

Human wildlife conflicting species and its impact on rural people of Central India

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Abstract: Human-wildlife conflict is major problems in developing countries; in India 60% population still rely on agriculture as major source of occupation. Agriculture, livestock husbandry and forestry are major occupation of the rural people in India. According to state department of agriculture data Chhattisgarh has 80% and Madhya Pradesh 74.73% agrarian population. For most of the rural people crop loss, livestock loss and human life loss is a major issue. In rural areas most of the people are from economically weaker section, hence any losses inflicted by wildlife leads to retaliatory killing of wildlife and also the destruction of wildlife habitats. A significant number of affected rural respondents suggested afforestation and perimeter fencing would reduce the intensity of human wildlife conflict.

Key words: Agriculture, crop loss, livestock depredation, mitigation.

Introduction

Human-wildlife conflict (hereafter HWC) occurs when the needs and behavior of wildlife impact negatively on the goals of humans or when the aspirations of human negatively impact the needs of wildlife. These conflicts may result when wildlife damage crops, injure or kill domestic animals, threaten or kill people. Injured and killed by wild animals. In India people killed in such conflict are generally from weaker socioeconomic sections of society (Das and Chattopadhyay 2011). Crop damages are the most prevalent form of human-wildlife conflict in Asian and African countries, with large mammals such as elephants being identified as the greatest threat by farmers (Parker et al. 2007). Elephants damage crops cost up to 3 million US\$, and break 10,000–15,000 houses annually in India (Bist 2006). In India crop damage is very common along the immediate circumference of wildlife sanctuaries and national parks, by primates and other wild animals. But in India there are several primate species, which lives in and around human habitations on the outskirts of village, towns and cities where they do considerable damage to crops and orchards (Chaudhry et al. 2010). In Kerala state elephant attack kills 500 people every year is a well documented fact. These studies took place in 1982 and the situation is thought to worsen since. In Chhattisgarh, Marwahi forest division record shows 28 human deaths due to wildlife attacks (Akthar and Chauhan 2008), and another report from Chhattisgarh, Sarguja region, elephants caused a damage to 939.02 acres of crops and causing 6 human accidents (Thakur et al. 2016). In the case of Central India, Madhya Pradesh is concerned at least 260 people have been killed and 10,955 (Anonymous 2016) injured in HWC in last 5 years. We attempted to know about the role of HWC in the life of forest dweller communities whose major source of income is from forestry, livestock and agriculture.

In Turkey, which has comprised three of the world hot spots, reports increase in matters related to HWC. Carnivore depredation on livestock is one of the major issues of human and wild animal conflict (Chynoweth et al. 2016). For the protection of livestock from wild animals (carnivores) many shepherds use guardian dogs. Conflict between human and wildlife is a one of the most challenging issues for conservation of wildlife. This problem is global in nature and is on the rise (Dowie 2011 and Woodroffe et al. 2005). Most of the people bearing the brunt of HWC belongs to economically weaker sections and loss of crops is a serious issue among them (Adams et al. 2004). Visible impacts of human-wildlife conflict, i.e. injury and fatality, crop and livestock loss, are its best documented consequences. Studies suggest that in Tanzania, between 1990 and 2004 lion attacks led to injury or death of over 800 people (Packer et al. 2005). In several

African countries are loss may amount to 10% of the total agricultural output products (Lamarque et al. 2009). Livestock depredation is one of other adverse impact of the human–wildlife conflict, especially in African countries where lions lift cattle from farms and ranches (Hazzah et al., 2009; Kissui, 2008).

Materials and methods

The main purpose of the study is villagers of Madhya Pradesh and Chhattisgarh which are totally depend upon the forest and agriculture for their life and livelihood. Anuppur, Bilaspur and Dindori are district where main tribal groups are present Gond, Bhil, Baiga, Korku, Bhariya, Halba, more than 50 percent tribal population are present in the district. Since most of the people live in the vicinity of the forest area study of conflicting species is important in this area. Most of the people living here are dependent on agriculture and forestry as their main source of income. Damgarh is a village of Anuppur district. Its latitude 22°44.138', longitude 81°46.154' and elevation 2885 ft. Dominant forest species are *Shorea robusta*, *Anogeissus latifolia*, *Terminalia elliptica*. Umargohan is a village of Anuppur district. It's latitude 22°46.099', longitude 81°42.351' and elevation 3160 ft. Dominant forest species are *Shorea robusta*, *Anogeissus latifolia*, *Terminalia elliptica*. Atrium is a village of Bilaspur district. Its latitude 22°34.227', longitude 81°45.352' and elevation 1820 ft. Dominant forest species are *Shorea robusta*, *Desmodium oojeinensis*, *Madhuca indica*. Marwahi is a village of Bilaspur district. Its latitude 23°00.946', longitude 82°03.349' and elevation 1742 ft. Dominant forest species are *Shorea robusta*, *Butea monosperma*, *Buchanania axillaris*. Dadargaon is a village of Dindori district. Its latitude 22°37.172', longitude 81°31.420' and elevation 3352 ft. Dominant forest species are *Shorea robusta*, *Lanea coromandelica*, *Buchanania axillaris*. (Table- 1)

The data were collected using questionnaire methods. Data were collected from farmers and forest collectors and local villagers. The study was carried out in the central Indian states of Madhya Pradesh and Chhattisgarh covering 3 districts i.e. Anuppur, Bilaspur and Dindori. The villages were selected on the basis of their proximity to the forest area. The conflicting species were identified using photographic field guide of Indian Mammals (Menon 2014). The main source of income for the villagers is from agriculture, livestock rearing and forest collection. We attempted to understand the HWC in this region and for this purpose a detailed questionnaire was prepared. The structured questionnaire contained aspects of HWC like damage and severity to crops and livestock. Mostly the farmers and forest collectors were targeted for the interview and effort was made to collect data. The severity of human-wildlife conflict was scaled on low, medium and high corresponding to the number of respondents. The respondents were also interviewed about their opinions and suggestive measures to reduce the same. This study was carried out between November 2017 and April 2018. The persons interviewed were in the age group of 30-60 years representing 5 villages were covered in data collection.

Result and Discussion

In all there are 18 mammal species and based on the interview of respondents their preference was recorded in 3 categories i.e. low, medium and high. It was found that *Semnopithecus entellus*, *Axis unicolor*, *Sus scrofa*, *Rattus rattus* and *Rattus norvegicus* having high crop damage severity. In moderate damage severity species like *Macaca mullata*, *Axis axis*, *Antilope cervicapra* and *Prionailurus rubiginosus* were recorded. In low damage severity species which do not greatly affect livestock and crops are *Muntiacus muntjack*, *Melursus ursinus*, *Canis aureas*, *Hyaena hyaena*, *Cuon alpinus*, *Vulpus bengalensis*, *Panthera tigris*, *Panthera pardus*, *Felis chaus*, *Herpestes javanicus*. *Melursus ursinus* is a unique species having the capacity to damage crops and depredate livestock. *Prionailurus rubiginosus* is reported to cause moderate damage to livestock because it lives in close vicinity of humans. Out of 18 mammal species 12 are reported to common intruders causing either crop or livestock loss. Villagers reported high damage due to boar (*Sus scrofa*) especially in the paddy fields. Destruction of their crops and attacks on their livestock

such as cow (calf), goat, buffalo (calf), and fowl. From the foregoing account on HWC it is clear that the rural people in this region face increased economic hardships due to crop and livestock losses. (Table-2)

The majority of the people of the District of Anuppur, Bilaspur, Dindori cited many problems caused by wild animals; just like sloth bear, wolf and tiger. These animals find their easy prey in human livestock; however, villagers of these regions reported such cases to be low. Livestock depredation is therefore not a very big issue apart from study sites like Marwahi where the sloth bear and in Dindori area leopard attacks is common. (Table-6)

Analysis of targeted questionnaire to farmers reveals that out of 8 crop raiding species 3 inflicted high damage. All the species had a high preference for paddy and pea probably because of the taste and large area under cultivation. Among the other species destroyed are corn (*Zea mays*) and bengal gram (*Cicer arietinum*). The common primates of the region wrecked havoc among the farmers and are known to damage all 4 major crops of the region. Deers like *Axis unicolor*, *Axis axis* and *Muntiacus muntjack* cause damage to paddy and pea crops. The other serious crop raider is a boar (*Sus scrofa*) which has unique ability to damage crop both by day and night. *Bos gaurus* is known to have a preference for paddy and pea however their numbers are extremely low. According to people the primates intrude the crop field at daytime, but deer mostly prefer night time. Monkey in the region gets more liberty, because human feed them due to religious reasons. (Table-3)

The majority (95%) of the people of the District of Anuppur, Bilaspur, Dindori having the following problems as being caused by wild animals; that their own safety was at stake as these animals would cause them deaths and injuries. Although the conflict intensity is reportedly on lower sites, however, these cases more often than not lead to retaliatory killing of wildlife. Among the animals that were likely to cause death were *Melursus ursinus* (Sloth bear) and *Panthera tigris* (Tiger). In Marwahi wild animal *Melursus ursinus* is infamous for causing human deaths, most of which are reported to occur while people were protecting their crops from being raided by animals (usually at night). Forest collectors also faced the wrath of such animals when they came very close to these animals. The other reasons cited were encountered near water points or close proximity with the injured Sloth bear or Tiger. (Table-4)

The village of Atariya, Umargohan, Damgarh, Dadargaon and Marwahi have identified as many as 16 mammalian species out of which 7 species were able to raid crops while 8 species had an ability to depredate livestock. In this village *Sus scrofa* badly affected the crop and damage intensity is reported to be high. Heavy losses to the crops were caused by *Sus scrofa*, *Semnopithecus entellus* and *Macaca mullata* while *Felis chaus* and *Canis aureas* caused the major problem in terms of livestock loss. All these villages are nearby forest and crops and livestock becoming alluring to these animals. Livestock depredating species like a *Melursus ursinus*, *Canis aureas*, *Hyaena hyaena*, *Vulpus bengalensis*, *Panthera tigris*, *Panthera pardus*, *Felis chaus*, *Prionailurus rubiginosus*, *Herpestes javanicus* are common in these areas. *Vulpus bengalensis* is a species living around human habitations and is most active during the night time. Atariya, Umargohan, Damgarh, Dadargaon and Marwahi villages and its surrounding area are totally affected by these animals. (Table-5)

In total there are 14 crop species cultivated in the study villages among this grass genus is the largest contributing 5 species, i.e. *Oryza sativa*, *Triticum aestivum*, *Paspalum scrobicollatum*, *Panicum flexuosum* and *Zea mays*. Hence the major cereal crops of this region are rice, wheat and corn while that of the minor cereals is Kodo millet and Kutki millet. Apart from the cereal species the other dominant crop is pulses; all the pulses belong to legume family. Pulses like *Cicer arietinum*, *Pisum sativum*, *Cajanus Cajan* and *Lens culinaris*. The oil yielding plant species are *Linum usitassimum* (Linseed), *Brassica campestris* (Mustard) *Glycine max* (Soy) and *Guizotia abyssinica* (Niger seed). The agricultural crop year in Madhya Pradesh and Chhattisgarh starts with onset of monsoon from June-July. The cropping season is classified into two main seasons-(I) Kharif and (ii) Rabi based on the monsoon. The kharif cropping season is from July –October during the south-west monsoon and the Rabi cropping season is from October-March (winter). The principal kharif crops traditionally grown in the district are *Oryza sativa* (Paddy), *Zea mays* (Corn) and *Glycine max* (Soybean) while the

main Rabi crops are *Triticum aestivum* (Wheat), *Pisum sativum* (Pea), *Cicer arietinum* (Chickpea), *Cajanus cajan* (Pigeon pea) and *Brassica campestris* (Mustard). It is also observed that most of the crops have maturity time of 4-5 months and during this time these crops are most vulnerable to pest attack and animal intrusion. The food source of the people of the region comes from rice and wheat and this is also the main source of income for the farmers. Most farmers in the region are poor and hence crop lost by animals cause lot of resentment among them. (Table-6)

Mitigatory measures for HWC

The response assessment for supplementary measures to be taken for the reduction of HWC suggested that in Anuppur district that all of them opined that compensation be paid for damage, 89.65 % people thought that afforestation was required, followed by perimeter fencing 72.41% and increasing the vigil 65.51 %. 93% of people were against deforestation and 79.31% opined against retaliatory killing of wildlife. This suggests that in this district the people were facing the HWC and also view deforestation as major problem causing an increased incidence of HWC. (Figure: 2)

In Bilaspur district similar trend were seen as all informants opined for compensation, the majority of respondent's opined afforestation 93.75%, fencing 81.25% and increasing vigil 81.25% as a major way to prevent HWC. Few respondents, 12.5% opined for killing of wildlife as means to achieve the same. Similarly, 87.5% people said no to deforestation and about 6.25-12.5% of the respondents had no opinion on the issues. From this it could be concluded that people are aware about the solutions to HWC and also view deforestation as a major concern for HWC. Small numbers of respondents in don't know section is probably having no issues with HWC or having an alternate source of livelihood. (Figure: 2)

In the Dindori district opinion of villagers for minimizing HWC were in increasing order are compensation 87.5%, afforestation 87.5%, fencing 75% and increasing vigil are also 75%. 100% of respondents opined against deforestation and killing wild animals 93.75%. A small number of respondents >20% didn't have any suggestions on the issue. This suggests that people are facing increased HWC due to deforestation and economic weakness compounds these problems. Besides that fencing and increasing vigil was another suggested mitigatory measure of the rural people. (Figure: 2)

The local people should engage in vigil activity for safeguarding crops and livestock. Government shall pay compensation to those who have lost crops or livestock to prevent further conflict. Though a good number of people do not think it is due to deforestation but about 82% think afforestation is required to reduce intensity of HWC. There is need to plant more edible fruit species in the wild this would also reduce the intensity of crop damage. One must not feed animals with human feed a very common practice in Central India which encourages monkeys to attack humans. Nearby protected areas fencing if possible should be taken up to reduce HWC.

Table-1: Study area village location and vegetation.

| S.No. | State | District name | Village Name | Latitude | Longitude | Elevation (ft) | Dominant forest species |
|-------|-------|---------------|--------------|------------|------------|----------------|-----------------------------------------------------------------------------------------|
| 1 | M.P. | Anuppur | Damgarh | 22°44.138' | 81°42.351' | 2885 | <i>Shorea robusta</i> , <i>Anogeissus latifolia</i> , <i>Terminalia elliptica</i> |
| 2 | M.P. | Anuppur | Umargohan | 22°46.099' | 81°46.154' | 3160 | <i>Shorea robusta</i> , <i>Anogeissus latifolia</i> , <i>Terminalia elliptica</i> |
| 3 | C.G. | Bilaspur | Atariya | 22°34.227' | 81°45.352' | 1820 | <i>Shorea robusta</i> , <i>Desmodium oojeinensis</i> . <i>Madhuca indica</i> |
| 4 | C.G. | Bilaspur | Marwahi | 23°00.946' | 82°03.349' | 1742 | <i>Shorea robusta</i> , <i>Butea monosperma</i> , <i>Buchanania axillaris</i> |
| 5 | M.P. | Dindori | Dadargaon | 22°37.172' | 81°31.420' | 3352 | <i>Shorea robusta</i> , <i>Lannea coromandelica</i> , <i>Buchanania axillaris</i> |

Table-2: Species wise conflict intensity in the region.

| S.No. | Species | Local name | Crop raiding | Livestock depredation | Conflict Intensity | | |
|-------|---------------------------------|--------------|--------------|-----------------------|--------------------|--------|------|
| | | | | | Low | Medium | High |
| 1 | <i>Macaca mullata</i> | Ratulia | √ | | X | √ | X |
| 2 | <i>Semnopithecus entellus</i> | Karia Banar | √ | | X | X | √ |
| 3 | <i>Axis unicolor</i> | Samar | √ | | X | X | √ |
| 4 | <i>Muntiacus muntjack</i> | Ghotri | √ | | √ | X | X |
| 5 | <i>Axis axis</i> | Chetar | √ | | X | √ | X |
| 6 | <i>Antilope cervicapra</i> | Karia Samar | √ | | X | √ | X |
| 7 | <i>Bos gaurus</i> | Van Bhainsa | √ | | X | X | X |
| 8 | <i>Sus scrofa</i> | Baraha | √ | | X | X | √ |
| 9 | <i>Melursus ursinus</i> | Reech | √ | √ | √ | X | X |
| 10 | <i>Canis aureas</i> | Bigwa | | √ | √ | X | X |
| 11 | <i>Hyaena hyaena</i> | Hundrey | | √ | √ | X | X |
| 12 | <i>Cuon alpinus</i> | Sonhar Kutta | | √ | √ | X | X |
| 13 | <i>Vulpus bengalensis</i> | Sikta | √ | √ | √ | X | X |
| 14 | <i>Panthera tigris</i> | Bagh | | √ | √ | X | X |
| 15 | <i>Panthera pardus</i> | Tendua | | √ | √ | X | X |
| 16 | <i>Felis chaus</i> | Bilra | | √ | √ | X | X |
| 17 | <i>Prionailurus rubiginosus</i> | BhodBilra | | √ | X | √ | X |
| 18 | <i>Herpestes javanicus</i> | Timra | | √ | √ | X | X |

Table-3: Species wise crop damage list.

| S.No. | Species | Local name | Crops damaged | Time of damage |
|-------|-------------------------------|-------------|---------------------------------------------------------------|--------------------|
| 1 | <i>Macaca mullata</i> | Ratulia | <i>Oryza sativa, Pisumsativum, Zea mays, Cicerarietinum</i> | Day time |
| 2 | <i>Semnopithecus entellus</i> | Karia Banar | <i>Oryza sativa, Pisum sativum, Zea mays, Cicer arietinum</i> | Day time |
| 3 | <i>Axis unicolor</i> | Samar | <i>Oryza sativa, Pisum sativum</i> | Night time |
| 4 | <i>Axis axis</i> | Chetar | <i>Oryza sativa, Pisum sativum</i> | Night time |
| 5 | <i>Sus scrofa</i> | Baraha | <i>Oryza sativa, Pisum sativum</i> | Day and Night time |
| 6 | <i>Bos gaurus</i> | Gaur | <i>Oryza sativa, Pisum sativum</i> | Night time |
| 7 | <i>Muntiacus muntjack</i> | Ghotri | <i>Oryza sativa, Pisum sativum</i> | Night time |

Table-4: Human Injury causing species.

| S.No. | Species | Local name |
|-------|-------------------------|------------|
| 1 | <i>Melursus ursinus</i> | Reech |
| 2 | <i>Panthera tigris</i> | Bagh |

Table-5: Village wise conflicting species.

| S.No. | Species | Local name | Atari ya | Damgarh | Umargohan | Dadargaon | Marwahi |
|-------|-------------------------------|--------------|----------|---------|-----------|-----------|---------|
| 1 | <i>Macaca mullata</i> | Ratulia | + | + | + | + | + |
| 2 | <i>Semnopithecus entellus</i> | Karia Banar | + | + | + | + | + |
| 3 | <i>Axis unicolor</i> | Samar | | + | | + | + |
| 4 | <i>Muntiacus muntjack</i> | Ghotri | + | + | + | + | - |
| 5 | <i>Axis axis</i> | Chetar | + | - | + | + | |
| 6 | <i>Antilope cervicapra</i> | Karia Samar | - | + | + | - | - |
| 7 | <i>Bos gaurus</i> | Van Bhainsa | + | + | + | + | - |
| 8 | <i>Sus scrofa</i> | Baraha | + | + | + | + | + |
| 9 | <i>Melursus ursinus</i> | Reech | + | + | + | + | + |
| 10 | <i>Canis aureas</i> | Bigwa | + | + | + | + | - |
| 11 | <i>Hyaena hyaena</i> | Hundrey | - | + | + | | - |
| 12 | <i>Cuon alpines</i> | Sonhar Kutta | + | + | - | - | - |
| 13 | <i>Vulpus bengalensis</i> | Sikta | + | + | + | + | + |
| 14 | <i>Panthera tigris</i> | Bagh | + | - | + | + | + |
| 15 | <i>Panthera pardus</i> | Tendua | + | + | - | - | + |

| | | | | | | | |
|----|---------------------------------|------------|---|---|---|---|---|
| 16 | <i>Felis chaus</i> | Bilra | + | + | + | + | + |
| 17 | <i>Prionailurus rubiginosus</i> | Bhod Bilra | + | + | + | + | – |
| 18 | <i>Herpestes javanicus</i> | Timra | + | + | + | + | + |

* + indicates presence and – indicates absence

Table-6: The agriculture calendar of farmers of Central India.

| Sl.No. | Species (Local name) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------|--------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | <i>Oryza sativa</i> (Dhan) | | | | | | | | | | | | |
| 2 | <i>Triticum aestivum</i> (Gehu) | | | | | | | | | | | | |
| 3 | <i>Paspalum scrobicolatum</i> (Kodo) | | | | | | | | | | | | |
| 4 | <i>Pisum sativum</i> (Matar) | | | | | | | | | | | | |
| 5 | <i>Cicer arietinum</i> (Chana) | | | | | | | | | | | | |
| 6 | <i>Linum usitassimum</i> (Alsi) | | | | | | | | | | | | |
| 7 | <i>Brassica campestris</i> (Rye) | | | | | | | | | | | | |
| 8 | <i>Glycine max</i> (Soya) | | | | | | | | | | | | |
| 9 | <i>Panicumflexuosum</i> (Kutki) | | | | | | | | | | | | |
| 10 | <i>Cajanus cajan</i> (Rahar) | | | | | | | | | | | | |
| 11 | <i>Zea mays</i> (Makai) | | | | | | | | | | | | |
| 12 | <i>Lens culinaris</i> (Masur) | | | | | | | | | | | | |
| 13 | <i>Guizotia abyssinica</i> (Ramtila) | | | | | | | | | | | | |
| 14 | <i>Hibiscus sabdariffa</i> (Amru) | | | | | | | | | | | | |

Annexure I: Questionnaire for HWC

Declaration - I declare that the manuscript has not been published in any journal/book or proceedings or in any other publication or offered for publication elsewhere in substantially the same or abbreviated form, either in print or electronically.

Figure 1: Study sites in the three districts of Central India

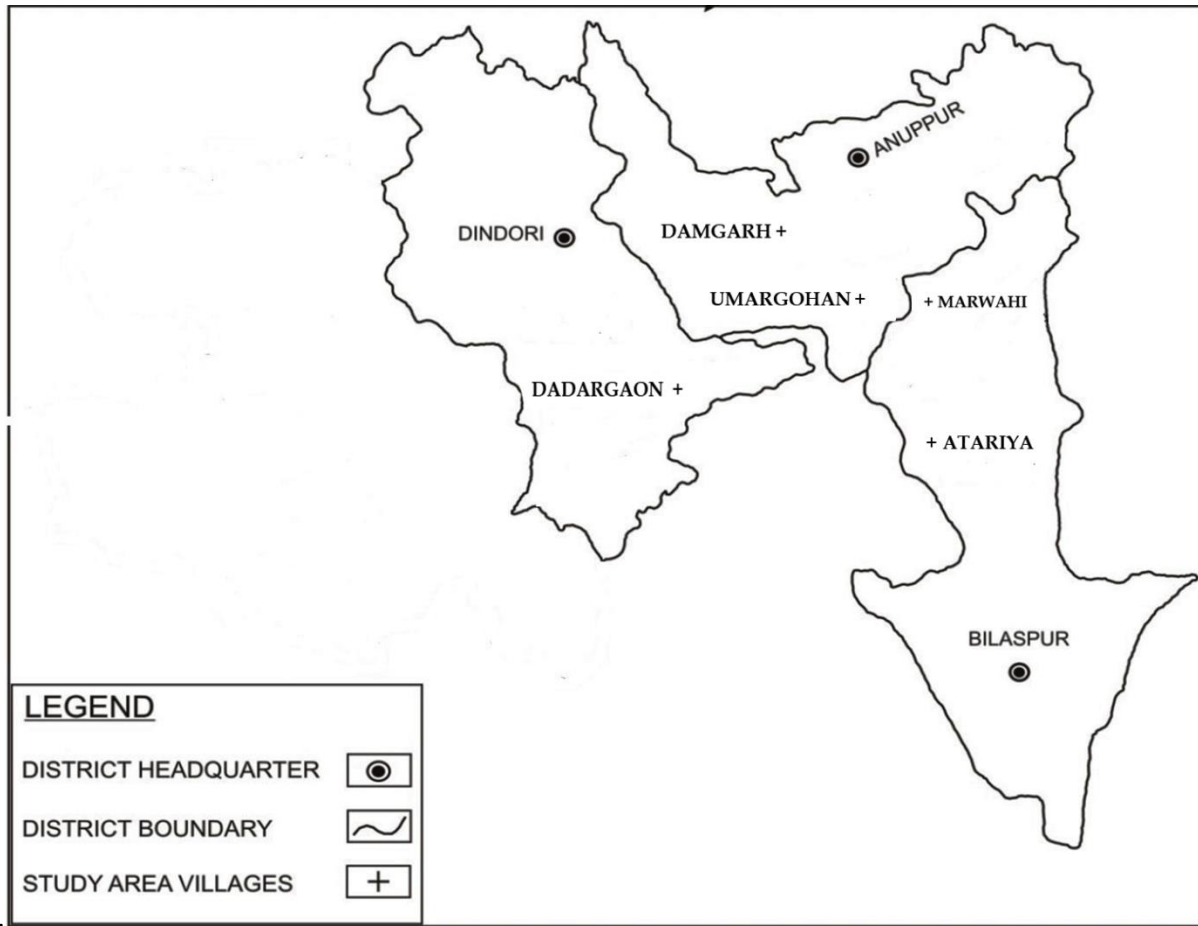
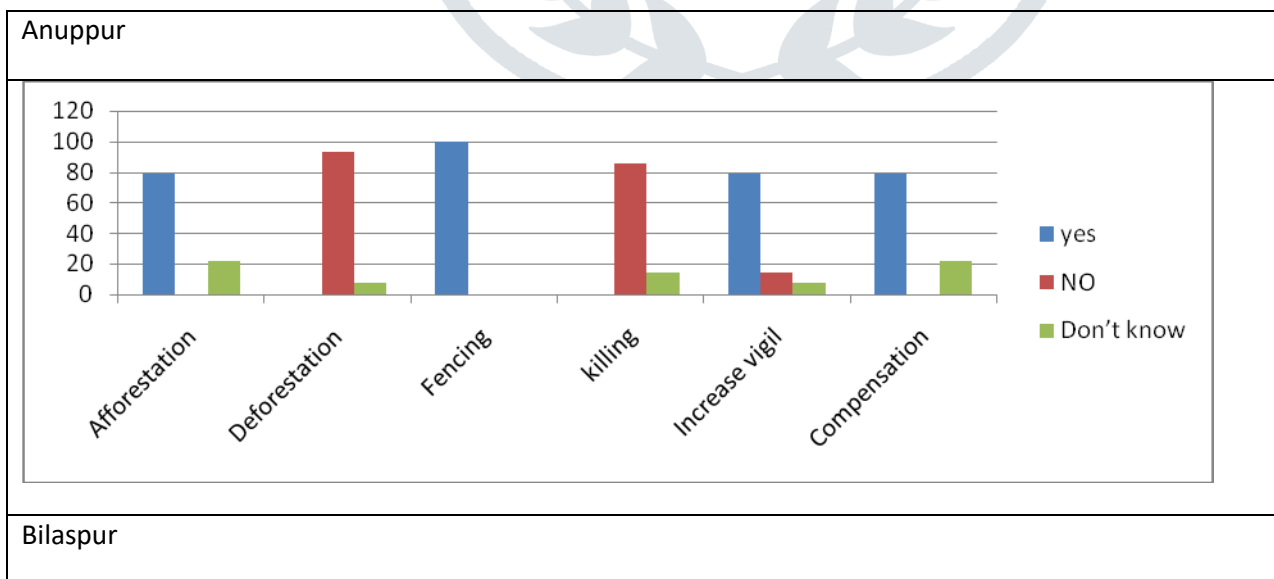
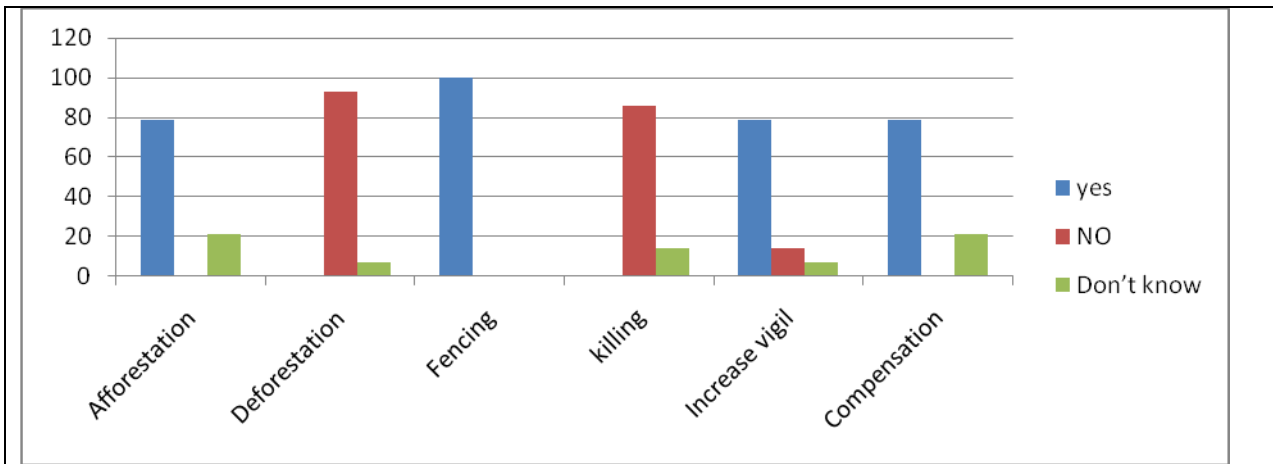
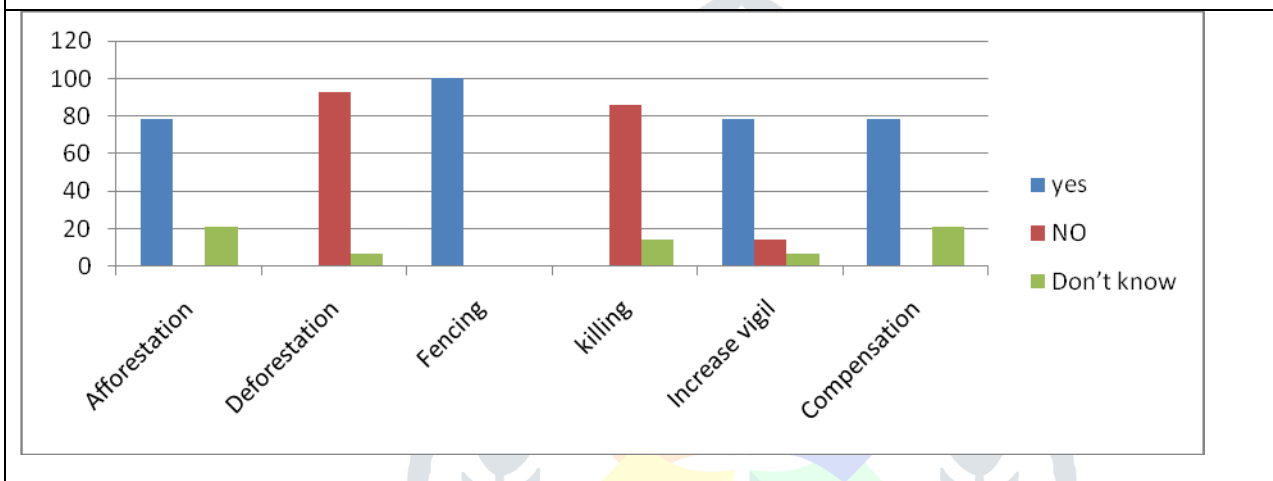


Figure-2: Districtwisemitigatory measures to reduce human wildlife conflict (% each category).





Dindori



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