



SAHYADRI E-NEWS: Issue LXII

SAHYADRI: Western Ghats Biodiversity Information System
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[Back](#)

[Next](#)

- [Introduction](#)
- [Articles](#)
- [News](#)
- [Bibliography](#)
- [Forum](#)
- [Announcement](#)
- [Books](#)
- [Reports](#)
- [Posters](#)
- [Experts](#)
- [E-Links](#)
- [Editors](#)

Issues 52

Conservation and Sustainable Management of Ecologically Sensitive Regions in Western G

- [E-mail](#)
- [Sahyadri](#)
- [ENVIS](#)
- [Energy](#)
- [GRASS](#)
- [CES](#)
- [IISc](#)
- [E-mail](#)



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SAHYADRI: Western Ghats Biodiversity Information System
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[Back](#)

[Next](#)

- [Introduction](#)
- [Articles](#)
- [News](#)
- [Bibliography](#)
- [Forum](#)
- [Announcement](#)
- [Books](#)
- [Reports](#)
- [Posters](#)
- [Experts](#)
- [E-Links](#)
- [Editors](#)

Issues 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62

Articles

- T.V. Ramachandra - Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats
- M D Subash Chandran - The Pulses of Life
- Bharath Setturu and Ramachandra T V - Visualization of Landscape Dynamics in National Parks of Central Western Ghats
- G. R. Rao, M. D. Subash Chandran and T. V. Ramachandra - Vegetation studies in Sacred Groves and Adjacent Non-Sacred Forests of Central Western Ghats
- Nimish Gupta, Bharath Setturu, T. V. Ramachandra - Landscape Dynamics in Protected Areas
- Tara NM and T. V. Ramachandra - Spatial Decision Support System
- Bindu R and T. V. Ramachandra - Information Dissemination through Web Portals (based on SOA)
- K. Gopalakrishna Bhat - Studies on Angithee, a rare medicinal plant of Karnataka with Special Reference to the Western Ghats
- Poornima R. Kunder and Vidya SM - Ethnomedicinal Importance of Rare Family Member of Vitaceae, Cissus elongata Roxb.
- Deviprasad.K.N - Experience of Involving Undergraduate College Students in Biodiversity Conservation Awareness Programs

- [E-mail](#)
- [Sahyadri](#)
- [ENVIS](#)
- [Energy](#)
- [GRASS](#)
- [CES](#)
- [IISc](#)
- [E-mail](#)



Human - Carnivore Conflicts: a case of Shettihalli village in Shettihalli Wildlife Sanctuary, Shimoga, Karnataka

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Abstract— Livestock depredation by Tigers (*Pantheratigris*) and Leopards (*Pantherapardus*), has resulted in a human-wildlife conflicts that hinders the conservation of these globally-threatened species. This report analyses the alleged economic loss due to livestock depredation by these carnivores and the retaliatory responses of an agro-pastoral community around Shettihalli Wildlife Sanctuary, a region in the Western Ghats of India. The methods used to conduct this study were sign surveys and structured and unstructured interviews with the households. The village of Shettihalli located inside Shettihalli Wildlife Sanctuary with 88 households, attributed a total of 72 livestock deaths to wild predators over a period of 12 months. At present, there are 346 cows and 8 buffalos owned by the 45 household who were interviewed in this village. A total of 70 cow deaths over a period of 1 year, about 231 cow deaths in the past 5 years, about 362 cow deaths in the past 10 years and about 507 cows death in the past 25 years were reported. A total of 2 buffalo deaths over a period of 1 year, about 10 buffalo deaths in the past 5 years, about 13 buffalo deaths in the past 10 years and about 24 buffalo deaths in the past 25 years were estimated through the interview. The total alleged losses due to the conflict amount up to Rs.16, 66,000 which averages about Rs 37,000 per family. No compensation was offered to the households who have lost their cattle which entered inside the Wildlife Sanctuary area illegally for grazing. Only in two cases when a Tiger (*Pantheratigris*) and a Leopard (*Pantherapardus*) separately entered inside the village and killed cattle, were provided compensation of about Rs.3000 for their losses. They mainly depended on wood as a source of fuel to cook. The roads leading to this village were all mud road in the interest of the sanctuary. There was no public transportation facility available for the residents of this village. Most of them owned motor bike and a few of them owned four wheelers. The Forest Department of this area wants the village to be evacuated in the interest of the Wildlife Sanctuary. Personal observation and unstructured interviews revealed that there were a many cases of illicit felling of trees for timber and hunting of prey species like Sambar, Chital, Hare etc. were common by people from both outside and by a few households of the village themselves. The need to address the problem of increasing livestock holding and kills in the long run is emphasized. The study conducted in this area is first of its kind

1. INTRODUCTION

The 21st century global landscape is increasingly human-dominated, with reports that

every ecosystem on the Earth's surface has now been influenced by human activities (Vitousek *et al.*, 1997). Around 40-50% of the Earth's surface is estimated to have been transformed by humans, often with marked ecological effects: for instance, 10-15% of the global land surface is now covered either by row-crop agriculture or urban areas, while an additional 6-8% has undergone conversion to pasture (Olson *et al.*, 1983; Vitousek *et al.*, 1997). Humans are now thought to appropriate 35% of the global productivity of ocean shelves (Pauly and Christensen, 1995), channel more than 40% of the world's annual primary productivity for their own ends (Vitousek *et al.*, 1986) and utilize 60% of freshwater run-off (Postelet *et al.*, 1996; Sanderson *et al.*, 2002).

The expansion of agriculture over the past 30 years, has affected global rates of nitrogen fixation and phosphorus accumulation. Irrigation schemes have heaped more demands on the world's freshwater systems (Tilman *et al.*, 2001; Sanderson *et al.*, 2002). The human disturbance index indicates that almost three-quarters of the Earth's habitable land surface has been disturbed by humans (Hannah *et al.*, 1994; Hannah *et al.*, 1995), while the recent human footprint map highlights how significant they are having on the planet (Sanderson *et al.*, 2002). Much of this anthropogenic impact is due to the world's burgeoning human population, which currently stands at 7 billion and is predicted by the UN to cross 8.9 billion by 2050 (UN, 2004). The spread of settlement and changing land use has resulted in the fragmentation of natural habitats. The worlds remaining biodiversity areas is increasingly getting restricted, to form small fragmented patches within a matrix of human-dominated landscapes (Spalding, 1989; McCloskey and Primack, 1993; Laurance and Bierregaard, 1997) that enhances interactions and lead to potential conflicts between conservation and development efforts.

From a conservation standpoint, although some wildlife species appear to be able to withstand these pressures of habitat loss and changing land use relatively well (Nee and May, 1992; Anderson, 1997; Purvis *et al.*, 2001), others are often particularly threatened by such environmental changes (Belovsky,



1987; Gittleman *et al.*, 2001). Certain biological characteristics that include large body size, complex social behavior, low population density, specialized niche requirements, high trophic level and large home range size (Diamond, 1984) make species more vulnerable to extinction. These traits are inherent to many large carnivores (Gittleman *et al.*, 2001), making them particularly vulnerable to habitat loss and environmental change, and intensifying conservation concern for such taxa as human domination of ecosystems escalates further.

The expansion of human influence even to the remotest corner of the globe, and the ever-increasing pressure to utilize the remaining natural resources has intensified the issue of human-wildlife conflict even necessitating a clear cut definition to address the problem. Human-wildlife conflict has been defined as a condition wherein ‘**The needs and behavior of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife**’ (Recommendation 5.20, 2003 World Parks Congress).

1.2 Global Extent of Human-Wildlife Conflict:

Human-wildlife conflict occurs in extremely wide range of situations globally, involving diverse species. A brief overview of the factors that cause conflict as highlighted by Thirgoodet *et al.* (2005) reveal that the most common and direct ones are, predation upon livestock, attacks on humans and crop raiding. This review will cover a range of wildlife species causing conflict, with a particular focus upon large carnivores.

1.2.1 Predation upon Livestock:

The most common issue cited as causing conflict between humans and carnivores in a study by Sillero-Zubiri and Laurenson (2001) was predation upon livestock. The problem is reported to be extremely widespread, with Lynx in France (Stahl *et al.*, 2001), Brown Bears in Norway (Sagoret *et al.*, 1997), Pumas in Brazil (Mazzoliet *et al.*, 2002), Golden Jackals (*Canis aureus*) in Israel (Yom-Tov *et al.*, 1995) and Tigers (*Pantheratigris*) in India (Sekhar, 1998) associated with the problem. Depredation has sometimes been intense with villagers in Nepal reporting that 63% of all stock deaths were due to predators (Jackson *et al.*, 1996). Even relatively low levels of stock loss can impose intolerable costs on poor households (Stander, 1997). Surplus killing, where predators kill multiple animals in one attack, can result in severe financial hardship to the stock-owners (Nowell and Jackson, 1996) and engenders a particularly intense hostility towards carnivores (Oli *et al.*, 1994).

1.2.2 Attacks on Humans:

Although not as common as attacks on livestock or game species, wild animal attacks on humans have particularly significant impact in terms of causing intense conflict (Quigley and Herrero, 2005). Records of fatalities due to attack by wild animals are poorly collated or difficult to obtain in many countries, but where such data exist, they suggest that deaths due to animals are a tiny minority of mortalities, e.g. 0.06% in Norway and 0.07% in the US, that includes those caused by domestic animals (Loe, 2002).

Despite its relative global rarity, attacks on humans can pose a significant threat in some areas: for instance, the Sundarban forest region of eastern India has long been a ‘hotspot’ for man-eating Tigers (*Pantheratigris*), with around 100 human deaths reported annually (Sanyal, 1987), while 100 - 200 people are killed by Asian Elephants (*Elephas maximus*) every year in India (Thirgoodet *et al.*, 2005; Veeramani *et al.*, 1996). Although the number of human fatalities in a global context due to wildlife is negligible when compared to famine, war and disease, it has been reported to generate very significant hostility towards conserving potentially dangerous species (Thirgoodet *et al.*, 2005). This is in line with research into risk perceptions, where demand for risk mitigation tends to be driven most strongly by the severity of the consequences of a hazard, rather than how often it is likely to occur (Sjoberget *et al.*, 2004). Data on human attacks are often vague, and researchers have called for more studies to investigate the circumstances surrounding human attacks (Quigley and Herrero, 2005), in an effort to reduce their prevalence and ease coexistence between humans and potentially threatening wildlife species.

1.3 Conflict between Humans and Wildlife: India's Perspective:

A large and growing body of conservation literature exists for understanding interactions between people and landscapes (De-Fries *et al.*, 2005, 2009). Countries in South Asia and India in particular, face immense challenges in terms of conservation efforts posed by poverty, high human population densities of people, rapidly changing landscapes, complicated political and institutional regimes, and recent economic growth and urbanization. Although these regions have historically supported and continue to support high biodiversity and significant conservation values, the rapidly increasing human populations and their dependence on landscapes for basic livelihood has created a need to balance broader conservation objectives and human needs.



India is largely an agrarian country (46% of total land area cultivated), with 57% of labor force depending mainly on agriculture (UN, 2006). It is already a home to 1.2 billion people and is projected to have a huge population to 1.4 billion by 2020 (UN, 2009). Although the population density is variable across biomes, ranging from the deserts of Rajasthan to the fertile Gangetic Plain (Rangarajan, 2007), its overall population density has quadrupled from 80 to 324 people /km² during the last 150 years. Majority (70%) of Indians lives in rural areas and 80% of the rural population lives in poverty, with an income of less than two dollars a day (UN, 2009). In spite of an high economic growth of approximately 8% over the last 15 years the country ranks 88th out of 135 countries under the Human Poverty Index (UN, 2009) , 134th out of 182 countries in the human development index (HDI) and 128th out of 182 for GDP per capita (UN, 2006).

India ranked as a mega diversity country due to its rich biological diversity, includes more than 400 mammal species (particularly the largest viable populations of Tigers and Asian Elephants) and two global hotspots the Western Ghats and Eastern Himalayas (Karanth *et al.*, 2009).

1.4 Conflict between Humans and Wildlife: Shettihalli Wildlife Sanctuary's Perspective

Shettihalli Wildlife sanctuary houses mammals like Tiger (*Pantheratigris*), Leopard (*Pantherapardus*), Wild Dog (Dholes – *Cuonalpinus*), Jackal (*Canis aureus*), Gaur (*Bosgaurus*), Elephant (*Elephas maximus*), Sloth Bear (*Ursusursinus*), Sambar (*Rusa unicolor*), Cheetal (*Axis axis*), Wild Boar (*Susscrofa*), Hanuman Langur (*Semnopithecus entellus*), Bonnet Macaque (*Macacaradiata*), Common Mongoose (*Herpestesedwardsii*), Striped-necked Mongoose (*Herpestesvittcollis*), Porcupine (*Hystrixindica*), Malabar Giant Squirrel (*Ratufaindica*), Giant Flying Squirrel, Pangolin (*Manis crassicaudata*) etc (about 20 species recorded). Indian Rock Python (*Python molurus*), Cobra (*Najanaja*), King Cobra (*Ophiophagushannah*), Indian Rat Snake (*Ptyas mucosa*), Green Vine Snake (*Oxybelisfulgidus*), Marsh Crocodile (*Crocodyluspalustris*) etc are among the reptiles found in the sanctuary. Birds include Hornbills, Kingfishers, Bulbuls, Parakeets, Doves, Pigeons, Babblers, Flycatchers, Munias, Swallows, Woodpeckers, Peafowl, Jungle fowl, Partridges etc (about 121 species recorded).

Shettihalli is a village which is located inside Shettihalli Wildlife Sanctuary, Shimoga District of Karnataka State in India. Shettihalli Wildlife Sanctuary was declared as a Wildlife Sanctuary on November 23, 1974. It is spread over an

area of about 395.6 km² and it is divided into a core zone (100.6 km²), a buffer zone (237.4 km²) and a tourism zone (57.6 km²). The sanctuary supports dry deciduous forest, moist deciduous forest and a few patches of semi-evergreen, evergreen forest and grassland patches. The area is surrounded by Teak plantations which were planted during the British era in India. Shettihalli village comprises of 88 households. The main occupation of the people in this village is agriculture with Areca nut and Paddy being the major crops grown in this village. They also own livestock comprising of cows and buffalos which yield milk that is sold on a daily basis to a co-operative federation owned by them.

Livestock depredation by the Tiger (*Pantheratigris*) and Leopard (*Pantherapardus*) has resulted in a human-wildlife conflict that hinders the conservation of these globally-threatened species throughout their range. This study aims at analyzing the alleged economic loss due to livestock depredation by these carnivores.

There are about 88 households currently residing in this village who make their living by cultivating Paddy, Areca Nut and other cash crops in a small scale. 346 cows and 8 Buffalos are collectively owned by 45 families who were interviewed during this study. These families claim to have lost more than Rs.16,00,000 due to the death of their livestock in the past 25 years. A loss of 507 cows and 24 buffalo during this period is being claimed. Wild boars are a common menace to the farmers of this area which are known to destroy crops. A herd of Elephants (*Elephas maximus*) entered the farm land about 3 years ago and destroyed the crops which were under cultivation. No official record of human death due to such conflicts has been reported. The study conducted here aims to record the wildlife conflict in a scientific way and evaluate wildlife conservation strategies in a sustainable manner. This study conducted is first of its kind in this area.

The Royal Bengal Tiger (*Panthera tigris*) of India are widely distributed from the alpine Himalayas to the rain forests of southern Western Ghats and from the dry forests of Rajasthan to the moist forests of north-east India. In the Indian subcontinent, tigers inhabit tropical moist evergreen forests, tropical dry forests, tropical and subtropical moist deciduous forests, mangroves, subtropical and temperate upland forests and alluvial grasslands. The length of the male ranges from 275-290 cm and that of the female is around 260 cm. The size and color vary according to the geographic location and climate. Tiger is solitary and territorial and the territory of an adult male may encompass territories

of two to seven females. It is carnivorous and hunts for prey primarily by sight and sound. It feeds on deer, wild pig, bovid and sometimes even other predators like leopards and bears.

The Indian Leopard (*Panthera pardusfusca*) is a Leopard subspecies widely distributed on the Indian subcontinent. It is about 85.5 cm in length with strong legs and a long well-formed tail, broad muzzle, short ears and small, yellowish grey eyes, light grey ocular bulbs; black at first sight, but on closer examination dark brown with circular darker colored spots, tinged pale red underneath. They inhabit tropical rain forests, dry deciduous forests, temperate forests and northern coniferous forests up to an altitude of 2,500 meters (8,200 ft) above sea level, bordering snow leopard habitat. But they do not inhabit the mangrove forests of the Sundarbans. Home ranges of male leopards comprised about 48 km² (19 sq mi), and of females about 17 km² (6.6 sq mi); female home ranges decreased to 5 to 7 km² (1.9 to 2.7 sq mi) when they had young cubs.

The study was conducted during a period between February 2011 to May 2012 in Shettihalli village which comes under Shettihalli Wildlife Sanctuary, Shimoga District, Karnataka, India. The methods used to conduct this study were sign surveys and structured and unstructured interviews with the households.

2. MATERIALS AND METHODS

Sign survey – Sign Surveys is a method where in the observer walks moved along a forest path to find out the signs such as pug marks, scrape marks, scat, territory markings or direct sighting of the carnivore to understand the distribution of the carnivores in the area. Four lines of the length of 2-4km with a width of 15m were moved on in search of signs, scat and

direct spotting at a speed of approximately 4km/hour. The lines were from the Aihole Anti-Poaching Camp (APC) to the fringe of the Shettihalli Village (Fig. 2.6), 2nd Beat Line of Aihole APC (Fig. 2.7), Ring Road (Left) (Fig. 2.8) and Rind Road (Right) (Fig. 2.9). A Global Positioning System (GPS) was used to record the surveyed area and the points were transferred on Google Earth to get the map of the location. A Vernier's Calipers was used to measure the size of the scat.

Field data were collected using a combination of qualitative methods (unstructured interviews, participatory observation and focused group discussions) and quantitative methods (structured interviews), which formed the main data source. Unstructured interviews and participatory observations were conducted with employees of the wildlife department, community representatives 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 and the perceptions and attitudes of local people towards the main conflict species. It included questions such as general information of the households, present number of livestock owned by them, livestock killed in the past 1, 5, 10 and 25 years, their opinion and suggestions on the conflict and the Wildlife Sanctuary along with the losses (in Rupees) occurred during these years. The Forest Department employees where questioned on information such as general information of the officials, change in habitat of the forest, change in herbivore number, change in carnivore number, crop raid, animal kill, human kill and other losses during the past 1, 5, 10, 25 years.

2.1 Maps

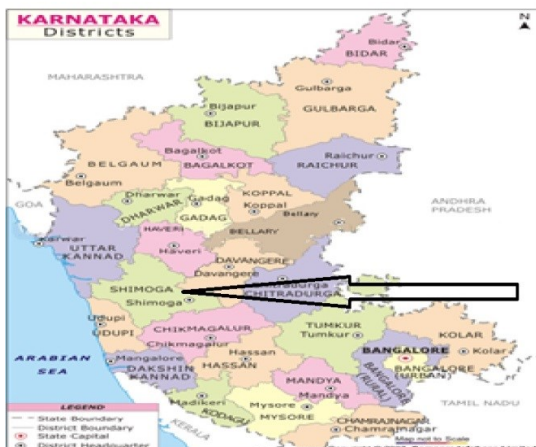


Fig.2.1 - Map of Shimoga District in Karnataka



Fig. 2.2 - District Map of Shimoga

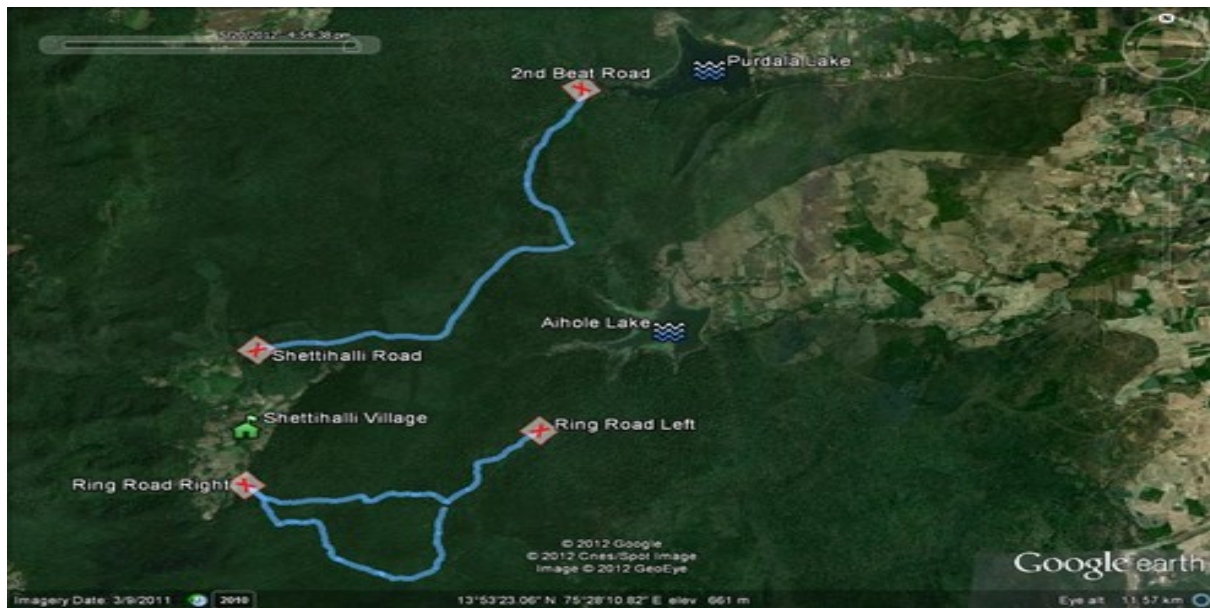


Fig. 2.3 Study Site Map with all Line Transects

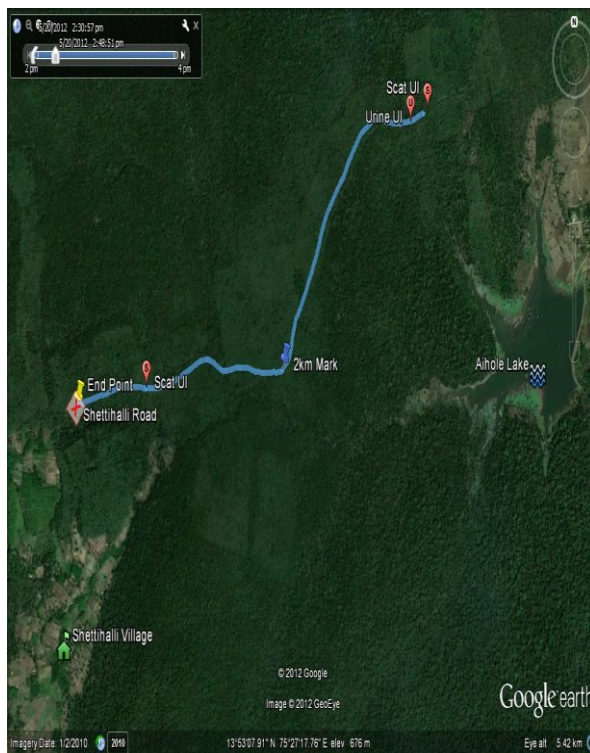


Fig 2.4 – Sign Survey Track Aihole camp to Line of Aihole APC Shettihalli Village

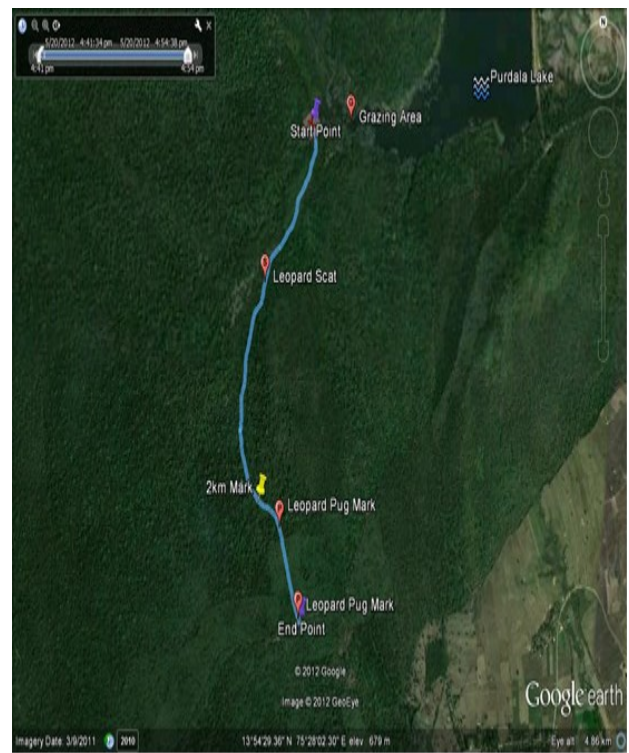


Fig 2.5 – Sign Survey Track 2nd Beat

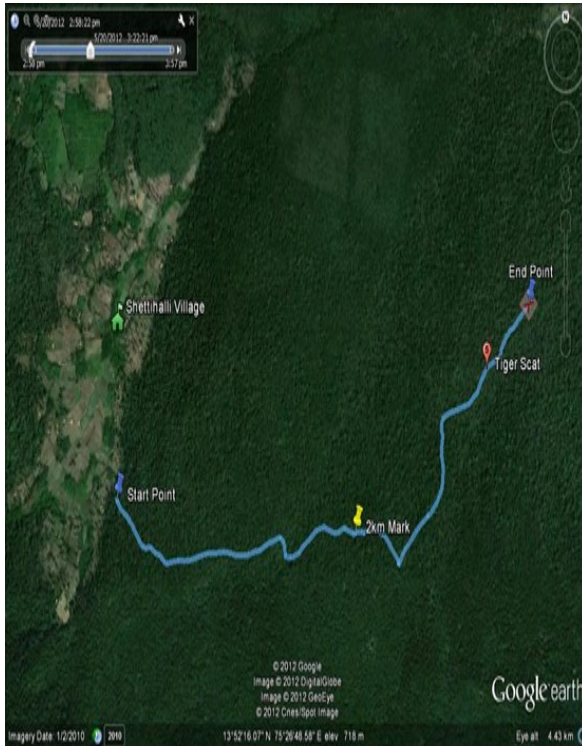


Fig 2.6 – Sign Survey Track Ring Road (L)

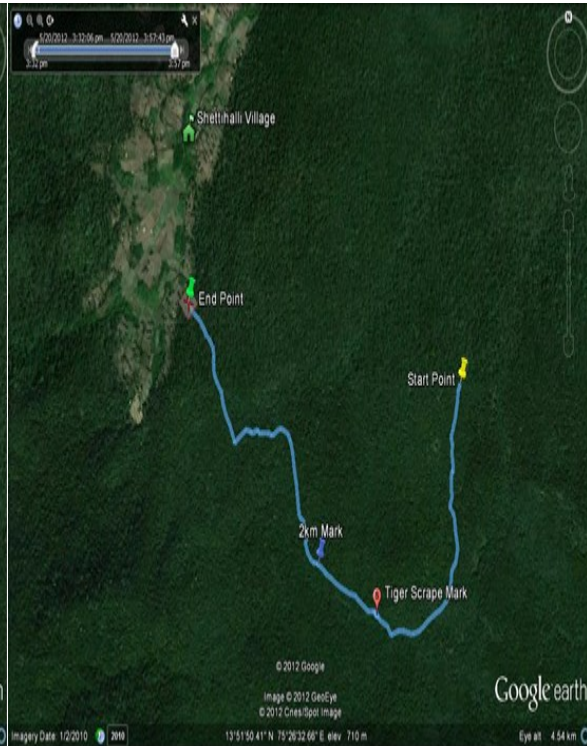


Fig 2.7 – Sign Survey Track Ring Road (R)

3. RESULTS

Particulars	Transect 1	Transect 2	Transect 3	Transect 4
Tiger Sighting	0	0	0	0
Tiger Pug Mark	0	0	0	0
Tiger Scat	0	0	1	0
Tiger Scrape	0	0	0	2
Leopard Sighting	0	0	0	0
Leopard Pug Mark	0	2	0	0
Leopard Scat	0	1	0	0
Unidentified Scat	2	0	0	0
Unidentified Urine	1	0	0	0

Table 3.1 –Signs of Carnivores



Lake 2016: Conference on Conservation and Sustainable Management of Ecologically

Sensitive Regions in Western Ghats [THE 10TH BIENNIAL LAKE CONFERENCE]

Date: 28-30th December 2016, <http://ces.iisc.ernet.in/energy>

Venue: V.S. Acharya Auditorium, Alva's Education Foundation, Sundari Ananda Alva Campus, Vidyagiri, Moodbidri, D.K. Dist., Karnataka, India – 574227

The work was carried out on four line transects i.e. from the Aihole Anti-Poaching Camp (APC) to the fringe of the Shettihalli Village (Fig. 2.6), 2nd Beat Line of Aihole APC (Fig. 2.7), Ring Road (Left

(Fig. 2.8) and Rind Road (Right) (Fig. 2.9). The following are the results which were obtained during this study.

Tiger Sighting	0
Tiger Pug Mark	0
Tiger Scat	1
Tiger Scrape Marking	2
Leopard Sighting	0

Leopard Pug Mark	2
Leopard Scat	1
Unidentified Scat	2
Unidentified Urine	1

Table 3.2 –Sings from Individual Sign Survey

By the above findings, there was evidence of presence of large carnivores (Tiger and Leopard) around the vicinity when the study was conducted.

Total no of Cows at Present	346
Total no of Buffalos at Present	8
Total no of Cows killed in past 1 year	70
Total no of Cows killed in past 5 years	231
Total no of Cows killed in past 10 years	362
Total no of Cows killed in past 25 years	507
Loss in Rupees (Cow)	15,19,000
Total no of Buffalos killed in past 1 year	2
Total no of Buffalos killed in past 5 years	10
Total no of Buffalos killed in past 10 years	13
Total no of Buffalos killed in past 25 years	24
Loss in Rupees (Buffalo)	1,47,000

Table – 3.3. Total number of livestock currently present and alleged loss due to carnivore predation

Majority of the households in this village owned cows and had lost them due to large carnivore kills. Only a few buffalos were owned in the past and currently only a few households own buffalos in very small number. Hence, a very small percent of them were killed by large carnivores. A few households said that Leopards (*Pantherapardus*) were the main causes for the kills of their livestock. At present, there are 346 cows and 8 buffalos owned by the 45 household who were interviewed in this village. A total of 70 cow deaths over a period of 1 year, about 231 cow deaths in the past 5 years, about 362 cow deaths in the past 10 years and about 507 cows death in the past 25 years were reported. A total of 2 buffalo deaths over a period of 1 year, about 10 buffalo deaths in the past 5 years, about 13 buffalo deaths in the past 10 years and about 24 buffalo deaths in the past 25 years were estimated through the interview. The total alleged losses due to the conflict amount up to Rs.16, 66,000 which averages about Rs 37,000 per family.

Majority of the kills that occurs were at a distance of 1-3 km range from the village boundaries which lead into the Wildlife Sanctuary. The data collected on grazing area of the livestock revealed that the livestock entered deep inside the Wildlife Sanctuary for forage in violation with the rules according to the law. Hence no compensation was offered by the Forest Department to the households unless it is killed within the village limit (The Forest Department paid Rs.3000 as compensation for two livestock kills within the village limits). There are about 7 grazing patches located within the Protected Area. These patches measure about 2-20 sq. meters in area which were formerly grassland which were used for forage by the herbivores residing around the area.

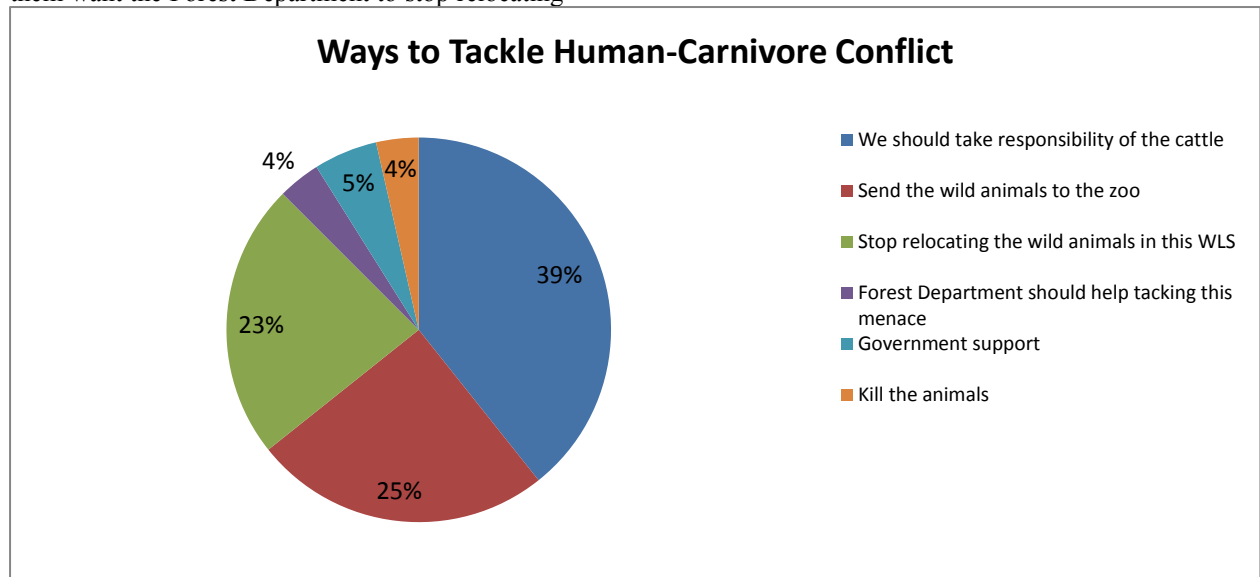
As per the bar graphs, which were deduced from the information provided by 45 households at Shettihalli village, deaths of livestock have increased significantly over time majority of them being cows. The buffalo deaths are less in number as the households own only a

handful of them. The villagers who were interviewed were also questioned about their views, thoughts on ways to tackle such conflicts along with their views on the forest and Wildlife Sanctuary.

3.6. Households Perspective on Ways to Tackle Human-Carnivore Conflict

According to information gathered, about 40% of the households said that they have to accompany the livestock to the grazing area and take responsibility of their cattle by not letting them wander inside the forest. About 25% of them want the animals to be sent to the zoos. 23% of them want the Forest Department to stop relocating

carnivores captured from other areas to be let inside this Wildlife Sanctuary. About 5% of them want the Government support them and help in resolving the conflict in this area. About 3.5% of them want the Forest Department to tackle these issues and the rest 3.5% want the carnivores to be killed. A few women even complained that they were afraid to get out of their house after dusk. Some households complained that the forest officials were inefficient and are maintaining this reserve poorly. Illegal activities like illicit felling of trees were common. The households are dependent on the forest surrounding their village for timely rains, firewood, manure, pleasant climate, fresh air etc.



4. DISCUSSION

Conflicts between humans and wildlife in India are escalating due to increased human population, loss of natural habitats and in some regions due to an increase in wildlife populations that was the result of successful conservation programs (Saberwalet *et al.*, 1994). In Shettihalli Wildlife Sanctuary, though the killing of livestock by large carnivores is not a recent phenomenon, the number of kills has increased in the last five to ten years according to study. This period coincides with the declaration of the area as a wildlife sanctuary in 1974. But some households disagreed to this fact.

Actual rate of predation on livestock in Shettihalli is not available. This is important but not easy to establish, since the losses attributed to wild predators are usually exaggerated, either deliberately, or due to an inability to ascertain the cause of death. Assessing peoples' attitudes and tolerance toward

carnivores can be tricky, as attitudinal variables often interact in complex ways. Thus far, there is no objective definition for 'tolerant' or how it allows an individual or a community to willingly coexist with carnivores. Collecting accurate and reliable data entails long periods of time in the field to gain the trust of community members and possible biases in research methods need to be considered.

Research has indicated that the most hostile attitudes towards carnivores are among farmers in close proximity to protected areas or carnivore home ranges (Naughton-Treves *et al.*, 2003). These hostile attitudes often reduce people's tolerance of carnivores, limiting their ability to cope psychologically with livestock loss. In addition, respondents may exaggerate their loss (Naughton-Treves, 1998) or attribute death of their animals to predators regardless of the actual cause of death (Oli *et al.*, 1994; Mishra, 1997). Only 3.6% of the



interviewees indicated that they would retaliate and kill a predator after their livestock was attacked. Majority of them accept that it is their fault that they let the cattle stray inside the forest in spite of the fact that there are constant prowling carnivores around the vicinity. Some percent of the households wants the carnivores in the area to be captured and released into zoos or relocated to other location or an area which is reserved for them separately. The small percent of them want the government or the forest department officials to help them to tackle the conflict.

One of the major concerns for the death of so many livestock in around Shettihalli Village is due to the conversion of grassland patches (which the herbivore depend on for forage) into grazing patches by the livestock. The livestock take over such patches and thereby increasing the competition for food and in-turn become an easy prey to the predator as their territory lack wild prey population. This directly leads to human-carnivore conflict in the area. Two major grazing areas namely SomanJadd and MavinJaddare located in dense forest area where maximum livestock are killed. SomanJadd is an area which is habituated with Teak plantation where as MavinJadd is covered with thick moist deciduous to semi evergreen forest. A few Chitals, Sambars and other small herbivores were spotted in this area along with dried Elephant dung during the study.

Throughout the survey, the households want the forest cover to be around them as they acknowledge the fact that it is helpful for rain, pleasant climate, fresh air etc. They also utilize the resources from the forest such as dry leaves, broken twigs, branches and other byproducts in manures. Dried wood and branches are used as a source of fuel.

No compensation was offered to the households who lost their cattle which entered inside the Wildlife Sanctuary area for grazing illegally. Only in two cases when a Tiger (*Pantheratigris*) and a Leopard (*Pantherapardus*) in separate incidence entered inside the village and killed cattle, were provided compensation of about Rs.3000 for their losses. Compensation was also provided to the farmers who lost their crop due to Elephant (*Elephas maximus*) raids during the year 2009-10.

The village of Shettihalli lack basic amenities such as electricity. There is no presence of any electric fencing as a result which can threaten the wildlife in this sanctuary. The households mainly depend on kerosene lamps as a source of light. Efforts on using solar lamps were tried by the Government but didn't pay off as the panels given to the

households didn't last long. The power company was evacuated immediately when power lines were being drawn into the village by the Forest Department. Majority of the households here do not use gas stove. They mainly depended on wood as a source of fuel to cook. The roads leading to this village were all mud road in the interest of the sanctuary. There is no public transportation facility available for the residents of this village. Most of them owned motor bike and a few of them owned four wheelers. The Forest Department of this area wants the village to be evacuated in the interest of the Wildlife Sanctuary. Personal observation and unstructured interviews revealed that there are many cases of illicit felling of trees for timber and hunting of prey species like Sambar, Chital, Hare etc by people from both outside and by a few households of the village themselves. Veterinary doctor facility was available in a village named Purdala which is about 8-10km from the study site who is called in case of any illness to the livestock. Recently a major fire broke out in this area which is suspected to be the work of the residents of the neighboring village.

5. CONCLUSION

The study revealed that Shettihalli village is highly affected by human-carnivore conflict and there are many immediate changes to be brought about to check the rate of conflict in this area. Though we could not directly encounter any carnivores in the study area, evidence of their presence by indirect methods confirmed their presence. Also, this region falls under the migration corridors of large carnivores and herbivores. The animals enter this Wildlife Sanctuary from adjoining Bhadra Wildlife Sanctuary on the South (Shimoga and Chikmagalur Districts) and Sharavathi Wildlife Sanctuary on the North (Sagar Taluk, Shimoga District) at the time of migration. It is essential that the household keep a vigil on their livestock and not let them stray into the forest. In case they do let the livestock inside the forest for grazing, they have to accompany to protect their own livestock and reduce financial losses.

It is still unclear as what animal is majorly responsible for such disturbances. But unstructured interviews with the households suggested that Leopards are the major predator responsible for the kills in this area. The best alternative which can be possible made are relocation of the household of this village with suitable compensation for their own benefits.

5.1 Possible Solution for Reducing Human-Carnivore Conflict



1. To build community grazing patches under the Gram Panchayat.
2. Revoke Gomala land.
3. Regulate livestock movement inside the Protected Area which could also give rise to render pest diseases and be a prey for carnivore as well.
4. The Forest Department has to instantly compensate with adequate amount after verifying the records and proofs.
5. A new Buffer Zone has to be identified and marked around each Protected Area within the Sanctuary.

5.2 Scope of Further Studies: The study conducted was restricted only to 45 household and the interviews for the remaining households must be carried out for improved interpretation and complete results. Statistical approach has not been completely applied here to understand the rate and occurrence of the kills of livestock to improvise on the results. The study can be further carried emphasized by collecting the information of kills during different months and seasons of the year.

More transects lines need to be identified where such work should be carried out for further investigation in other surrounding areas to check the evidence of the presence of large carnivores in that area and the density of prey and predator. Prey-Predator ratio and density should be estimated in the area to determine the population of carnivore which is viable in this area. Using such data, the carrying capacity of the Sanctuary can also be calculated.

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