

Livestock and Human Predation by Carnivores in Katerniaghat Wildlife Sanctuary, Uttar Pradesh, India

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Abstract

Based on information collected from the forest department and interviewing 153 households in five different villages with local people, a total of 21 human casualties and 288 livestock depredation were reported in different villages in Katerniaghat wildlife sanctuary during 2000-2007. During the study periods, out of 21 cases, 11 cases were killings and 10 cases were injured. Male casualties were more than the females. There was marked monthly and annually variation in the occurrence of human casualties. Among 21 cases, 11, 6, 3 and one casualties occurred in the age group of 21-30 years, 31-40, 41-50 and 11-20 years respectively. Highest number of 13 human casualties occurred between 1601-2000 hours. In the Katerniaghat wildlife sanctuary, Uttar Pradesh state, human population is constantly on the increase and as a result, there are increasing biotic pressure on protected areas and reserve forests. During the study periods, propose livestock growth programmes, including pasture improvement, and financial compensation as short-term measures to reduce conflict between people and predators. In the long-term, recommend that the feasibility of an insurance scheme should be tested, the possibility of relaxing the resource use restrictions in the Forest and Nature Conservation Act of 1995 be explored.

1. Introduction

Carnivores exert a profound influence on biological communities via predation and interspecific competition. Carnivores often regulate or limit the numbers of their prey, thereby altering the structure and function of entire ecosystems (Schaller, 1972; Estes et al., 1998; Berger et al., 2001 and Terborgh et al., 2002). Human-carnivore conflict is considered to be a major conservation and rural livelihood issue because many carnivore species have been heavily persecuted due to elevated conflict levels with communities (Dar et al., 2009). One of the main contributors to human-wildlife conflict in Bhutan is predation of livestock by wild mammalian carnivores (Sangay and Vernes, 2008).

Human-wildlife conflict is a worldwide problem, exemplified by carnivores preying on cattle and goats in Africa; and tigers (*P. tigris*) and leopards (*P. pardus*) killing livestock in Asia (Jackson and Nowell, 1996; Kaczensky, 1999; Karanth and Madhusudan, 2002) pumas (*Puma concolor*) and jaguars (*Panthera onca*) taking cattle in South America and wolves (*Canis lupus*) and bears (*Ursus* spp.) killing sheep in North America and Europe. Some conditions, individual carnivores attack humans, with tragic consequences for all (Brain, 1981;

McDougal, 1987; Treves and Treves, 1999; Rajpurohit and Krausman, 2000; Karanth and Madhusudan, 2002). This competition over food and space is not restricted to big, fierce predators. Smaller carnivore species have long been involved in competition with humans over game species, crops, apiaries, fish stocks, and poultry (Gipson, 1975; Jorgensen et al., 1978; Reynolds and Tapper, 1996).

Human carnivore conflict arises for several reasons. Carnivore's protein rich diet and large home ranges draw them into recurrent competition with humans, who have somewhat similar needs. Indeed many carnivore species are specialized for ungulate predation; therefore some individuals readily kill domesticated ungulates when opportunities arise (Meriggi and Lovari, 1996; Karanth et al., 1999; Polisar, 2000; Treves and Karanth, 2003). All the large cats viz. lion, tiger, leopard and snow leopard are involved in conflicts with humans in India (Chakrabarti, 1992; Chellem and Johnsingh, 1993; Saberwal et al., 1994; Daniel, 1996; Mishra, 1997; Jhala and Sharma, 1997; Jackson, 1999; Atherya et al., 2004; Chauhan et al., 2002 and Yadav, 2011).

Conflict between wildlife and humans is significance problem is many parts of the world. Influential factors include



increasing human populations, loss of natural habitat and in some regions, growing wildlife populations resulting from successful conservation programmes. The conflict has been exacerbated by people and pets animals' encroaching on the leopard. Increasing people pressure has mint increasing to the big cats coming face to face with humans more frequently. Left to itself, the leopard is the most adaptable of all the big cats in the Indian sub-continent. It lives in the deciduous, evergreen, scrub jungle and tarai region and fringes of human habitation. It is the largest predator of the forest (tigers and leopards). which can be easily seen in the late hours in its habitat. The leopard and tigers eat almost anything it can catch from birds to deer, it also scavenges. Leopard does not need vast forest to maintain itself as does a tiger or a Lion. Some of the large carnivores prey upon livestock causing economic loss and bad-will frequently leading to their destruction (Mills, 1998; Nowell and Jackson, 1996). Tigers mostly survive in small numbers in protected areas which are isolated due to habitat fragmentation and disturbances. Presently tiger population is threatened due to increasing biotic pressure, habitat loss, degradation and fragmentation, which make such population very unstable (Soule, 1986). In the past predation on domestic livestock was considered an aberrant form of behaviour (Finn, 1929). The genesis of the term *cattle lifter* connotes an individual animal habituated to almost exclusive feeding on cattle.

Leopard managed to co-exist with tigers, by hunting smaller prey and hauling the carcasses up on the tress. They also prey upon cattle, dogs, goat; sheep's and now increasingly venturing closer to human habitation have even started snatching away children. Livestock holdings form an integral part of the local pastoral and agricultural economy, and grazing of substantial herds is widespread in, or adjacent to, wildlife sanctuary. Predator's attacks livestock that are grazed in, or close to, forest area, and venture in to farms to take livestock, as well as posing risks to humans. Such damage to local livelihood angers farmers who may resort to retribution (Conforti and De Azevedo, 2003), thereby breeding a conflict of interest between local communities and wildlife mangers. Human-wildlife conflicts attract greatest attention when the wildlife species involved is endangered or where the conflict poses a serious threat to human welfare (Saberwal et al., 1994). Most large carnivores presently highly regarded by the public and management are directed at species recovery and conservation (Mech, 1995 and 1996; Bangs and Frtitts, 1996). In the Indian sub-continent, a few ecological studies have been conducted on the tiger in the past (Karanth, 1993; Schaller, 1967; Seidensticker, 1976; Sankhala, 1977; Thapar, 1989; McDougal, 1977; Panwar, 1979; Sunquist, 1981; Tamang, 1982 and Smith, 1984). But little bit scientific information is available on the genesis of human-tiger conflict and mitigation strategies from

different tiger areas in India, with herder caused by carnivore depredation on livestock. The problem is worldwide but appears to be especially acute in this area. The tarai region is flat alluvial stretch of land lying between the Himalayan foothills and the Gangetic plain. It extends through the Indian states of Uttar Pradesh, Uttarakhand, and part of south-west Nepal. The moist deciduous vegetation of this region is dominated by extensive patches of semal, *Bombax ceiba* and teak, *Tectona grandis* forest, interspersed with grass lands dominated by *Sacchrum* species.

2. Materials and Methodos

The study was undertaken in the Katarniaghat wildlife sanctuary. It is located in the Nanpara tehsil of Bahraich district. The Indo-Nepal border constitutes the northern boundary of the sanctuary. The entire area, measuring 400.69 km², is situated between 28°24' N latitudes and 81°19' longitudes. It is one of the most significant representatives of the Tarai-Bhabhar bio-geographic sub-division with highly rich, diverse and fragile tarai ecosystem. The sanctuary has a strong connectivity with the Royal Bardia national park of Nepal and Dudhwa National Park in Uttar Pradesh, India. In the low alluvial tracts, sissoo (*Dalbergia sissoo*), khair (*Acacia catechu*), semal (*Bombax ceiba*) and many other miscellaneous species grow. Katarniaghat Wildlife Sanctuary consisting of five forest types. These are Sal forest, Teak forest, Scrub Forest, Mixed Forest and Riverine Forest.

During the study period in 2007, information was collected from the records of the forest department, survey of affected villages and by direct interview of the victims or their family members and by analysis of human attack cases in Katarniaghat wildlife sanctuary. To know the nature and extent of the conflict, questionnaire survey of affected villages in the study area was carried out.

Informal household interviews were conducted, people inhabiting the villages in and around KWS areas. The interview is carried out to collect information on the presence of carnivores in their respective village forest area, indirect or sign evidences, places of occurrence, forest dependency by the people on collection of timbers and NTFPs such as fuel wood, food plants, fodder plants, medicinal plants, bamboos and canes, thatches, etc., human casualties caused by carnivore attacks, The above information is collected by using a well defined questionnaire formats.

The affected areas were visited to collect information on the area profile, level of conflict, human casualties, livestock killings, place, time and seasonality of incidences and cause of conflict through interview from villagers. Selected villages canvassed 153 randomly selected household from within five villages in the park: Karikot (30 households), Barkhadia

(12 households), Sujawali (57 households) Bichhia (39) and Nisangarh (15). These households represented about 40% of the total households within the park.

3. Results and Discussion

The area has a long-standing problem of man killing and cattle lifting by tigers and leopard. These incidents now mostly occur outside the protected area boundaries as the agricultural fields offer continuity of habitat out of the forest areas by providing appropriate combination of conditions for resting, hiding and ambush cover.

A total of 21 cases of human casualties by tiger and leopard were reported in Katerniaghat wildlife sanctuary during 2000-2007 (Table 1). Out of 21 cases 11 cases were killings and 10 cases were injured. Out of 11 cases, tiger killed cases were higher 10 as compare to leopard, 1. Highest 4 number each of human casualties occurred in 2005 and 2007, followed by 2002, 2000, 2001, 2003, 2004 and 2006, 3 number and 2 number of each respectively human casualties cases were found (Table 1). Out of the 21 cases, male casualties were higher 14 than the female casualties 7. Among the males, highest number of casualties 4 was recorded during the 2007, whereas female 2 casualties were recorded during the 2003. Among the male casualties, the killings cases was highest then the 5 injuries cases. In case of female there were 4 killing cases then the 3 injuries cases. All these human casualties showed a decreasing trend during 2000-2007 (Table 2). Males were found to move extensively inside forest for collection of non timber forest produce and in agricultural fields for farming activity. So they are exposed more and succumbed to tiger and leopard attacks more than the females.

During 2000-2007, most of the human casualties by tiger occurred in the periphery of the sanctuary and few occurred inside. Yearly variation was observed during the 2000-2007 periods. Number of incidences of livestock killings varied in different years. Out of 288 cases, Maximum livestock (20.5%) depredation were during 2007, followed by (16.0%) depredation in 2006. In 2001 and 2003 (12.2% each) were livestock, (10.8%) in 2005, (10.1%) in 2004, (9.7%) in 2002 and (8.7%) in 2000 livestock cases were recorded (Figure 1).

During the study period marked monthly variation were observed. The maximum casualties occurred in the month of August (28.6%) followed by (19.0%) casualties in March, (14.3%) casualties in January and (9.5%) casualties in February. There were same percentages (4.8%) of casualties during the month of April, May, September, October, November and December respectively. No casualties in June and July (Figure 2). Human casualties occurred in all the months showing variation in these years. The monthly and diurnal patterns of occurrence of human casualties can be correlated with the

activity pattern of people in and around the sanctuary.

Out of total 21 human casualties by tiger and leopard, among these cases, highest number of 11 human casualties occurred in the age group of 21-30 years, Followed by 6 casualties were in the age group of 31-40 years, 3 casualties were in the age group of 41-50 years recorded during the study period. There were one cases of human casualties found in the age group of 11-20 (Table 3). Chauhan (2005) reported 114 cases of human casualties by tiger were reported during 1984-2001.

A total of 288 livestock depredation by tiger and leopard occurred in the vicinity of the Katerniaghat wildlife sanctuary during 2000-2007 (Table 4). There was highest number of livestock's depredation by tiger 75 were cattle's followed by 58 goats, 17 buffaloes and 10. Whereas the highest number of livestock's depredation by leopard 115 were goats, followed by 11 sheep and 2 cattle's and could not found the buffalo depredation by leopard during the study period (Table 4).

The livestock depredation by tiger and leopard in different month wise variation were observed in the vicinity of the Katerniaghat wildlife sanctuary. The highest (18.4%) livestock

Table 1: Number casualties by tiger and leopard in Katerniaghat wildlife sanctuary during 2000-2007

Year	Tiger		leopard		Total
	Killed	Injured	Killed	Injured	
2000	1	-	1	-	2
2001	2	-	-	-	2
2002	3	-	-	-	3
2003	1	-	-	1	2
2004	-	1	-	1	2
2005	2	1	-	1	4
2006	1	-	-	1	2
2007	-	1	-	3	4
Total	10	3	1	7	21

Table 2: Male and female casualties by tiger and leopard in Katerniaghat wildlife sanctuary during 2000-2007, (n=21)

Year	Carnivore (tiger and leopard)	
	Male (9 killing and 5 injuries)	Female (4 killing and 3 injuries)
2000	1	1
2001	2	-
2002	3	-
2003	1	2
2004	1	1
2005	1	1
2006	1	1
2007	4	1
Total	14	7



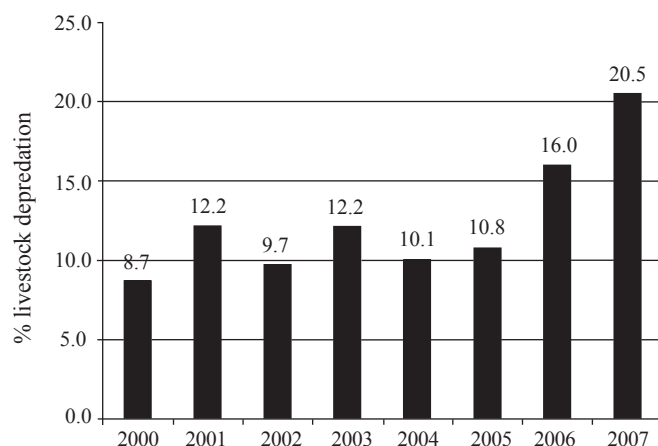


Figure 1: Yearly variation of livestock depredation by tiger and leopard during 2000-2007, (n=21).

killing occurred in the May, followed by (12.2%) in April, (9.7%) in November, (9.4%) in December, (9.0%) in March, (8.7%) in June, (8.0%) in September, (6.6%) in January, (5.9%) in February, (5.2%) in August, (3.8%) in July and (3.1%) in October livestock's cases were recorded (Figure 3).

The presence of high density of humans and livestock gives rise to high probability of encounters. The incidences of human casualties are consequently more even if it is accidental. It is believed by some that old age or being incapacitated by injuries often compels a tiger to prey on human beings, which are easy prey. In Sundarbans, high human casualties were related to the presence of people collecting non-timber forest produce. A man-eating tiger is actually very rare, only about three or four in a thousand (Gee, 1964; Siddiqi and Choudhury, 1987). But Hendrich (1975) claimed that 95% of the victims were killed by man-eaters during 1969-1971. Hendrich (1975) and Chakrabarti (1984) also claimed that the salinity of water influenced the tigers to become man-eaters. Cattle in these areas also serve as supplement to natural prey. All the same, it contributes significantly to the human-tiger conflict situation.

The livestock and human predation were caused by tiger and leopard in the vicinity of Barkhadia, Karikot, Nishangarh, Bichhia and Sujawali. Informal interviews conducted in 5 villages and of 153 households in and around the wildlife sanctuary.

A total of 21 human casualties were caused by tiger and leopard in Katerniaghat wildlife sanctuary, Uttar Pradesh during 2000 to 2007. Marked annual variation in human casualties by tiger and leopard was recorded in Katerniaghat wildlife sanctuary. A total of human casualties by tiger and leopard cases occurred almost every year from 2000 to 2007. Maximum casualties were recorded in 2005 and 2007. Annual variation in the tiger and leopard attacks on people could be directly correlated with the human activities and human-carnivore interactions in forests. There has been increasing degradation and fragmentation of

carnivore habitat and resources utilization.

Monthly variation in human casualties seems to be correlated with influx of villagers visiting forests for hunting purpose and collection of non-timber forest produce (NTFP). The causalities arise simply when human beings and wildlife come into contact and share resources. Carnivore's wide-ranging movement, their opportunistic nature, and capacity for learning also increased the probability of encounters with humans. This may be correlated with the intense activity pattern of men in forests in this region. Men regularly visit forests for hunting purpose and collection of fuel wood and fodder for their livestock, medicinal plants or to graze their livestock and also they spend more time in farming activities. Whereas women had restricted activity in forests and agricultural areas. All the casualties were accidental due to sudden encounters when villagers ventured into the forests.

Protected areas in Uttar Pradesh, instituted barely a decade ago involve powerful conservation laws, strong ethics and the Uttar Pradesh government priority conservation- this all

Table 3: Age group of human casualties by tiger and leopard in Katerniaghat wildlife sanctuary during 2000-2007 (n=21)

Year	Age group (years) for Tiger					Age group (years) for leopard attack					Total casualties
	11-20	21-30	31-40	41-50	51->	11-20	21-30	31-40	41-50	51->	
2001	-	1	1	-	-	1	1	1	-	-	5
2002	-	1	1	1	-	-	1	1	-	-	5
2003	-	1	1	-	-	-	-	-	1	-	3
2004	-	1	1	1	-	-	-	-	-	-	3
2005	-	1	1	-	-	-	-	-	-	-	2
2006	-	1	-	-	-	-	1	-	-	-	2
2007	-	-	-	-	-	1	-	-	-	-	1
Total	-	6	5	2	-	1	3	3	1	-	

Table 4: Livestock depredation tiger and leopard in Katerniaghat wildlife sanctuary 2000 to 2007 (n=288)

Year	Tiger					Leopard		
	A	B	C	D	E	F	G	I
2000	10	2	3	1	1	1	7	0
2001	9	1	9	1	0	2	13	0
2002	7	2	5	2	1	0	11	0
2003	11	0	13	2	0	0	9	0
2004	9	0	4	3	0	2	11	0
2005	12	0	2	1	0	2	14	0
2006	8	4	12	3	0	1	18	0
2007	9	1	10	4	0	3	32	0
Total	75	10	58	17	2	11	115	0

A: cattle; B: sheep; C: goat; D: buffalo; E: cattle; F: sheep; G: goat; I: buffalo;

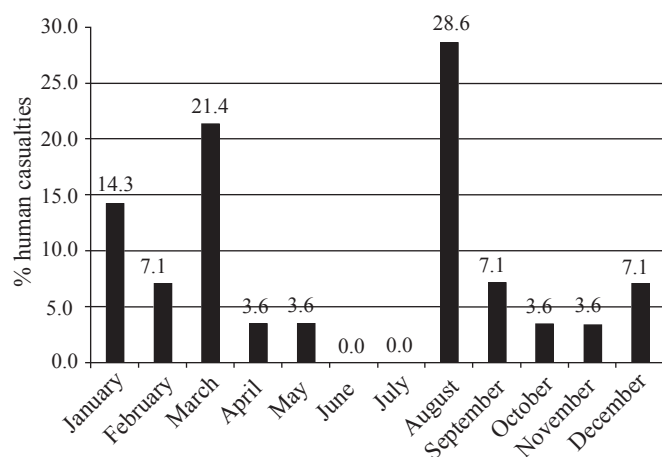


Figure 2: Monthly variation of human casualties by tiger and leopard during 2000-2007, (n=21)

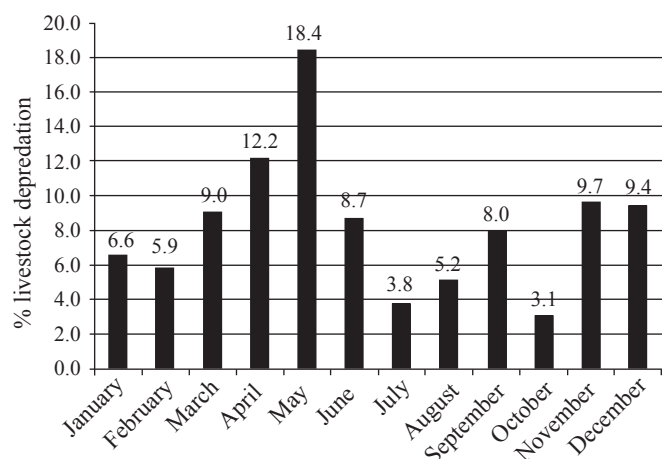


Figure 3: Monthly variation of livestock depredation by tiger and leopard during 2000-2007, (n=288).

within a cultural setting, where religious ethics are resonant with environmental protection. However, a disadvantage of strict conservation policies combined with a lax herding system within the park is the loss of livestock to wildlife.

A total of 288 livestock depredation by tiger and leopard occurred in the in and around Katerniaghat wildlife sanctuary during 2000 to 2007. The livestock depredation by tiger and leopard in different month wise variation were observed in the vicinity of the Katerniaghat wildlife sanctuary. The Maximum livestock killing occurred in the May, followed by April, November, December, March, June, September, January, February, August, July and October livestock's cases were recorded

Our analysis supported the general finding that where food in this case domestic stock is abundant, predation losses increase, leading to predation hotspots (Nass et al., 1984; Yom-Tov et al., 1995). The study identified heightened predation levels, where livestock were heavily grazed in forest habitats used by

predators. The hotspots for tigers and leopards did not overlap, except in Sujawli, raising the possibility that leopards are excluded by tigers. It is important to educate farmers to avoid grazing their livestock in predator hotspots or, at least, to be especially vigilant there.

The Katernighat Wildlife Sanctuary being surrounded from all side by human habitation has been bearing the brunt of human activities inside and outside of the Sanctuary. Over the period of last five year the population of free ranging tigers and leopards in the Katernighat Wildlife Sanctuary has been increasing according to census, conducted by the Forest Department.

The man-animal conflict is emerging as a major concern in several parts in several parts of the country in recent year. The most affected places being the states of Uttaranchal, West Bengal, Maharastra, Rajasthan, Orissa and Assam. The man-tiger, leopard conflict is actually an increasing war for space and food between men and animals.

With losses during 2007 almost equal to annual cash incomes for those households affected, there is an urgent need to address this problem. Government managers, researchers, and farmers should work together to devise a conservation management strategy that accommodates the needs of both wildlife and farmers. Restoration of an adequate natural prey base together with a programme of compensation for livestock lost may minimise conflict by increasing farmers' tolerance of wildlife (Michelle and Smirnov, 1999). A suitable management strategy should be evidence-based, and should explore methods to improve livestock management, monitoring the abundance of prey species, assessing the ecological impacts of over-grazing, and the feasibility of a sustainable compensation scheme. In the short-term, a ban on transient grazers entering the park and on grazing in predator hotspots should reduce encounter rates between livestock and predators. Alternative benefits from community-based ecotourism, livestock intensification, and sustainable harvesting of non-timber forest products should be explored as such benefits could generate more favourable attitudes towards conservation (Conforti and de Azevedo, 2003).

In the Katerniaghat wildlife sanctuary, Uttar Pradesh state, human population is constantly on the increase and as a result, there are increasing biotic pressure on protected areas and reserve forests. There were 21 human casualties by tiger and leopard over period of 8 years. Recommendations for mitigation of human-by tiger and leopard casualties and a conservation strategy for carnivore: People are required to be alert and vigilant moving in wildlife areas and restrict their activities. There should be complete ban on hunting of wildlife. Strict punishment should be imposed on people involved in such activity. Livestock grazing should be restricted in forest areas. The graziers should avoid

livestock grazing in forests. There should be strict regulation on collection of carnivore food items from wilderness areas and non-timber minor forest produce. Public education and awareness with respect to species conservation, natural history and wildlife damage is important. Unless, these damage problems can be reduced, the local inhabitants will not support wildlife conservation.

In most of the states, payment of compensation for human casualties by the state forest department is a good gesture. This would help develop understanding between affected people and forest department and help conserving wildlife. Compensation procedure for incidences should be simplified and payment should be made immediately. However, we believe compensation should be discouraged in protected areas. Reduction or even a complete ban on livestock grazing within forests will help replenish habitat and increase in wild animal population. Study on ecology and management of sympatric carnivore is also very necessary for formulation of action plan for mitigation of human-carnivore causalities and long term conservation of the species.

4. Conclusion

Emphasis should be on involving farmers in managing human-wildlife conflict and developing ways of enabling them to benefit from the existence of the park. There is immediate need to stop the depredation of the leopard and tiger habitats and improve their prey availability. It is a big challenge for forest managers, to find a workable solution to restore peace between tiger, leopard and human.

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