

## Prevailing Human Carnivore Conflict in Kanha-Achanakmar Corridor, Central India

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**Abstract:** A questionnaire survey was carried out to understand the level of human carnivore conflict in Kanha-Achanakmar corridor of Central India. 16 villages throughout the corridor were randomly selected for the survey and 238 people were interviewed. Secondary data on livestock mortality and human causality from 2005 to April 2011 also collected from the forest department. We reported 57 livestock depredation events during the household survey. Out of all depredation incidents, Tiger was involved in 21 incidents (37%), Leopard in 27 incidents (47%), Jackal in 5 incidents (9%) and wolf involved in 4 incidents (7%). According to respondents, Leopard is the most common agent for livestock damage and Sloth Bear for human casualty. The study revealed that in monsoon, the highest number of livestock depredation incident occurred, when the highest number of human casualty reported in winter. Conflicts create negative impact on local community, but they still positive towards carnivore conservation. Sustainable livelihood opportunities needed to minimize the pressure on forest and eco-development practices with modified compensation programme to give rapid relief to conflict victims.

**Key words:** Human-Carnivore Conflict • Kanha- Achanakmar • Corridor • Mitigation • Conservation

### INTRODUCTION

Certain biological characteristics make species more vulnerable to extinction, including large body size, complex social behavior, low population density, specialized niche requirements, high trophic level and large home range size [1] and these traits are inherent to many large carnivores [2], making them particularly vulnerable to habitat loss and environmental changes. Carnivores exhibit morphologies and behaviours [3] and occupy geographic ranges [4] that reflect interference competition in its various forms. But with the increasing pressure of population growth in around the protected areas forced the carnivores to share their geographical distribution area with humans, which resulted as a Human- Carnivore conflict or Human wildlife conflict. It has become more frequent and severe over recent decades as a result of human population growth, degradation of natural habitats, extension of transport routes and expansion of agricultural and industrial activities which together have led to increased human

encroachment on wild and uninhabited areas [5]. It is a very common global phenomenon and has been defined as, "Any action by human or wildlife that has an adverse impact on the other" [6]. Free-ranging large carnivores constitute one of the most prominent human-wildlife conflict issues. Ultimately, the degree to which communities support and participate in predator conservation will depend on the value that people place on predators [7]. This value is likely to be a function of costs (e.g. livestock losses or threats to peoples' lives) and benefits (e.g. tourist revenues or cultural values) resulting from the presence of predators. Livestock predation in particular has been a serious challenge to conserving threatened predators outside protected areas [8] with predators potentially adversely affecting the profitability of livestock production and people's livelihoods. Accordingly, the outside boundaries of protected areas often represent an anthropogenic sink for predator populations [9]. Conflict between humans and carnivores that kill livestock is a worldwide phenomenon with significant conservation implications. Well known

examples of human-carnivore conflict include hyenas (*Crocuta crocuta*) and lions (*Panthera leo*) in Africa [10, 11]; snow leopards (*Uncia uncia*) in India and Pakistan [12, 13] wolves (*Canis lupus*) in North America [14], puma (*Puma concolor*) and jaguar (*Panthera onca*) in South America [15, 16] and dingoes (*Canis lupus dingo*) in Australia [17]. In India Livestock depredation by large felines such as tiger (*Panthera tigris*), Lion (*Panthera leo*), Leopard (*Panthera pardus*) and snow leopard (*Uncia uncia*) has resulted in a human wildlife conflict that hinders the conservation of the globally threatened species throughout their range [18-21]. It is a major issue for conservation biologists in the 21<sup>st</sup> century [22] and the survival of rare and endangered species is at stake and local people are constrained in their living strategies and accessing available natural resources [23].

Although not as common as attacks upon livestock or game species, wild animal attacks upon humans clearly have particularly significant impacts in terms of causing intense conflict [24]. Attacks on humans can pose a significant threat in some areas: for instance, the Sundarbans region of eastern India has long been a 'hotspot' for man-eating tigers, with around 100 human deaths reported annually [25], while 100 - 200 people are killed by Asian elephants every year in India [26, 27]. Data on such attacks are often vague and researchers have called for more studies to investigate the circumstances surrounding human attacks [24], in order to try to reduce their prevalence and ease coexistence between humans and potentially threatening wildlife species.

## MATERIALS AND METHODS

**Study Area:** The Kanha-Achanakmar corridor is an extensive forested landscape and therefore it is vital for long term tiger conservation in central India (Fig. 1). This corridor forms a crucial linkage between two source tiger populations of Kanha and Achanakmar tiger reserves via Phen wildlife sanctuary which is recently declared as satellite core of Kanha tiger reserve. Most of the corridor area falls into territorial divisions of Kawardha and Bilaspur in Chhattisgarh and Dindori and East Mandla in Madhya Pradesh. The aerial length of the corridor is approximately 60 km with an average width of 10 km. It is spread over 6000 sq km and has a great potential to carry good diversity of wild animals. Vegetation composition comprises mixed deciduous forest interspersed with bamboo on hilly slopes. Hill tops are generally flat with grasses and bushes along with sparsely distributed trees; such habitat is locally known as Dadar. The valleys are dominated by the sal (*Shorea robusta*) forests. Forests of this area are a source of major rivers including Narmada and Son. Major tribal communities in this part of landscape include Gond, Baiga and Yadav. Primary occupations of these communities are livestock rearing, grazing and subsistence farming. Owing to large number of cattle and goat population creates tremendous grazing pressure on forest areas. In addition to this, several livestock herds of nomadic pastoralist community also graze their livestock in this forest area.

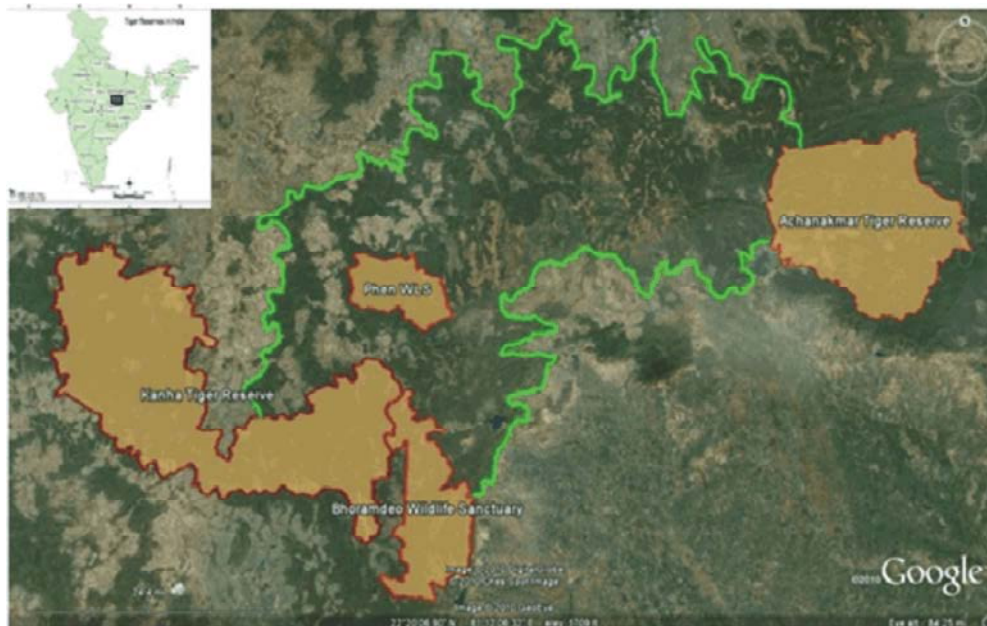


Fig. 1: Map of Study Area, Kanha- Achanakmar Corridor, Central India

**Secondary Data Collection:** Secondary data was collected from the forest department regarding human-carnivore conflict. Data on livestock kill; human causality, place of conflict (division, range, village etc.) were collected from the department. Based on this secondary information villages or cluster of villages were selected using random sampling method.

**Questionnaire Survey:** Questionnaire survey was done to collect the data on human carnivore conflict from intensively sampled villages within the corridor. Field data was collected using a combination of qualitative methods (unstructured interviews and focus group discussions) and quantitative methods (structured interviews), which formed the main data source. Unstructured interviews were conducted with employees of the wildlife department and people who had experienced conflict with carnivores. The main aims of the questionnaire surveys were to explore the different aspects of human-carnivore conflict patterns, socio-economical impacts, the perceptions and level of tolerance and attitudes of local people towards the main conflict species. The questionnaire consisted of five main sections: demographic and socio-economic characteristics of respondents; human-carnivore conflict experience; financial loss of livestock; perceptions towards carnivores; and, tolerance towards carnivores. To find out solution options for mitigating human-carnivore conflict from interviews with locals, we presented five possible management s i.e. 1. Do Nothing; 2. Repel the predator using disruptive stimulants; 3. Lethal Control; 4. Translocation; 5. Physical barrier; 6. Habitat improvement.

**RESULTS**

**Socio Demography of Studied Villages:** Total 238 persons from 238 households were interviewed from these 16 villages. Out of these respondents 91% were male as women members are shy in nature and hesitate to speak. Even they were unable to speak. Average family size of the sampled households was calculated as 5.5 persons per family (Table 1). Total 58% respondents were between 30 and 50 years age group. Less than 2% respondents are having age of more than 70 years (Fig. 2). Out of 238 respondents 148 (62%) respondents were uneducated (Fig. 3).

**Livestock Profile of Sampled Households:** It was reported that out of total 238 sampled households 84% of them hold livestock as a secondary source of income. A total of

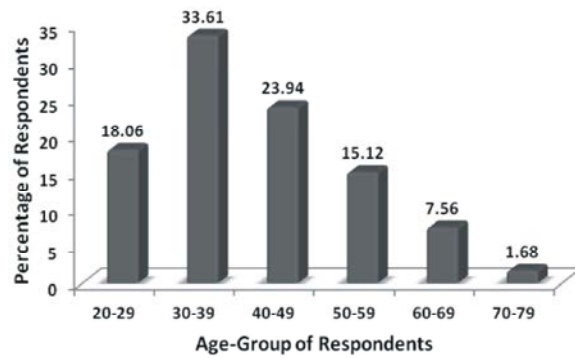


Fig. 2: Percentage of Respondents in relation to their age-group

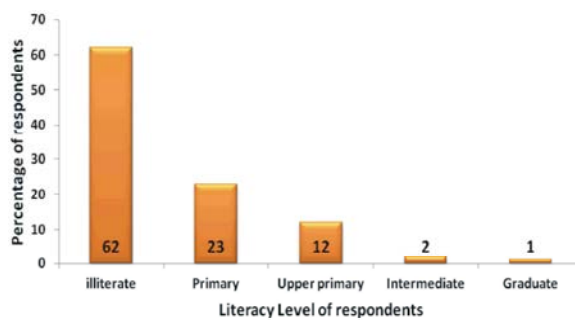


Fig. 3: Percentage of Respondents in relation to their Literacy level

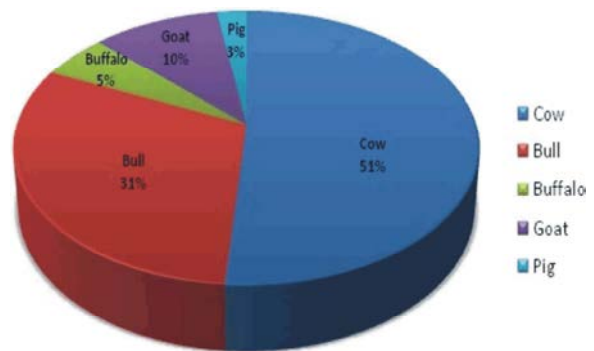


Fig. 4: Percentage of livestock holding of sampled household

1254 number of individual livestock was reported from which cow holds the highest 51% (864 numbers) and lowest was Pig with 3% (41 numbers) (Fig. 4).

**Livestock Predation:** Total 57 livestock depredation events were reported during the household survey. Out of these, Leopard was found to be involved in 27 incidents (47%), followed by Tiger in 21 incidents (37%), Jackal in 5 incidents (9%) and wolf involved in 4 incidents (7%). Mostly the predators attack on Cow (23; 43%) and least number of attacks on horse (1; 2%; Fig. 5).

Table 1: Family profile of sample households (average number per family)

Average	Tarwatola	Manjhetola	Bhadratola	Devarintola	Boiraha	Jhiriya	Sargadi	Sathiya	Behermunda	Orein	Sajah Lagan	Dhavaipani	Linga	Kukti Sarai	Jungli Kheda	Bhimdongri
Family Size	5.1	5.1	6.6	5.4	5.0	5.2	5.2	4.4	6.1	6.6	5.2	8.3	5.4	5.3	4.8	6.3
Male	2.4	2.8	2.7	2.6	2.9	2.7	2.8	2.3	2.9	3.5	2.5	4.3	2.5	3.1	2.3	3.0
Female	2.7	2.3	3.9	2.8	2.0	2.5	2.4	2.1	3.3	3.2	2.7	4.0	2.8	2.2	2.5	3.3
Adult	2.9	3.0	3.1	3.3	3.1	2.5	2.3	2.7	3.4	4.1	2.5	4.9	2.8	2.6	2.7	4.2

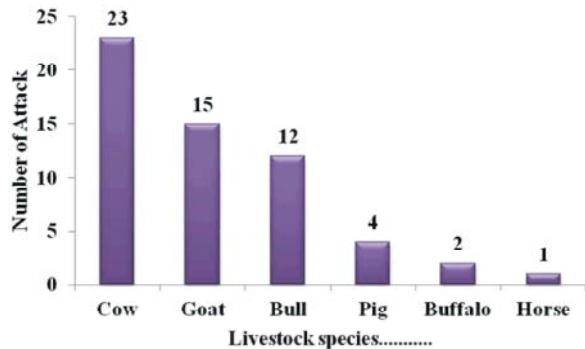


Fig. 5: Incident of carnivore attack on different livestock reported from surveyed household

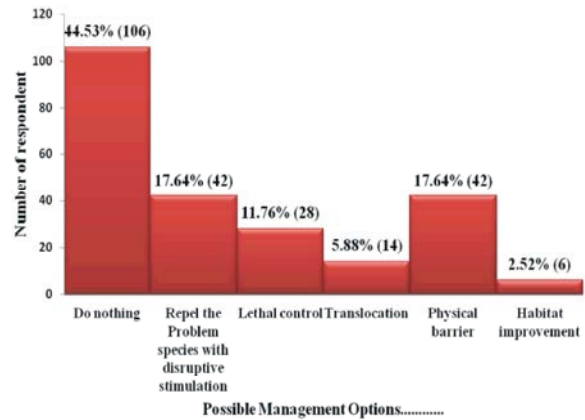


Fig. 8: Respondent's perception towards the carnivores

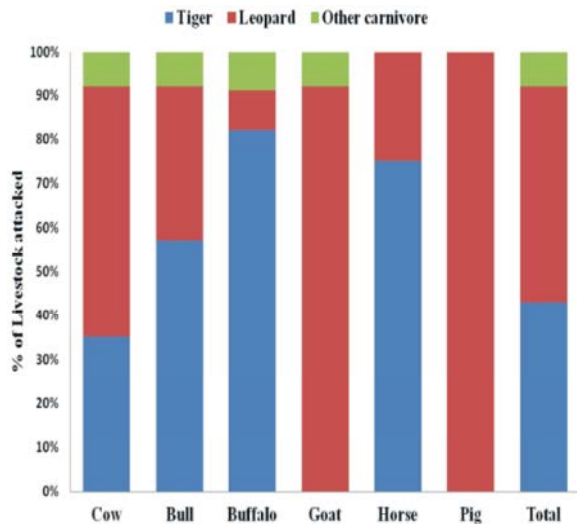


Fig. 6: Percentage of livestock deprecation events by different carnivore species

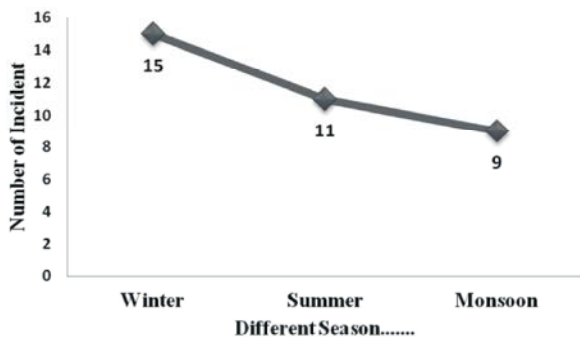


Fig. 7: Seasonal pattern of human attacks (as recorded by forest department, Madhya Pradesh)

The highest number of cattle was depredated by Leopard than Tiger. Tiger mostly kill the livestock of large body size such as bull, buffalo and cow whereas Leopard preferred small livestock such as Calf, Goat etc. According to the household survey data and forest department data highest number of attack was made by Leopard than Tiger and other carnivores. The following graph shows that Tiger kill maximum number of bull and buffalo than other predators, whereas Leopard preferred Cow (including calf) (Fig. 6). According to respondent's maximum number of attack on livestock reported during monsoon (41%). In winter Leopard attacks are more than Tiger and other carnivores like jackal, wolf etc. and in summer Tiger kill the maximum numbers of Livestock than other large predator exist in this area. Tiger kills are mostly during the day time and most of the Leopard kills are at night. According to secondary data collected from range offices along the corridor, 151 incidents of Human-Carnivore conflict was reported from the time period of year 2005 to 2011. Data revealed that Tiger was involved in 65 incidents (43%), leopard was involved in 74 incidents (49), jackal was involved in 10 incidents (6%) and wolf was involved only in 2 incidents (1%). There was a record of sloth bear attack on livestock (1%).

**Human Casualty, People's Perception and Attitude Survey:** There are 35 cases of human injury and only in one case human death was recorded by the forest

department. Sloth bear was involved in highest number of incidents (27 incidents) and leopard was involved only in one incidents. Jackal was involved in 7 incidents. Most of the attacks were on adult person with an average age of 37.7. According to forest department information most of the attack on human reported during winter, followed by summer and monsoon (Fig. 7).

To know the perception respondents were asked five possible management options for mitigating predator attacks on livestock. Out of 238 respondents 106 respondents answered do nothing and only six respondents answered habitat improvement. Though human-carnivore conflict had a negative impact on them both economically and mentally but they have a positive attitude towards carnivores. 44% respondents answered to keep them at their place and they have no problem for such human carnivore conflict. Out of 238 respondents 12% respondents answered for lethal control (Fig. 8).

## DISCUSSION

Human wildlife conflict is a common phenomenon from the past and become a significant problem throughout the world and in country like India ecological research in areas of high conservation value is often focused in protected areas where human impact is minimal in unprotected areas [28]. The rapid growth of human population is reducing and fragmenting the available habitat for the wildlife and here existing corridors play an important role to connect these scrappy habitats. The dependency on forest product forced the wild animal and human to share the same place for their basic needs and it become very crucial in unprotected areas. The presence of carnivores like tiger, leopard in human dominated landscape is not the main cause for conflict. Conflicts generally arise when local people, dependent on forests for various needs, unknowingly come in close contact with the carnivores, possibly resulting in an attack. Livestock grazing inside the forest decrease the herbivore density which leads to livestock predation by carnivores. Poaching of predators and their prey for their great economic value also causes human wildlife conflicts.

In Kanha-Achanakmar corridor also human-carnivore conflict arises due the similar resource use pattern by people and wild animals. Encroachment by the locals in forest habitat for their every day needs gradually decreased the space for wild fauna, which force them to come out from their natural habitat. The rapid deforestation of natural habitats is the main cause with local people dependency on forest products finally

resulted as Human-Carnivore conflict. The study result represented the highest number of livestock depredated by Leopards followed by Tiger and other carnivores according to both household survey and secondary information from forest department. Carnivore species differed in their prey selection which is based on body size [10]. Tiger differentially attacked larger livestock prey like cow, bull and buffalo whereas Leopard prefer small livestock prey such as goat, pig, sub-adult cows and sometimes bull or buffalo. Maximum tiger kills are inside the forest. Leopards frequently enter into the villages and lifting the livestock from the livestock shed. This is because these animals can be easily dragged into the secluded and safer place after being killed [29]. Study result revealed that Tiger and Leopards were the common agents of livestock killing. Other carnivores like Jackal, wolf were also involved in some cases of livestock predation. Maximum tiger kills were inside the jungle and the mid time of the day whereas Leopard kills were inside the villages and attacks are mostly at night. The mean wild and domestic prey body mass killed by leopard in Indian tropical forests was 23 kg [30], while a synthesis of 33 published and unpublished leopard diet studies found that leopard preferentially preyed upon species within a weight range of 10-40 kg [31]. In the present study it has been found that in Kanha-Achanakmar corridor area about 44% livestock was depredated by leopards where Tiger involved in 41% of livestock killing as reported by the respondents. About 43% cows were attacked by different carnivores followed by Goat 28%, bull 23% as reported by the respondents. Both Tiger and leopard Prefer cow for their prey. As stated by the respondent Leopard is the most problematic species in the study area for livestock killing and Sloth bear is for Human causality.

The survey results showed that people living in the corridor have a strong support towards the conservation of wildlife. This is because of their greater dependency on forest products such as fuel wood, timber and Non Timber Forest Product (N.T.F.P.). One of the respondent told, "Jungle are for the wildlife and they must stay there and the forest is our property, we should take care of our jungle and our natural resources." Some people told that they have no any problem for their loss and they should happy if governments pay them a suitable amount as compensation for their loss. Some people who had experienced with conflict most of them also shows a positive attitude towards wildlife. They said the compensation process of the forest department is very slow and the amount they were paid is very less.

Human wildlife conflict can have a financial impact on local community because people living in the closest to wild habitats having the lowest income category [29]. Conflict can therefore reduce the tolerance towards the particular species and their conservation. Conflict is a major problem in wildlife management. Therefore it is necessary to collect the baseline information on it to reduce the conflict. Before going to mitigate human carnivore conflict and for conservation plan it is necessary to study the current status of conflict patterns and intensity. The livelihood of these peoples is fully dependent on the agriculture and the livestock's. So, agricultural damage and livestock predation affect the livelihood patterns of those peoples. Conflicts create negative impact on local community, but they still positive towards carnivore conservation. Community-based wildlife conservation action plan is bottom-up (or grass root) activities that bring local community, individuals and organizations together to work towards achieving desired local community goals for conservation of wildlife [32]. Sustainable livelihood opportunities needed to minimize the pressure on forest and eco-development practices with modified compensation programme to give rapid relief to conflict victims. To take any mitigation measures and conservation action it is also important to know about the timing and location of conflict and the attitudes of local peoples towards the carnivore conservation.

#### ACKNOWLEDGEMENT

We acknowledge the Forest Department of Madhya Pradesh for their permission and help to complete this research work. The first and second author wants to express their gratitude towards WWF India, Satpuda-Maikal landscape for financial and logistic support. Finally first author wants to express his gratitude towards Prof. S.K. Dutta, Dr. R.K. Mishra and all classmates of North Orissa University for their continuous support with valuable comments to improve the study design and manuscript.

#### REFERENCES

1. Terborgh, J., 1974. Preservation of natural diversity: the problem of extinction-prone species. *BioScience*, 24: 715-722.
2. Gittleman, J.L., S. M. Funk, D.W. Macdonald and R.K. Wayne, eds, 2001. *Carnivore Conservation*. Cambridge University Press, Cambridge, U.K.
3. McDonald, R.A., 2002. Resource partitioning among British and Irish mustelids. *Journal of Animal Ecology*, 71: 185-200.
4. Tannerfeldt, M., B. Elmhagen and A. Angerbjörn, 2002. Exclusion by interference competition? the relationship between red and arctic foxes. *Oecologia* (Berlin), 132: 213-220.
5. Lamarque, F., J. Anderson, R. Fergusson, M. Lagrange, Y. Osei-Owusu and L. Bakker, 2009. *Human-Wildlife conflict in Africa, Causes, consequences and management strategies*. Food and Agriculture Organization of the United Nations, Rome, pp: 1-98.
6. Conover, M.R., 2002. *Resolving Human-Wildlife Conflicts*. Lewis Publishers, Boca Raton, Florida.
7. Sillero-Zubiri, C. And M.K. Laurenson, 2001. Interactions between carnivores and local communities: conflict or coexistence? In *Carnivore Conservation* (eds J.L. Gittleman, S.M. Funk, D. Macdonald and R.K. Wayne), Cambridge University Press, Cambridge, UK, pp: 282-312.
8. Treves, A. and K.U. Karanth, 2003. Human-carnivore conflict and perspectives on carnivore management worldwide. *Conservation Biology*, 17: 1491-1499.
9. Woodroffe, R. and G.R. Ginsberg, 1998. Edge effects and the extinction of populations inside protected areas. *Science*, 280: 2126-2128.
10. Patterson, B.D., S.M. Kasiki, E. Selempo and R.W. Kays, 2004. Livestock predation by lions (*Panthera leo*) and other carnivores on ranchers neighboring Tsavo National Park, Kenya. *Biological Conservation*, 119: 507-516.
11. Kolowski, J.M. and K.E. Holekamp, 2006. Spatial, temporal and physical characteristics of livestock depredation by large carnivores along a Kenyan reserve border. *Biological Conservation*, 128: 529-541.
12. Hussain, S., 2003. The status of snow leopard in Pakistan and its conflict with local farmer livelihoods. *Oryx*, 37: 33-37.
13. Jackson, R.M. and R. Wangchuk, 2004. A Community-based approach to mitigating livestock depredation by snow leopards. *Human Dimensions of Wildlife*, 9: 307-315.
14. Musiani, M., C. Mamo, L. Boitani, C. Challaghan, C. Gates, L. Mattei, E. Visalberghi, S. Breck and G. Volpi, 2003. Wolf depredation trends and the use of flammable barriers to protect livestock in western North America. *Conservation Biology*, 17(6): 1538-1547.

15. Mazzolli, M., M.E. Graipel and N. Dunstone, 2002. Mountain lion depredation in southern Brazil. *Biological Conservation*, 105: 43-51.
16. Polisar, J., I. Maxit, D. Scognamillo, L. Farrell, M.E. Sunquist and J.F. Eisenburg, 2003. Jaguars, pumas, their prey base and cattle ranching: ecological interpretations of a management problem. *Biological Conservation*, 109(2): 297-310.
17. Allen, L.R. and E.C. Sparkes, 2001. The effect of dingo control on sheep and beef cattle in Queensland. *Journal of Applied Ecology*, 38: 76-87.
18. Mishra, C., 1997. Livestock depredation by large carnivores in the Indian Trans Himalaya: conflict perceptions and conservation prospects. *Environ. Conserv.*, 24: 338-343.
19. Sekhar, N.U., 1998. Crop and livestock depredation caused by wild animals in protected areas: the case of Sariska Tiger reserve Rajasthan, India. *Environmental Conservation*, 25: 160-171.
20. Vijayan, S. and B.P. Pati, 2002. Impact of Changing Cropping patterns on Man-Animal Conflicts Around Gir Protected Areas with Specific Reference to Talala Sub-District, Gujarat, India. *Population and Environment*, 23(6): 541-559.
21. Rao K.S., R.K. Maikhuri, S. Nautiyal and K.G. Saxena, 2002. Crop damage and livestock depredation by wildlife: a case study from Nanda Devi Biosphere Reserve, India. *Journal of Environmental Management*, 66: 317-327.
22. Priston, N.E.C., 2009. Exploser plots as a mechanism for quantifying damage to crops by wildlife. *International Journal of Pest management*, 55(3): 243-249.
23. Naughton-Treves, L., 1998. Predicting patterns of crop damage by wildlife around Kibale National Park, Uganda. *Conservation Biology*, 12(1): 156-168.
24. Quigley, H.B. and S. Herrero, 2005. Characterization and prevention of attacks on humans. In R. Woodroffe, S. Thirgood and A. Rabinowitz, editors. *People and Wildlife: Conflict or Coexistence?* Cambridge University Press, Cambridge, U.K., pp: 27-49.
25. Sanyal, P., 1987. Managing the man-eaters in the Sundarbans tiger reserve of India: a case study. In R.L. Tilson and U.S. Seal, editors. *Tigers of the World: The Biology, Biopolitics, Management and Conservation of an Endangered Species*. Noyes Publications, Park Ridge, New Jersey, pp: 427-434.
26. Thirgood, S., R. Woodroffe and A. Rabinowitz, 2005. The impact of human-wildlife conflict on human lives and livelihoods. In R. Woodroffe, S. Thirgood and A. Rabinowitz, editors. *People and Wildlife: Conflict or Coexistence?* Cambridge University Press, Cambridge, U.K., pp: 13-26.
27. Veeramani, A., E.A. Jayson and P.S. Easa, 1996. Man-wildlife conflict: cattle lifting and human casualties in Kerala. *Indian Forester*, 122: 897-902.
28. Maurya, Kamalesh K., Bilal Habib and Satish Kumar, 2011. Food habits of Indian Wolf (*Canis lupus pallipes*) in Deccan Plateau of Maharashtra, India. *World Journal of Zoology*, 6(3): 318-322.
29. Dar, N.I., R.A. Minhas, Q. Zaman and M. Linkie, 2009. Predicting the patterns, perceptions and causes of human-carnivore conflict in and around Machiara National Park, Pakistan. *Biological Conservation*, 142: 2076-2082.
30. Karanth, K.U. and M.E. Sunquist, 1995. Prey selection by tiger, leopard and dhole in tropical forests. *Journal of Animal Ecology*, 64: 439-450.
31. Hayward, M.W., P. Henschel, J.O. Brien, M. Hofmeyr, G. Balme and G.I. Kerley, 2006. Prey preference of the leopard (*Panthera pardus*). *Journal of Zoology*, 270: 298-313.
32. Aryal, Achyut, 2012. Brown Bear Conservation Action Plan in Nepal: Efforts, Challenges and Achievements. *World Journal of Zoology*, 7(1): 75-78.