

Short Communication

Endangered markhor *Capra falconeri* in India: through war and insurgency

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Abstract The flare horned markhor *Capra falconeri* occurs in northern Pakistan, Afghanistan, India, Uzbekistan and Tajikistan. Most of the species' range is along volatile international borders and limited information is available, especially for the population of the Pir Panjal or Kashmir markhor *C. f. falconeri* in India. From October 2004 to April 2005 we therefore conducted the first range-wide survey of the species in India since independence. The markhor's range has shrunk from c. 300 km² in the late 1940s to c. 120 km² in 2004–2005. Our surveys and interviews with key local informants indicate that 350–375 markhor may yet exist in the region. All the populations are small (usually < 50) and fragmented. International conflicts, developmental projects, the needs of an increasing human population and poaching, along with lack of awareness, are the primary threats to the species. The largest population in India, in Kajinag, may have potential for long-term survival if immediate conservation measures can be implemented.

Keywords *Capra falconeri*, India, Jammu, Kashmir, markhor, threats.

The markhor *Capra falconeri* is a goat (Family Bovidae) of the Hindu Kush–Himalaya (Schaller, 1977; Shackleton, 1997; IUCN, 2008), occurring from Kashmir (Fox & Johnsingh, 1997) in the south-east to Afghanistan in the west (Habibi, 1997) and Tajikistan in the north (Wienberg et al., 1997). The core of the species' distribution is in the Northern Areas and North-West-Frontier Provinces of Pakistan, with a population of c. 5,000 estimated in the 1970s (Schaller & Khan, 1975), although numbers may have declined to < 3,000 in the late 1990s, mostly in small (< 100) fragmented

populations (Hess et al., 1997). Markhor are rare throughout their range and are categorized as Endangered on the IUCN Red List (IUCN, 2008). Warfare and insurgency can have detrimental or positive effects on conservation (McNeely, 2003; Mishra & Fitzherbert, 2004) and almost the entire markhor range is afflicted by continuing war and social strife, making the future of the species uncertain.

In India the flare horned subspecies *C. f. falconeri* is often referred to as the Pir Panjal or Kashmir markhor (Schaller, 1977). Stockley (1936) reported the species in Poonch, Hirpura, Boniyar, Moji nala (on the north flanks of the Kajinag) and Shamsabari. According to Burrard (1925) markhor were found in Pir Panjal but only where that 'system lies in the Kashmir Valley'. Schaller (1977), quoting sources in Jammu and Kashmir, suggested that 200–300 markhor may survive on the Indian side of the Line of Control with Pakistan. Roberts (1997), however, suggested that the unstable situation may possibly have led to the extirpation of the species in this region. Credible recent information on these populations was thus almost non-existent.

Since 1948 the disputed border in Jammu and Kashmir between India and Pakistan has been defined as the Line of Control, with frequent clashes between the military of both countries (Akbar, 2002). With the eruption of insurgency in 1989 the military presence increased on both sides. The distribution of the markhor lies within this volatile region. With insurgency, protection of wildlife was a low priority and even the declaration of four protected areas in the region, the Hirpura, Limber and Lacchipora Wildlife Sanctuaries and the Naganari Conservation Reserve, did not facilitate conservation action or collection of data on the status and distribution of markhor in these areas. We therefore surveyed the status of markhor to map its current distribution, determine minimum numbers and identify key threats because, given the recent conflict in the entire markhor range, the continued survival of the species is uncertain.

The primary source of historical information on markhor is the 1947 Survey of India *shikar* (hunting) map (R.C. Hanson, Survey of India; unearthed by IAL), which shows the distributions of seven species, including the markhor. Based on this map, and on Burrard (1925) and Stockley (1936), we identified six areas to survey: Kajinag (which includes Lacchipora and Limber Wildlife Sanctuaries and Naganari Conservation

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Reserve), Hirpura Wildlife Sanctuary, Shamsabari and Boniyar in Kashmir, and Poonch and Badherwah-Kisthwar in Jammu (Fig. 1). The latter doesn't have any published information on markhor but records on Kisthwar National Park suggested the species was present. We thus covered most of the species' known habitat east of the Line of Control. The vegetation is temperate coniferous and sub alpine forest, with alpine meadows above c. 3,000 m (Champion & Seth, 1968). The Pir Panjal Range runs approximately south-east to north-west and separates Poonch and Rajouri in Jammu from the Kashmir Valley.

People in the area are mostly agro-pastoralists who grow maize, or rice at lower elevations. Walnut and apple are locally important cash crops. There are traditionally nomadic pastoralists, the Gujjars (herding buffaloes) and the Gaddis and Bakkarwals (herding sheep and goats), who move into the surveyed area during summer. Both Kashmir and Jammu are heavily populated, with 339 and 148 people km⁻², respectively, and the state recorded a decadal growth rate of > 30% between 1991 and 2001, more than the national average of c. 25% (Anon., 2003).

Survey teams, usually of four researchers, visited each area and spoke with a cross-section of local people, especially hunters (n = 30), to ascertain presence of markhor, the areas frequented by the species, and estimates of numbers. We then walked through all areas from where markhor were reported to confirm the presence of the species and conduct counts. We attempted to replicate counts in each area but security constraints sometimes impaired our ability to survey during the best time of the day (early morning and evening) and thus to replicate our sampling on subsequent days. We surveyed for c. 500 man-days from October 2004 to April 2005 (details in Ranjitsinh et al., 2005). Access to high quality base maps was restricted and we therefore used vector maps from the Digital Chart of the World (2006) to generate base layers (drainage, places and boundaries). The Survey of India *shikar* map was georeferenced using known coordinates of five locations, and the former (based on the *shikar* map) and current distribution of markhor (based on our fieldwork) were plotted. The geographical information system *Manifold v. 6* (Manifold, Carson City, USA) was used for mapping and area calculations. The population estimate

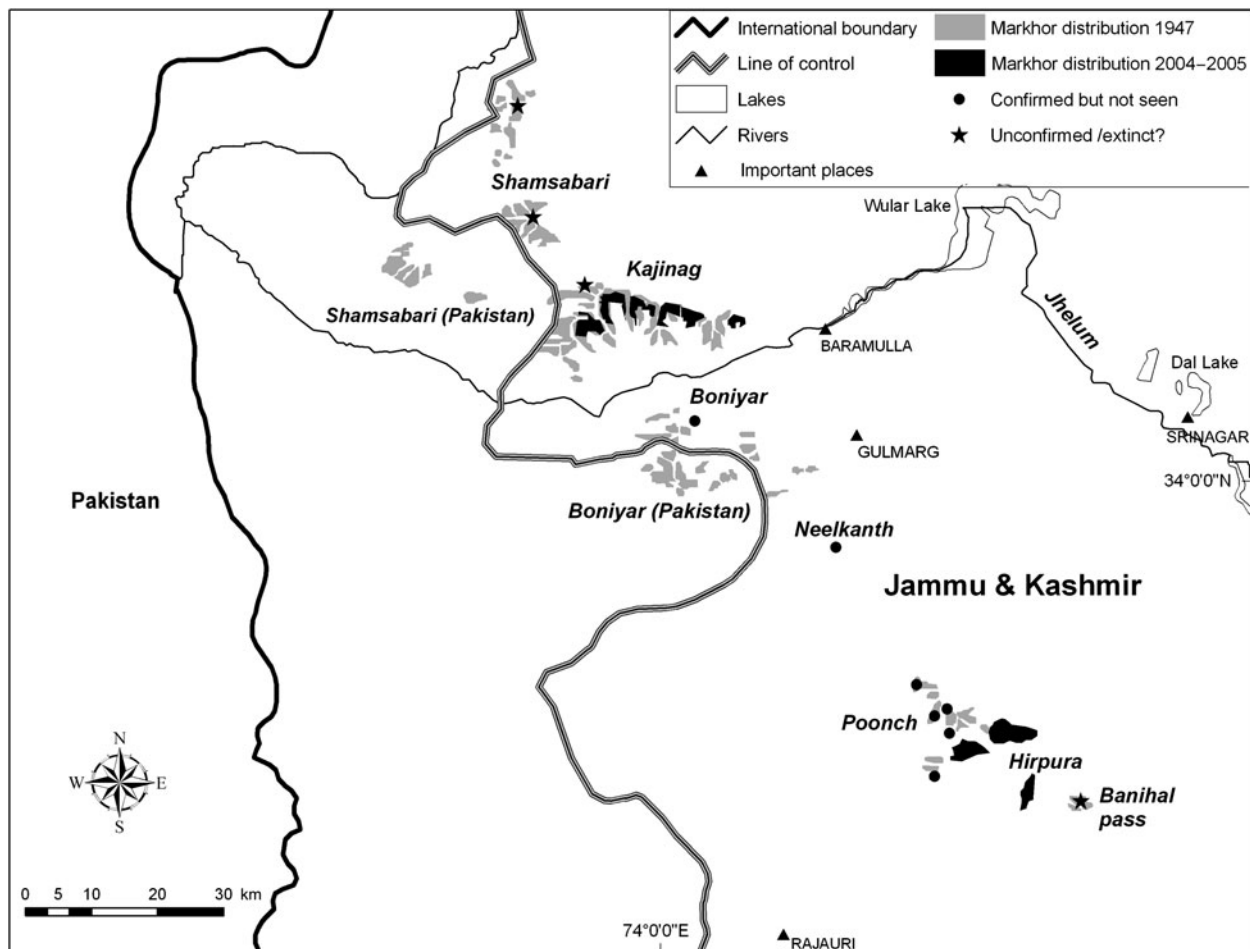


FIG. 1 The past (based on 1947 Survey of India *shikar* map) and present (2004–2005) distribution of markhor in Jammu and Kashmir. In this study we surveyed Shamsabari, Kajinag, Boniyar, Poonch, Hirpura and Badherwah-Kisthwar (not shown in map, but to the south-east of Hirpura).

in each surveyed area is expressed as minimum numbers, determined from individuals observed and informed guesses based on information from key local informants. The value of the former is that any numbers seen (after removing double counts) are important for a rare and threatened species, and an estimate that is informed by reports from key informants adds value to the best possible estimate for the species. A similar methodology has been used for Tibetan gazelle *Procapra picticaudata* (Bhatnagar et al., 2006) and Tibetan argali *Ovis ammon* (Namgail et al., 2009).

In 1947 markhor were known over c. 300 km² in seven populations (Fig. 1, Table 1). One population in Shamsabari and one in Boniyar (c. 60 km²) are now on the Pakistan side of the Line of Control. We observed markhor only in Kajinag and Hirpura, and confirmed evidence of their occurrence in Boniyar, on the Indian side of the Line of Control, and Poonch. All populations are small and isolated. Compared to 1947 markhor distribution has shrunk in all areas, especially in Boniyar and Poonch, with an overall reduction of c. 60%. In Shamsabari no recent evidence of markhor was found; the population is thus either extinct or near extinction. Even though we did not survey the Banihal Pass area, informed sources in nearby Hirpura and the Wildlife Department are confident that markhor are absent there. The 1947 map does not include Hirpura and Neelkanth but we found confirmed reports from these areas. In Badherwah-Kisthwar we could not find any evidence of the species.

We sighted 35 markhor groups, comprising a total of 155 individuals, in Hirpura and Kajinag. The largest population of markhor appears to be in Kajinag. Based on the markhor that we saw and on information from key informants we estimate that 355–375 markhor may survive in the four areas in Jammu and Kashmir where we confirmed their presence (Table 1). This is slightly higher than previous estimates of 200–300 (Schaller, 1977; Fox & Johnsingh, 1997), probably because earlier reports were incomplete guesses based on information from only parts of the Kashmir Valley.

Key threats to the markhor's range are insurgency related effects, intensified local resource use, poaching and large-scale development. Since independence the region has had two major wars and frequent skirmishes between the military and militants. Alleged infiltration of militants has caused the Indian Government to fence the entire Line of Control with multi-layered barbed wire. This includes Boniyar, Kajinag and Shamsabari, and may have caused further fragmentation of populations of markhor and other large mammals of the region. Approximately half of our informants felt that insurgency may have increased poaching pressures by both the military and militants but others felt that poaching may have declined due to confiscation of arms and restriction on human movements. Poaching by professional hunters may have been the primary cause of decimation or local extinction of markhor in the past but we were told of winter communal hunting that was practised until recently. This involved driving a markhor group into

TABLE 1 The past (calculated from the 1947 Survey of India *shikar* map; R.C. Hanson, Survey of India) and present (this survey) range of markhor in Jammu and Kashmir, with the approximate distance covered in our surveys, the number of markhor seen, and the estimated markhor population in each area.

Location	Area of occurrence (km ²)		Distance covered (km)	No. of markhor seen ²	Estimated population ³
	1947 ¹	2004–2005			
Kashmir					
Kajinag	126	44	131	133	225
Hirpura		31	71	22	50
Boniyar (including parts of Neelkanth in 2004–2005)	30	20 ⁴	40	0	30
Shamsabari	53	Extinct?	40	0	
Banihal Pass	6	Extinct?			
Shamsabari (in Pakistan-held Kashmir)	28	Not assessed			
Boniyar (in Pakistan-held Kashmir)	32	Not assessed			
Jammu					
Poonch	30	25 ⁵	10	0	50–70
Badherwah-Kisthwar		Extinct/not present in recent past	20	0	
<i>Total</i>	305	120		155	355–375

¹The 1947 *shikar* map didn't include the Hirpura, Neelkanth and the Badherwah-Kisthwar areas

²Minimum numbers, calculated after removing possible duplications

³Based on minimum numbers seen and local information

⁴Based on local interviews and from checking the relevant area

⁵Estimated from records of the Department of Wildlife Protection

deep snow and slitting their throats; a process in which large groups could be killed at one time. Other pressures come from habitat encroachment by camps of Gujjars and the armed forces, excessive livestock grazing by local and nomadic Bakkarwal herders in parts of the range, and collection of timber and non-timber forest produce that includes medicinal plants, mushrooms and building material. Jammu and Kashmir are now recovering from over a decade of insurgency and there is increased political and local pressure for large-scale developmental programmes, notably, the proposed Mughal road connecting the state capital Srinagar with Rajouri, which passes through the Hirpura Wildlife Sanctuary, and limestone and gypsum mining around Limbar and Lacchipora Wildlife Sanctuaries.

In spite of these threats markhor has survived in parts of its erstwhile range in Jammu and Kashmir. One explanation for this may be a reduction in hunting pressure in areas such as Kajinag because of restrictions imposed by the army and periodic halting of movements of migratory herders by security forces, easing pressure on pastures. The largest markhor population, in Kajinag, merits the establishment of a protected refuge and the state's Wildlife Department has already initiated a move to set up the Kajinag National Park. It emerged during our survey that the army, policy makers and local people were not aware of the rarity of the markhor and the importance of the region for its conservation. While mitigating the larger impacts due to fencing and insurgency may be beyond the scope of conservation agencies, better awareness among the armed forces, policy makers and local people would help markhor conservation in the region. Realignment of grazing practices that leave out important areas of markhor habitat would be valuable, as it is for the Tibetan gazelle (Bhatnagar et al., 2006, 2007) and bharal *Pseudois nayaur* (Mishra et al., 2003). Conservation of markhor needs to be carried out in collaboration with the people of the region, especially the nomadic herders and the armed forces. A detailed joint ecological study by the Nature Conservation Foundation, Wildlife Trust of India and the state's Wildlife Department is underway in Kajinag that will lead to the preparation of an effective management plan for the Kajinag National Park. A comprehensive awareness programme targeting the armed forces and local people is also being developed.

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Biographical sketches

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