative cover (pers. observ.). These areas are also the winter range of markhor, thus increasing the threat to the continued survival of this species unless availability of sufficient forage in winter is ensured. Rotational grazing of these pastures after every second or third year may reduce such threats. The recent decline in livestock numbers and high pasturing in Khyber and to some extent the lower villages of SKB will probably benefit wild herbivores through reduced competition with livestock and improved pastures. Consequently, larger prey populations would be available for large predators such as snow leopard; this could reduce livestock losses to depredation and hence snow leopard and human conflict. The younger generation was reluctant to adopt an agro-pastoral lifestyle, particularly in Khyber. Combining a wildlife production system with animal husbandry and intensive agriculture on the valley floor could be a viable land use option, where villagers have to invest little in maintaining a reasonably high population of ibex. Managing wildlife populations with other forms of land uses is successful in some Eastern and Southern African countries (Makombe 1994, Child 1995, Richardson 1998). Bond (1995) reported that managing wildlife is an expanding landuse option in Zimbabwe only in cases where landholders have full control (tenure) over wildlife as a resource.

Firewood collection is common. Under the existing forest law, villagers are customary given the right to collect dead-fallen wood from the natural forests. As in many developing countries (e.g. Soussan et al. 1991, Shackleton 1993, Badola 1998), firewood constitutes the cheapest and the most accessible source of household energy for the people of Khyber and SKB. Almost everyone uses firewood for cooking and space heating, and wood is collected by men, women, and children (Table 3.2). The main source of wood is the natural forest; villagers, however, are now increasingly using wood (mostly branches and twigs) collected from plantations and fruit trees (Table 3.3). With

the increasing demand and scarcity of wood on the nearby mountain slopes, firewood collection has become more difficult. This was evident from the distance and time reported by the villagers to collect a back-load of wood. Fox et al. (1994) also reported over-exploitation of fuelwood, particularly juniper woodlands, from the areas closer to human settlements in Ladakh, India. Though the communal ban on cutting green trees was largely effective, I noticed some partially damaged juniper and willow trees during wildlife surveys. Most of the lower slopes once covered with scattered patches of juniper woodlands are now totally devoid of tree cover and are taken over by artemisia (*Artemisia* spp.) and associated shrubs. The villagers claimed that these woodlands were damaged severely during the construction of KKH when construction workers used local wood for cooking and heating as well as to heat the tar to pave the road. Average monthly firewood consumption both during summer and winter was higher in SKB than in Khyber, because people in Khyber had access to alternative sources of energy. Several households from Khyber reported using electricity, coal (brought from China), and LPG for cooking and space heating in addition to the firewood, where people in SKB totally relied on firewood. The wood consumption in SKB was even significantly higher than that cited in the literature for NAs (Government of Pakistan, 1992 cited in Clemens and Nusser, in press) and in another study in Rupal Valley of the Astore region in NAs (Clemens and Nusser, in press). Increased links to outside world will lead to further uses of fossil fuels and less reliance on renewable resources.

Knowledge, attitudes, and perceptions towards wildlife

Local people were generally aware of their surrounding environment and had considerable knowledge concerning wild animals found around their settlements. Virtually everyone interviewed knew many of the wildlife species that occurred in the area and accurately distinguished those which were not. Some even mentioned species that were not listed on the questionnaire, indicating a good knowledge of their natural surroundings. These findings are consistent with studies in southern Asia (e.g. Fox et al. 1994, Oli et al. 1994, Shrestha and Kattel 1996). Many people did not mention those

species which were either rare or difficult to detect (e.g. musk deer and golden eagle). Several people did not mention red fox; perhaps they did not give any importance to this species. The villagers generally had an opinion of the current status and population trend of most species (Table 3.4 and 3.5). Villagers' assessment about the abundance and trend in wildlife population was generally consistent with the results of population surveys carried out by project staff (IUCN 1997).

Local people's attitudes towards wildlife were generally positive. Most villagers considered wildlife as a common resource of the village; some even knew that legally it belonged to the government. Villagers may have never accepted government ownership of this local resource because most of the communities in NAs claim that ownership of natural resources was wrongly vested to the government and should revert back to the local communities (Knudsen 1992). This was evident from the villagers' response to the question "to whom should wildlife belong"; most people said it should belong to the village as a common resource. Mehta and Kellert (1998) also found that local communities in Nepal regarded common property regimes as preferable to either state or non-property (open-access) regimes. Recognition of the customary rights of local communities to natural resources, including wildlife, will entitle them to participate in management and benefit from the sustainable use of these resources. Legalizing local resource use rights and balancing them with well-defined responsibilities for managing the resource by the producer communities can provide long-term sustainability to local conservation initiatives (Gadgil et al. 1993, Lewis and Phiri 1998).

Villagers generally believed wildlife was a useful resource from which both households and communities could derive some benefit. Most of the respondents considered economic values of wildlife more important than aesthetic values. They saw wildlife as a resource that could contribute to socio-economic development of the local communities. The most important benefits they mentioned were income at the household level and village development at the community level. However, several key informants mentioned that if they were not able to derive some economic benefit from wildlife, they

would still be happy to see these animals around and future generations should have opportunity to see them, as well. People linked conservation of wildlife to economic or village development; communities in both Khyber and SKB benefited from the physical infrastructure projects provided to them under the BCP as an incentive for their participation in a village-based conservation program. Such an incentive probably influenced their attitudes and perceptions toward wildlife. Linking conservation with development in a meaningful way helps improve local peoples' attitudes toward wildlife. Infield (1988) reported that households in Natal, South Africa that benefited from conservation areas were more likely to support conservation than those that had not, indicating the importance of allowing sustainable use of wild resources by local people and integrating such uses with local economic development. People are generally receptive to the idea of wildlife conservation, but usually require tangible benefits to do so (Kellert 1985). Addressing developmental needs, which benefit both people and nature, encourages local communities to conserve wild species. Conservation of biological resources through economic incentives is now increasingly considered a workable approach, particularly in the developing world (McNeely 1988).

As in many agro-pastoralist communities in Asia and elsewhere (e.g. Parry and Campbell 1992, Saberwal et al. 1994, Mishra 1997, Mehta and Kellert 1998), the main disadvantage of wildlife mentioned by the villagers was depredation of their livestock. Many households suffer livestock losses every year, and for poor communities like Khyber and SKB, any loss of domestic stock could be a substantial blow to annual household incomes. Schaller et al. (1987) noted in the Mariang Commune Area of the Taxlorgan Reserve of Xinjiang, China, loss of even 3 goats represented a considerable financial burden to a household with just 50 animals. In my study, the primary predators were wolves and snow leopards. The damage from these 2 species was the main cause of human and wildlife conflicts and the primary reason for some negative sentiments of villagers towards wildlife. The people in SKB have no sympathy for wolves, but probably would tolerate snow leopards if they accrued some economic benefit from the sustainable use of other species e.g. trophy hunting of ibex or some form of compensation

for their losses. Some respondents may have exaggerated their claims to emphasize the problem, but interviews with key informants and discussions with the local staff of the Forest Department confirmed heavy losses. High levels of predation on livestock by snow leopards and wolves have also been reported from other parts of their range (Schaller et al.1987, Fox et al. 1994, Oli et al. 1994, Nowell and Jackson 1996, Mishra, 1997). Livestock predation was more frequent in SKB where animal husbandry was the major form of land use. Livestock depredation was a serious conflict and a major problem within my study area. This situation will have serious implications in the long run for sustaining CBC efforts unless benefits from conservation of wild species compensates for the individual losses. Under the present approach, most benefits are collective at the community level, while the cost for conservation is more at the household level. A mechanism will have to be developed to address this issue, so that benefits could trickle down to the household level. Moreover, a detailed study will be needed to analyze the biological, social, and economic aspects of this problem.

Various methods have been tried to reduce the level of predation and to resolve livestock-predator conflicts elsewhere. These include predator control programs implemented in North America and elsewhere (Bjorge and Gunson 1985), removal or translocation of problem animals (Anderson 1981), and paying compensation to farmers (Mishra 1997). Introducing economic incentives (Oli et al. 1994) and encouraging alternate land uses (Newmark et al. 1994) have also been suggested. Predator control programs are often considered inappropriate and controversial due to ecological, social, and political reasons (Bjorge and Gunson 1985). Villagers reported the killing of only wolves and foxes in recent years; they apparently have restrained from killing of snow leopards since the establishment of Community Conservation Areas in 1995. Killing of snow leopards in retaliation for livestock predation has been reported from other parts of NAs.

Recent wildlife conservation initiatives in NAs have created some awareness among the local communities, which have saved the lives of several animals. During the

last 3 years, villagers have released snow leopards back into their natural habitat on 4-5 occasions with the help of local administrators and conservation NGOs. These animals were trapped in livestock sheds after killing goats and sheep of the local farmers. Villagers still believe that close guarding of livestock is the best way to prevent livestock losses. About one-third of respondents suggested that eradication of predators seemed the only solution, which highlighted the significance of the problem. Construction of safe corrals and corralling animals at night could help in reducing livestock predation in many pastoralist communities in northern Pakistan and elsewhere in the Himalayan and Karakoram Mountains. Total eradication of predators cannot be justified; both the snow leopard and wolf are Schedule-III species (protected species) and their killing is prohibited under the NAs Wildlife Preservation Act of 1975 (though killing of problem animals in self-defense and damage to corralled livestock is permitted). Livestock depredation in the Community Conservation Areas is a contentious issue requiring immediate attention. Specific management strategies to reduce pastoralist-predator conflicts should be promoted, including a community run, self- financed compensation scheme under the Village Conservation Funds established by the villagers. Oli et al. (1994) and Mishra (1997) recently suggested carefully designing a compensation program, improving husbandry practices, constructing safe corrals, using shepherd (guard) dogs, and launching a community education program. I briefly looked into livestock-predator conflicts in the context of human and wildlife relationship. A more in depth analysis of livestock predation in NAs is needed to address this problem.

Conservation of wild animals and plants was supported strongly; this is consistent with other studies (e.g. Harcourt et al. 1986, Infield 1988, Shrestha and Kattel 1996, Badola 1998). Those who showed some negative feelings could have recently lost livestock to predation. Even these people support conservation, but not of wolves. People who suffer losses to property e.g. livestock predation or crop damage, often have negative attitudes toward wildlife and its conservation (Oli et al. 1994, Fiallo and Jacobson 1995, Badola 1998).

Indiscriminate killing of wildlife was reported by both key informants and respondents to the questionnaire survey as the major cause of the past decline in wildlife numbers. Control over wildlife resources was taken over by the government after the abolition of feudal states in 1974. With meager administrative structure in the area and limited resources, government agencies were never able to enforce effective control over these resources, leading to uncontrolled exploitation. Wildlife was considered free for all and was exploited both by locals and outsiders. Poachers came from all over NAs, and in many cases army and police personnel were involved in poaching. Two key informants, who were formerly hunters, told me that each of them had killed more than 250 ibex and/or markhor during their hunting careers. Poaching continued even after the government established some important wildlife habitats as game Sanctuaries (e.g., SKB catchment was earlier part of the larger Baltistan Game Sanctuary). However, since establishment of Khyber and SKB as Community Conservation Areas, the number of poaching incidents has decreased substantially. During the last 3 years, only 2 incidents of poaching were reported from SKB and one incident took place after my study (Ali Chau, pers. commun.). In 2 cases, outsiders were involved and in one case, a local hunter was responsible. Though the local hunter (a key informant) never confessed to the charge, he paid Rs.1000 (1 US$=Rs.50) fine to the community and gave his word to the village elders that he would never again take his rifle to the mountains. No incidents were reported from Khyber. The villagers may have not told me openly about the current level of hunting because I was involved in implementation of the community conservation program. Still, I was unable to detect any other poaching incidents in the study area. A dramatic drop in poaching when local communities received benefits from a conservation program has also been reported by Lewis et al. (1990) in Zambia.

Perceptions on consumptive and non-consumptives uses of wildlife

In the past, local people depended on wild animals to meet their material needs. Wild animals, particularly markhor, ibex, and musk deer, were hunted for meat, musk, wool, horn, and skin, in some cases simply to make tools or household items. Wolves and

snow leopards were often persecuted in retaliation for predation of domestic stock. Considerable changes in the lifestyle of the villagers in both study areas have occurred. However, meat of ibex and markhor is still considered a delicacy and prestigious, particularly when someone gets it for free from the wild. The older men would probably still hunt, if allowed, but the younger generation is reluctant to go into the mountains and to spend considerable time chasing wild animals. Very few consumptive uses of wildlife have taken place in the study areas over the last 5 years. Possible explanations include--1) a communal ban on big game hunting, and 2) little pay off in the wake of very low populations of mountain ungulates. Presently, no one sells wildlife products (meat, skin, and trophies). However, in the past local hunters sold skins, trophies (for Rs.500-1000), and even snow leopard pelts (for Rs.3000-10000) as reported by one hunter, who said now he can make more money while working for the community as a Village Wildlife Guide. Furthermore, more opportunities exist in the area to supplement income than selling wildlife products. I tried to probe this delicate issue through an indirect question to see whether villagers ever discussed hunting and selling of wildlife products, but without success. The villagers mostly talked about wildlife protection, benefits from conservation, and livestock predation. Villagers may have held back their views on these issues due to my association with the project. Most villagers enjoyed wildlife viewing and considered the aesthetic values of this resource. About one-third of the respondents mentioned that on several occasions they went outside the village just to see wild animals on the nearby slopes in the winter. Some of them said they would like to show them to tourists and protect these animals for viewing by future generations. According to the key informants, villagers have changed their attitudes towards wild animals after the start of CBC program. Earlier, whenever a villager spotted an ibex or markhor herd near the village, he rushed to inform the local hunters. Hunters took their rifles and chased these animals deep into the mountains in a bid to obtain free meat. Meat was shared with the informers. Now, whenever a group of animals appear near the village, the villagers bring their binoculars and view these animals. Sometimes traffic on the road stops and passengers view these animals, too. This has happened for the last 3 years or so, when these animals have started coming close to the human settlements.

Attitudes and perceptions towards the CBC approach

Villagers were divided over the government's role in managing wildlife. The difference in opinion between the respondents from Khyber and SKB was correlated with the level of education. Many respondents in Khyber had more than 5th grade of education as compared to SKB, which may have influenced their opinion on governments' role (Sections 3.5.21 and 3.56). However, almost all the key informants from both study areas expressed their dissatisfaction over the existing role of the government in managing wildlife. They held the opinion that Forest Guards and Game Watchers appointed by the government never worked vigilantly and the higher authorities had not listened to the villagers' views sympathetically. Most respondents stated that government can not manage wildlife alone. Villagers' cooperation is needed in controlling poaching, since in most cases local hunters are either involved in poaching or assist outsiders.

Villagers overwhelmingly supported their participation in wildlife conservation programs. They saw this an opportunity to regain control over a resource, which they lost when government declared wildlife a state property. They believed that their involvement in the conservation program would lead to government's recognition of their customary (de facto) right over wild lands. At the same time, most villagers would like to see the government continue technical and regulatory (but not policing) roles in the management of wild lands through joint efforts by the community and the government. The villagers increasingly appreciated conservation NGOs (IUCN) role in bridging the gap between local communities and government agencies, and influencing attitudes of both by putting together collaborative natural resource management programs at the village level. This could be the reason that most of the respondents said that they would like to see Community Conservation Areas managed jointly by the community, government, and conservation NGOs (Table 3.9). The villagers viewed their involvement in the conservation program as a means to secure benefits for the community and reduce the level of poaching of wild animals in their areas. Similarly, in Belize, Hartup (1994) found

that local people felt they benefited from participation in the community conservation program.

The villagers were generally supportive of the CBC (Table 3.10). Most of the villagers felt that it helped in economic development of the village and provided an opportunity to think, plan, and take actions collectively for the benefit of people and wildlife. This could be the reason that village development was thought of as the main benefit of the CBC approach, because all the villages in the study areas received development aid (irrigation channels and water supply scheme). Mehta and Kellert (1998) found a similar pro-development attitude of the communities in Makalu-Barun Conservation Area in Nepal. Linking conservation with development helps in winning the support of local communities and actually promotes positive attitudes towards conservation of wild species. Some people probably did not fully understand the pros and cons of the CBC approach because it was just the second year of the CBC project when my study was conducted. Perhaps this was why several respondents said that they "have no idea" of the benefits and a number of others did not provide a response. Very few people perceived any disadvantage from this approach (Table 3.10). Those who did mention crop and livestock damage felt that the number of wild animals would increase with increased protection; this would then lead to increased crop damage and livestock depredation. Some respondents who said they "have no idea" or did not give any response may have opted not to mention any disadvantages because of my involvement in the implementation of the CBC program in their villages. I do not believe this was a significant problem, however.

Due to recent initiatives by some international and national NGOs for promoting sustainable use of natural resources, local communities in NAs increasingly became aware of the value of the natural capital found in their catchments. And when the government decided that 75% of the proceeds from trophy hunting of ibex would go the communities, trophy hunting was considered a viable option to promote sustainable use of wild species. This was considered a low impact, high return activity that could generate considerable income to sponsor self-supporting, community-based conservation

and development programs. Though no trophy hunting took place in the study areas prior to my study, people were aware of its importance from the news that the people of Bar Valley (another conservation area in Gilgit District) earned handsome amounts from permits sold to foreign hunters. Perhaps this was the reason that most of the respondents suggested trophy hunting by foreigners, even though most of them had no idea how much money this would bring to the village. The villagers perceived economic values of the resource more important than any other form of wildlife use. The villagers were willing to provide all possible cooperation to the hunter to make the sustainable trophy hunting program a success.

Communities in the study areas were familiar with the importance of economic development instigated by the AKRSP in NAs and the villagers were already running a creditable program in their villages. Each VO maintained a bank account where collateral savings of the VO members were kept. The manager and president of the VO, elected through the majority vote of the members, jointly operated this account, where the manager maintained the account books. Any collective income of the village went into that account and was spent for projects agreed upon by the majority of the members. The villagers believed that income generated from sustainable use of natural resources could be used for conservation and socioeconomic development of their villages. This could be the reason that most of the respondents said that they would like to see any income generated from the use of wildlife spent on both conservation and socioeconomic development projects in their villages. Most of the people were against the idea of dividing the income among the households. As one key informant said: " if we gave money earned from trophy hunting to villagers, they will eat it up within days and will forget where this money came from. That would mean losing the spirit of our conservation and development thinking."

3.7 Literature Cited

AKRSP. 1997. Fifth Annual Review, 1997, Aga Khan Rural Support Program (AKRSP), Babar Road, Gilgit, Pakistan: 84pp.

Anderson, J.L. 1981. The establishment and management of a lion *Panthera leo* population in Zululand, South Africa. Biological Conservation, 19: 107-117.

Badola, R. 1998. Attitude of local people towards conservation and alternatives to forest resources: a case study from the lower Himalayas. Biodiversity and Conservation, 7: 1245-1259.

Bjorge, R.R., and J.R. Gunsin. 1985. Evaluation of wolf control to reduce cattle predation in Alberta. J. Range Manage., 38: 483-486.

Brandon, K. E. and M. Wells. 1992. Planning for People and Parks: Design Dilemma. World Development, 20: 557-570.

Bond, I. 1995. Wildlife and livestock as options for landuse in Zimbabwe. Pages 203-206. In J. A. Bissonette and P.R. Krausman, eds., Integrating People and Wildlife Conservation for a Sustainable Future. The Wildlife Society, Bethesda, Maryland.

Boonzair, E. 1996. Local responses to conservation in the Richtersveld National Park, South Africa. Biodiversity and Conservation, 5: 207-214.

Borrini-Feyerabend, G. (ed.). 1997. Beyond Fences: Seeking Social Sustainability in Conservation. IUCN, Gland (Switzerland), Vol. 1 and 2.

Butz, D. 1993. Pastures and pastoralism in Shimshal; un-published report. Aga Khan Rural Support Program, Gilgit, Pakistan: 31pp.

Carpenter, J. F. 1998. Internally Motivated Development Projects: A potential tool for biodiversity conservation outside of protected areas. Ambio, 27 (3): 211-216.

Child, G. 1995. Wildlife and People: the Zimbabwean Success, Wisdom Foundation, Harare and New York: 267pp.

_____,. 1996. The practice and principles of community-based wildlife management in Zimbabwe: the CAMPFIRE programme. Biodiversity and Conservation, 5: 369-398.

Clemens, J., and M. Nusser. (In press). Resource management in Rupal Valley, Northern Pakistan: The utilization of forests and pastures in the Nanga Parbat Area.

Colchester, M. 1996. Beyond Participation: indigenous people, biological diversity conservation and protected area management. Unasylva, 186 (47): 33-39.

Fiallo, E. A., and S. K. Jacobson. 1995. Local Communities and Protected Areas: Attitude of Rural Residents Towards Conservation and Machalilla National Park, Ecuador. Environmental Conservation. 22(3): 241-249.

Fox, J. L., C. Nurbu, S. Bhatt, and A. Chandola. 1994. Wildlife conservation and land use changes in the transhimalayan region of Ladakh, India. Mountain Research and Development, 14(1): 39-60.

Gadgil, M. 1992. Conserving biodiversity as if people matter: A case study from India, Ambio, 21(3): 226-270.

_____., F. Berkes and C. Folke. 1993. Indigenous knowledge for biodiversity conservation. Ambio, 22(2-3): 151-156.

Getz, W.M., L. Fortmann, D. Cumming, J du Toit, J. Hilty, R. Martin, M. Murphree, N. Owen-Smith, A.M. Starfield, and M.I. Westphal. 1999. Sustaining Natural and Human Capital: Villagers and Scientists. Science. 283: 1855-1856.

Ghimire, K.B., and M.P. Pimbert 1997. Social Change and Conservation: Environmental Politics and Impacts of National Parks and Protected Areas. UNRISD and Earthscan, London.

Gloekler, M.A. 1995. High-pastures-high hopes: a socioeconomic assessment of some high pastures in Baltistan, un-published report. Aga Khan Rural Support Program, Skardu, Pakistan: 28pp.

_____,. 1997. Project process monitoring; Biodiversity Conservation Project Sites, Khyber, un-published report. IUCN, Gilgit, Pakistan.

_____,. 1997. Project process monitoring; Biodiversity Conservation Project Sites, SKB, un-published report. IUCN, Gilgit, Pakistan: 14pp.

Harcourt, A.H., H. Pennington, and A.W. Weber. 1986. Public attitudes to wildlife and conservation in the Third World. Oryx, 20(3): 152-154.

Hartup, B.K. 1994. Community conservation in Belize: demography resource use, and attitude of participating landowners. Biological Conservation, 69: 235-241.

Heinen, J.T. 1993. Park-people interaction in Koshi Tappu Wildlife Reserve, Nepal: a socio-economic analysis. Environmental Conservation, 20(1): 25-34.

Hofmann, K.C., I. Hussain, A. Nyborg, O. Holand, and P. Weggi. 1998. Pasture, livestock, and biodiversity; un-published Report No. 3. Aga Khan Rural Support Program, Skardu, Pakistan: 53pp.

IIED. 1994. Whose Eden? An Overview of Community Approaches in Wildlife Management. International Institute for Environment and Development, U.K.: 121pp.

Infield, M. 1988. Attitude of a rural community towards conservation and a local conservation area in Natal, South Africa. Biological Conservation, 45: 21-46.

IUCN-Pakistan. 1997. Maintaining Biodiversity in Pakistan with rural Community Development; Annual Progress Report, Jan.-Dec., 1997: 24pp.

Kellert, S. R. 1985. Social and perceptual factors in endangered species management. Journal of Wildlife Management, 49(2): 528-536.

Khan, R. A. 1996. Role of women in the conservation of biodiversity, Khyber Valley; un-published report. IUCN, Gilgit, Pakistan: 13pp.

Kiss, A. 1990. Living with wildlife: wildlife resource management with local people participation in Africa. Tech. Paper No. 130. The World Bank, Washington, D.C.: 127pp.

Kothari, A., R.V. Anuradha, and N. Pathak. 1998. Community-based Conservation: Issues and Prospects. Pages 25-57 In A. Kothari, N. Pathak, R. V. Anuradha, and B. Taneja, eds., Communities and Conservation; natural resource management in South and Central Asia, Sage Publications, New Delhi.

Kreutzmann, H. 1992. Development process in the Hunza Valley; a case study from the Karakoram mountains. Pakistan Journal of Geography, Vol. II(1&2): 1-17.

_____. 1993. Challenge and response in the Karakoram: socioeconomic transformation in Hunza, Northern Areas, Pakistan. Mountain Research and Development, 13(1):19-39.

Knudsen, A. J. 1992. State intervention and community protest; nature conservation in Hunza, North Pakistan. Pages 103-125, In O. Bruun and A. Kalland eds., Asian Perceptions of Nature. Nordic Proceedings in Asian Studies, no 3, Copenhagen: Nordic Institute of Asian Studies.

Lewis, D. M., G. B. Kaweche, and A. N. Mwenya. 1990. Conservation outside protected areas: lessons from an experiment in Zambia. Conservation Biology, 4 (2): 171-180.

Lewis, D. M. and A. Phiri. 1998. Wildlife snaring- an indicator of community response to a community-based conservation project, Oryx 32 (2): 111-121.

Lynch, O.J., and J.B. Alcorn. 1994. Tenurial rights and community-based conservation. Pages 373-392 427 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

Makombe, K., ed. 1994. Sharing the land: wildlife, people and development in Africa, IUCN/ROSA, Environmental Issues No.1, IUCN/ROSA, Harare, Zimbabwe: and IUCN/SUWP, Washington, USA: 36pp

McNeely, J.A. 1988. Economics and biological diversity: developing and using economic incentives to conserve biological diversity. IUCN, Gland, Switzerland: xiv+232pp.

_____,. 1997. Conservation and the future trends and options toward the year 2005. IUCN Biodiversity Policy Coordination Division, Gland, Switzerland: 119pp.

Mehta, J. N., and S.R. Kellert. 1998. Local attitude toward community-based conservation policy and programmes in Nepal: a case study in the Makalu-Barun Conservation Area. Environmental Conservation 25(4): 320-333.

Mishra, C. 1997. Livestock depredation by large carnivores in the trans-Himalaya: conflict perceptions and conservation prospects. Environmental Conservation, 24(4): 338-343.

Mkanda, F.X., and S.M. Munthali. 1994. Public attitude and needs around Kasungu National Park, Malawi. Biodiversity and Conservation, 3: 29-44.

Murphree, M.W. 1994. The Role of Institutions in Community-based Conservation. Pages 403-427 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

_____. 1998. Ex Africa Semper Aliquid Novi? Consideration in Linking Environmental Scholarship, Policy and Practice. Pages 3-7 in N. Christoffersen, B. Campbell and J. Du Toit, eds., Communities and Sustainable Use; Pan-African Perspectives. Proceedings of the Pan-African Symposium on the Sustainable Use and Community Participation, Harare, Zimbabwe.

Newmark, W..D., N. L. Leonard, H.I. Sariko, and D.M. Gamassa. 1993. Conservation attitude of local people living adjacent to five protected areas in Tanzania. Biological Conservation, 63: 177-183.

_____., D.N. Manyanza, D.M. Gamassa, and H.I. Sariko. 1994. The conflict between wildlife and local people living adjacent to protected areas in Tanzania; human density as a predator. Conservation Biology, 8(1): 249-255.

Nowell, K., and P. Jackson, eds. 1996. Status and Conservation Action Plan; Wild Cats. Gland, Switzerland. IUCN/SSC Cat Specialist Group, IUCN: 382pp.

Nusser, M., and J. Clemens. 1996. Impacts on mixed mountain agriculture in the Rupal Valley, Nanga Parbat, Northern Pakistan. Mountain Research and Development, 16(2): 117-133.

Oli, M.K., I. R. Taylor, and M.E. Rogers. 1994. Snow leopard *Panthera uncia* predation of livestock: An assessment of local perceptions in the Annapurna Conservation Area, Nepal. Biological Conservation, 68: 63-68.

Parry, D., and B. Campbell. 1992. Attitude of Rural Communities to Animal Wildlife and its Utilization in Chobe Enclave and Mababe, Botswana. Environmental Conservation, 19(3): 245-252.

Pimbert, M.P., and J.N. Pretty. 1995. Parks, People and Professionals. Putting 'Participation' into Protected Area Management. UNRISD Discussion Paper No. 57. Geneva: 60pp.

Robinson, J. G., and K. H. Redford. 1994. Community-based Approaches to Wildlife Conservation in Neotropical Forests. Pages 300-319 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

Richardson, J.A. 1998. Wildlife utilization and biodiversity conservation in Namibia: conflicting or complementary objective? Biodiversity and Conservation, 7: 549-559.

Saberwal, V. K., J. P. Gibbs, R. Chellam, and A.J.T. Johnsingh. 1994. Loin-human conflict in the Gir forest, India. Conservation Biology, 8(2): 501-507.

Schaller, G.B., L. Hong, H. Talipu, L. Hua, R. Junrang, Q. Mingjiang, and W. Haibin 1987. Status of large mammals in Taxkorgan Reserve, Xinjiang, China. Biological Conservation, 42: 53-71.

Shackleton, C.M. 1993. Fuelwood harvesting and sustainable utilization in a communal grazing ground and protected area of the eastern Transvaal Lowveld. Biological Conservation, 63: 247-254.

Shrestha, R., and G.R. Kattel. 1996. Women's knowledge and attitudes in wildlife conservation: a case study in Padampur Village Development Committee (VDC), Royal Chitwan National Park, Nepal. Tiger Paper 23(3): 20-22.

Soussan, J., E. Gevers, K. Ghimire, and P. O'Keefee. 1991. Planning for sustainability: access to fuelwood in Dhanusha District, Nepal. World Development, 20(10): 1299-1314.

Tsing, A.L., J.P., Brosius, and C. Zerner. 1999. Assessing Community-based Natural Resource Management, Conference Report. Ambio, 28(2): 197-198.

Upreti, B.N. 1986. The park-people interface in Nepal: problems and new directions. Pages 19-24 In J.A. McNeely, J.W. Thorsell, and S.R. Chalise. Eds., People and protected areas in the Hindu Kush-Himalaya. Proceedings of the International Workshop on the Management of National Parks and Protected Areas in Hindu Kush-Himalaya, 6-11 May, 1985. King Mahendra Trust for Nature Conservation and ICIMOD, Kathmandu, Nepal.

VMP. 1996. Village Management Plan, Khyber, un-published document. IUCN, Gilgit, Pakistan.

WCP., 1997. Wildlife Conservation Plans, Khyber and SKB Community Conservation Areas; un-published documents, IUCN, Gilgit, Pakistan.

Wells, M., K. Brandon, and L. Hannah 1992. People and Parks: linking Protected Areas with Local Communities. World Bank, Washington D. C.: 99pp.

West, P. C. and S. R. Brechin (eds). 1991. Resident peoples and National Parks: Social Dilemmas and Strategies in International Conservation. University of Arizona Press, Tucson.

Western, D. 1989. Conservation without Parks: Wildlife in the Rural Landscape. Pages 158-165 In D. Western and M. Pearl, eds., Conservation for the Twenty-first Century. Oxford University Press, New York.

Western, D. and R. M. Wright. 1994. The Background to community-based conservation. Pages 1-12 in D. Western and R. M. Wright. eds., Natural Connections: Perspectives in Community-based Conservation. Island Press, Washington, D. C.

Williams, A., T.S. Masoud, and W.J. Othman. 1998. Community-Based Conservation: Experience from Zanzibar. Gatekeeper Series No. 80, International Institute for Environment and Development, London: 20pp.

Wright, R. M. 1994. Recommendations. Pages 524-535 165, In D. Western and M. Pearl, eds., Conservation for the Twenty-first Century. Oxford University Press, New York.

Chapter - 4

4. Monitoring Mountain Ungulate Populations in Community Conservation Areas, Northern Areas of Pakistan

4.1. Introduction

The continued decline in wildlife numbers in Pakistan has led government agencies, national conservation NGOs, and the donor community to re-examine the wildlife conservation policies of Pakistan. These agencies now actively search for the alternatives to parks and protected areas for conserving wildlife resources of the country, particularly in rural areas. There is growing recognition that wildlife conservation in the rural landscape cannot succeed unless local communities are more directly involved in the management of natural resources (Western and Wright 1994). Community involvement has been obtained by integrating wildlife conservation with rural community development in Northern Areas (NAs) of Pakistan through implementing a UNDP/GEF funded pilot project, "Maintaining Biodiversity in Pakistan with Rural Community Development." This approach requires development and demonstration of new methods that facilitate local institutional development and build the capacity of the local communities to manage wildlife resources sustainably. The latter requires periodic monitoring of wildlife populations. Monitoring wildlife numbers is often expensive, time consuming, and laborious. With limited budget and personnel, wildlife agencies in Pakistan cannot conduct annual population assessments in the Community Conservation Areas. Moreover, inputs from the donor- funded conservation projects cannot last forever.

Local hunters may be used as enumerators of wildlife and can generate reliable results with little supervision or outside material. The technique was useful for community-based wildlife programs in Zambia, Africa because it was cost effective, enhanced local participation, and built capacities in management and protection of wildlife (Marks 1994, 1996). Involving local people in monitoring their natural resources makes them aware of changes as they occur and often produces passionate advocates who

will motivate others to participate in wildlife conservation and restoration efforts (Saunders 1990).

To develop a community-based wildlife monitoring system, the Biodiversity Conservation Project (BCP) involved local people in wildlife surveys by selecting community activists (who were mostly former hunters) as Village Wildlife Guides (VWGs) and training them in village based wildlife management activities, including wildlife surveys. These VWGs were later involved in wildlife surveys as observer/enumerators to demonstrate a simple method for monitoring mountain ungulate populations that built upon local knowledge and skills. Ideally, population status of all wildlife species should be available. However, I focused on mountain ungulate species because they are highly valued by local people for both economic and esthetic reasons. Promoting these values as an incentive for conservation could potentially contribute to restoration of mountain ungulate populations in NAs. Local people value ungulate species because:

a) They have potential for generating funds for the village-based conservation and development programs through a sustainable, community-based trophy hunting program;
b) They are attractive to local hunters for meat;
c) They could be of interest for viewing by the villagers and by ecoutourists; and
d) These species are natural prey for large predators (e.g. snow leopard) and thus may reduce predation on domestic livestock.

Mountain ungulate populations were monitored by conducting winter and spring counts in 2 Community Conservation Areas between January 1996 and December 1998. The VWGs/local hunters were used as observers/enumerators during these counts. I designed, supervised, and participated in most of these surveys both for the BCP project and my research. In this paper, I will discuss the methods used for the surveys and

evaluate the utility of these methods for monitoring mountain ungulate populations in Community Conservation Areas in northern Pakistan.

4.1.1. Monitoring Mountain Ungulate Numbers

Monitoring changes in ungulate populations is extremely important not only as a measure of the effectiveness of a particular management strategy, but also as a basis to establish harvest quotas (Cooperrider et al. 1986). However, mountain ungulate surveys are often difficult, especially in rugged and precipitous terrain such as northern Pakistan. Standard sampling schemes, such as strip counts, line transects, stratified sampling, and even randomized block counts are generally impossible to use in these environments (Caughley 1977, Burnham et al. 1980, Seber 1982). Large mammals are often counted from light airplanes or helicopters in Africa and North America, allowing standardized sampling procedures. However, hiring aircraft is not only prohibitively expensive, but maneuvering of an aircraft for the mountain ungulate surveys in the broken terrain and narrow valleys of NAs would be quite dangerous. Sample counts are often considered practical, but their extrapolation to a larger area may be inaccurate because random sampling in this type of terrain is quite difficult. Moreover, mapping of productive habitats of these species in rugged and broken terrain is extremely difficult: calculation of areas under steep slopes, barren rocks, and glaciers requires considerable efforts. Summer and winter distributions of these species also vary substantially. Hence, extrapolation of densities obtained from the sample counts to a larger area may over-estimate or under-estimate the population. Another difficulty in estimating numbers of Caprinae species (like ibex and markhor) with some degree of accuracy and reliability is fluctuation in their group size and composition (Harris 1994). Individuals occasionally join or leave a specific group, so that group size and composition may vary from day-to-day or even hour-to-hour (e.g. Himalayan ibex) (Jackson and Hunter 1996). Their cryptic coloration and shyness (i.e., they can detect and will flee from humans at a great distance) are additional problems.

Group Composition Counts (GCCs) were conducted initially by covering different drainages in the study areas. I became interested in ways to improve survey methods after conducting preliminary counts of ibex in Khyber Community Conservation Area. It became appearant from the GCCs that these counts do provide the information on group composition and productivity of the population, but they do not provide population estimates of animals present on their winter range.

I felt that GCCs probably underestimated the total number of animals present on the winter range because a number of groups may have been missed during a single count in each drainage. Double counting of a group on a subsequent day in the adjacent drainage could also occur. Consequently, I made a series of "Repeated Group Counts" (RGCs) over 3 consecutive days using the same fixed vantage points selected on the first day at accessible locations in each drainage. This was also needed to standardize a technique that could be easily used by the communities to monitor ungulate populations in their conservation areas. I evaluated the practicality of both GCCs and RGCs for community-based wildlife surveys.

4.2. Objectives

My primary purpose was to establish a method to monitor changes in mountain ungulate populations to see whether the community-based conservation approach has any effect on these populations. My secondary objective was to involve local communities in wildlife surveys as a potential means of enhancing their participation in management of their natural resources. Documentation of change in ungulate populations in just 2 or 3 years period is difficult, but the numbers generated from these surveys provide base-line data needed for future analyses. My specific objectives were to:

a) demonstrate a survey technique for monitoring mountain ungulate numbers in which the VWGs/local hunters, with their local knowledge and skills, could be used as observers/enumerators;

b) monitor changes in mountain ungulate populations in the Community Conservation Areas; and
c) ensure repeatability of the technique at low cost and with low technology and educational requirements.

Repeatability was made simpler by keeping the survey methods very simple; the survey equipment (binoculars, spotting scopes, compasses, mini-tape recorders, and field notebooks) used during these counts was easily available to the project staff and VWGs for periodic monitoring of the mountain ungulate populations.

4.3. Study Areas

This study was conducted in Khyber Community Conservation Area, a small catchment of about 250 km^2 in the northwestern Karakoram Mountains in District Gilgit and Skoyo-Karabathang-Basingo (SKB) Community Conservation Area (186 km^2) in the western Himalayas in District Skardu, NAs, Pakistan (Fig.2.1). Khyber stretches 19 km along the Karakoram Highway and its altitude ranged from 2500m to 5708m. SKB lies 45 km west of Skardu along the Gilgit-Skardu road across the Indus River. Both areas are characterized by a very rugged mountain landscape with precipitous slopes, innumerable spurs, high ridges, and broken cliffs. Several glaciers and snow-covered peaks occur within these catchments. The SKB was formerly part of the Baltistan Wildlife Sanctuary, but now both Khyber and SKB have been designated as Community-Managed Controlled Hunting Areas.

The climate of these areas is generally dry because they fall under the "rain shadow" of the Himalayas where annual rainfall rarely exceeds 200 mm. Most precipitation occurs in the form of snow between December and February. The mean maximum temperature in summer is between 30-35°C while the temperature often drops to -10°C during winter. The vegetation in the study areas is mainly xerophytic and corresponds to alpine and sub-alpine scrub zones (Roberts 1997). The mountain slopes

are mostly barren with varying degrees of sparse vegetation. However, variation in altitude, terrain, soil, aspect, light, and moisture supports a variety of plant life. In addition, grazing by domestic stock and wild herbivores shapes the floral diversity of the areas. Vegetation in the steppe regions of the valley bottoms and along the streambeds includes *Hippophae rhamnoides, Myricaria elegans, Populus* spp., *and Salix* spp. The dry slopes are occupied by *Artemsia* spp., *Ephedra* spp., *Polygonum viviparum, Rosa webbiana,* and scattered *Juniperus macropoda* trees. The main plant species found in ravines and moist places include *Salix* spp., *Mertensia* spp., *Spirea lycioides, Rosa* spp., and *Betula utilis.* Dominant grasses include *Poa bulbosa, P. attenuata, and Festuca altacia* (Roberts 1997, UNDP 1999). Patches of *Pinus wallichiana* are also found on slopes with northerly aspects at the higher elevations in SKB.

Three out of 6 mountain ungulate species occurring in NAs are found in the study areas. These include Himalayan ibex (*Capra ibex sibirica*), flared-horned markhor or Astore markhor (*Capra falconeri falconeri*), and Himalayan musk deer *(Moschus chrysogaster*). The latter 2 only occur in SKB, and musk deer are extremely rare. Not a single musk deer was seen during the surveys; hence a quantitative estimate for this species was not attempted. However, a local farmer saw one female with 2 fawns in the birch forests in SKB during August 1997 (Chapter 3). Other important wildlife species found in the areas included snow leopard (*Uncia uncia*), wolf (*Canis lupus*) (only in SKB), red fox (*Vulpes vulpes*), Kashmir flying squirrel (*Hylopetes fimbriatus*), and golden marmot (*Marmot caudata*). Both snow leopard and wolf cause considerable damage to the livestock of local herders (Chapter 3). A family of 4 snow leopards was sighted in Khyber during ibex counts in February 1996 (pers. obser.). The villagers also reported frequent sightings of snow leopards during the winter months. Himalayan snow cock (*Tetraogallus himalayensis*) and chukar partridge (*Alectoris chukar*) are common game bird species.

Poaching, competition for forage with livestock, and habitat degradation from firewood collection were the main causes of decline in mountain ungulate populations in

the past (Hess et al. 1997). Poaching was curtailed considerably through effective "watch and ward" activities of the villagers and by frequent patrols of the VWGs. However, livestock grazing, degradation of winter habitats from firewood collection, and agricultural activities on the slopes close to the human settlements remain major threats to these species (Chapter 3).

4.4. Methods

No single method exists that works well for monitoring mountain ungulate populations in NAs. Some modifications were needed in existing approaches due to differences in the behavior of different species, topography, weather conditions, terrain, and, most importantly, the availability of funds and manpower. Another important consideration was the applicability of a particular technique for the community-based wildlife surveys. Based on these factors, 2 direct count methods were used to monitor ungulate numbers: a) Group Composition Counts and b) Repeated Group Counts from fixed-vantage points on accessible locations. Although GCCs alone may reveal little information about the population dynamics of ungulates, they do provide insights to population productivity. If independent estimates of population size are obtained, the errors associated with GCCs are minimized (McCullough 1993, 1994). Fixed-point counts are considered to be more suited to mountainous and broken terrain, and for species that live in groups (Jackson and Hunter 1996).

4.4.1. Group Composition Counts

The GCCs for ibex and markhor were conducted in the study areas during winter and spring of 1996, 1997, and 1998, when most animals were concentrated at lower elevations. Counts conducted in December, January, and February were considered winter counts, whereas counts in April, May, and June were treated as spring counts. Peak parturition in ibex in the study areas occurs from mid June to early July and in markhor during the first half of June (Schaller 1977, Roberts 1997). The peak rut in ibex

occurs during the last week of December (Roberts 1997, Guda Muhammad, pers. commun.) and in markhor during mid December (Schaller 1977, Roberts 1997, Muhammad Yaqoob, pers. commun.). However, annual variation in precipitation and temperature regimes may influence the timing and duration of rut. Such effects have been observed for wild goat (*Capra aegagrus*) in a study in Kirthar National Park, Sindh, Pakistan (Edge and Olson-Edge 1990). Thus, most of my winter and spring counts represented post-rut and pre-parturition counts, respectively. Optimum timing for surveying mountain ungulates is during the rut when animals are especially visible. Most animals join rutting aggregations, sex and age classes are least segregated, and animals are somewhat less wary that at other times (Jackson and Hunter 1996). Unfortunately, counts could not be conducted during the rut season of these species due to other commitments of the project staff and the community. Only one survey in Khyber, conducted during the third week of December 1998 (rut), was by the community itself, whereas an early December 1998 count in SKB was before the rut.

Survey routes were selected in consultation with the Village Conservation Committees (VCCs) and VWGs based on terrain, previous sightings of animals by the villagers, the extent of visibility along the route, and the quality of habitat present. All the GCCs were conducted on foot by trekking into the mountains following designated routes in each drainage (nullah), although in most cases the survey teams ascended to middle ridges (ca. 3800m elevation) which were often used as observation points. On many occasions, survey teams stayed overnight in the mountains and followed a different route while descending to the villages. Vehicles were only used to scan the slopes facing the Karakoram Highway and Gilgit-Skardu Road. The number of survey teams depended on the number of drainages in the watershed or the number of designated survey routes needed to cover the important ibex and markhor habitats in the study areas. In most cases, 2-6 teams were needed for each survey. Each team was comprised of 3 members: one VWG (the main observer), one project staff member (observer-cum-recorder), and a villager as an additional observer-cum-porter. Sometimes more than one porter was needed due to the ruggedness of survey routes. When a team did not have a literate

member, a mini-tape recorder was given to the VWG to record group size and age/sex composition of ungulates, as well as other related information (e.g. time of the day, weather condition, and search site). While constituting teams, designated routes and search sites were clearly explained to each team to avoid double counting. Each team was equipped with at least two 8 x 40 binoculars and one 15-60x or 15-45x spotting scope.

Observations were usually made from 7:00 to 11:00 am or 4:00 to 6:00 pm. The ungulates were spotted with binoculars, often first by the VWGs, who later showed them to other team members. Once located, sex and age composition of each group was determined with variable magnification of spotting scopes mounted on a tripod; data were recorded on a survey sheet. Individual animals were classified as unidentified if sex and age could not be determined. Ibex and markhor were classified by sex and age categories using the criteria slightly modified from Schaller (1977): adult female (≥ 2 yr), yearling (1-2 yr, M or F), kid (<1yr old), and males (classes I, II, III, and IV). However, for the purpose of this study, all male age classes were combined. No attempt was made to determine sex of yearlings, though some experienced VWGs were able to differentiate between male and female yearlings using body pelage and horn structure. Yearlings and kids were lumped as juvenile, because on many occassions they could not be reliably differentiated from a distance. The sum of all the counts over each drainage was taken as the minimum population in the area.

4.4.2. Repeated Group Counts on Accessible Locations

The RGCs for ibex and markhor were conducted for 3 consecutive days on the accessible locations in winter and spring of 1998 in both study areas. However, the winter surveys in SKB remained incomplete due to bad weather and poor visibility. Much of the upper-elevations and high-pastures were difficult to access during winter due to heavy snowfall and danger of avalanches in spring. Therefore, I decided to monitor ungulate numbers through repeated counts only on the accessible locations. In addition, these sites were most likely to be adversely impacted by human activities.

The basic survey approach and equipment used in these surveys were the same as described above for the GCCs, though survey efforts and strategies changed considerably. The VWGs and local hunters knew the area and behavior of the species very well and they were good at spotting animals in the broken terrain. Hence, they were given the lead role in RGCs as the main observers. Each team was comprised of 2 villagers (one VWG and one hunter) as observers and one project staff or a forest employee as an observer-cum-recorder. The number of teams depended on the number of accessible locations in the study areas, but usually between 3 and 6 teams conducted these counts. Each team was equipped with at least 2 (8x40) binoculars, a spotting scope (15-45x or 15-60x), an altimeter, a compass, a photocopy of the topographic map (scale 1:250,000) of the area and at least 2 copies of the survey form for each survey day. All teams were briefed about the survey methods prior to each survey. To standardize the search efforts, the main observer for the winter and spring surveys remained the same; however, some observer-cum-recorders were switched among the teams on the subsequent survey days and between winter and spring surveys. This provided an opportunity for the project staff to get familiar with different accessible locations in the study areas. To avoid biases from double counting of any group, all counts were made on the same day. The groups were generally first located by VWGS and hunters using binoculars, and then sex and age composition was determined with spotting scopes. Animals were recorded as unidentified, and used only to obtain the minimum number of animals seen during the counts, when the sex and/or age of some animals was unclear due to distance.

Observations were made from 6:30 to 11:00 am up to the last Fixed-Vantage Point (FVP) in each drainage and again from 3:00 to 6:00 pm from the same FVPs while descending to the villages or camp sites. A "FVP" was defined as a strategic point (location) from where most of the surrounding mountain slopes were clearly visible (usually within a range of 300-600 m). Late afternoon observations were made just to see whether size and composition of the groups changed from the morning. These times were

used to minimize visibility problems associated with heat haze and the tendency of ibex and markhor to rest in the middle of the day. On the first day, each team identified FVPs and corresponding search sites in each drainage. The names of FVPs and search sites were recorded on the sketch maps of the survey routes. The exercise was impossible to complete without the assistance of the VWGs and local hunters because the names of those places are only known to the villagers. This was essential to standardize the search efforts for each survey day as well as for future surveys by the community. Each VFP was visited for 3 consecutive days following the same route. Observations were made at variable distances averaging ca. 500m (range 100-1000m). The distance between observers and animals was greater when animals were observed from the opposite slopes. In many cases, animals were on slopes ≥30°, thus forcing observers to scan the search sites from a distant point away from the slope. Approximately 15-20 minutes were spent at each FVP scanning the surounding slopes. When a large group of ibex or markhor was spotted, usually it took more than 30 minutes to examine the group composition completely. Observers in a team independently counted each group of animals and determined its composition until a consensus on the total present was reached. This procedure helped reduce counting error and observer bias. Once counted, FVP, search site, group size, sex/age composition, time of sighting, and direction of movement of the group (if any) were recorded on the survey form. In addition, any distictive characteristic of the group (e.g. a male with broken horn or presence of a trophy size animal or a nursery group) was recorded. This helped in deciding whether or not the same group was observed on other days. A group was considered to be a gathering of animals within a 50m radius that did not split during the time of observation.

4.4.3. Analysis of Data

Mean group sizes and population structures (sex and age ratios) obtained from all the winter and spring GCCs for ibex and markhor were compared to examine characteristics and productivity in populations of these species after embracing the community conservation program by the local communities. Statistical comparisons were

made with the G-test to determine any change in juvenile:female ratios among the counts and were considered significant at $\alpha = 0.05$. The RGCs data were used to estimate means and standard deviations of 3 successive day's counts of winter and spring. Standard deviations, standard error, and coefficient of variance were used as measures of the variability involved in these counts. Population estimates of ibex and markhor present during winter and spring at the accessable locations in Khyber and SKB were obtained by using the "Uniquesness Probability" (UP) approach developed by Harris (1994). Each group of ibexes observed during RGCs were assigned a UP ranging from zero to one based on qualitative evidence. For instance, a probability of 1.0 was given to those groups that were clearly distinct or unique (e.g., they were seen simultaneously or far apart during the same or subsequent day, and their composition differed from the groups observed earlier), and a probability of 0.05 was given to those groups where a high probability of duplicate counts existed (e.g., they were seen near the same location where another group was seen on day one or their composition was similar to the groups observed earlier). The point estimates were obtained by simply multiplying the corresponding UP of each group by group size and adding these figures across all groups was considered the total estimate of the number of animal present on the accessable locations. A frequency distribution and a confidence interval of total number of animals observed in each drainage were determined by calculating the probability associated with each possible combination of all the groups. For further details see Harris (1993, 1994).

4.4.4. Advantages of RGCs

As an inducement, each VWG and the hunter was paid a daily stipend for each survey day. I assumed that once the project was over, these people would get their stipend from the respective VCCs ensuring continuity in annual monitoring of ibex and markhor populations in the Community Conservation Areas. The teams usually sat together at the end of each survey day to compile survey results based on the total number of animals seen in each group during 3 day's counts. Survey results were shared with the VCCs, which helped in creating awareness among community members and also

in building rapport and confidence between project staff and the community as well as with the former hunters.

4.5. Results

4.5.1. Group Composition Counts

4.5.1.1. Himalayan ibex

Khyber:

Sixty-three ibex were observed during winter 1996 in 6 groups. Group size ranged from 3-27 with mean group size 10.5. Overall, males, females, and juveniles comprised 35, 36, and 18 % of the population, respectively, whereas 11% of the animals could not be classified. There was very little snowfall during winter of 1997 and most of the animals did not descend to lower elevations (winter range). This may explain why only 25 ibex in 4 groups were seen in 1997 in the same area surveyed in 1996. Group size ranged from 3-10 with a mean group size 6.3. Of these ibex, 28% were male, 24% female, 24% juvenile, and 24% were unidentified. In the winter of 1998, the study areas received normal snowfall and 128 ibex in 9 unique groups were sighted. Group size ranged from 2-37 with a mean group size 14.2. These groups contained 30% male, 40% female, and 28% juvenile. Three animals (2%) were not classified because of uncertainty about their sex and age from a distance. In December 1998, the VWGs and local hunters conducted counts under the supervision of VCC, Khyber without any assistance from the project. They saw 152 ibex in the same survey areas and there were 14 groups (ranging in size from 3-27) with a mean group size 10.9. Overall, males, females, and juveniles comprised 19, 47, and 34 % of the population, respectively. The number of Juvenile: 100 female observed during winter counts of 1996, 1997, and 1998 varied considerably (Fig. 4.1). This variation was not statistically significant ($G= 1.65$, $df= 3$, $P > 0.50$), however.

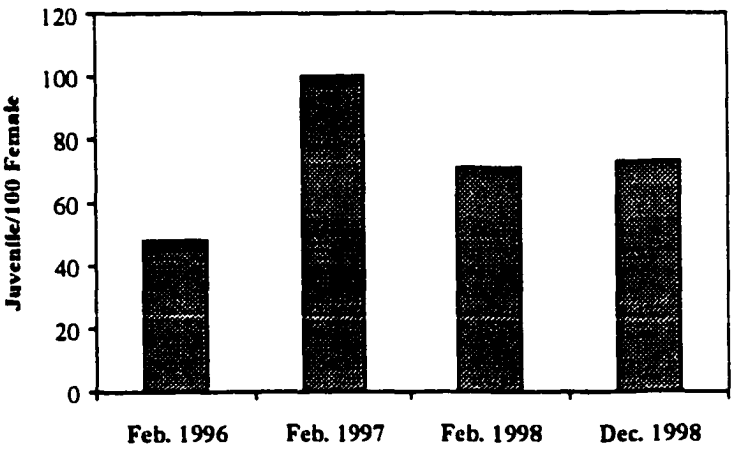

Fig. 4.1: Juveniles per 100 females' ratios of Himalayan ibex at Khyber during winter counts of 1996, 1997, and 1998. The number of juvenile sighted was 11 in Feb. 1996, 6 in Feb. 1997, 36 in Feb. 1998, and 52 in Dec. 1998.

In spring 1996, a total of 37 ibex were observed in 8 small groups. Group size ranged from 2-14 (mean = 4.7). Of these ibex, 30% were male, 40 % female and 30% juvenile. During counts in May 1997, 65 animals were seen and mean group size was 6.5 (ranging in size from 1-18). Males, females, and juveniles comprised 42, 38, and 20% of the population, respectively. During spring 1998, repeated counts were conducted for 3 days and a total of 155 ibexes were observed in 14 unique groups. This total was used to compare age and sex composition with those of the previous 2 years. During 1998 counts, relatively less area was surveyed than in 1996 and 1997, but search efforts were more intensive than the earlier surveys. Group sizes ranged from 3 to 37 with a mean group size of 11.1. The population structure was made up of 23% male, 37% female and 40% juvenile. Again, the number of Juveniles: 100 females observed during spring counts of 1996, 1997, and 1998 varied considerably (Fig. 4.2), though this difference was not statistically significant ($G = 3.796$, $df = 2$, $P > 0.10$).

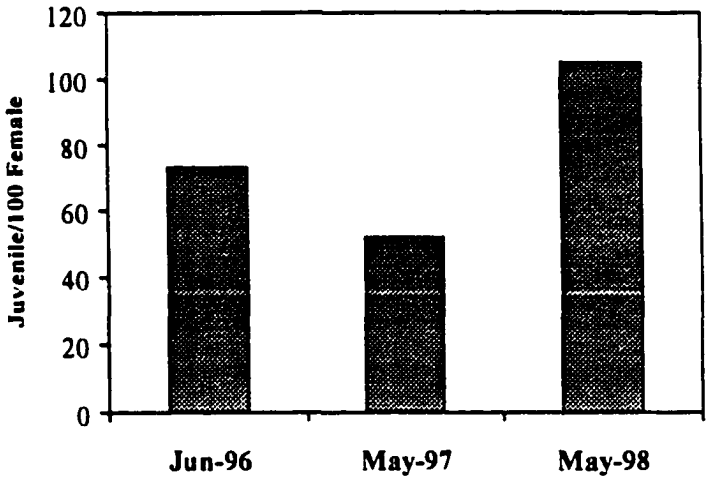

Fig. 4.2: Juveniles per 100 females of Himalayan ibex observed during spring counts of 1996, 1997, and 1998 in Khyber. The number of juveniles sighted was 11 in June 1996, 13 in May 1997, and 61 in May 1998.

SKB:

Most winter counts in SKB were hampered by bad weather and poor visibility. On overcast days it was virtually impossible to make counts. In January 1996, project staff and community activists/hunters jointly counted 216 ibexes on the winter range. Overall, males, females, and juveniles comprised 24, 44 and 32% of the population, respectively. In winter of 1997, there was little snowfall in the area and the animals mostly remained at higher elevations. Moreover, the weather turned bad on the first day of the counts, which forced us to abort the survey. The survey teams, however, observed 64 animals on the slopes facing the River Indus before abandoning the survey. Group size ranged from 6-14 with mean group size 10.7. This population was composed of 39% male, 36% female and 22% juvenile, whereas 3% (2 ibex) could not be identified due to distance.

In February 1998, weather again turned unfavorable and only 36 ibex were counted, mainly from the roadside. Of these, 28% were males, 39% female, and 33% juvenile. In December 1998, another survey (pre-rut) was conducted jointly by the

project staff and VWGs/hunters and a total of 159 ibexes were observed in 21 different groups. Group sizes ranged from 2-20 with a mean group size of 7.6. The population consisted of 33% males, 40% females, and 27% juveniles. Again, the proportion of juveniles in the population varied considerably (Fig. 4.3), but there was no significant change in juvenile: female ratios among these counts (G= 0.318, df=3, P > 0.95).

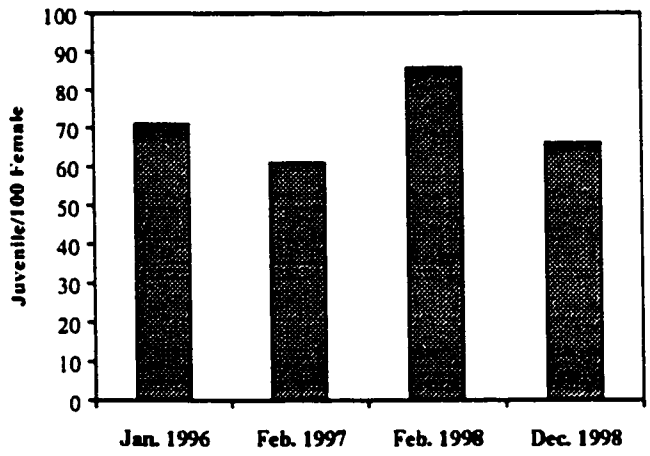

Fig. 4.3: Juveniles per 100 females of Himalayan ibex observed during winter counts of 1996, 1997, and 1998 at SKB. The number of juveniles observed was 68 in Jan. 1996, 14 in Feb. 1997, 12 in Feb. 1998, and 43 in Dec. 1998.

Only one spring count was conducted in April 1998 for 3 consecutive days and a total of 232 ibex were observed in 33 different groups. Group size ranged from 1-19 with a mean group size of 7. The population consisted of 28% males, 40% females, 31% juveniles, and 3 animals (1%) could not be identified because of the distance.

4.5.1.2. Flared-horned markhor

Eighty-two markhor were observed during a January 1996 survey conducted jointly by the project staff and community activists/hunters in SKB. The population structure was 27% male, 49% female, and 25% juvenile. During February 1997, the survey teams could make only a partial count because of bad weather and observed 42

markhors in 6 different groups, mainly from the roadside on the slopes facing the Indus River. The group size ranged from 2-15 with a mean group size of 7. Overall, males, females, and juveniles comprised 31, 38, and 21% of the population, respectively, whereas 10% (4 markhor) could not be classified to age or sex. In February 1998, bad weather again restricted survey teams from making complete counts and only12 markhor were observed (25% males, 42% females, and 33% juveniles). In December 1998,

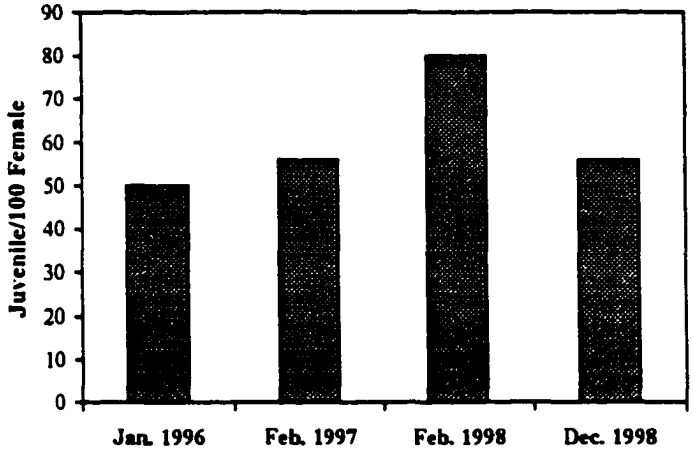

Fig. 4.4: Juveniles per 100 female markhor observed at SKB during winter counts of 1996, 1997, and 1998. The number of juvenile sighted was 20 in Jan. 1996, 9 in Feb. 1997, 4 in Feb. 1998, and 9 in December 1998.

another survey was conducted mainly to determine the number of trophy-sized males and to observe population composition; 37 markhor in 9 different groups were observed in this survey. The group size ranged from 2-9 with mean group size 4.1. The population structure was 32% male, 43% female, and 25% juvenile. The juvenile: female ratios did not significantly differ between these counts (Fig. 4.4, $G = 0.088$, $df = 2$, $P > 0.95$).

I was able to conduct spring counts only in 1998. Nineteen markhor were observed during these counts conducted over 3 consecutive days. The group size ranged from 3-6 with mean group size 4.8. The population structure was 4 males (21%), 8 females (42%), and 7 juveniles (37%).

4.5.2. Repeated group counts on accessible locations

4.5.2.1. Himalayan ibex

Khyber:

Generally, more groups of ibex were observed in Khyber during RGCs than seen during GCCs. This may have been the result of high intensity search efforts, with FVPs at about 500-1000m apart. The variability in spring counts was lower than the variability in winter counts (Table 4.1).

Table 4.1: Summary statistics of Repeated Group Counts of Himalayan ibex for three consecutive days at Khyber during winter and spring of 1998

Season	Day 1	Day 2	Day 3	Mean	SD	SE	CV
Winter	78	99	100	92.3	12.4	7.1	0.13
Spring	122	139	133	131.3	8.6	4.9	0.07

During winter RGCs, the population comprised of 33% males, 40% females, and 27% juveniles on day 1, 22% males, 43% females, and 35% juveniles on day 2, and 32% males, 37% females, 28% juveniles, and 3% animals were unidentified on day 3. Juvenile/ 100 adult female ratios for 3 day's counts in winter were 68, 83, and 76, respectively ($\bar{x}$=75, SD=7). During spring counts population consisted of 22% males, 39% females, and 39% juvenile on day 1, 19% males, 39% females, and 42% juvenile on day 2, and 27% males, 35% females, and 38% juveniles on Day 3. Juvenile per 100 females ratios for 3 day's counts in spring were 100, 107, and 111, respectively ($\bar{x}$=106, SD=5).

Population Estimate

A total of 19 groups of ibex were seen during 3 consecutive days of RGCs in winter of 1998 when lower slopes were partially covered with snow and the groups were relatively stable. Each group was generally, but not always, found in the same drainage each day. Hence, probability distributions of groups seen in each area were estimated

separately. Though each drainage was surveyed simultaneously, the uniqueness of a number of groups remained uncertain due to shifting of groups and changes in their sizes within each drainage.

Uniqueness probabilities assigned to each group and their rationales are provided in Appendix II A. Using these probabilities and the method described by Harris (1994), the point estimates and the 95% Confidence of Intervals (CI) for the number of ibex observed in each area were calculated (Table 4.2). Combining these point estimates yielded an estimate of 134 ibex for the winter counts.

Table 4.2: Point estimates of ibex observed in each drainage at Khyber, NAs Pakistan during 1998 winter and spring RGCs (95% CIs are given in parentheses and rounded to nearest whole numbers).

Drainage	Ibex Observed	
	Winter	Spring
Shaojerab	35	45 (43 – 53)
Kriligoze	10 (9 – 14)	20 (19 – 25)
Roadside	67 (64 – 94)	74 (65 – 81)
Across River	22	30 (25 – 38)
Total =	134	169

No snow was present on the lower elevations at the time of early spring RGCs in 1998. However, ibex were still concentrated on the lower slopes to forage on newly sprouted vegetation. The groups were relatively smaller and more dispersed, and their movements were more frequent than during winter, which made it difficult to determine the uniqueness of each group. Forty-three groups were observed during 3 days of RGCs. Qualitatively derived UPs were assigned to the individual groups (see Appendix II B). The total estimate for the spring counts was 169 ibex (Table 4.2).

SKB:

The RGCs for the 1998 winter were incomplete due to bad weather. However, I was able to conduct RGCs for ibex over 3 consecutive days in early spring of 1998. These counts produced very different totals on each survey day-- 127 ibexes on day 1, 144 on day 2 and only 54 on day 3. The mean of these counts was 108.3 with SD, 47.8; and CV, 0.44. The population structure comprised of 26% males, 35% females, 37% juveniles, and 2% unidentified on day 1, 31% males, 39% females, and 30% juveniles on day 2, and 18% males, 54% females, and 28% juveniles on day 3. Juveniles per 100 females were 107, 79, and 48, respectively ($\bar{x}$=78, SD=29). Using the UPs to the individual groups of ibex seen during RGCs and their rationales (Appendix II C), I estimated a total of 235 ibex seen during the spring counts of 1998 in SKB.

4.5.2.2. Flared-horned markhor

Like ibex surveys in SKB, I was unable to conduct complete winter RGCs for markhor during winter of 1998 due to bad weather. However, I obtained an estimate of markhor population through RGCs for 3 consecutive days in April 1998. Despite intensive search, the survey teams were unable to observe more than 11 markhor on any single survey day. The daily totals were-- 9 animals on day 1, 11 on day 2 and again 11 animals on day 3. Mean of these counts was 10.3 with SD, 1.1; and CV, 0.11. The population comprised of 33% males, 33% females, and 34% juveniles on day 1, 27% males, 46% females, and 27% juveniles on day 2, and 18% males, 36% females, and 46% juveniles on day 3. Juvenile per 100 adult female ratios were 100, 60, and 120, respectively ($\bar{x}$=93, SD=30). Using the UPs to the individual groups of markhor seen during RGCs and their rationales (Appendix II D), I estimated a total of 19 markhor seen during the spring counts of 1998 in SKB.

4.6. Discussion

Group Composition Counts

Khyber:

Although GCCs did not produce total population estimates for ibex and markhor in the study areas, they did provide useful information on changes in population characteristics of these species from 1996 to 1998. The total animals seen during each count was treated as an estimate of the minimum number present in the conservation areas. The number of groups during winter counts in Khyber increased from 6 in 1996 to 14 in 1998. The average group size also changed from 10.5 in 1996 to 14.2 in 1998. These are similar group sizes to those found by Schaller (1977): mean (±SD) group size of 9.4 ± 6.0; and Fox et al. (1992): median group size of 11.0 in Ladakh (range, 1-40). Group sizes varied seasonally. Relatively bigger groups were seen during winter than in spring. Seasonal variation in Asiatic ibex herds have been observed elsewhere (Dzieciolowski et al. 1980, Fox et al. 1992). The number of juveniles in the population during winter increased from 48 per 100 females in 1996 to 73 in 1998. Though this was not a significant change, it suggests a healthy population. The higher ratio of juveniles per 100 females for the February 1997 survey was probably due to small sample size. The number of animals seen during winter counts increased from 63 in 1996 to 152 in December 1998; this increase may be due to increased reproduction in the population or to improvements in our ability to count ibex.

Fewer ibex were observed during the June 1996 survey than counts in May 1997 and 1998. Perhaps most of the animals already had moved to the higher elevations during late spring, which made it difficult for the survey teams to spot ibex at the lower elevation. Late June is an inappropriate time for the counts. As in winter surveys, the number of groups observed during spring counts increased from 8 in 1996 to 14 in 1998 and mean group size increased from 4.7 in 1996 to 11.1 in 1998. The groups were relatively smaller in size during May and June, but more scattered and unstable than during winter. On many occasions group sizes changed within hours. The adjacent

groups, which were separate in the morning, joined together into one group and sometimes a large group split into 2. Smaller group sizes of Asiatic ibex during spring than winter were also reported from a study in Ladakh, India (Fox et al. 1992). The number of juveniles per 100 females was 73 in 1996 and 105 in 1998, which suggests healthy reproduction and perhaps an increasing trend in the Khyber ibex population. Thirty-seven ibex were seen in June 1996 and 155 in May 1998. Possible reasons for this relatively sharp upward trend include-- 1) decreased poaching from the effective "watch and ward" system embraced by the villagers (Chapter 3), 2) improvement in survey efficiency as observers gained experience, and 3) high recruitment in the ibex population. The people of Khyber were also surprised by the frequent sighting of ibex close to human settlements, which they had not experienced during recent years.

SKB:

The variability in my data on GCCs for ibex and markhor in SKB may have been due to inconsistency in survey efforts and to problems inherent in the technique (Section 4.6.2). However, these counts at least provide some base-line figures for further studies and a direction for implementation of the Wildlife Conservation Plan devised by the community, particularly where annual trophy hunting of ibex is feasible. The winter counts of 1996 were made during the peak of rut; perhaps this is why maximum number of ibex was seen during these counts. Because these counts were made over a 2 day period by several teams, some double counting may have occurred. Some of the survey teams did not record the size of the groups, which made it difficult to calculate mean group size for these counts. Some observers may have over-estimated females due to the difficulty in differentiating yearlings from young females. The counts conducted in early December of 1998 were pre-rut counts with little snow cover in the study area. This could be the reason that fewer animals were seen during that survey. The mean group size was smaller in this population than observed during the winter counts in Khyber, and there was no significant change in juveniles per 100 females (Fig. 4.3). The higher ratio of juveniles for the February 1998 counts was probably due to small sample size. Only one

early spring count was made in SKB. It produced the most animals seen (232 animals from 3 days of surveys). The mean group size for these counts was smaller than the spring counts in Khyber. However, juvenile per 100 female ratios were relatively high (77:100), which indicates healthy reproduction in the population.

The markhor population was relatively small in SKB catchment as compared to ibex, even though the habitat was more suitable for the former species (Hess et al. 1997). The markhor population in SKB was severely depleted in the past, mainly from indiscriminate hunting (Chapter 3). This species inhabits lower altitudes than Asiatic ibex, which makes it more vulnerable to poaching and predation. Fewer markhor were observed after the first count in January 1996 mainly because of difficulties in making complete counts due to bad weather. Some survey teams did not report group sizes for 1996 markhor counts, while mean group size in December 1998 was relatively smaller (4.1) than reported by Schaller (1977) and Habibi (unpublished report of 1997) from their studies of markhor populations in Chitral Gol and Tushi Game Reserve. There was no noticeable change in juvenile: female ratio (50 juveniles in January 1996 and 56 in December 1998 per 100 females). The higher ratio of juveniles per 100 females for the February 1998 survey was probably due to small number of markhor sighted during this survey (N=12). Indeed, GCCs for markhor in SKB did suggest healthy reproduction in this small population, but whether the markhor population in the area decreased or increased is unclear. The villagers, however, attributed the decline in sighting of markhors to heavy predation, mainly by snow leopard. Four markhor were reportedly killed by snow leopard during winter 1996 (WCP 1997), and perhaps many kills remained undetected due to difficulty of the terrain. Two deaths were confirmed from predation,when the project staff and VWGs witnessed snow leopards feeding on markhor carcasses during winter 1997. The VWGs and forest staff also reported that several markhor may have emigrated across the River Indus due to frequent pursuit by snow leopards. These reports might have some validity because 4 markhor were spotted on a ridge across the river by a survey team in April 1998. In addition, there were 2 unconfirmed reports of poaching of 2 markhors between 1996 and 1998 (Ali Chao, pers.

Comm.). The markhor population in SKB apparently remained under stress from predation and poaching.

Repeated Group Counts

The RGCs at accessible locations produced more reliable results and were liked by most VWGs/local hunters and the project staff. The RGCs were instrumental in locating more unique groups while surveying the same search sites over 3 days. The mean, SD, and CV calculated from these daily counts provided an idea of the amount of variability in sighting of ibex and markhor during winter and spring counts in the steep and rugged terrain.

Khyber

There was relatively high variation in daily counts of ibex in Khyber during winter (SD= 12.4, CV = 13%). This variability could be due to a number of factors-- 1) intermittent appearance of groups, 2) presence of predators (snow leopard) at the lower elevations during winter, 3) frequent movement and changes in assemblage of the groups, 4) disturbance by humans and livestock, and 5) severity of weather. All these factors are interlinked (Eltringham 1973, LeResche and Rausch 1974, Reilly and Emslie 1998). I believe intermittent appearance of groups was one of the major sources of variability in daily counts during winter. For example, at one search site (Uch Lakhish) a group of 23 animals was seen on day 1, 32 on day 2, and 37 on day 3 at the same site. This band of 37 animals was seen at 9:00 am, but when the same location was rescanned at about 4:00 p.m., not a single animal was observed. The group certainly moved to a location where it was not visible from the corresponding FVP. The presence of snow leopards in the area can affect numbers of ibex seen. A survey team encountered fresh tracks of 2 snow leopards (male & female) on the morning of day 1 and later in the day observed only 11 ibex in the whole drainage. The next day the team returned to the same area and observed 32 ibex in the whole drainage, 22 of them at the search site where only 11 were seen on the previous day. Disturbance by humans and livestock affects the number of ibex seen.

At a search site near a village, 11 animals were seen from the road on day 1. The next day, a villager took his sheep and goats to this spot and not a single ibex was seen at this site during that day. However, 5 ibex reappeared on the same spot on day 3. If the survey crew had decided just to stop after the first day, they would have concluded the presence of a minimum of 78 ibex in the area, but from 3 successive days counts a highest count of 100 animals was obtained (Table 1). However, careful analysis, by uniqueness probabilities to the individual groups seen during 3 day's counts, suggested that the survey teams actually observed 134 animals during RGCs in winter (Table 2). Multiple counts are often considered desirable over a single count, because a single count may fail to account for a number of animals (Colwell and Cooper 1993).

There was also a high degree of variability in male: adult female ratios among daily counts during winter (SD=0.19) and spring (SD=0.15). The winter ratios varied more than the spring ratios. This variability was probably due to intermittent appearance of some all-male groups. Juvenile: adult female ratios were relatively stable during winter (SD=0.07) and spring (SD=0.05).

SKB

Variability in 3 successive day's counts for ibex in SKB during spring of 1998 was higher than Khyber. I suspect that variability was probably due to 2 factors-- 1) visibility constraints due to weather and rugged terrain (high ridges and deep gorges), and 2) intermittent appearance of groups. Before these counts, the weather was heavily overcast with snowfall at higher elevations and rain at lower altitudes. After 2 days, the weather cleared and survey teams moved in. The first 2 days of the counts generated relatively good totals. On the third day, the weather suddenly turned warm and most of the animals moved to higher elevations. Perhaps this could be the reason that fewer groups were sighted on the third day, which resulted in high variation in the daily counts. Male: adult female and juvenile: adult female ratios also varied considerably by day

(male: female, SD=0.24; juvenile; female, SD= 0.29). The high variability in these ratios was probably also due to fluctuations in weather conditions.

Population sampling from RGCs for markhor in SKB was perhaps too low to reflect accurately the true variability in 3 successive day's counts. The 11% variation in these counts was probably due to the small population. Reilly and Emslie (1998) reported that small population size contributes to high variability. In a small population, the presence or absence of even a single individual can have a marked effect upon the variability of the counts (Eltringham 1973). The high variability in daily ratios of male per adult female (SD=0.24) and juvenile per adult female (SD=0.29) was perhaps also due to the small sample size.

Several researchers have studied variability in repeated counts. Beasom (1979) reported variations in replicated counts of white-tailed deer using helicopter ranging from 0.9-32.3% in Texas. Magin (1989) described a high degree of variability in the accuracy of 8 repeated total ground counts of 9 ungulate species on a game ranch in Kenya (SDs ranging from 4.4-71.1). Reilly and Emslie (1998) reported CVs ranging from 6.0 to 36% in 4 replicated helicopter counts for 9 ungulate species in a nature reserve in South Africa.

Population Estimates

I assume there are 3 possible options for obtaining population estimates of ibex from RGCs on accessible locations in Khyber. These are explained below.

a) Managers can assume that the highest count obtained from 3 consecutive day's counts is the closest to the true number present. This highest total of single day counts can be taken as the minimum size of the population estimate. This would require no statistical treatment and would leave few doubts about double counting of a group. For instance, the highest daily count from winter and spring surveys in

Khyber was 100 and 139 ibex, respectively (Table 4.1). These numbers can be considered as minimum population estimates obtained from winter and spring counts. This estimate would be acceptable to a wildlife agency because of few chances of duplicate counts, but perhaps not to the community and VWGs, who will claim that they have seen more animals during 3 days counts than these totals.

b) The second option could be keeping track of the uniqueness of each group (those groups assigned UP one, Appendix II A) during 3 days of counts at the same search sites. Sex and age composition of each group, distance between groups, evidence of movement, physical characteristics of the terrain (e.g. river or other physical barrier between the groups), and the highest count on each search site should be considered. Then, crude population estimates could be obtained. For example, during winter and spring counts of 1998 in Khyber the survey teams carefully kept records of the above factors for each ibex group observed and estimated a population of 128 ibex in winter and 155 ibex in spring. These estimates would be acceptable to the community and would be easiest for them to report without worrying about complex statistical procedures.

c) Third, the population estimates obtained under (b) above could be further improved by deriving UPs for the individual groups observed during RGCs based on their probability of uniqueness and using the "Uniqueness Probability Method" developed by Harris (1994). For example, estimates of 134 and 169 ibex (higher than reported above) for the winter and spring counts, respectively, were obtained (Table 2) using this technique. This technique could be useful for estimating mountain ungulate numbers, but it requires complex mathematical computations to make efficient use of UPs data, particularly if a large number of small groups are observed with a high level of uncertainity about their distinction. Moreover, in rugged terrain like that of NAs, counts must be made simultaneously or at least in rapid succession in each drainage to reduce the level of uncertainity concerning duplicate counts or movements of groups between adjacent drainages (Harris 1993).

Extensive searches were made to locate the maximum number of groups during winter and spring counts, but the existence of unseen animals in the area can not be ruled out. Fox et al. (1991) reported that ground surveys always miss animals, and a correction factor may be needed to estimate actual numbers and density. I do not claim that RGCs represent a completely accurate technique for estimating mountain ungulate populations in community conservation areas. This was simply an attempt to evaluate the repeatability of the existing survey methods for estimating mountain ungulate populations in steep and rugged terrain by using VWGs/local hunters.

In addition, using VWGs/local hunters was successful because it provided an opportunity for 2-way training. The project staff learned how locate groups of ibex and markhor in broken terrain and determine sex and age composition of these species from the VWGs/local hunters. On the other hand, VWGs learned about survey techniques and reporting of data. The local hunters know where wildlife is most likely found in a particular season. Their eyes are perhaps better tuned to scanning mountain landscape than those of the wildlife managers and biologists who spend more of their time scanning papers and computer screens. Benefiting from local knowledge and skills can provide a useful and cost effective means for monitoring trends in mountain ungulate populations in Community Conservation Areas, given that appropriate incentives are introduced for creation of community-based wildlife management regimes.

The VWGs will have a very important role in the village-based wildlife conservation program. According to their terms of reference spelled out in the Wildlife Conservation Plans of Khyber and SKB, their main responsibility is to assist VCCs in monitoring wildlife populations. In addition, they will have to helpVCCs organize and guide activities associated with "Watch and Ward" pasture use by livestock and monitor village rules on grazing, approved trophy hunting, and wildlife viewing opportunities for tourists (WCP 1997). VWGs can be effectively used for biannual mountain ungulate

surveys in Khyber and SKB because they work for the community and get their remunerations from the VCCs.

4.6.1. Methods considered unsuitable for surveys

While designing this study, I planned to use the 2 most commonly applied methods for estimating ungulate populations--1) randomly selected block counts, and 2) stratified sample counts. After initial reconnaissance surveys of the study areas and discussions with the VWGs/local hunters, both of these methods were considered unsuitable for monitoring the trend of mountain ungulate populations in the study area.

4.6.1.1. Randomly selected block counts

Randomly selected block counts are made on a randomly pre-selected proportion of blocks to estimate density of a target species that can then be extrapolated to the entire area. The enumerator assumes that the animals are evenly distributed throughout the survey area. The use of this method for monitoring ibex and markhor populations in study areas was considered unsuitable because:

1. The distribution ibex and markhor is often patchy and associated with specific habitat types. For example, markhor primarily occupy rugged terrain having sheer cliffs. This habitat component may not be spread evenly over the whole landscape, thus, violating the assumption of even distribution of animals.
2. Selection of blocks at random by placing grids on the map was possible, but locating those blocks in the rugged and extremely difficult terrain in Khyber and SKB was impossible. Any deviation from random selection of blocks could have generated incorrect counts. Moreover, precision in such cases is likely to be low, because most counts would be zeros. Hence, variability of counts obtained from these data would be very high (Harris 1993).

3. Mapping the area in each block in a vertical landscape was a very difficult task. Calculation of areas under steep slopes, sheer cliffs, and glaciers requires considerable effort and resources.
4. Most of the higher elevations in the study areas are inaccessible from December to May (the optimum timing for ibex and markhor counts). A randomly picked block at a higher altitude would have been impossible to reach during the survey period. Moreover, it usually takes 4-6 hrs of difficult hiking to reach higher locations. By the time a survey team reached that randomly selected block, the observers would have been exhausted, leaving little energy for an intensive search for animals. This would have resulted in unequal search efforts between blocks.
5. Both ibex and markhor migrate vertically between their winter and summer ranges. Generally, they are concentrated at lower elevations in winter. Any block count focused on lower elevations would have produced high density and extrapolation to the entire conservation area would have over-estimated the population of these species.
6. Continuity in annual monitoring of mountain ungulate populations was one of the important considerations of this study. It would have been difficult for the VCCs to conduct annual surveys of ibex and markhor by using randomly selected blocks with all the limitations of using this technique in steep and rugged terrain.

4.6.1.2. Stratified sample counts

For stratified sample counts, researchers must have extensive information concerning status, distribution, habitat use, and seasonal movement of the species concerned. Such information is rarely available for the mountain ungulate species found in northern Pakistan, particularly the ibex and markhor populations in the study areas. Survey areas stratified using information on apparent densities gathered from local knowledgeable persons or hunters may be problematic because of the tendency of some villagers to exaggerate or conceal facts from outsiders unless proper rapport is built. I

could have stratified the study areas by winter and summer ranges, then randomly selected a number of blocks or drainages (or even-sub-drainages), for surveys. Yet, given the ruggedness of the terrain and relatively small populations of ibex and markhor, it would have been difficult to meet the assumption of random selection of drainages and some of the challenges mentioned above. Hence, it was decided to conduct GCCs and RGCs on accessible locations within the study areas as an index to population change.

4.6.2. Possible biases in GCCs and RGCs

There was considerable similarity between GCCs and RGCs, except RGCs were relatively more standardized and were conducted over 3 successive days. Sources of possible biases in these types of counts include:

a) Both ibex and markhor were difficult to detect because their cryptic body color blends with rocky and broken backgrounds and with the steppic vegetation. Inexperienced observers could easily miss a group or individual animals particularly from a distance, thus under-estimating the population.

b) Intermittent appearance of groups makes observation of all the groups present in the area difficult, especially during a single GCC in each drainage. Therefore, a number of groups might have been missed during GCCs.

c) Because most of the GCCs were conducted over 2 or 3 days visiting different drainages each day, double counting of some individuals, even though survey teams were very careful, could not be ruled out.

d) Yearling ibex resemble females except their pelage is slihtly darker than females (Schaller 1977), which was often difficult to differentiate from a distance. It was particularly difficult to differentiate female yearling from 2-year old females during the spring counts when yearlings were about 20-22 months old. Hence, some survey teams might have over-estimated females (and under-estimated yearlings) during both GCCs and RGCs.

e) Detection of groups was often hampered by physical obstacles such as steepness of the slopes, deep gorges, boulder outcrops, and juniper scrub, thus some groups of ibex and markhor perhaps remained unseen.

f) Intensity of searching efforts greatly affects accuracy of RGCs. Distance between FVPs usually depends on the terrain at a particular location, but they should not be more than 1000m apart to minimize the chance of missing a group. Local hunters often know which area is clearly visible from which site, and they could be very helpful in selecting suitable location for FVPs.

g) Frequent movement of animals or changes in group size, particularly during spring, made it difficult to decide whether a group was the same as a group seen earlier in the morning or a different group. Such movements may take them out of an area in which they were counted or conversely into an area from which they were previously absent, thus generating biases in survey results by double counting groups. However, potential for duplicate counts can be minimized by conducting RGCs simultaneously in adjacent drainages and keeping track of composition and sizes of groups seen in each drainage during surveys on 3 successive days.

4.6.3. Repeated group counts a suitable method for community-based surveys

I believe that RGCs are more suited for monitoring mountain ungulate populations in Community Conservation Areas than other techniques I tested, providing data on group composition for each survey day, allowing statistical analysis of each data set, and providing estimates of minimum population size at the accessible locations. The main advantage of RGCs is that they are simple, only require knowledge of the area and the species found, and can therefore be undertaken by individuals with no formal biological or statistical training. Because they include data on the composition of each group, population estimates derived from these counts can be used to monitor long-term population trends in the Community Conservation Areas. Use of RGCs allows local institutions (e.g. VCCs) to adopt a standardized wildlife monitoring system. It also

provides an opportunity for regulatory agencies to analyze the results of community-based wildlife surveys and to give appropriate advice to the concerned VCCs on the annual off-take of trophy-sized animals. I, therefore, offer the following suggestions with regard to using RGCs: (1) RGCs should be made simultaneously in each drainage over 3 successive days using the same FVPs each day. Involvement of VWGs/local hunters in the surveys could provide the manpower needed for these counts. (2) Additionally, I suggest 2 options with regard to population estimates derived from RGCs. One possibility involves using only those groups for the point estimates for each drainage, which have uniqueness probability of one (where the survey teams are 100% sure that these groups are unique or independent). This could be done at the community level without any mathematical treatment. Second, the data generated from the RGCs by the community could be used by the wildlife managers to derive uniqueness probabilities (ranging from zero to one) for all the groups observed during RGCs. By applying mathematical calculations suggested by Harris (1994), population estimates for monitoring trends in mountain ungulate populations could be obtained.

Furthermore, if the objective were to determine the number of trophy-sized animals in the population, the best timing for RGCs would be during the rut when herds are mixed and most visible. Another good time for RGCs is early spring when most of the animals still concentrate at the lower elevations (accessible locations). This also is a good time to gather information on recruitment of young into the population. The RGCs are largely suited to small areas where coordination between survey teams is easy. However, larger areas can be surveyed by dividing them into 2 or 3 sections. Three successive day's counts would be sufficient for biannual monitoring (winter and spring) of mountain ungulate populations. More than 3 days of repeated counts would be probably too expensive for the communities relative to the additional information gained.

A simple census method like RGCs, with minimum statistical treatment, will be useful for wildlife managers, project staff, and community guides to monitor the

mountain ungulate population in the Community-Managed Conservation Areas in northern Pakistan and elsewhere with similar topography.

4.7. Literature Cited

Beasom, S. L. 1979. Precision in helicopter censusing of white-tailed deer. J. Wildl. Manage. 43(3): 777-780.

Burnham, K. P., D. R. Anderson, and J. L. Laake. 1980. Estimation of density from line transects sampling of biological populations. Wildl. Monogr. 72: 1-202.

Caughley, G. 1977. Analysis of vertebrate populations. John Wiley and Sons, New York: 234 pp.

Colwell, M. A., and R. J. Cooper. 1993. Estimates of coastal shorebird abundance: the importance of multiple counts. J. Field Ornithol. 64(3): 293-301.

Cooperrider, A. Y., R. J. Boyd, and H. R. Stuart. 1986. Inventory and monitoring of wildlife habitat. U. S. Department of Interior, Bureau of Land Management Service Center, Colorado: 858 pp.

Dzieciolowski, R., J. Krupka, and R. Dziedzic. 1980. Argali and Siberian ibex populations in Khuhsyrh Reserve in Mongolian Altai. Acta Theriol. 25(16): 213-219.

Edge, W. D., and S. L. Olson-Edge. 1990. Population characteristics and group composition of *Capra aegagrus* in Kirthar National Park, Pakistan. J. Mammal. 71(2): 156-160.

Eltringham, S. K. 1973. An assessment of variability in repeated ground counts of large African mammals. J. Appl. Ecology. 10(2): 409-415.

Fox, J. L., C. Nurbu, and R. S. Chundawat. 1991. The mountain ungulates of Ladakh, India. Bio. Cons. 58: 167-190.

_____., S. P. Sinha, and R. S. Chundawat. 1992. Activity patterns and habitat use of ibex in the Himalaya Mountains of India. J. Mammal. 73(3): 527-534.

Habibi, K. (un-published manuscript). Status of markhor *Capra falconeri Kashmirensis* in Chitral Gol National Park and Tushi Game Reserve: 8 pp.

Harris, R. B. 1993. Wildlife conservation in Yeniugou, Qinghai province, China. Ph.D. Thesis, Univ. of Montana, USA: 327 pp.

____. 1994. Dealing with uncertainty in counts of mountain ungulates. Proceedings of the International Snow Leopard Symposium 7: 105-111.

Hess, R., K. Bollmann, G. Rasool, A. A. Chaudhry, A. T. Virk and A. Ahmed. 1997. Pakistan Country Report. Pages 239-260, in D. M. Shackleton ed. Wild sheep and goats and their relatives. Status Survey and Conservation Action Plan for Caprinae. IUCN, Gland, Switzerland.

Jackson, R., and D. O. Hunter. 1996. Snow leopard survey and conservation handbook. 2nd edition. International Snow Leopard Trust, Seattle, USA. 154 pp + appendices.

LeResche, R. E., and R. A. Rausch. 1974. Accuracy and precision of aerial moose censusing. J. Wildl. Manage. 38(2): 175-182.

Magin, C. D. 1989. Variability in total ground counts on a Kenyan game ranch. Afr. J. Ecol. 27: 297-303.

Marks, S. A. 1994. Local hunters and wildlife surveys: a design to enhance participation. African Journal of Ecology, Vol. 32: 233-254.

_____. 1996. Local hunters and wildlife surveys: An assessment and comparison of counts for 1989, 1990 and 1993. African Journal of Ecology, Vol. 34: 237-257.

McCullough, D. R. 1993. Variation in Black-tailed deer herd composition counts. J. Wildl. Manage. 57: 890-897.

_____. 1994. What do herd composition counts tell us? Wildl. Soc. Bull. 22: 295-300.

Reilly, B. K., and R. H. Emslie. 1998. Power and precision of replicated helicopter surveys in mixed bushveld. Koedoe 41(1): 47-56.

Roberts, T. J. 1997. The mammals of Pakistan. 2nd edition. Oxford Univ. Press, Karachi: 525 pp.

Saunders, D. A. 1990. The landscape approach to conservation: community involvement, the only practical solution. Australian Zoologist, Vol. 26(2): 49-53.

Schaller, G. B. 1977. Mountain monarchs: wild sheep and goats of the Himalaya. Univ. Chicago Press, Chicago: 425 pp.

Seber, G. A. F. 1982. The estimation of animal abundance and related parameters. 2nd edition. Oxford Univ. Press, New York, USA: 654pp.

UNDP. 1999. Pakistan Mountain Areas Conservancy Project (MACP); a project proposal: 122 pp.

WCP. 1997. Wildlife Conservation Plans, Khyber and SKB Community Conservation Areas, un-published documents, IUCN, Gilgit, Pakistan.

Western, D. and R. M. Wright. 1994. The Background to community-based conservation. Pages 1-12 in D. Western and R. M. Wright. eds., Natural connections: perspectives in community-based conservation. Island Press, Washington, D. C.

Chapter-5

5. Effectiveness of Community Based Incentive Measures

In this chapter, I summarize some of the main findings of my field research (Chapters 3 and 4), particularly the issues concerning community involvement, control of poaching, status of wild ungulate populations, and changes in attitudes and perceptions of the local communities toward wildlife and its conservation after introduction of incentive measures. While summarizing these, I evaluate the effectiveness of the community-based incentive measures approach adopted by the Biodiversity Conservation Project to motivate local communities in Northern Areas (NAs) of Pakistan toward conservation and sustainable use of wildlife resources. I also examine factors that contributed to success, and sustainability. Finally, I discuss constraints faced in implementing these measures and replicability of the incentives approach.

Several questions concerning effectiveness of incentive measures were included in the key informant interviews conducted to study attitudes and perceptions of the villagers toward wildlife and its conservation (Chapter 3). Key informants were asked their opinion regarding the project's ability to motivate villagers for conservation and sustainable use of their natural resources. These interviews were useful in crosschecking (triangulation) information obtained from project documents and reports (Pretty et al. 1995) on the incentive measures (Chapter 2). On several occasions, I participated in quarterly meetings of the Village Conservation Committees (VCCs), which provided feedback from the local communities on some of the incentive measures. My participation in the annual reviews of the village conservation and development action plans provided me an opportunity to make a better assessment of the effectiveness of the incentives approach. I occasionally held informal discussions with community representatives and local hunters regarding village "watch and ward" activities, poaching incidents, trophy hunting, Village Conservation Funds (VCFs), and implementation of the physical infrastructure projects. This helped me understand villagers' perceptions

about the Community-based Conservation (CBC) approach and the effects of incentive measures.

5.1. Community involvement

Local communities were deprived of their traditional rights for so long that they did not trust government agencies. They often were skeptical about the motives of outside Non-Government Organizations (NGOs), too. Villages were afraid the government would take over their land and its resources to create another national park (e.g. people of Khyber). Therefore, participation in initial meetings about the project was relatively low, but after the Participatory Rural Appraisals and numerous interactions between community representatives and the project staff, the villagers' interest in the project gradually increased. As a result, the number of people attending village meetings increased. The process of participatory planning and learning was effective in stimulating community involvement in the program. This further gained momentum when the villagers prepared Village Management Plans, signed Terms of Partnerships with the project, and received their first payments for the infrastructure projects financed under the program (social and economic incentives). This whole process took almost a year and the villagers liked it. One key informant from Skoyo-Karabathang-Basingo (SKB) said "we have never experienced such a moment before when someone listened to our problems, helped us in village management planning, and provided us funds to build irrigation channels for increasing our arable lands. This is all because of the wild animals found in our mountains and when we protect them we might be able to get more benefits in the future." Out of 15 key informants interviewed, 12 said the villagers were encouraged by the physical infrastructure project they received under the program and now everyone willingly talks about the protection of wild animals. One key informant from Khyber said, "when people felt that wild animals belonged to us, they started giving importance to them; but when they believed that these belonged to government, nobody took interest." The effectiveness of some incentives to motivate the villagers for their participation in the conservation program was also evident from the results of my

questionnaire survey conducted in 1997. The majority of respondents (88%) said participation by local people in the program is a step in the right direction because the community would benefit and poaching of wild animals would decline (Chapter 3). Moreover, the people of Khyber and SKB bore half of the labor cost of the infrastructure projects and one-fourth of the initial capital for the VCFs, which showed their commitment to the project. This also ensured their long-term involvement in the village-based conservation program.

The level of local peoples' participation in a conservation project often depends on the strength or maturity of local institutions. The Village Organizations (VOs) and other institutions at Khyber evolved over the last 15 years while working with the Aga Khan Rural Support Program (AKRSP) and they were sufficiently mature to involve the whole community in conservation activities. In SKB, the supra-village level VCC established under the CBC project was still in its embryonic stage. Perhaps this is why it could not mobilize the whole community to participate actively in conservation actions, despite the number of incentives introduced under the project.

5.2. Control of poaching

Villagers believed that indiscriminate killing was the primary cause of decline in wildlife numbers during the past in Khyber and SKB (Chapter 3). The villagers were able to curtail poaching through "watch and ward" activities and by frequent patrol by Village Wildlife Guides (VWGs). No incidents of poaching were known from Khyber after the inception of the village-based conservation program. Three incidents of killing of markhor and ibex were reported from SKB; 2 outsiders were involved. The decline in poaching after the introduction of community-based incentives has been reported elsewhere (Lewis et al. 1990, McNeely and Dobias 1991, Barbier 1992). During a questionnaire survey in 1997, most of the villagers believed the government couldn't manage wildlife resources alone because it needed local peoples' cooperation to control poaching. One of the advantages of the CBC approach perceived by the villagers was that

it decreased poaching (Chapter 3). The introduction of the community-based trophy hunting program provided an incentive for the villagers to protect their wildlife resources. It gave them an idea of the value of this resource; hence, most villagers believed that sustainable use of wildlife had the potential to run the self-supporting community-led wildlife management program and to support socio-economic development of their village. Though poaching by local hunters in SKB was controlled, poaching by outsiders remained a major threat. There were 2 main reasons for this: (1) loop-holes in village "watch and ward" system put in place by the people of SKB; and (2) jealousies of hunters from nearby villages on locking up a resource that they utilized in the past. Hence, effective protection of wildlife in SKB remains questionable.

5.3. Status of wild ungulates

Though ungulate populations often recover if threats to them and their habitats are removed, 3 years probably were not long enough to provide any hard evidence that populations of these species increased due to incentive measures introduced by the project. However, sightings of these animals (particularly of ibex) increased substantially in both Khyber and SKB. For example, the number of ibex observed during winter counts in Khyber increased from 63 in 1996 to 152 in 1998. Similarly, the number of juveniles per 100 females increased from 48 in 1996 to 73 in 1998, which suggests good recruitment in the ibex population in Khyber. In SKB, I found 71 juvenile ibex per 100 females in 1996 and 77 in 1998, indicating healthy reproduction in this population (Chapter 4). The markhor population in SKB was too small to detect any change in numbers (see details in Chapter 4). The villagers, however, reported frequent sightings of markhor at lower elevations close to human settlements; these animals may see little danger from the presence of humans in close proximity.

The training of VWGs in wildlife surveys and the community-based wildlife monitoring system introduced by the project was effective in generating local peoples' interest in annual wildlife surveys to provide knowledge concerning the status of their

wildlife resources. For example, the people of Khyber conducted several ibex surveys without any assistance from the project. They provided status reports on the ibex population in their conservation area to the NAs Forestry, Parks, and Wildlife Department and local conservation NGOs; this showed a positive aspect of the communities' embrace of the conservation program.

5.4. Changes in attitudes and perceptions

The incentive measures also had a positive effect on the attitudes and perceptions of local people about wildlife and the CBC approach. The villagers who were pessimistic in the beginning later became enthusiastic about the program. One of them even became the president of the VCC, and he represented the community for several District Conservation Committee meetings (pers. obser.). The attitudes and perceptions of local people towards wildlife and CBC approach during late 1997 were overwhelmingly in favor (97%) of conservation of wild animals and plants. Even the villagers who lost livestock due to depredation supported wildlife conservation (but still held their reservations toward predators). When they were asked what types of benefits the community could get from wildlife resources, village development, collective income, and beauty of their area were mentioned by most. The villagers' often linked conservation of wildlife to development of their villages (Chapter 3). Similarly, the majority of the villagers said they liked their involvement in the conservation program because they received benefits. The opportunity to obtain more land for individual households was acknowledged by most key informants. For example, the people of Khyber had equally divided the newly acquired land among 84 households. The interviewees reported that an increase in their land holding or irrigated land meant, they would be able to grow more fodder and crops, hence achieve an increased annual household income. The most frequently mentioned advantages of the CBC approach were village development, unity among villagers, and reduction in poaching (Chapter 3). In the same study, villagers were asked: "How would you like to utilize income generated from the sustainable use of wildlife resources?" Only 4% said they would like to see the income divided among the

households (Chapter 3). The active involvement of former hunters and community activists in monitoring wildlife numbers and the community-based trophy hunting program also suggested that some of the social and economic incentives introduced by the project were effective in changing attitudes and perceptions of local communities toward wild species and their conservation. The improvement in attitudes towards wildlife and its conservation due to community-based incentives have been documented elsewhere (e.g. Lewis 1993, Child 1996, Lewis and Alpert 1997, Mehta and Kellert 1998). Moreover, incentive measures were not only effective in changing the attitude of people of Khyber and SKB, but the practical demonstration of the incentives also affected the adjacent communities' attitude towards wild species, even though they did not receive any benefit from the program. For example, in 2 cases people from adjacent villages (one each to SKB and Khyber) voluntarily released snow leopards back to the wild that were trapped in livestock sheds after killing goats of a local farmer. In the past, they would certainly have been killed because they are seen as a threat to livestock, the main source of income of local people. Incentive measures introduced by the project brought a positive change in local peoples' attitude about wild species.

5.5. Factors contributing to success

It is to early to tell if the CBC will be successful in solving Pakistan's conservation problems in the long run; however, initial results were quite promising. A number of factors contributed to this initial success in CBC initiatives. The main factors included: (1) participatory and flexible approach adopted by the project; (2) building on the social infrastructure (VOs) created by the AKRSP and strengthening it by establishing watershed level VCCs; (3) financial assistance from the project for construction of new irrigation channels for land development; (4) institution of VCFs; (5) local capacity building; (6) devolving control over wildlife resources to local communities; (7) establishment of community-based trophy hunting programs; and (8) effective participation of working partners (government agencies, local NGOs, and local communities). The project largely benefited from the social organization work of

AKRSP. Therefore, working through the existing social setups provided easy access to the local institutions (VOs), at least for the demonstration phase of the project. However, 2 main issues largely remained un-tackled: (1) livestock depredation by snow leopards and wolves was a serious problem for the local communities; the Biodiversity Conservation Project could not develop an appropriate strategy to address this problem or provide a mechanism for giving some relief to the individual households for the loss of their livestock; (2) the project heavily focused on big-game trophy hunting as a sustainable use activity, while other avenues (e.g. ecotourism, use of medicinal plants, game bird hunting, etc.) for generating funds for the village-based conservation program were poorly explored. In case of market failure or complications in tourist safari hunting, the local communities would have no alternative to continue their conservation and development programs. These issues could have serious implications for maintaining the initial success in CBC efforts unless they are addressed effectively.

Economic incentives often encourage conservation and sustainable use of wild species (McNeely 1988). This is largely true, but social and institutional incentives (e.g. villagers' participation in planning and decision-making and regaining control over natural resource) may be equally important for motivating local communities for conservation (Chapter 3). Regular interactions between the project staff and community representatives helped build trust and provided a mean for dissemination of information to the villagers. Recognizing that success rested on stable local institutions, the Biodiversity Conservation Project focused on building local-level capacity to implement a village-based conservation strategy. Rather than creating dependency on external agencies, the objective was to enhance local peoples' skill to manage their own wildlife resources.

5.6. Sustainability of incentive measures approach

Long-term commitment by the community and continuous support of the government are fundamental for the sustainability of wildlife in NAs of Pakistan. The

communities will probably remain committed as long as some of the incentives introduced by the project remain intact (e.g. VCFs and community-based trophy hunting program). The measures undertaken by the project to ensure ecological, social, institutional, and economic sustainability in the incentive measures approach included:

1. Introducing sustainable use of wild resources based on biological, economic, and social factors will foster ecological sustainability in the long run. By minimizing the chances of destructive resource-use practices (indiscriminate hunting) and giving value to wild species (trophy hunting), the project provided an effective incentive for the long-term viability of wildlife species.
2. Active participation of local communities in planning and implementation of conservation activities at the village level ensured social sustainability. Two key informants from Khyber reported that the villagers felt they could run the program with little support from outside agencies. This showed the strength of the village-based conservation initiative. The full involvement of the villagers in preparation and implementation of Village Management Plans and Wildlife Conservation Plans was instrumental in reflecting perceptions and needs of the local people, which ensured long-term commitment and support from the community.
3. Establishment of the VCCs at the village level and District Conservation Committees at the district levels provided a mechanism for local management of wildlife resources and ensured institutional sustainability. The designation of Khyber and SKB as community-managed Controlled Hunting Areas (a de facto resource tenure) and appointment of community representative as Honorary Wildlife Officers enabled local communities to regain control over local resources and make investments in conservation initiatives. Enhancement of technical skills of the villagers through training former hunters as VWGs ensured sustainability in the village-based wildlife monitoring system (Chapter 4).

4. Financial stability was ensured by establishing VCFs as self-sustaining financial mechanisms for supporting conservation activities in the long run. Giving (income from trophy hunting) local communities an incentive to generate income and re-invest in conservation and sustainable use of wild species may have provided a sound footing for the program.

The Biodiversity Conservation Project focused only on those programs that the villagers could manage after external support is withdrawn. Encouraging people to participate and making them invest in conservation and development activities have insured continuation of some of the activities. Sustainability of some incentives (e.g. effective management of VCFs and marketing of trophy hunts), however, remains a challenge.

5.7. **Constraints in implementation of incentives**

Constraints which the incentive measures are intended to overcome include: lack of land tenure and usufruct rights; unclear responsibility for resource conservation; insufficient understanding of rights and options available under the laws; lack of access to resources, expertise, appropriate markets; and lack of awareness concerning benefits available from conservation actions (McNeely 1988). Constraints to implement incentives in different communities often vary, both in kind and degree. It is, therefore, important that local power structures, socioeconomic conditions, and health of the natural resource base be understood before designing appropriate incentive measures. Some of the constraints faced while implementing incentives introduced under the Biodiversity Conservation Project included:

1. *Distrust of government agencies*: Initially, the program faced many difficulties because local communities did not trust government. The villagers were afraid that the project was an excuse to take over their land and resources by the government. For example, the people of Khyber documented in their Village

Management Plan that they would withdraw from the project if government took over the project. Some communities took almost a year to decide whether or not to participate in the program, while others collaborated conditionally. Hence, it took considerable time to build project credibility.

2. *Low populations of wild species*: Control over wildlife resources was given back to local communities only after wildlife populations had been depleted. This meant the communities first had to face the challenge of increasing these populations to a level where sustainable use was feasible. Under such circumstances, communities have to wait for years to derive any economic benefit, which may undermine the strength of the incentive measures approach (e.g. markhor population in SKB).
3. *Lack of tenure over land and its resources*: Under existing law, land above the water channels belongs to the state, though local people have customary (de facto) rights of access to high pastures and firewood collection from the natural forests (Chapter 3). Hence, lack of tenurial rights over land and its resources remained an obstacle for the local communities to make long-term investments in conservation initiatives.
4. *Lack of local management capacity:* Capacity building by its very nature is a long-term and slow process, particularly in mountain communities with inherent logistical constraints. The major obstacle faced in SKB was the inability of the newly established VCC to coordinate activities related to conservation incentives at the watershed level. Therefore, the project had to struggle with the implementation of some of the incentives given at the village level (e.g. implementation of the infrastructure projects, effective "watch and ward", and monitoring of wildlife numbers).
5. *Complexity of sport/trophy hunting market*: A sustainable, community-based trophy hunting program was one of the main economic incentives. However, the trophy hunting market is international (in Europe and the U.S.), which is beyond the reach of local communities. Communities had to rely on outside support to benefit from this opportunity. If this support is withdrawn,

communities will have difficulties sustaining this activity in the long run, unless another mechanism is developed.

6. *Lack of supporting policies and legislations*: One of the main objectives of the project was to empower local communities to sustainably manage their wildlife resources. No such provision existed in the previous wildlife regulations, which made it difficult for the people of Khyber and SKB to keep their wildlife resources from being exploited by outsiders. The communities, however, were empowered in the later stage of project implementation (October 1998) by designating community-managed Controlled Hunting Areas and appointing community representatives as Honorary Wildlife Officers; the effectiveness of this incentive remains to be assessed.
7. *Lack of conservation awareness*: Conservation awareness adds a moral dimension to the conservation initiative. Insufficient awareness among the villagers about the ecological implications of some current resource-use practices may hinder the outcome of some incentives. For example, the role of predators in maintaining healthy populations of mountain ungulates with potential trophy values is rarely considered in local decision making.
8. *Lack of monitoring capacity*: Strong monitoring of the effectiveness of incentives is critical for successful community-based incentive measures. Generally, both the community and project staff lacked capacity for the timely monitoring of the effectiveness of each incentive introduced; this made it difficult to assess which incentive was most effective.

5.8. Replicability of the approach

Can community-based incentive measures introduced under the Biodiversity Conservation Project serve as a model for programs elsewhere? There is no easy answer because no single incentive is suited in all conditions. Supportive government policies and regulations, effective local institutions, appropriate land tenure and usufruct rights, and social receptivity of conservation initiatives are essential ingredients for incentives to

be effective. Incentives designed for one setting may not be appropriate for another, calling for a site-specific design of incentives and disincentives (McNeely 1993). Moreover, different communities have different capacities and needs and, therefore, require different approaches. However, it is often easier to design community-based conservation programs where: communities are organized, local institutions are strong, wildlife resources are intact and valued by the local people, conservation initiatives are socially acceptable, sustainable use of wild species has a potential to provide economic benefits to local communities, and/or wildlife attractions could bring large revenues from international tourists. The detailed guidelines provided by McNeely (1988) and the work of Swanson and Barbier (1992) are highly relevant for designing community-based incentive measures for conserving wild species in the rural landscape.

5.9. Conclusion

The Biodiversity Conservation Project certainly did not solve all of the conservation problems facing NAs of Pakistan, but it did demonstrate the potential of using community-based incentive measures and a new way of conserving wildlife resources of the country. The project benefited the local communities by providing them economic and social benefits and built their capacity for managing natural resources. By involving local communities in conservation activities, the project impacted management of wildlife resources in a way that was highly cost-effective, at least at the local level. Involvement of local people in planning and implementation of the village-based conservation program was instrumental in reducing the level of poaching, which led to frequent sighting of wild animals (e.g. ibex, markhor, and snow leopard) close to human settlements, and probably to an increase in ibex numbers in the community-managed Controlled Hunting Areas. The project was able to build its credibility after overcoming some initial difficulties. The incentives introduced helped improve the attitudes and perceptions of local people towards wildlife and the CBC approach. The project induced an awareness of the value and need to manage wildlife resources sustainably, and provided a self-supporting mechanism by instituting VCFs and a community-based

trophy hunting program. However, the sustainability of these initiatives remains a challenge. Although the Biodiversity Conservation Project was able to devolve control over wildlife resources back to the local communities, ultimate ownership of wildlife remains in the hands of government, which has the authority to make the most important decisions related to wildlife management, including allocation of trophy hunting quotas and disbursement of the communities' share from the trophy hunting permit fees. Local people do not yet have the capacity to interact with government authorities without the help of intermediary agencies (e.g. conservation NGOs); this will probably change as the CBC movement progresses.

The experience from recent efforts for conservation of biological resources in Pakistan suggests that a partnership between government, donor agencies, conservation NGOs, and local communities helps achieve long-term goals of conservation. Changing attitudes and introduction of local management systems takes time. Results are not easily quantifiable, so it is important to keep track of the effectiveness of community-based incentive measures to monitor change in wildlife populations. Establishing a system for conserving biological diversity in NAs of Pakistan will require a combination of incentives and disincentives, sustainable use areas and protected areas, wildlife use regulations, economic benefits, law enforcement, conservation education and awareness, and enhanced resource tenure to the local communities. Finding an effective combination of incentives and disincentives will require much more flexibility. What will work will not likely be obvious at the onset of a program; success must be measured in small increments (Hackel 1999). Incentive measures, whether economic, social, or service oriented, are probably the best bet at present for conservation of wild species in the rural landscape of Pakistan and elsewhere in developing nations.

5.10. Literature Cited

Barbier, E. B. 1992. Community-based development in Africa. Pages 103-135 in T. W. Swanson and E. B. Barbier (eds.), Economics for the wilds; wildlife, diversity, and development. Island Press, Washington D.C.

Child, G. 1996. The practice and principles of community-based wildlife management in Zimbabwe: the CAMPFIRE programme. Biodiversity and Conservation, 5: 369-398.

Hackel, J. D. 1999. Community conservation and the future of Africa's wildlife. Conservation Biology 13(4): 726-734.

Lewis, D. M., G. B. Kaweche, and A. N. Mwenya. 1990. Conservation outside protected areas: lessons from an experiment in Zambia. Conservation Biology, 4 (2): 171-180.

____. 1993. The Zambian way to Africanize conservation. Pages 77-99 in D. M. Lewis and N. Carter (eds.), Voices from Africa; Local perspectives on conservation. World Wide Fund. Washington D.C.

____., and P. Alpert 1997. Trophy hunting and wildlife conservation in Zambia. Conservation Biology 11(1): 59-68.

McNeely, J.A. 1988. Economics and biological diversity: developing and using economic incentives to conserve biological resources. IUCN, Gland: 236pp.

McNeely, J. A. 1993. Economic incentives for conserving biodiversity: lessons for Africa. Ambio 22(2-3): 144-150.

____., and R. J. Dobias. 1991. Economic incentives for conserving biodiversity in Thailand. Ambio 20(2): 86-90.

Mehta, J. N., and S.R. Kellert. 1998. Local attitude toward community-based conservation policy and programmes in Nepal: a case study in the Makalu-Barun Conservation Area. Environmental Conservation 25(4): 320-333.

Pretty J. N., I. Guijt, I. Scoones, and J. Thomson. 1995. A trainer's guide for participatory learning and action. International Institute for Environment and Development, London: 267pp.

Swanson, T. M. and E. B. Barbier (eds.) 1992. Economics for the wilds; wildlife, diversity, and development. Island Press, Washington D.C: 226pp.

Appendix - I

Questionnaire

Knowledge, Attitudes, and Perceptions of Local People toward Wildlife and Community-Based Conservation Approach in Northern Areas of Pakistan

Questionnaire Number: _____ **Date:**_____

Interviewers Name: _____

Area: _____

Village: _____

Dear Sir/Madam,

Aslam-u-Alaikum!

I am evaluating Biodiversity Conservation Project which is being implemented in your area jointly by the local communities and IUCN (The World Conservation Union) in collaboration with Agha Khan Rural Support Programme (AKRSP) and Forest Department, Northern Areas. W e are conducting a research study to learn about socio-economic profile of your village; consumptive and non-consumptive uses of wildlife; and peoples' knowledge, attitudes, perceptions and behaviour toward wildlife and community-based conservation approaches adopted by the Project.

Your household has been chosen randomly as one of the select sample of your village, hence your views are very important to us. For this study to be successful, it is important that you answer the questions thoughtfully, honestly and without any hesitation. You are not required or obliged to answer any of the questions that you may feel uncomfortable with. If you opt not to answer any of the questions, it will not result in any kind of penalty. I tell you this is not any kind of test and there is no right or wrong answer. It is also important that you answer the questions only on the basis of experience of your household and not from the rest of the village. I assure you that all of your responses are completely confidential. Neither your name nor other identifying characteristics will be associated in publication with the information you will give to me, so please feel free to express your opinion.

Section - I. Current land use practices

1. What types of crops do you grow on your agriculture land?

Crop Type	(Tick if "yes")	**Any Sold**	(Tick if "yes")
Wheat			
Maize			
potato			
Millet			
Barley			
Buckwheat			
Peas			
Turnip/Carrot			
Alfalfa			
Vegetables			
Others (if any)			

2. Main method of plowing.

1 = Hand 2 = Cattle 3 = Donkey 4 = Yak/Zo 5 = Tractor [ ]

3. Livestock owned by household members.

Livestock Type	**Number**	**No. sold last year**
Yak		
Zo/Zomo		
Cows		
Goats		
Sheep		
Horses/Donkeys		
Chicken		
Others (if any)		

4. What type of fruit trees or plantation do you raise on your land?

Fruit Trees	(Tick as responded)	**Sold on commercial basis** (yes/no)
Apple		
Apricot		
Peaches		
Walnut		
Cherry		
Grapes		
Mulberry		
Others (if any)		

Plantation

Poplar	_____	_____
Willow	_____	_____
Ailanthus/ Robinia	_____	_____
Mulberry	_____	_____
Seabuckthorne	_____	_____
Russian Olive	_____	_____
Others	_____	_____

5. Do you use firewood for cooking and heating rooms?

0 = No 1 = Yes [ ]

5a. If no, what do you use?

_____

_____

5b. If yes, who collects it? (Tick as responded)

Men : _____
Women : _____
Children: _____

5c. What is the approximate monthly consumption of firewood at your household (approximately how many back loads or basket loads or donkey loads or maund or kg)?
(in winter) _____
(In summer) _____

5d. From where do you mostly collect this firewood?

1. Natural Forests _____
2. Plantations _____
3. Pruning of fruit trees _____

5e. If from the natural forests, how for away? Time it takes _____
Distance: _____km

6. Your village have some common pastures. Do you take your livestock there?

0 = No 1 = Yes [ ]

6a. If yes, what type of livestock and how long?

Pasture's Name	Livestock Type	Duration	Season

Section - II: Knowledge, Attitudes and Perceptions toward Wildlife

Now I would like to learn about your knowledge and feelings about wild animals found in the mountains around your village. I believe you know more about them than anybody else from outside the village. So, tell me something about them.

1. What types of wild animals are you aware of in your area? How common are they?

Note for Interviewer: Please do not tell names of the animals. Tick only when respondent speaks out.

Species	Local Name			Tick as responded		
	Urdu	Wakhi	Balti	Common	Rare	Have no idea
Markhor (Capra falconeri)	Boom	Youkish	Chura			
Asiatic ibex (Capra ibex)	Keel	Vezik	Skin			
Musk deer (Moschus chrysogaster)	Mushik-e-Nafa Hiron	Kurmai	Khla			
Snow Leopard (Unica unica)	Barfanni Cheeta	Pes	Khchen			
Wolf (Canis lupus	Bharria	Shapt	Hubo			
Red Fox (Vulpes vulpes)	Lumurri	Nakhcheer	Wa			
Snow Cock (Tetregalus himalaynsis)	Ram Chakur	Kherz	Gumo			
Chakur Partridge (Alectris chukar)	Chakur	Chikair	Straqpa			
Cape Hare (Lepus capensis)	Khergoosh	Sui	Rayang			
Golden Eagle (Aquila chrysaetos)	Uqqab	Busir	Dayandak			
_____(Any other spp.)						

* Tick in upper half of box for abundance and trend in lower half of box.

\+ increasing in past 5 years
\- decreasing in past 5 years
0 about the same

2. In your opinion, the ownership of these animals belong to whom?

Note for Interviewer: Please do not suggest these options, just tick as responded by the people.

(Tick as responded)

	Who do they belong to?	Who should they belong to?
a. Government	_____	_____
b. Common resource of our village	_____	_____
c. Belongs to no body	_____	_____
d. I don't know	_____	_____

3. Do you think these animals currently provides any benefit at all for:

a. Your household

0 = No benefit 1 = Yes, they are useful [ ]

If yes, what type of benefits?

a. _____
b. _____
c. _____
d. _____

b. Community in general

0 = No benefit 1 = Yes, they are useful [ ]

If yes, what type of benefits community can get?

a. _____
b. _____
c. _____
d. _____

4. What do you consider are the disadvantages of wildlife for your household or the community in general?

a. _____
b. _____

c. _____
d. _____

5. Did your household suffer from livestock depredation due to wild animals within the last three years? Tell only about your losses not those of the other villagers.

No = 0 Yes = 1 [ ]

5a. If yes, what was lost and which species was responsible?

Livestock Type	Number Lost	Species Responsible
Cattle/yak/zo/zomo	_____	_____
Sheep/goats	_____	_____
Horses/donkeys	_____	_____
Chicken	_____	_____
_____	_____	_____

5b. What measures do you take to reduce loss of your livestock?

a. _____
b. _____
c. _____
d. _____

5c. What measures should be taken to prevent livestock losses by wild animals (like snow leopard, wolf, and foxes)?

a. _____
b. _____
c. _____
d. _____

6. Had any of the predatory animals been killed in you village during the past 3 years?

No = 0 Yes = 1 [ ]

If yes, how many of each of the following predators have been killed?

a. Snow Leopard _____
b. Wolf _____
c. Foxes _____
d. Hawks/eagles _____
e. Others _____

7. Is the conservation of wild animals and plants a good or a bad thing?

Good = 1, Bad = 0 [ ]

8. What do you think, are the main causes of decrease in wildlife numbers of those species, which you have mentioned earlier as declining?

Note for Interviewer: Please cross check this response with the responses at question # one of this section.

a. _____
b. _____
c. _____
d. _____
e. _____

9. If hunting was the main cause of decline in numbers, who used to hunt in your area?

a. _____
b. _____
c. _____

10. Do you think hunting of wild animals occur now-a-days in your area?

No = 0 Yes = 1 [ ]

If yes, which animal is being killed and how many?

Animal : _____ Numbers: _____

Section - III: Consumptive and Non-Consumptive Uses of Wildlife

For this section I would like to ask you whether you or any of your household members have ever used wild animals for meat, trophies, skin, pelts etc. I am not interested whether it was taken legally or illegally. This is just for the sake of information whether local people use wild species or not. Similarly, I would like to ask whether any one from your household likes to watch wildlife or guide tourists for wildlife viewing in your area. I would like to re-iterate here that all the answers you will give are confidential and they will not be used to penalise anybody in any way. I tell you, I am not interested in judging peoples' practices, I am merely trying to understand them.

1. Did anyone from your village hunt wild animals during the last five years?

No = 0, Yes = 1 I don't know = 2 [ ]

1a. If yes, what species and for what purpose and how many? (meat, trophy, skin, pelt etc.)

Species	Purpose	How many?
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

2. Did anyone from your household sell any wildlife products e.g. meat, horns, skin or musk etc. during the last five years?

No = 0 Yes = 1 [ ]

2a. If yes, what was sold?

a. _____
b. _____
c. _____

3. Have the villagers ever had discussion among themselves about the wild animals?

No = 0 Yes = 1 [ ]

3a. If yes, on what subjects?

a. _____
b. _____
c. _____

4. Does anyone from your household like to watch birds and animals in the wild?

No = 0 Yes = 1 [ ]

5. In the last two years, have you been outdoors primarily to see wildlife?

No = 0 Yes = 1 [ ]

5a. If yes, how many times?

1. _____ 1 time
2. _____ 2 - 3 times
3. _____ 4 - 5 times
4. _____ more than 5 times

Section - IV: Attitudes and Perceptions toward Community-Based Conservation Approach

Now I would like to ask you about your feelings on local communities participation in Wildlife Conservation Projects (community-based conservation approach).

1. How successful is the government in managing wildlife resources in your area?

   a. Very good
   b. good
   c. Fair
   d. Poor
   e. Very poor [ ]

2. In your opinion, can government alone manage wildlife resources?.

   No = 0 Yes = 1 I don't know = 2

   If no, why?
   d. _____
   e. _____
   c. _____
   d. _____

   If yes, how?
   a. _____
   b. _____
   c. _____

3. Do you feel the participation of the local community in conservation of wildlife is a step towards right direction?

   No = 0 Yes = 1 I don't know = 2 [ ]

   3a. If no, why? _____

   3b. If yes, why? _____

   3c. If yes, what type of community conservation area management system would you like to see? Tick as answered by the respondent.

   a. Totally managed by the community _____
   b. Jointly managed by the government and the local community _____

c. Collaboratively managed by the local community, conservation NGOs, and government _____
d. Local community and NGOs under participatory approach _____
e. I don't know _____

4. What do you consider are the benefits of the community-based conservation approach?

a. _____
b. _____
c. _____

5. What do you consider are the disadvantages of the community-based conservation approach?

a. _____
b. _____
c. _____

6. If populations of ibex, markhor, etc. increase, what do you think should occur? (Tick as many as you like)

a. trophy hunting by foreigners _____
b. trophy hunting by Pakistanis _____
c. hunting for meat by the local hunters under the sustainable use principle _____
d. show to ecotourists _____
e. enjoy viewing them by ourselves _____
f. others _____ _____

6a. What facilities do you think are necessary at the village level to establish successful trophy hunting program?

a. _____
b. _____
c. _____
d. _____

7. How much income do you think this programme could bring annually to your village?

a. Approximately Rs. _____ b. I don't know _____

8. Do you think that income generated from wildlife use could provide a valuable addition to the overall economic development of your village?

No = 0, Yes = 1, I don't know = 2 [ ]

9. If your community began receiving income from wildlife utilization, what would you like to spend most of the money on?

Note for Interviewer: Please do not speak out options, just tick as responded by the people .

		Tick as responded
a.	Social works	_____
b.	Economic development of the village	_____
c.	Deposit in Village Conservation Fund for conservation of wild animals	_____
d.	Divide among households	_____
e.	I don't know	_____

Section - V: Personal/Household Data

To conclude, let me ask you a few questions about yourself.

1. Your place of birth _____
2. Gender (Male= 0) (Female=1): [ ]
3. Your age (in approximate years) _____
4. Number of people in the household under 15 years. _____
5. Number of people in the household over 15 years including yourself. _____
6. What is your (the respondent's) highest level of education:

   0 = None
   1 = Primary
   2 = Middle
   3 = Matric
   4 = Intermediate
   5 = Graduation and above [ ]
7. How many months per year are you resident in the village? _____
8. What are the sources of your household income? _____
   _____
   _____
9. Do any of your household members receive income from other economic activities e.g. wage labour, business, service etc.

   No = 0 Yes = 1 [ ]

   10a. If yes, from which household members. Describe their relationship to you and their work:

Member (Bro./son/wife etc.)	Description of work	Where ?
_____	_____	_____

_____	_____	_____
_____	_____	_____
_____	_____	_____

11. Could you (the respondent) give rough estimate of your household's annual income?

0 = Difficult to assess 1 = Yes [ ]

If yes, how much? (In rupees)

1 = ≤ 10,000
2 = 10,000 - 20,000
3 = 20,000 - 30,000
4 = 30,000 - 40,000
5 = 40,000 - 50,000
6 = ≥ 50,000 [ ]

12. What is your (the respondent's) approximate land holdings? (in Kanals)

a) Developed agriculture land

(including used for orchids and plantations) _____

b) Undeveloped land _____

THANK YOU VERY MUCH FOR YOUR TIME AND PATIENCE IN ANSWERING THESE QUESTIONS

SPACE FOR ANY ADDITIONAL COMMENTS FROM RESPONDENT

_____
_____
_____
_____
_____
_____
_____
_____
_____

****

Appendix - II

(A): Uniqueness probabilities for ibex groups observed (relative to a largest group) in each drainage during 3 consecutive day's RGCs in winter of 1998 at Khyber, NAs Pakistan (observations assigned 0.0 UPs are omitted for clarity).

Drainage	G. Size	UP	Distance[1]	Rationale[2]	Composition[3]
Shaojerab					
	22	1.00	-	-	2k, 4y, 8♀, 8♂
	10	1.00	1.0	S	2k, 1y, 4♀, 3♂
	2	1.00	1.5	S	1♀, 1♂
	11	0.05	0.3	C	3k, 2y, 3♀, 3♂
Kriligoze					
	9	1.00	-	-	2k, 1y, 4♀, 3♂
	8	0.05	0.5	C	1y, 4♀, 3♂
	5	0.05	1.5	T	2k, 1y, 2♀, 1♂
Roadside					
	37	1.00	-	-	
	16	1.00	7.5	C	6k, 1y, 12♀, 15♂, 3u
	11	1.00	7.0	C	7k, 2y, 7♀
	7	0.10	1.0	C	2k, 6♀, 3♂
	32	0.05	0.0	C	5K, 5y, 13♀, 9♂
	23	0.05	0.0	C	1k, 1y, 9♀, 8♂
Across River					
	18	1.00	-	-	4k, 1y, 7♀, 6♂
	3	0.50	2.0	C	1k, 2♀
	12	0.10	0.3	C	3k, 3y, 4♀, 2♂

[1] Distance (km) from the larger group observed during 3 consecutive days surveys.
[2] S = simultaneous observation; C = composition or size differ from (or similar to) the groups seen earlier; T = temporary or disturbed group.
[3] k = kid, y = yearling, ♀ = female, ♂ = male, u = unidentified

(B): Uniqueness probabilities for ibex groups observed (relative to a largest group) in each drainage during 3 consecutive day's RGCs in spring of 1998 at Khyber, NAs Pakistan (observations assigned 0.0 UPs are omitted for clarity).

Drainage	G. Size	UP	Distance[1]	Rationale[2]	Composition[3]
Shaojerab					
	37	1.00	-	-	7k, 6y, 10♀, 14♂
	9	1.00	2.0	C	2k, 1y, 2♀, 4♂
	2	0.05	0.4	C	2♂

	3	0.05	0.6	C	1k, 1y, 1♀
	6	0.05	1.5	C	1k, 1♀, 4♂
	11	0.05	1.0	C	3k, 3y, 3♀, 2♂
	10	0.05	0.5	C	2k, 2y, 4♀, 2♂
Kriligoze					
	15	1.00	-	-	5k, 3y, 5♀, 2♂
	4	1.00	1.5	S	2k, 2♀
	9	0.05	0.7	C	3k, 1y, 5♀
	6	0.05	0.0	C	1k, 2y, 1♀, 2♂
Roadside					
	18	1.00	-	-	5k, 5y, 8♀
	14	1.00	3.0	S	5k, 1y, 6♀, 2♂
	13	1.00	12.0	S	3k, 1y, 5♀, 4♂
	11	1.00	8.0	S	1y, 3♀, 7♂
	3	1.00	10.0	S	1k, 1y, 1♀
	6	1.00	6.0	S	2y, 4♀
	6	0.50	12.0	C	3♀, 3♂
	9	0.20	10.0	C	1y, 1♀, 7♂
	8	0.20	7.0	C	4k, 4♀
	11	0.10	10.0	C	4k, 2♀, 3♂
	11	0.10	7.0	C	2k, 2y, 6♂
	6	0.05	12.0	C	1k, 1♀, 4♂
	7	0.05	8.0	C	2k, 1y, 4♀
Across River					
	13	1.00	-	-	4k, 3y, 6♀
	4	1.00	0.5	S	1k, 1y, 2♀
	8	1.00	1.5	S	1k, 1y, 3♀, 3♂
	5	0.30	3.0	C	1k, 1y, 2♀, 1♂
	9	0.20	2.0	C	5♀, 4♂
	6	0.10	2.0	C	2k, 1y, 3♀
	8	0.05	0.5	C	2k, 3y, 3♀
	5	0.05	0.5	C	2k, 3♀

[1] Distance (km) from the larger group observed during 3 consecutive day's surveys.
[2] S = simultaneous observation; C = composition or size differ from (or similar to) the groups seen earlier; T = temporary or disturbed group.
[3] k = kid, y = yearling, ♀ = female, ♂ = male, u = unidentified

(C): Uniqueness probabilities for ibex groups observed (relative to a largest group) in each drainage during three consecutive day's RGCs in spring of 1998 at SKB, NAs Pakistan (observations assigned 0.0 UPs are omitted for clarity).

Drainage	G. Size	UP	Distance[1]	Rationale[2]	Composition[3]
Roadside					
	16	1.00	-	-	3k, 2y, 6♀, 5♂
	6	1.00	0.5	S	2y, 3♀, 1♂

	6	1.00	9.0	S	3k, 3♀
	4	1.00	10.0	S	2k, 2♀
	12	1.00	15.0	S	3k, 3y, 3♀, 3♂
	6	1.00	17.0	S	2k, 2y, 2♀
	9	1.00	10.0	C	2k, 2y, 4♀, 1♂
	7	0.10	14.0	C	2k, 2♀, 2♂, 1u
	3	0.10	6.0	C	1k, 1♀, 1♂
	4	0.05	0.6	C	2y, 1♀, 1♂
	7	0.05	16.0	C	4k, 3♀
Irk Nullah (lower)					
	14	-	-	-	
	4	1.00	0.4	S	2k, 1y, 5♀, 3♂, 3u
	7	1.00	1.0	S	1y, 1♀, 2♂
	5	1.00	1.0	S	2y, 2♀, 3♂
	3	1.00	3.0	S	1♀, 2♂
	9	1.00	3.5	S	1k, 2y, 4♀, 2♂
	8	1.00	4.2	S	2k, 2y, 3♀, 1♂
	6	0.05	2.0	C	2k, 1♀, 3♂
Irk Nullah (upper)					
	19	1.00	-	-	4k, 4y, 8♀, 3♂
	6	1.00	0.2	S	2y, 2♀, 2♂
	14	1.00	0.8	S	2k, 2y, 7♀, 3♂
	5	1.00	1.5	S	2♀, 3♂
	8	1.00	3.0	S	2k, 1y, 2♀, 3♂
	7	1.00	3.5	S	2♀, 5♂
	3	1.00	3.8	S	3♂
	10	0.05	2.5	C	2k, 2y, 3♀, 3♂
Basingo					
	14	1.00	-	-	2k, 2y, 4♀, 6♂
	6	1.00	4.0	S	2y, 2♀, 2♂
	11	1.05	1.0	C	2k, 1y, 4♀, 4♂
Karabathang					
	10	1.00	-	-	2k, 8♀, 1♂
	1	1.00	0.4	S	1♂
	1	0.05	1.0	C	1♂
Moniklugma (Skoyo)					
	9	1.00	-	S	1k, 2y, 5♀, 1♂
	4	1.00	1.0	S	1y, 3♀
	3	1.00	1.0	S	1k, 1♀, 1♂
	1	1.00	1.5	S	1♂
	3	1.00	2.0	S	1♀, 2♂
	6	1.00	2.5	S	1y, 5♀
	3	1.00	3.0	S	1♀, 2♂

[1] Distance (km) from the larger group observed during 3 consecutive day's surveys.
[2] S = simultaneous observation; C = composition or size differ from (or similar to) the groups seen earlier; T = temporary or disturbed group.
[3] k = kid, y = yearling, ♀ = female, ♂ = male, u = unidentified

(D): Uniqueness probabilities for ibex groups observed (relative to a largest group) in each drainage during three consecutive day's RGCs in winter of 1998 at Khyber, NAs Pakistan (observations assigned 0.0 Ups are omitted for clarity).

Drainage	G. Size	UP	Distance[1]	Rationale[2]	Composition[3]
Roadside					
	6	1.0	-	-	1k, 1y, 2♀, 2♂
	5	1.0	14.0	C	1y, 3♀, 1♂
Irik Nullah					
	5	1.0	-	-	2k, 1y, 2♀
	3	1.0	1.3	S	1y, 1♀, 1♂

[1] Distance (km) from the larger group observed during 3 consecutive day's surveys.
[2] S = simultaneous observation; C = composition or size differ from (or similar to) the groups observed earlier; T = temporary or disturbed group.
[3] k = kid, y = yearling, ♀ = female, ♂ = male, u = unidentified.