

Human–Carnivore conflict in Anamalai Tiger Reserve, Tamil Nadu, Southern Western Ghats

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Abstract

To understand the human-wildlife conflict in Anamalai Tiger Reserve (ATR) both primary and secondary data were collected. Totally 45 villages randomly selected for the survey and 353 people were interviewed. In addition, secondary data on livestock loss and human casualty from 2001 to 2018 were collected from the forest department. According to primary data, 105 livestock loss events have been reported. Out of these, leopard was found to be involved in 71 (68%) depredation incidents followed by wild dog in 23 (22%), Anecdotal records showed 14 human deaths and 24 human injuries and 65 livestock losses. Out of these, Leopard was involved in 82 incidents (80%) followed by Bear 12 (12%), Tiger in 4 incidents (4%) and wild dog involved in 3 (4%) incidents. The secondary data showed that a total of 14 human deaths and 24 human injuries. Highest percentage of carnivore attack on livestock was on cow (64%), followed by goat (34%). Human casualty and livestock losses were reported more during winter. Even through conflicts caused negative impacts on local community, still some people have positive attitude towards carnivore conservation.

Key words: Carnivore, Conflict, Anamalai Tiger Reserve, Human Casualty, Livestock Loss

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INTRODUCTION

As the population continues to grow rapidly, finding effective ways to conserve large carnivores has become a challenge (Woodroffe *et al.*, 2005). Large home ranges, and the threat they pose to livestock and human life make the co-existence of carnivores and humans difficult (Linnell *et al.*, 2001). Conflict often arises if two or more stakeholders compete for the same resource. Livestock depredation by large carnivores is a primary cause of their conflicts with humans and serious conservation concern across the world (Madhusudan and Mishra, 2003; Thigood *et al.*, 2005; Treves *et al.*, 2006). Increasing interactions between humans and large carnivores have led to escalated livestock damage by large carnivores and their retaliatory killing by the people (Woodroffe *et al.*, 2005). Estimating the global extent of livestock damage by large carnivores is difficult. Less than 10% of livestock holdings were being lost due to large carnivores in Africa (Mizutani, 1999; Rasmussen, 1999; Butler, 2000; Woodroffe *et al.*, 2005) and less than 18% average loss reported from Asia (Mishra 1997; Ikeda, 2007).

Economic loss due to the large carnivores generally contributes to the negative attitudes toward them (Williams *et al.*, 2002; Bagchi and Mishra, 2006). The ecology of negative interactions remains poorly understood. Understanding the ecological aspects of livestock depredation by carnivores is important for framing policies of global relevance. Balancing the goals of human development and wildlife conservation are the challenge especially when dealing with the large carnivores like Tigers and Leopards. Human–carnivore conflict (HCC) 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. Therefore, efforts to identify and implement human-carnivore conflict mitigation strategies are urgent, especially in the reserve borders and buffer zones where contact between humans and carnivores is more likely (Woodroffe and Ginsberg, 1998; Sunquist, 2002; Crawshaw, 2004). However, before taking such actions, it is important to examine spatial and temporal patterns of such conflicts in order to propose viable and effective site-specific interventions (Treves *et al.*, 2006). There are only a few studies assessing the extent of damage by carnivores in Asia and Africa despite the relatively high frequency of human- carnivore conflict (Thigood *et al.*, 2005). Few research works have mainly focused on describing the socio-economic aspects negative impact of human-carnivore

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interactions (Badola, 1998; Woodroffe *et al.*, 2005; Baghi and Mishra, 2006; Allendorf, 2007).

This study is mainly focused to assess the status of HCC in the Anaimalai Tiger Reserve (ATR). There is no complete record of HCC in the ATR. Hence this study is mainly concentrated to consolidate the available data of HCC in ATR. For this purpose, both primary and secondary data were used.

Study area and Methods

The Anaimalai Tiger Reserve (76° 49.3' and 77° 21.4'E and latitudes 10° 13.2' and 10° 33.3 N) falls within the Western Ghats mountain chain of South West India, a region designated as one of twenty-five Global Biodiversity Hotspots (Fig1). ATR spread over the 958.59 Sq.km and has reserve forest and protected areas on three sides bordering with Kerala and Tamil Nadu. Study area experiences and exhibits the widest

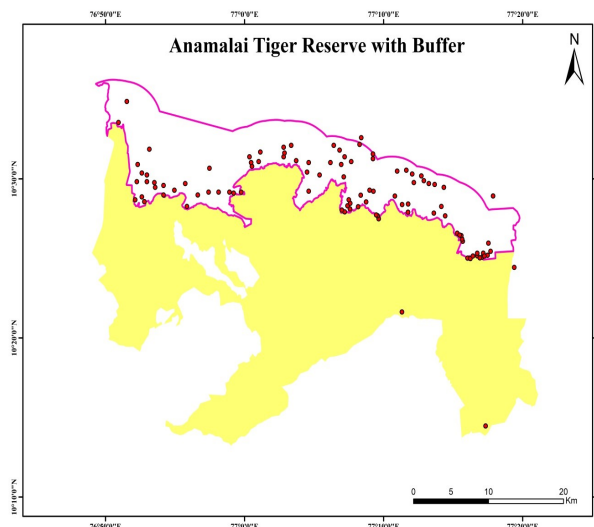


Fig.1. Map of the study area – Anaimalai Tiger Reserve

variation in annual rainfall among its different parts with maximum 50 mm to 5000 mm rainfall. The tiger reserve supports diverse habitat types. Unique habitats like mountain grasslands, savannah and marshy grasslands are also present. Considerable extent of man-made teak plantations, invasion of exotics like eucalyptus, wattle and pines are also present. The biota of this region is not only highly diverse but also distinctive with more than 2000 species of plants and more than 600 species of vertebrates. ATR is divided into six ranges and 32 divisions. The ranges include Manambolli, Pollachi, Ulandy, Udumalpet, Amaravathy and Valparai. The Northern boundary of the reserve opens into the plains of Pollachi and Udumalpet Taluks, and it shares the boundary with human habitations, farm lands and few villages. Ten Kilometres of these regions have been announced as buffer zone.

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Secondary data collection

Secondary data were collected regarding livestock depredation, livestock kill, human casualty and place and date of conflict, from the different ranges of forest department

Primary data collection - Questionnaire survey

The questionnaire survey was carried out from October 2016 to April 2018 to collect the data on HCC from fringe villages (Buffer) of ATR which are located 5 km within the boundaries. For primary data collection households were selected randomly. The households chosen for the survey of property damage and life loss due to human carnivore conflict was based on the ownership of large population of cattle and ownership of large agricultural lands. Interviews were conducted in Tamil (local language). Field data were collected by using a combination of both qualitative (unstructured interviews) and quantitative method (structured interviews). The main aim of the questionnaire survey was to explore the different aspects of Socio-economic status, livestock depredation, perception of local people and level of tolerance and attitudes of the local people towards the main conflict species.

RESULTS

Socio - Demography of surveyed people

A total of 353 persons from 353 households were interviewed during the study across 45 villages. Out of these 79% were male. Average family size of the sampled households was calculated to be 4.01 persons per family. Totally 64% of the respondents were between 30 and 50 years age group. Less than 3% respondents were more than 70 years (Fig. 2). Out of 353 respondents 123 (34%) respondents were uneducated followed by 106 (30%) who studied till the primary level of education, 90% of them attended upto high school, 9% were graduates and 7% of them had

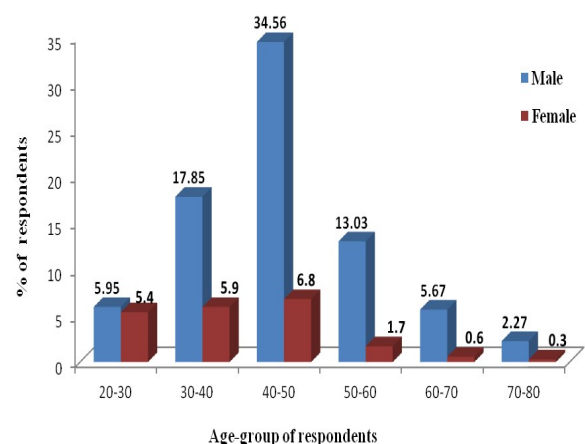


Fig.2. Age group - wise percentage of the respondents

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education upto middle and Higher Secondary level (Fig. 3).

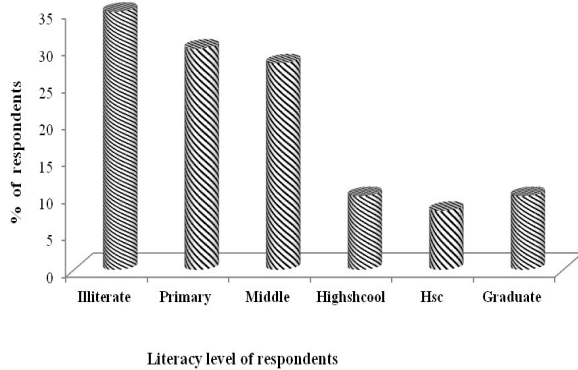


Fig.3. Percentage of respondents in relation to their literacy level

Livestock profile of sampled house hold

Out of 353 sampled households 56% of them holding livestock as their secondary source of income 78% of the respondents mainly had dog as their guard for farm. A total of 1462 number of individuals were found to possess livestock, of which possession of cow was the highest 56% (816) followed by both cow and goat/sheep 24 % (636) (Fig. 4).

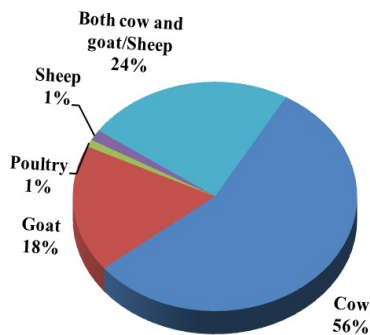


Fig.4. Livestock profile (%) of sampled household.

Primary data --: -Livestock predation

Out of 353 sampled household livestock loss was reported only from 30% of the family. Total of 105 depredation incidents were reported during the household survey. Of which, 47 were cattle species and 58 incidents were on pet animals. Of these, leopard was found to be involved in 71 (68%) times followed by wild dog in 23 (22%), fox in 6 (6%) and panther, mongoose, python, tiger and wild cat (1%) (Fig.5).

Most of the carnivore attacks were on goat (27; 57%) and least number of attacks were on poultry and Horse. The number of livestock depredated by leopard was higher when compared to the other carnivores. (Fig. 6).

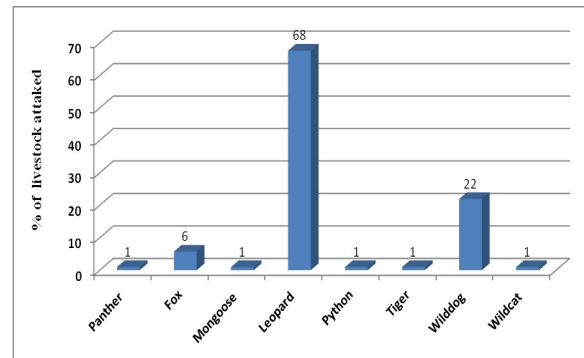


Fig.5. Percentage of carnivore attacks on livestock depredation.

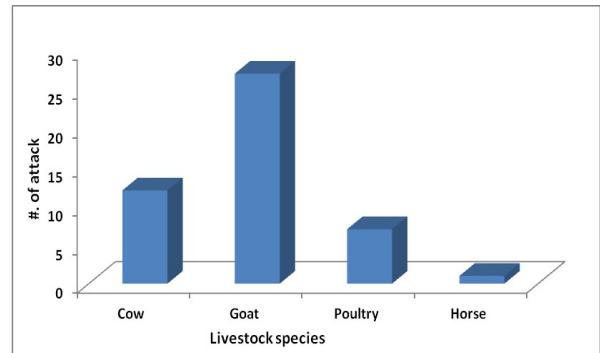


Fig.6. Incidents of carnivore attack on different livestock reported from household.

Livestock loss

According to the secondary data from the various range offices, 103 attacks were reported during 2018. Of which 14 were human death 24 human injuries and 65 livestock losses. Data revealed that leopard was involved in 82 incidents (80%) followed by bear 12 (12%), tiger 4 incidents (4%), wild dog in 3 (4%). There was only one record of python attack on livestock. Sixty four percent, (n=41) of the livestock loss was of cow, followed by goat (22; 34%) and only 2% of horse (Fig.7).

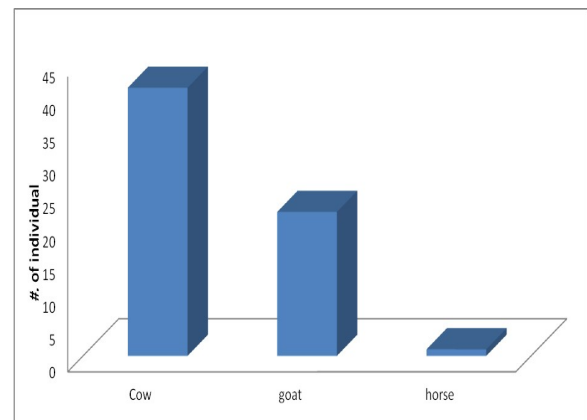


Fig.7. Incidents of carnivore attack on different livestock loss reported during 2001-2018

Human casualty and injury:

There are 14 human deaths and 24 human injury cases recorded from during of 2001 - 2018. Leopard is responsible for nearly 93% of the human death and 50% of the injury Followed 46% of injuries caused by Bear (Figure 8). Out of these, in 14 cases of human deaths (57%) were on adult persons and 6 (43 %) attacks on below 20 years old persons.

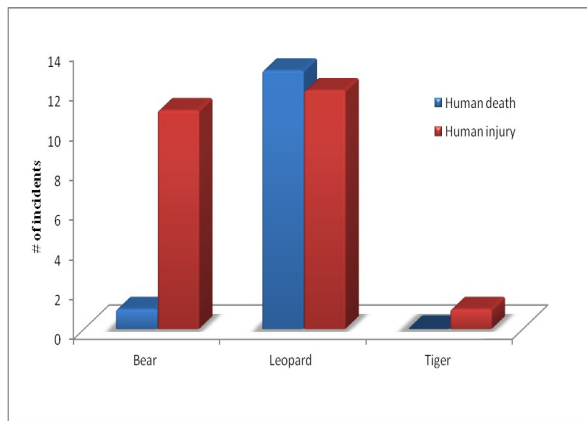


Fig.8. Different Carnivore attacks on human

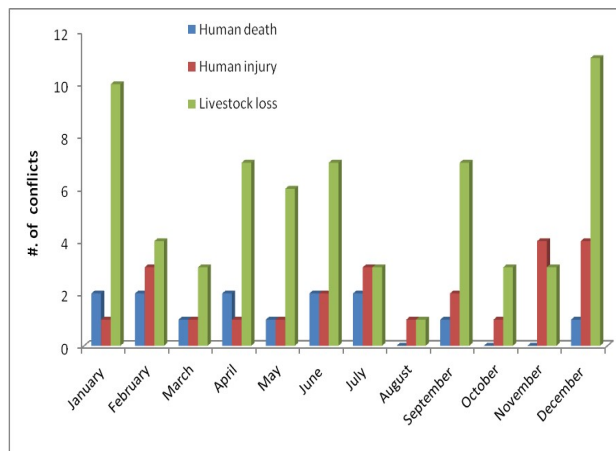


Fig.9. Frequency of carnivore attacks by month over a 18 year period (2000-2018)

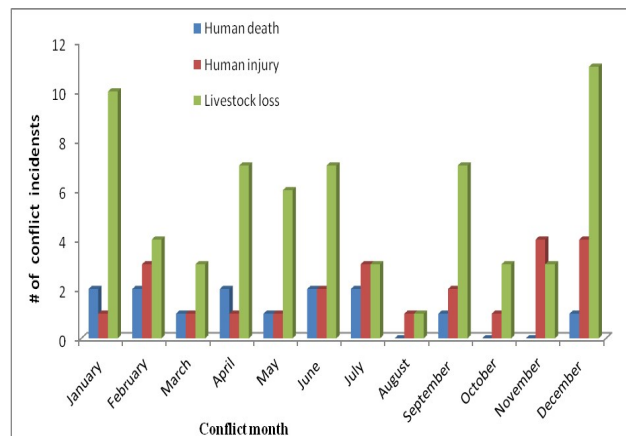


Fig.10. Occure of conflicts in various months of a year

Maximum of the livestock loss (17%; n=11) was reported during December followed by January (15% (n=10) and minimum loss of to livestock was reported in the month of August (2%; n=1). fourteen percent (n=2) of the human deaths were reported during January, February, April, June and July. Seven percent of human injuries were recorded during November and December (Fig.10).

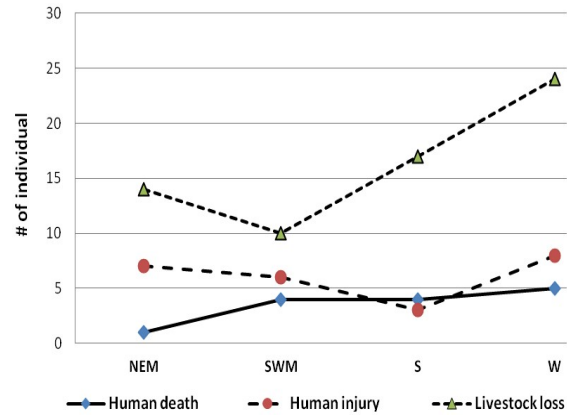


Fig.11. Seasonal pattern of carnivore attacks on human and livestock (North East Monsoon, South west monsoon, Summer, Winter)

According to forest department information most of the HCC were reported during winter (36%) followed by summer (23%), north east monsoon (21%) and south west monsoon (20%) (Fig .11).

Out of six ranges, the maximum number of carnivore attacks on human and livestock was reported in the Valparai (50%) followed by Manambolly (40%), 5% were reported from Amaravathy whereas minimum incidents were reported in udumalpet (3%), pollachi and Ulandy (< 1%), These three ranges are adjoining to fringe villages (buffer zone) of ATR. There was no human death and injury reported from fringe villages (Fig.12).

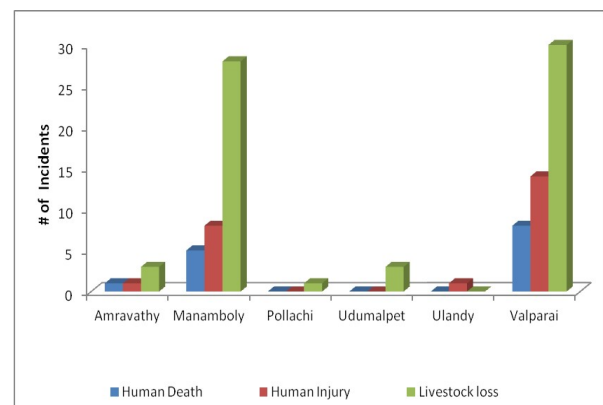


Fig.12. Human- carnivore conflicts in various ranges of ATR (Source: Data of forest department, ATR, TN)

From 2001 to 2018, the frequency of livestock depredation varied substantially by year but it consistently increased over time. Maximum number of livestock loss were reported in 2016 and 2017 (14 and 22%) followed by 2010 and 2014 (10 and 15%) and minimum reported during 2007 and 2008 (1 and 2%). No record was available for 2001-2006.

From the period of 2001 to 2018, 21% of human deaths were reported during 2018 followed by 14 % in 2001 and 2010 and only one (7%) death was reported during 2006-2008 and 2011- 2013. There was no death reported in the following years 2002, 2004, 2005, 2009, 2014 to 2017. Nearly 28% (n= 5) of the human injuries due to the various carnivore animals were recorded during 2013 followed by (4 and 17%) in 2008 and 2015 and 8 % (n=2) during 2010, 2011, and 2017. Only one case was reported in 2005 and 2007, 2002, 2014 and 2016 (Fig. 13).

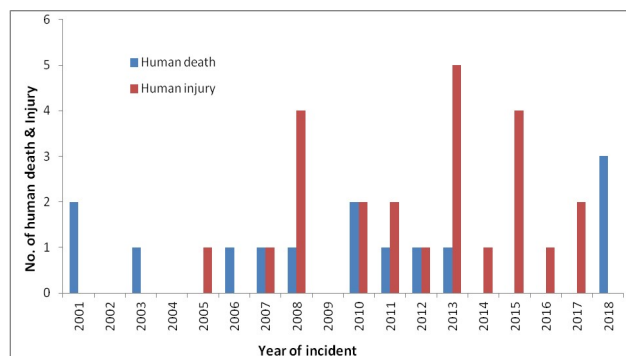


Fig.13. Human causality and injury during the years 2001-2018

People perception and attitude on carnivores

To know the perception and tolerance level of respondents, questionnaire method was followed focusing ways to curb human carnivore–conflicts. Out of 353 respondents 32% of them demanded compensation for loss followed by 31% of the respondent who preferred physical barriers (Electric and solar fence and stone wall). 9 % of them suggested not to keep carnivore attracted animals and 3 % of them answered do nothing and co-existence is the only possible way and another 3% of them strongly answered that carnivores have rights to live. Only 5% of them answered that habitat improvement should be very important and 7 % of them suggested that translocation is a only choice to reduce HCC and 4% of the people recommended that suitable mitigation measure should be adopted. Four percentage of the people suggested that regular patrol is better way to reduce the conflict. Though, the result of this study shows human –carnivore conflicts have a negative impact economically and mentally on the people but there is also positive attitude towards the carnivore conservation.

DISCUSSION

Understanding patterns of human –wildlife conflict and identifying the underlying causes are an important component of conservation of wildlife. Human-felid conflicts have been recognised as one of the major impediments to the future conservation of some of these most endangered species. Habitat loss and fragmentation, prey deficiency, poaching and conflict with humans remains the major causes of various carnivores decline such as Tiger (Ramakrishnan *et al.*, 1999; Linkie *et al.*, 2003) and leopard. Our results shed light that leopards are the primary depredating carnivore when compared to the other carnivores based on both household survey and secondary information from the forest department. This provides insights into future conservation needs. Similar results were reported from Corbett Tiger Reserve in northern India and Bhutan, where Leopards kill substantially more livestock than other carnivores like Tigers (Sangay and Vernes 2008; Malviya and Ramesh 2015).

According to historical records the cattles especially cow were killed more frequently followed by goats and in our survey the primary data shows that pet animals (dogs) were killed more followed by goat and cow. This may due to our survey conducted in fringe villages of ATR and this shows that livestock losses like cow, buffalo, bull were not much in fringe village of ATR and mostly they are grazing in their own land and they are using livestock proof-shed. In addition the population of carnivores have been increased considerably within two decades (incorporate data) which also leads to the depredation of livestock in recent years.

From the anecdotal data, we witnessed a spike in livestock loss, human death and injury was high during winter. The more livestock losses during winter was contrast with reports from other protected areas in South Asia (Sangay and Vernes, 2008; Singh *et al.*, 2015). This could be due to limited eye sight during winter.

As per the record, the carnivore attacks on human and livestock was more in Valparai and Manambolli range of ATR which might be due to habitat fragmentation. HCC was recorded very less in other ranges, namely, Amaravathy, Udumalpet, Ulandy and in Pollachi, where no dense forest area and the climate also doesn't support carnivore. However, these three ranges are located in North eastern part of ATR which open into plains and more human activities and agricultural practices take place here and ten km from the boundary has been announced as buffer zone. In Ulandy, most of the people were scheduled tribes, the population is also limited and

they are known to manage the conflict and livestock was not allowed. Anecdotal reports brief that majority of the livestock were killed in the buffer zone and minimum were killed in the core zone (Miller,2015). But in our study, results of secondary data shows more livestock loss have been recorded Manambolloy range and human casualty was reported in Valparai range. This is because of human population is more in Valparai area compared to the Manambolloy range.

From 2001 to 2018, 93% human casualties were caused by Leopard and most of these occurred in the tea estates. Human casualties by carnivore in the area of this study were not as serious as that represented in other studies. In this study the average number of human killed from the period of 2001-2018 was only 0.8 per year while 20 per year for the period of 2000-2008 in Uttarkhand state. When we came across the reports of other protected areas our study area ATR has minimum livestock loss. There are 4561 livestock cases reported from 2001-2009 in Khanha Tiger Reserve. But in contrast to this, our study area had only 65 cases of livestock loss from 2001-2017.

Understating local people's beliefs about the importance of the tiger, leopard and other carnivore and their tolerance level towards this carnivore is important to develop effective mitigation strategies. The survey results showed that people living in the fringe area have a strong support towards the conservation of wildlife. Though, human carnivore conflicts have a negative impact on them both economically and mentally, they have positive attitude towards the carnivore conservation. Mitigation measures have largely focused on reducing the interaction between carnivores and humans, and improved protection or compensation for damage of livestock (Ogada *et al.*, 2003; Mishra *et al.*, 2003; Treves and Karanth, 2003). Moreover, the relevant laws and conservation policies being in place their implementation is fraught with challenges and is substantially influenced by the attitudes of local residents towards the species (West *et al.*, 2006).

CONCLUSION

Conflict is a major problem in wildlife management. This study revealed that, type of conflict not same in all part of the ATR and it varies from place to place. Therefore, it is necessary to collect the base line 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 pattern and intensity throughout the ATR. In most of the fringe villages, the livelihood of these people is fully dependent on agriculture and livestock. So agriculture damage and livestock predation affect the livelihood of those peoples.

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Expansion of agricultural area, mushrooming of concrete buildings, violation in building construction further aggravate the carnivore problems in the wildlife habitats. Also new constructions should follow the Hill Area Conservation Authority (HACA) rules and regulation. Human causality which cause negative attitude of the community towards wildlife due to the HCC. It has a great impact on biodiversity conservation. Though, conflict forms the negative impact on local community, there is still some positive attitude towards carnivore conservation. An integrated community development and habitat conservation practice can be useful to reduce the conflict by developing economic and social tolerance to damage caused by carnivores. We suggest the approaches to mitigate HCC especially in conflict prone zone people can make an insurance policy on them and their livestock. In addition, instant compensation with simple government procedures from the government (Forest Department) side will reduce the animosity of farmers and peoples towards wildlife. Also compensation should be given as per the market price for the crop damage. And also promote the use of predator-proof livestock sheds. Gas connection to the families residing adjacent villages and settlements help them to avoid fire wood collection from the forests. To implement any mitigation measures and conservation action it is also important to know about the clear scenario of the conflict, timing and reason for conflict around the location and attitudes of the local peoples towards the carnivore conservation. Furthermore, it needs training the community on how to reduce the causes of conflict with wildlife. NGOs and forest department can help in creating awareness on mitigating HCC. Specific strategies based on current situations can be included as the conflict is dynamic in nature.

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