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STATUS OF FLARE-HORNED MARKHOR (*CAPRA FALCONERI FALCONERI*) IN JUTIAL CONSERVANCY, DISTRICT GILGIT, GILGIT-BALTISTAN (PREVIOUSLY NORTHERN AREAS), PAKISTAN

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ABSTRACT

This study was carried out to investigate the status of the flare-horned markhor (*Capra falconeri falconeri)* in Jutial Conservancy, District Gilgit, Gilgit-Baltistan. Field surveys were conducted during the winter (rut season) of 2014 when markhor population gathered in large herds at lower slopes. Habitat degradation due to removal of natural vegetation for fodder, firewood collection, over- grazing of pastures by livestock and uncontrolled movement of tourists in the core markhor habitat are still major factors that restrict the markhor population in the conservancy. The illegal hunting in the Conservancy is still a threat to markhor population due to movement of markhor to the adjacent/surrounding conservancies of Sai and Kargah. Field surveys using vantage point method for counting markhor were conducted in potential markhor habitat during December, 2014 and questionnaire-based interviews were also held with the community wildlife rangers, local hunters and shepherds to assess the ingenious knowledge and to compare the current and past status of the species. Survey results revealed the presence of a total of 162 markhor with the composition of kids/yearlings, females and males. The results of the study also indicated a significant increase in the population of markhor, including trophy-sized animals, validating that community participation and co-management has contributed to the conservation of the area's wildlife and habitat. The outcomes of the study further justify that the conservation interventions, specifically the trophy hunting program initiated in the Conservancy both by the Parks & Wildlife Department Gilgit-Baltistan and the Wildlife Conservation Society, are a successful model of community-based markhor conservation in the region, which can be replicated in other parts of the range of the species for collaborative management of markhor and other natural resources and to improve the livelihood of local communities.

Key words: Markhor, *Capra falconeri falconeri,* Jutial Conservancy, Gilgit-Baltistan

INTRODUCTION

Gilgit-Baltistan

Pakistan's Gilgit-Baltistan (GB) Province is located between 35°-37° N and 72°-75° E, and is considered the water tower and energy hub of the country based on its significant water resources (Fig.1). Three of the greatest mountain ranges of the world – the Himalayas, the Karakoram, and the Hindu Kush – collide here. These high mountains block the influence of the summer monsoons that affect the southern Indian subcontinent, so most parts of GB are extremely arid.

Gilgit-Baltistan can be characterized as a high, cold desert and dry temperate region. Below 6,000 feet in elevation the region is essentially barren and considered to be rocky desert with little or no vegetation. Above 6,000 feet vegetation is dominated by sagebrush (*Artemisia spp.*) and scattered juniper (*Juniperus macropoda*), while at higher elevations in valleys to the south there are open forests of pine (*Pinus wallichiana* and *P. gerardiana*), deodar cedar (*Cedrus deodara*), and spruce (*Picea smithiana)* at roughly 8,000 to 12,000 feet (Zahler and Woods, 1997).

This region is a globally important conservation landscape and has been included in the list of Global 200 Ecoregions by the World Wildlife Fund and an Endemic Bird Area of Urgent Biological Importance by Birdlife International. The region has significant populations of several globally important wildlife species including 54 mammals, 230 birds, 23 reptiles, 20 cold-water fish and 6 amphibian species (GoP/IUCN, 2002). The area contains some of the last remaining arid conifer forests in the Greater Himalayan mountain chain – critically important to both wildlife and local livelihoods – and it is also one of the important strongholds for a range of spectacular and critically threatened wildlife species, most notably the snow leopard (*Panthera uncia*) and the flare-horned markhor. It is also one of the remaining strongholds in Pakistan for species such as the Marco Polo sheep (*Ovis ammon polii*), Ladakh urial (*Ovis orientalis vignei*), Asiatic black bear (*Ursus thibetanus*), Himalayan brown bear *(Ursus arctos isabellinus*), several endangered pheasants, and a host of other rare and threatened wildlife species.

Flare-horned Markhor

The flare-horned markhor (*Capra falconeri falconeri*) belongs to the Caprinae group of the Bovidae family (Schaller, 1977; Roberts, 1977). Ellerman and Morrison-Scott (1951) identified five sub-species of markhor in Pakistan: Astor markhor, Kashmir or Pir Panjal markhor, Kabul markhor, Suleiman markhor, and Chiltan markhor, whereas Roberts (1969, 1977) described the former four forms as subspecies of markhor and considered the Chiltan markhor as a hybrid between true markhor and wild goat. All the markhor sub-species were categorized as "Endangered" under the IUCN's Red List of 2008 (Valdez, 2008). Most of the world population of markhor lives in Pakistan where two sub-species are now recognized, i.e. flared-horned markhor (*Capra falconeri falconeri*) and straight-horned markhor (*Capara falconeri megaceros*) (Shaller and Khan, 1975; Hess *et al*., 1997).

Markhor are generally found in steep mountain conditions and where rainfall is low and erratic, and are found between 600-3,600 meters in elevation (Roberts, 1977). Markhor are gregarious; females with young males associate in small herds, but when the terrain is of restricted nature they may associate in large herds. Adult males lead a largely solitary life; they join female herds for rut in late November and stay with them until early spring. The markhor feeds early in the morning and late in the evening, but in mid-winter they have been observed feeding intermittently throughout the day.

The markhor is one of the most impressive of the "mountain monarchs" – the wild sheep and goats of Asia. An adult male has huge corkscrew horns, and it is also one of the best climbers in its family, often scaling trees to feed on foliage. The markhor is critical to the landscape as it is one of the few wild prey items in its range for large carnivores such as the snow leopard, and because it is an important local and national cultural icon as the "National Animal of Pakistan". Unfortunately, in recent times the markhor was under threat of extinction across its range, including the substantial global population within Pakistan's borders. In recent decades the markhor population dramatically decreased due to unrelenting hunting pressure, and existed in highly fragmented subpopulations (Schaller, 1977). Excessive removal of natural vegetation for grazing and domestic energy by ever-increasing numbers of human and domestic livestock has led to widespread degradation of fragile alpine and subalpine pastures, which consequently has threatened the survival of the region's most threatened wildlife species including the markhor, their habitats and the mountain ecosystem.

Focused community-based conservation efforts in Gilgit-Baltistan are now seeing a significant population recovery in markhor across a large part of this region. Because of community-based conservation efforts aimed at markhor, the markhor is now listed as Near Threatened by IUCN (2015 estimate: ~5,800 individuals) due to the absence of a projected total population decline and ongoing conservation efforts to keep this population level (IUCN, 2015).

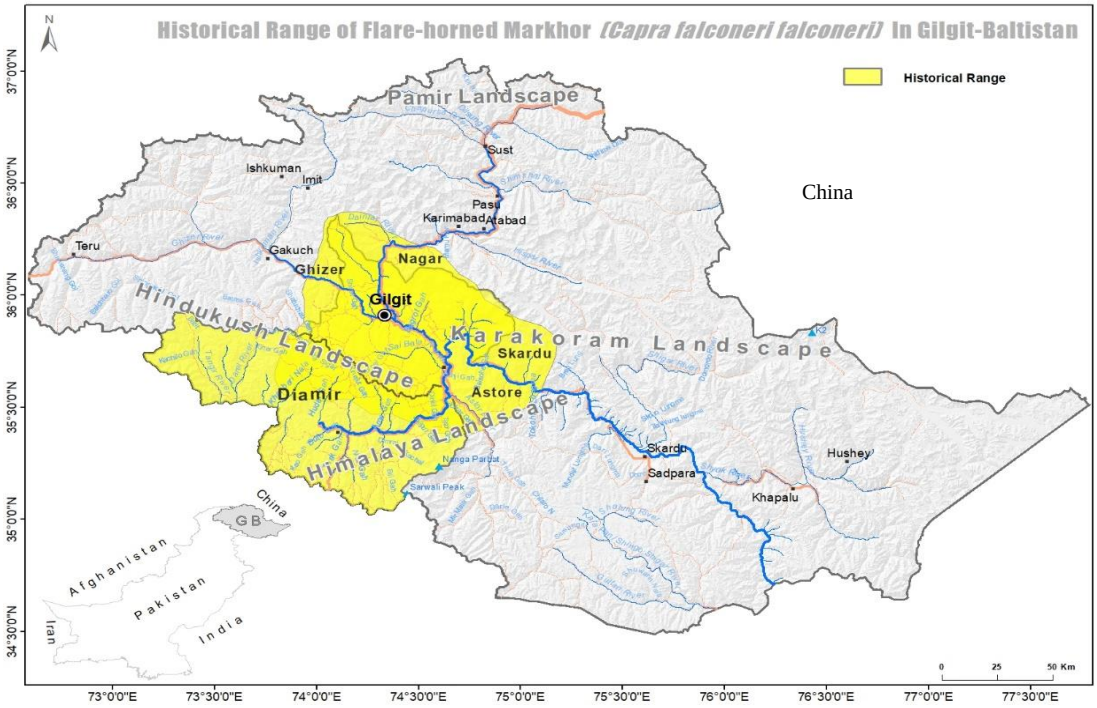

Fig. 1. Map of Historical Range of Flare-horned Markhor in Gilgit-Baltistan.

Objectives of the Study

The main objective of study was to assess the current population status of the flare-horned markhor (*Capra falconeri falconeri*) in Jutial conservancy of District Gilgit. This study also aimed to collect data on associated wildlife and other natural resources of Jutial Conservancy. Another objective of the study was to identify the number of trophy-size male markhor in order to help the relevant government departments and community organizations make sustainable management decisions for the allocation of markhor trophy quotas and to strengthen the community-based watch-and-ward system for co-management of markhor and other natural resources found in the conservancy.

MATERIALS AND METHODS

Description of the Study Area

Jutial Conservancy is located in the Hindu Kush Range to the south of Gilgit town. The valleys of the Conservancy include Jutial, Sakwar, Barmas and Minawar, which are situated on the upper bank of the Gilgit River and adjacent to the main town of Gilgit. This region has an area of 201 km^2 (Fig. 2. Map of Jutial Conservancy Gilgit). The Conservancy is located between 35° N and 74° E, and it is considered as part of the core markhor habitat in Gilgit-Baltistan.

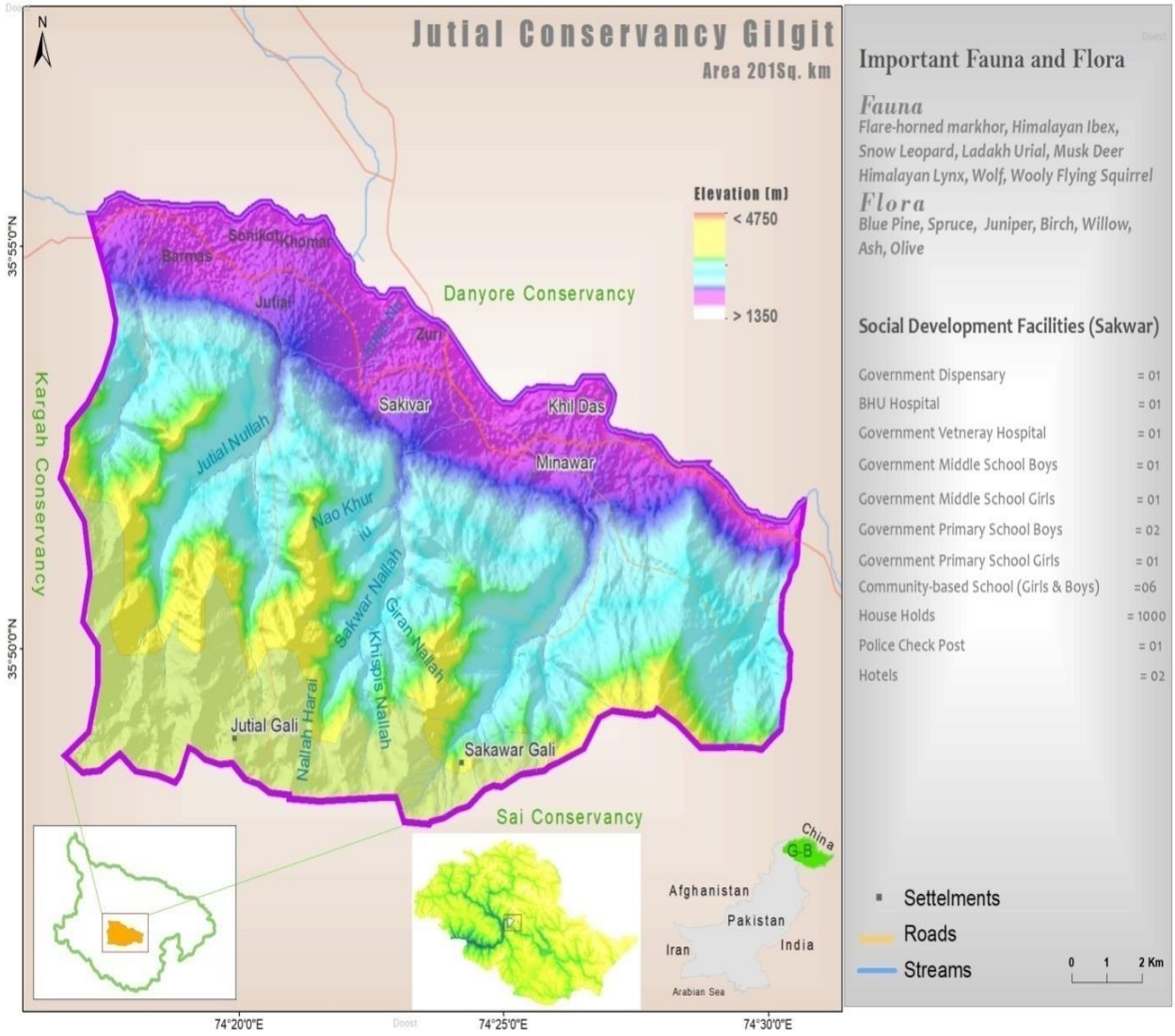

Fig. 2. Map of Jutial Conservancy Gilgit.

Major forest species are blue pine, fir, spruce, juniper, willow, birch and ash while wildlife species include markhor, snow leopard, ibex (*Capra sibirica*), lynx (*Lynx lynx*), musk deer (*Moschus cupreus*), wolf (*Canis lupus*), leopard cat (*Prionailurus bengalensis*), and woolly flying squirrel (*Eupetaurus cinereus*) (P&WDGB and WCS, 2016). Jutial Conservancy is bounded by Sai and Kargah Conservancies to the southwest and the Gilgit River to the north. Jutial valley is quite well developed because of its closeness to Gilgit town, which is administered by the Municipal Committee and Cantonment Board.

The Parks & Wildlife Department of the GB Government and The Wildlife Conservation Society (WCS) have been implementing a community-based conservation program in the four valleys of the Conservancy for the last two decades (WDGB & WCS, 2006). These conservation initiatives include community mobilization, conservation education, resource mapping, wildlife surveys, establishment of resource governance institutions (Wildlife Conservation and Social Development Organizations or WCSDOs), community watch and ward system, and development of collaborative management of markhor, associated wildlife species and other natural resources in the Conservancy.

The four valley-based WCSDOs of the Conservancy were established and registered with the Government of Gilgit-Baltistan (P &WDGB and WCS, 2016). These include WCSDOs of Jutial, Sakawar, Minawar, and Barmas. These WCSDOs work closely with the relevant government departments, NGOs, and other organizations to undertake various conservation and development initiatives for the local economic development and to promote peace and harmony among the diverse communities of the area.

Table 1. Flare-horned Markhor Observation Sites in Jutial Conservancy Gilgit.

S#	Valley	Observation site	Estimated aerial distance (m)	Equipment used
	Jutial	Rakhoni Tik	1000m	Binocular, SS, DC
		Chan Chan Daar	800m	Binocular, SS, DC
		Daari	100m	Binocular, SS, DC
		Chan Chan Khor	1100m	Binocular, SS, DC
		Shaye Daar	1200m	Binocular, SS, DC
		Bhgno Kho	1000m	Binocular, SS, DC
		Choki Daar	900m	Binocular, SS, DC
		Narkhor Daar	1100m	Binocular, SS, DC
		Chan Chan Tok	1000m	Binocular, SS, DC
1		Chani Khor	1000m	Binocular, SS, DC
	Barmas	Ashkali	800m	Binocular, SS, DC
		Chawburie	1200m	Binocular, SS, DC
		Dologopi	1000m	Binocular, SS, DC
2		Gonbatha	1000m	Binocular, SS, DC
	Sakwar	UwaluKhu	600m	Binocular, SS, DC
		Bidirung	800m	Binocular, SS, DC
		DhuNalla	900m	Binocular, SS, DC
		Korniril	1200m	Binocular, SS, DC
3		Kornillphiyao/ Kornill Hall	1100m	Binocular, SS, DC
	Minawar	Sheral Khur	800m	Binocular, SS, DC
		Gooey Kue	1000m	Binocular, SS, DC
		Chooko Naar	1200m	Binocular, SS, DC
		Baah Kure Gah	700m	Binocular, SS, DC
		Meropi Dud	1000m	Binocular, SS, DC
		Ganary Khur	1200m	Binocular, SS, DC
		Danoey Muti	1000m	Binocular, SS, DC
4		Baro karo	900m	Binocular, SS, DC

SS: Sporting Scope; DC: Digital Camera

Population Estimation

During the winter an intensive survey was performed from 22-25 December, 2014 in the four valleys of Jutial Conservancy Gilgit. For estimating population, the vantage point method was used, as this is an acknowledged appropriate method to count wild ungulates in rugged mountainous habitats (Shackleton, 1997). During this study, all visible areas were carefully scanned for direct observations of the animals, as well as their signs of presence i.e. fecal pellets and hairs. Based on general surveillance findings, vantage points were marked for further detailed studies. Vantage points (n=18) were selected at such places as along ridge lines from where a clear and unobstructed view of the maximum area could be scanned to count the animals. Time specification for taking direct observations was adjusted according to the activity patterns of the animal. The best time for observation of markhor is usually 7 to 9 a.m. and 3 to 5 p.m. However, in winter markhor feed intermittently throughout the day from dawn to dusk and observations can be made throughout the day.

Age and Sex wise Distribution and Identification

All the animals observed during scanning were counted with the help of binoculars (Nikon BM20682, 8-24x25) and spotting scope (Nikon 20x60). Efforts were made to classify each observed animal as young or mature and female or male. Males were further classified by size, using horn length as an indicator of age, using class I (1-3 years old), class II (3-4 years old), class III (5-6 years old) and class IV (>6 years old) as proposed and defined by Schaller and Mirza (1974). Photographs were taken by using digital camera (Nikkor 36X, 12.1 megapixels). Visual scan-based counting of individuals was considered as the minimum population of the markhor at different localities of the valleys in the Conservancy. Besides direct sighting of animals, information on population and conservation status of markhor was also collected from local hunters, shepherds and other knowledgeable local people using semi-structured questionnaires.

RESULTS

Status of Markhor

During the winter survey from 22-25 December, 2014 in the four valleys of Jutial Conservancy Gilgit, a total of 162 markhor were observed, with a composition of 74 young, 56 females and 32 males, including 5 trophy-size animals (>6 years old) in the Conservancy (Table 2).

Table 2. Summary of the Rut Survey 2014 in Jutial Conservancy Gilgit.

S#	Name of Valleys	K/YL	AF	Male				Total
				C -1	C-11	C-111	C-1V	
1	Jutial	32	27	5	3	3	2	72
2	Sakwar	23	19	4	4	1	2	53
3	Minawar	13	6	2	1	1	1	24
4	Barmas	6	4	2	0	1	0	13
	Total	74	56	13	8	6	5	162
% age observed		46	35	8	5	4	3	324
Mean		18.5	14.0	3.3	2.0	1.5	1.3	

K: Kids; YL: Year Ling; AF: Adult Female; C-1: (1-3 years old), C11; (3-4 years old), C111: (5-6 years old), C1V: (>6 years old)/Trophy Size.

Beside field surveys, information was also collected from informed local people, e.g. hunters, shepherds, and wood cutters/collectors, about various aspects of the population of the target species. The communities perceive a gradual increase in the population of markhor in Jutial Conservancy with the passage of time. The community considered that the population has increased as a result of a ban on illegal hunting and community-based conservation initiatives started by the Parks & Wildlife Department Gilgit-Baltistan, WCS, and the respective WCSDOs (Fig.3).

DISCUSSION AND RECOMMENDATIONS

Because of the complex mountains and forest ecosystem in Gilgit Baltistan the wildlife in the region, especially in Jutial Conservancy, is surprisingly rich and diverse, with some being endangered and endemic to the region. However wildlife in the region has suffered significant pressures in recent decades. Hess *et al.* (1997), Shackleton

(1997), and Khan *et al.* (2014) reported that populations of markhor were negatively influenced by illegal hunting, habitat degradation, slow reproduction and genetic isolation. Ali (2008) reported that unsustainable use of natural resources by the people living in and around this region due to limited livelihood opportunities have led to the depletion of habitat of wildlife and resultantly the markhor population was declining in many areas. Habitat loss (Shackleton 2001; Arshad *et al*., 2012), poaching (Woodford *et al.,* 2004; Bhatnagar *et al.,* 2009), uncontrolled hunting (Johnson, 1998; Arshad *et al*., 2012) and livestock competition for forage (GoP and IUCN, 2002; Woodford, *et al.,* 2004; Arshad *et al*., 2012) were the major causes of depletion of this precious wildlife resource.

However, this study shows that the markhor population in Jutial Conservancy has increased from a previous estimate of a minimum of 118 in 2011 (WCS, unpub. data) to a minimum of 162 animals in 2014. The study also suggests that markhor population in Jutial Conservancy of Gilgit is stable as young and female and male ratio matches the assumed population dynamics of stable wild ungulate populations. However, poaching and habitat degradation are still the main threats to the population of markhor and other wildlife in this region.

The findings of this study suggest that partnership among GB Parks and Wildlife Department, local communities and conservation NGOs, as well as provision of economic incentives through sustainable markhor trophy hunting, have helped improve the status of flare-horned markhor in Jutial Conservancy.

This study concluded that a viable markhor population exists in the Conservancy, which will further spread to the adjacent conservancies if the current conservation initiatives are continued and strengthened by the relevant government departments and conservation NGOs. The markhor trophy hunting program and local watch-and-ward community ranger patrol and monitoring system in the Conservancy can be considered a successful model of a community-based conservation program and can be easily replicated in the surrounding Conservancies and other parts of markhor range in GB.

Keeping in view the findings of the study, the conservation of flare-horned markhor populations in Jutial Conservancy of District Gilgit should be continued as a collaborative co-management initiative that ensures the active participation of the communities through their respective WCSDOs and community wildlife rangers. Field research should continue to be focused on markhor and other threatened and endangered wild species, including regular surveys to determine threats, population status and trends. Capacity building training should be organized on wildlife survey techniques, data recording and proper use of survey equipment, e.g. binoculars, compass, spotting scopes and cameras, etc. Livestock grazing in the core habitat of markhor in Jutial conservancy should be managed through a proper pasture management plan. The public's awareness about the importance of biodiversity in general and threatened species in particular should be raised to win their support and cooperation in conservation efforts.

The trophy hunting program contributes to the conservation of markhor and its habitat in the Conservancy by providing an enormous financial incentive to protect and conserve the species. The increasing population of markhor, as indicated by the wildlife surveys, is quite encouraging. However, there is a need to assess the success, effectiveness, and sustainability of current markhor trophy hunting in the Conservancy and provide recommendations that will directly and positively impact conservation activities and outputs (e.g. Lindsey *et al*., 2007; Shackleton, 2001). Such an assessment, and the implementation of these recommendations, are likely to greatly enhance markhor conservation in the area.

The relevant Government Departments and conservation NGOs, specifically the Parks & Wildlife Department GB and Wildlife Conservation Society, should continue to build local capacity and also introduce other sustainable livelihood options besides trophy hunting in accordance with the approved Conservation and Development Plan and agreements signed with WCSDOs of the Conservancy. For example, promotion of eco-tourism as an alternative livelihood in the area can also help to protect markhor, its habitat and other associated wildlife species. It will also to improve the livelihoods of local communities. Training of local tourist guides, porters, cooks and helpers while registration of their relevant business with national-level tour operators and companies would be an important step in this process. Maintenance of camping sites, construction of tracks, huts, link roads, and valley bridges while setting up of stages as per local preferences with well-elaborated tourist plans might be a milestone for promotion of environment-friendly tourism in the Conservancy.

Progress must also be made in ensuring legal actions against violators involved in poaching, illegal forest felling and other illegal natural resource degradation cases reported by the respective WCSDOs and community rangers of the Conservancy. The community-based watch-and-ward mechanism should be enhanced to minimize chances of markhor poaching and other illegal activities in the conservancy.

Economic incentive including alternate income sources should be provided to the people living around the habitat of markhor. Community-based research studies should be conducted on regular basis to assess markhor population trend, conservation status and other ecological parameters for long-term conservation of the species and other natural resources in the Conservancy.

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