

tainable living through modeling and helping implement new methods will greatly reduce the impact on the forest resources and, hopefully, convince locals on the need for protection of forested areas. Regardless of the path and methodology chosen, incorporation of local villagers into conservation programs is crucial to the survival of wild tigers. As over 50% of Madhya Pradesh's tigers

reside outside national parks and reserves, resident people will ultimately determine their fate.

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Human Attitudes to Leopards in Khosrov Reserve, Armenia

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Rural people have been a crucial factor to ensure a long-term viability of the endangered leopard (*Panthera pardus*) population in its stronghold in Armenia—Khosrov Reserve. Therefore, understanding local knowledge and attitudes towards this predator becomes very important in our current research activities, otherwise public resentment, conflicts and overall failure of the system of a protected area will be unavoidable (Nepal and Weber, 1995).

When living near people, the predators are regarded as a nuisance (confined to livestock or game losses and direct threat to human safety) and killed at every available opportunity, even if a species is legally protected. This is a case for many felid species: Eurasian lynx *Lynx lynx* (Jedrzejewski et al., 1996), cheetah *Acinonyx jubatus* (Conniff, 1999), snow leopard *Uncia uncia* (Oli et al., 1994), leopard (Danov, 1985; Seidensticker et al., 1990), Asiatic lion *Panthera leo persica* (Saberwal et al., 1994), African lion *P. l. leo*, tiger *P. tigris* (Woodroffe and Ginsberg, 1998) and Iberian lynx *L. pardinus*. Similarly, occasional poaching of rare leopards occurs in Armenia's Khosrov Reserve and we have studied human attitudes towards these carnivores.

Public surveys were conducted in Oct. 1999 in Vedi village (13 people), Jan-Feb. 2000 and July-Aug. 2000 in Garni village (46), Bayburd village (10) and among pastoralists living at temporary summer livestock grazing stations on alpine plateaus above the reserve's canyons (11) (see figure). In total, 80 people were interviewed and we did not need to increase this number due to the uniformity of results of this study. All people with whom we talked were men, as they play a dominating role in rural life and would provide us most reliable information about the leopards. Three questions were asked of the villagers (Saberwal et al., 1994):

1. frequency of leopard sightings on their lands;

2. problems they encountered owing to the presence of leopards near their villages; and

3. individual attitude towards the leopards. Attitudes, in their turn, were categorized as strongly like, slightly like, indifferent, slightly dislike and strongly dislike (Oli et al., 1994). Discussions and casual conversations with stock-owners, herdsman and their neighbors were performed as a principal approach to minimize a bias caused by inaccuracies in answers and cross-check the obtained information.

The results of our survey are intriguing in their uniformity. All interviewed people told us that the leopards never visit agricultural land and villages and do not kill domestic livestock and pets. Also, they reported no reliable cases when a leopard attacked a man, mauled or killed him. Hence, people do not express hostility (slight or strong) to this predator and do not have any problems with it. Only one case of leopard attack on livestock was reported to us, but we were unable to confirm or refute it—in mid-1990s, a leopard killed a calf near Bayburd village and ate half of the carcass. Next day, the shepherd, who was searching for his lost animal, found the cat on the cliff overhang in front of the remains of the calf (A. Malkhasyan, pers. comm.). In fact, people are completely indifferent to the leopard and its conservation. In a few words, this can be reflected by the following sentences: "What is strange in having the leopards

around? Only a few people ever glimpsed them in the wild, as they are extremely secretive and nocturnal and live in caves, which are very hard to access". Public opinion about leopard conservation is similar: "Their staple food, bezoar goats (*Capra aegagrus* – I.K.), are abundant throughout Khosrov Reserve and due to the leopard's secrecy and tolerance to humans it will survive whether we conserve them specially or not".

Even though the leopards do not cause economic damage to the rural community in Khosrov Reserve, people sometimes kill them. Out of 10 records in late 1990s-2000 in this protected area, two were associated with poaching (two young siblings between Chimankend and Sovetashen villages and one adult male in Tapchan Yallah canyon, all in January 2000) (Khorozyan, 2000). An attempt was made to sell the skin of the adult animal for \$2,000, but as soon as the owner knew that we and rangers intended to visit him to confiscate the trophy, he escaped. However, we succeeded in studying the skin for morphology (Khorozyan, 2000) and taking a piece of pelage for genetic analysis in future.



Fig. Location of villages around Khosrov Reserve where our public surveys were conducted. Abbreviations: Y – Yerevan, capital of Armenia; G – Garni; V – Vedi; B – Bayburd; S – summer livestock grazing stations

It is very hard to identify the incentives for leopard poaching other than human fear. The stories of "heroic killing of a sparkle-eyed beast which swooped on a man" are quite common in villages around Khosrov Reserve. Walker (1994) mentions a tale: "I was told that the shepherd was sitting below a small rock overhang and saw the shadow of the leopard above him. As the leopard leaped down upon him he was able to raise his gun and shoot the animal in mid-air. Such stories of daring-do were often related to us regarding wolves, leopards and other predators". However, as said earlier, no trustworthy cases of leopard attacks on people are recorded in Armenia, hence the danger to human safety described in such tales is entirely fictional. Most likely, the storytellers pursue the goal of attracting more attention from the general public and scientists. I also heard about a shepherd who stabbed a leopard in spring 2000 near Kajaran town elsewhere in southern Armenia, but the reliability of this case is dubious.

In Khosrov Reserve, humans and leopards have co-existed since mid-Holocene (Kasabyan and Manaseryan, 1998) and the cats have evolved to be extremely cryptic, living in rough rocky terrain and leading a preferably nocturnal lifestyle. Many cases of seeing local leopards in daytime refer mainly to the young, inexperienced males looking for food and roaming widely for new territories, and they have the highest chance of being shot. However, if seen too close they can be frightened away by making a noise and firing blank shots in the air (Gasparyan and Agadjanian, 1974).

To ensure the leopard's survival, we urgently need a workable national leopard conservation strategy which would be able to create a harmony in man-leopard relationships and make public awareness and environmental education a highlight topic, not only on paper, but essentially in practice. This will be a real implementation of a widely recognized idea that promotion of indigenous knowledge, socio-environmental responsibility and public participation in conservation decision-making is an important constituent of local sustainability in rural areas (Becker, 1998). Now is a good time to do this, as the local human population has been greatly reduced in number due to mass emigration to urban areas and other countries as a result of poor economic conditions, warfare with Azerbaijan for Nagorno-Karabakh in early 1990s, and severe drought in summer 2000, hence human pressure on wildlife of Khosrov Reserve can be objec-

tively minimal. Surrounding areas formerly inhabited by people (mainly ethnic Azerbaijani and Kurds) and abandoned now are incorporated in the reserve.

Commonly, agro-ecosystems (e.g. based on livestock breeding) have a low significance for biodiversity conservation, being highly dependent on management approaches and tolerance of farmers to wildlife. But sound agricultural practices may create a healthy environment and public well-being (Soule, 1991). In this context, implementation of measures to co-exist with leopards can benefit the rural community of Khosrov Reserve, if performed in a socially and environmentally friendly way. These measures are two:

1. enforcement of protection
2. implementation of outreach educational campaigns.

Enforcement of protection

Our main hope rests in selfless and devoted work of Khosrov Reserve rangers, but currently we cannot demand much in the conditions of dire poverty that has struck this area. According to the latest available estimates, this protected area has a staff of 82 people (Grigorian, 2000) and receives \$39,600 from the national government annually (56% for salaries, 43% for other operational costs and 1% for capital expenditures, including equipment), but the average monthly salary is only \$20 (Ministry of Environment, 1999). Actually, its staff is not paid salaries for years and the rangers have to care for themselves – keep livestock/poultry and orchards on their private land and use the natural resources of the reserve. Shooting and snaring of locally abundant small wildlife (European hare *Lepus europaeus*, red fox *Vulpes vulpes*, and others) for meat, collection of mushrooms, wild fruits, berries, nuts and greenery, grazing of livestock and horses and cutting of walnut *Juglans regia* trees for fuelwood are common, but carried out mainly around the staff lodgings in the reserve (pers. obs.). The caves can be used as camp sites, including those where leopards can rest or even breed. When this happens, the disturbed cat moves away for a long distance until complete safety is guaranteed (pers. obs.).

The skins of badgers *Meles meles*, foxes and wolves *Canis lupus*, which are abundant throughout Khosrov Reserve and adjacent territories are freely sold together with souvenirs to numerous tourists who come to Garni village to see the unique pagan temple dating from the 1st century AD

(pers. obs.). Suffering from the same poverty as other locals, rangers have to violate the protection regime and sympathize with fellow villagers who do the same. But many of them try to do something within their limited opportunities to make things better. In spite of a very low personal income, locals are neither "intrinsically anti-environmental" nor hostile to us, environmentalists, as "snobby urban and rich intellectuals" as many would believe (McBeth and Foster, 1994); instead, they expressed the attitudes conditional on their lifestyle and very survival.

To improve this situation, it is essential to give villagers the chance to raise their own money and thus avert their interest from the reserve's natural resources. Historical reverence of local people for Khosrov Reserve (it was founded as a royal sanctuary by King Khosrov, the Third Kotak in 330-338 A.D.) is weak as never before, because economic priorities dominate. The best solution is to launch a long-term ecodevelopment program like Irbis Enterprises in Mongolia, which sells handicrafts produced by pastoralists and uses the funds raised for conservation of local snow leopards (McCarthy, 2000; McCarthy and Allen, 1999). Khosrov villagers have a tradition making beautiful knitted goods (women) and wood carvings (men) from locally abundant resources, e.g. apricot trees, whose wood is very nice and amenable to treatment (pers. obs.). Such products with leopard images would be saleable on the market, especially to foreigners. As the leopard has a great option value in Armenia (Khorozyan, 1998), a good alternative for gaining money for local people and leopards would be ecotourism, which has a perfect potential in the country but is not developed yet.

Implementation of outreach educational campaigns

George Bernard Shaw once said: "The worst sin toward our fellow creatures is not to hate them, but to be indifferent to them; that's the essence of inhumanity". Goethe's words are similar: "There is nothing more frightful than ignorance in action" (Chiras, 1991). As shown above, all people that participated in our survey expressed indifference towards the leopard, which we regard as a result of complete absence of knowledge about this predator (here the logic "we do not see it – it is not interesting to us" works). Meanwhile, Armenia's leopards have a high existence value, i.e. ethical and aesthetic perception of a species' existence *per se*

(Khorozyan, 1998), and this kind of value is significantly influenced by information about the animal's physical and behavioral characteristics and about its endangered status (Munasinghe, 1992). For example, the fact that 87% of 80 randomly chosen local people interviewed for their perception of tigers in the Russian Far East expressed positive attitudes to these predators ("they are the treasure of our taiga and need protection") (Prokhorova, 1996) has certainly been a result of strong and long-term educational and information campaigns. Hence, providing information to local villagers about the leopard status, research and action plan in their environment is a crucial element to increase public interest and awareness about this cat.

What is most important in this job is to make people understand that it is essential not to do the following things:

- Pursue and shoot a predator. The leopard is perfectly adapted to its rocky habitat and human pressure in following it can be mortally dangerous, as either the wounded animal will lurk in the rocks and then attack a hunter, or the hunter himself will fall from cliffs. Hunting dogs are of little use and frequently die in leopard habitat (pers. obs.). Moreover, there is a high probability of confronting a brown bear *Ursus arctos*, which can be very aggressive, especially in the period from late fall to late summer associated with hibernation and raising young (pers. obs.).
- Visit the caves, rock piles and/or agglomerations of boulders where the predators may breed or rest. Constant disturbance by people may cause a depression in adrenal responsiveness, as recorded in cougars *Puma concolor* of Utah, USA (Harlow et al., 1992), and possibly produce damaging reactions in animal behavior, physiology and disease susceptibility. However, careful behavior of humans within the leopard's vision does not cause any significant disturbance in animal activities (Bothma and le Riche, 1993).
- Let livestock and horses graze uncontrolled. Even though in 1970s some cases of livestock attacks by leopards were recorded in Khosrov Reserve (Gasparyan and Agadjanian, 1974), now there are none and this item is provided here just as a recommended measure to a villager to be assured that his livestock will not be affected by leopard predation. Using aggressive and well-trained

guard dogs (e.g., Anatolian shepherds) and keeping grazing livestock away from rough terrain, where the predator may lurk, will guarantee complete safety of livestock. Besides, it is essential to keep grazing animals in a relatively limited area, so that other portions of good feeding grounds remain available to bezoar goats, the staple prey for the leopards.

Public education as a measure to conserve leopards is successfully implemented in Russia's Far East (Hotte, 1999), Namibia (www.africat.org) and United Arab Emirates (www.arabianwildlife.com) and we welcome exchange of information describing methodologies and results of such education campaigns.

Acknowledgements

Two of three field trips which included our public surveys in Khosrov Reserve were supported by Societa Zoologica La Torbiera (Italy), and I sincerely thank F. Rocca and M. Pizzetti for this. I am also grateful to J. du P. Bothma, M. Hotte, P. Jackson, M. Oli, K. Schmidt and J. Seidensticker for providing information referred to in this paper, and to A. Malkhasyan and H. Kazaryan for valuable comments.

References

- Becker, J. (1998). Sustainable development assessment for local land uses. *Int. J. Sustain. Dev. World Ecol.* 5: 59-69.
- Bothma, J. du P. and le Riche, E.A.N. (1993). Disturbance bias when tracking Kalahari leopards *Panthera pardus* by spoor. *Koedoe* 36: 109-112.
- Chiras, D.D. (1991). Environmental Science: Action for a Sustainable Future. 3rd edn. Red Wood City, Benjamin/Cummings Publ. Co., Inc.
- Conniff, R. (1999). Cheetahs – ghosts of the plains. *Nat. Geogr.* 196: 2-32.
- Danov, R. A. (1985). Life and death of the leopards (*Panthera pardus* L.) in Aidere portion of the Syunt-Khasardag Reserve. In *Vegetation and Animal Kingdom of the Western Kopetdag* (N. Nechaev, ed.), pp. 95-100. Ashkhabad, Ilym.
- Gasparyan, K. and Agadjanian, F. (1974). Panther in Armenia. *Biol. J. Arm.* 12: 84-88.
- Grigorian, A. (2000). Armenia. In *Cooperation in the European Mountains 2: The Caucasus* (Price, M.F., ed.), pp. 7-21. Gland and Cambridge, IUCN.
- Harlow, H.J., Lindzey, F.G., Van Sickle, W.D. and Gern, W.A. (1992). Stress response by cougars to nonlethal pursuit by hunters. *Can. J. Zool.* 70: 136-139.
- Hotte, M. (1999). Amur Leopard Protection. Progress Report, June 1999. Amsterdam, Tigris Foundation.
- Jedrzejewski, W., Jedrzejewska, B., Okarma, H., Schmidt, K., Bunevich, A. and Miklowski, L. (1996). Population dynamics (1869-1994), demography and home ranges of the lynx in Bialowieza Primeval Forest (Poland and Belarus). *Ecography* 19: 122-138.
- Kasabyan, M. and Manaseryan, N. (1998). Predator mammals of Holocene in Armenia. *Proc. Natl. Sci. Conf. Zool.* May 14-15, 1998: 63-64.
- Khorozyan, I. (1998). Leopard (*Panthera pardus ciscaucasica*) in Armenia: basic trends, dangers and hopes. *Int. J. Sustain. Dev. World Ecol.* 5: 1-10.
- Khorozyan, I. (2000). The leopard in Armenia's Khosrov Reserve: spots, rosettes and population genetic status. *Cat News* 33: pp. 16-18.
- McBeth, M.K. and Foster, R.H. (1994). Rural environmental attitudes. *Environm. Manag.* 18: 401-411.
- McCarthy, T. (2000). Snow leopard conservation in Mongolia comes of age. *Cat News* 32: 12.
- McCarthy, T. and Allen, P. (1999). Knitting for snow leopards. *Cat News* 30: 24-25.
- Ministry of Environment (1999). Biodiversity Strategy and Action Plan for Armenia. Yerevan, Armenia.
- Munasinghe, M. (1992). Biodiversity protection policy: environmental valuation and distribution issues. *Ambio* 21: 227-236.
- Nepal, S.K. and Weber, K.E. (1995). The quandary of local people – park relations in Nepal's Royal Chitwan National Park. *Environm. Manag.* 19: 853-866.
- Oli, M.K., Taylor, I.R. and Rogers, M.E. (1994). Snow leopard *Panthera uncia* predation on livestock: an assessment of local perceptions in the Annapurna Conservation Area, Nepal. *Biol. Conserv.* 68: 63-68.
- Prokhorova, I. (1996). From a sociologist's note pads. *Wildl. Conserv. Bull.* 11: 55-56.
- Saberwal, V.K., Gibbs, J.P., Chellam, R. and Johnsingh, A.J.T. (1994). Lion-human conflict in the Gir Forest, India. *Conserv. Biol.* 8: 501-507.
- Seidensticker, J., Sunquist, M.E. and McDougal, C. (1990). Leopards living at the edge of the Royal Chitwan National Park, Nepal. In *Conservation in Developing Countries: Problems and Prospects* (J. C. Daniel and J. S. Serrao, eds.), pp. 415-423. Bombay,

Bombay Natural History Society.
Soule, M. (1991). Conservation: tactics for a constant crisis. *Science* 253: 744-750.
Walker, G.L. (1994). Khosrov Reserve: a Technical Report. Boone, Appalachian State Univ. Press.

Woodroffe, R. and Ginsberg, J.R. (1998). Edge effects and the extinction of populations inside protected areas. *Science* 280: 2126-2128.
<http://www.sciencemag.org/feature/data/980867.shl>

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Arabian Leopard Specialists Confirm its Critically Endangered Status

A workshop of specialists on the wildlife of Arabia, held in Sharjah in the United Arab Emirates in February 2001, confirmed the critically endangered status of the Arabian leopard (*Panthera pardus nimr*) and noted the lack of information about the species.

The workshop continued and expanded work on the status and future management of some of the region's wild animals, which began at the first workshop in Sharjah in February 2000. The present workshop was a joint collaboration of the Breeding Centre for Endangered Arabian Wildlife in Sharjah with the Cat Specialist Group (Cat SG), the Antelope Specialist Group (Antelope SG), and the Conservation Breeding Specialist Group (CBSG) of the IUCN Species Survival Commission (SSC).

Countries participating included Saudi Arabia, Yemen, Oman, Bahrain, Iran, Qatar, United Arab Emirates: (Abu Dhabi, Sharjah and Dubai), Netherlands, Switzerland, Belgium, United Kingdom, and the United States of America. The Conservation Analysis and Management Project (CAMP) review included eight gazelle taxa (species and subspecies), the leopard, the Arabian tahr, and the ibex.

The first task of the CAMP group work on the leopard was to fill in the Taxon Data Sheet. This led to a lot of discussion on various aspects with a wealth of details from all countries, but also a clear demonstration of lack of information. One of the open questions concerned population estimates. For each region a minimum and a maximum was given and it added up to a total population of 82 to 290 animals. This was more than at last year's CAMP workshop. Nevertheless, everybody agreed that the leopard population is decreasing. The discrepancy was explained by the fact that more information was available this year.

The group then identified six groups of threats and ranked them as follows: (1) habitat loss, (2) human persecution, (3) shortage of wild prey, (4) lack of legislation, (5)

lack of baseline information and (6) public awareness. In each of these 6 categories, factors causing the threat were listed.

In the next step, goals were defined to reduce or eliminate these threats. Some of the prominent ones were: (1) develop the appropriate legislation where needed; (2) improve law enforcement; (3) limit the increase of livestock (which is responsible in the first place for habitat deterioration); (4) develop community assistance for leopard presence; and (5) define the target groups for public awareness programs.

Finally, specific actions were listed that can be performed in the short term (12-18 months). The first was to establish a leopard working group in each country within the leopard's range, draft a status report for each country involved, prepare training material for field workers, produce a poster for police stations and the general public, and organize the following meetings: (1) leopard working group meetings in each country by June 2001; (2) a first meeting of the advisory group in fall 2001 in Sharjah; and (3) a workshop on field techniques and monitoring in Yemen probably in early 2002.

The captive management group of the Arabian leopard met prior to the CAMP and produced a number of recommendations. The group wants to evolve into a valuable tool for the management of the Arabian leopard in captivity, and it is ready to take on further responsibilities as needed.

(Report based on the Executive Summary of the draft report of the workshop by Ulie Seal, Chairman, Conservation Breeding Specialist Group)

Leopard in the Soan Valley, Pakistan

by Zulfiqar Ahmad*

Soan Valley

The southern edge of the Potohar Plateau is demarcated by the Salt Range of Pakistan, which extends from Mianwali in the west, to Jhelum in the East. The western end of the Salt Range forms a semi-loop, creating a valley called the "Soan Valley". The average elevation of the valley is 2,000 feet. The mountains surrounding the valley are covered with subtropical forests. The highest peak in the western Salt Range is Mount Sakesar, which is 1,586 m. (*Reference Atlas of Pakistan by Surveyor General*). The valley has three lakes, which play a vital role in the climate and ecology of the region. These lakes are the staging areas of winter migrating flocks, including some of the endangered species of waterfowl and other birds.

Soan is a strange valley in terms of its intriguing culture, environment, climate and ecology. It is moderately populated with approximately 60% of the population engaged in farming. Most of the land is under cultivation. Soan is famous for its out-of-season vegetables, and fruits like cauliflower, oranges etc, which are sold by the farmers at high prices to bring handsome inflow of cash to the valley.

Leopard (*Panthera pardus*)

The Salt Range supported a comfortable population of leopards until mid-20th century, but thereafter it fell prey to hunting and loss of habitat. Influential people in Mianwali and Kalabagh (adjoining districts of the western Salt Range), engaged in ruthless killing of the cat to a stage where it was declared extinct (Roberts 1977).

The leopard made its first reappearance in 1995, when one was sighted at the top of Mount Sakesar. The animal was seen by a number of people from close range in broad