STATUS OF HUMAN-WILDLIFE CONFLICT AND MITIGATION STRATEGIES IN MARWAHI FOREST DIVISION, BILASPUR CHHATTISGARH

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Introduction

Human-wildlife conflict has been a well known problem in vicinities of protected and non-protected areas. Incidences of human casualties, livestock depredation and crop damage caused by wild animals e.g. elephant, tiger, lion, sloth bear, leopard, nilgai, deer and wild pig have been widely reported from various parts of India (Bargali *et al.*, 2005, Chauhan, 2005a, b; Bargali, 2003; Mankadan and Rahmani, 1998; Mishra, 1997; Chandra, 1997; Rajpurohit; 1996; Saberwal *et al.*, 1994; Indrukar *et al.*, 1994; Sinha and Jha, 1994; Chauhan and Singh, 1990; Schultz, 1986). Fragmentation of forests, expansion of agricultural fields and human settlement not only destroy the habitat of wild animals but also expose animals to people which ultimately lead to confrontation (Akhtar, 2004, Akhtar *et al.*, 2004; Chauhan and Sawarkar, 1989). These confrontations are always detrimental for the well being of the animals in the area on long run.

Marwahi Forest Division has been well known for having human-sloth bear conflict (Bargali *et al.*, 2005, Bargali, 2003; Chauhan *et al.*, 2003; Shankar and Murthy, 1995). Long term study had been carried out in this area by Wildlife Institute of India, Dehra Dun during 1998-2000. Study was concluded with recommendations i.e. translocation of sloth bear population from isolated den sites to other suitable areas, restoration of sloth bear habitat in degraded areas, protection of large contiguous forests, sustainable use of forest resources and easy mechanism of paying compensation to people for their crop and lives loss, caused by bear. After six years of study, Marwahi Forest Division was visited again to see the changes in status of human-wildlife conflict and formulate strategies to deal existing human-wildlife conflict and to prepare conservation plan for the wild animals in the area.

Study Area

Former North Bilaspur Forest Division has been reorganized into Marwahi Forest Division with seven ranges. Data was collected from Pendra, Marwahi and Gaurela range as these areas had been having maximum incidence of conflict. Available forest cover was highly degraded, fragmented and interspersed with agriculture crop fields, human settlements and small townships. In this forest division, 200,000 human population and 150,000 livestock population was inflicting severe extent of biotic pressure on bear habitats. The study area lies

between one of the oldest mountain chains of India i.e. Vindhya or Maikal range. The North Bilaspur Forest Division was classified under Eastern Deccan biogeographical zone (Rodgers and Panwar, 1988). Topography of the area is undulating, interspersed with chain of hillocks and rocks. Many of the hillocks were scattered and surrounded by villages; these hillocks with big boulders provide caves (dens) to sloth bears as well as to various other animals. The elevation of hillocks varies between 450-1050 m amsl.

Methods

Information on human-animal conflict was collected from Forest Department records. We collected information till the month of May 2006. Then this information was further sorted and analyzed. Victims and villagers of conflict areas were interviewed to assess the nature and extent of conflict. To see the change in the status of sloth bear population, sloth bear count was done at the same 6 den sites (Pundi dongri (Tauli), Jhandi dongri (Masurikhar), Amli dongri (Chuabahra), Lamra dongri (Ghusariya), Ladara dongri (Jhirna Pauri) and Niranjan Kharil (Jhirna Pauri)) that were used for the estimation of sloth bear during previous study (Akhtar, 2004). To assess impact of biotic pressure, 10 previously marked transects were walked again to know change in timber extraction in terms of felled and lopped trees and grazing (abundance of dung) per hectare (Akhtar, 2004). One sample Kolmogorov-Smirnow test was used to test difference in occurrence of mauling cases over the different months whereas paired sample t-test was used to test difference in occurrence of mauling cases between males and females (Dytham, 2005).

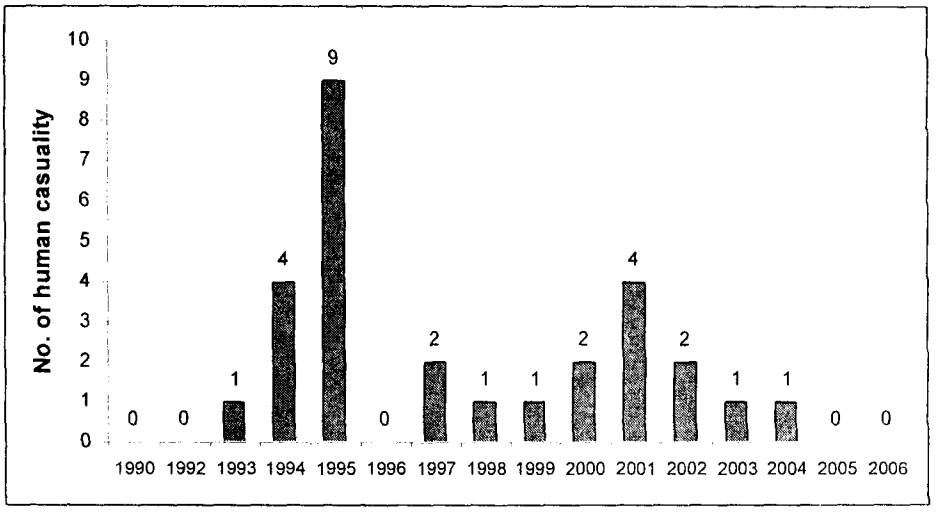
Results

Extent of human casualties caused by wild animals : Though human-animal conflict in the area is very old, but data since 1990 revealed 28 cases of human death, comprising of 13 males and 15 females. Except 2 causality, rests were caused by sloth bear. Fig. 1 shows that human casualties were on the decline since 1995.

Extent of human mauling caused by wild animals : Altogether 801 incidences of human mauling recorded between 1990-2006 comprised of 591 male and 210 female victims (Table 1). Maximum 604 incidences of human mauling were recorded in Marwahi range followed by 135 and 62 in Pendra and Gaurela range. Similarly maximum 444 people (males) were attacked by wild animals in Marwahi range followed by 98 and 49 in Pendra and Gaurela range respectively. Whereas, 150 people (females) were mauled by wild animals. Maximum 528 incidences of mauling were caused by sloth bear followed by 220 and 53 by jackals and other wild animals respectively. In total 53 incidences of human mauling comprising of 41 males and 12 females were caused by other wild animals i.e. wolf, gaur, wild pigs, hyena, tiger, jungle cat and leopard who were responsible for attack on human (Fig. 2).

Occurrence of human-animal incidences vis-à-vis months : Pattern of happenings on human attack shows that maximum 92, 79, 93 and 75 of 801 incidences were occurred during the months of August, September, October and November respectively. One sample Kolmogorov-Smirnow Test shows that occurrence of mauling in people across the different months was not significantly different

Fig. 1



Status of human casualties in Marwahi Forest Division, Bilaspur, Chhattisgarh.

Table 1

No. of human mauling incidences caused by wild animals per year in Marwahi Forest Division

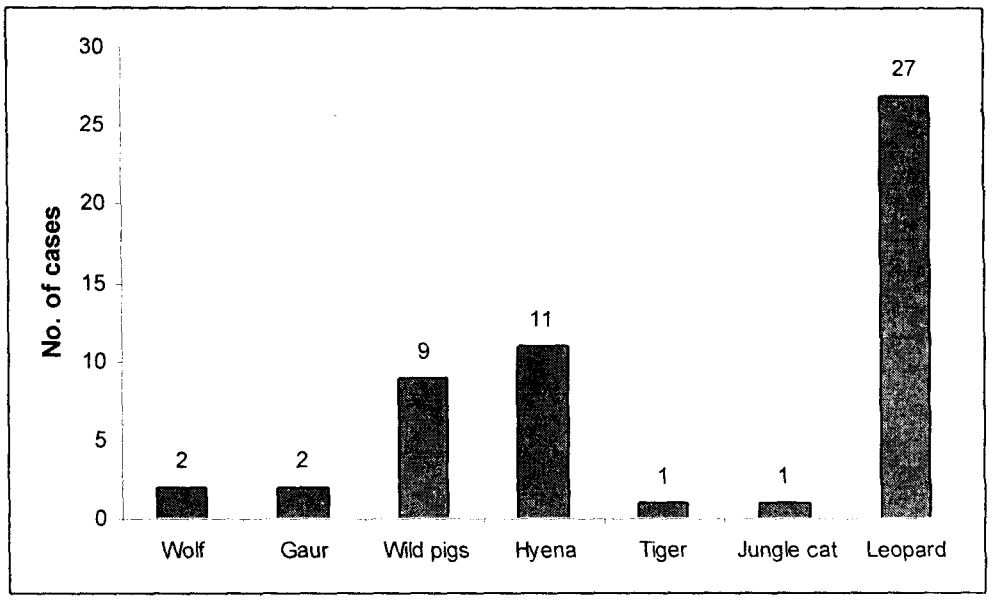
Year	Marwahi	Pendra	Gaurela	Total
1990	8	6	0	14
1991	20	0	0	20
1992	15	3	0	18
1993	24	9	1	34
1994	31	11	0	42
1995	27	14	1	42
1996	11	12	1	24
1997	18	16	4	38
1998	55	16	1	72
1999	54	6	8	68
2000	43	3	11	57
2001	46	5	11	62
2002	40	11	9	60
2003	52	9	4	65
2004	70	9	4	83
2005	59	3	4	66
2006	31	2	3	36
Total	604	135	62	801

(Z=0.813, n=12, p= 0.52). Range of incidences per month varied 51-93 with the mean 66.8 ± 14.8 (SD). Whereas paired samples t-test shows that occurrences of mauling incidences in male and females person (t=12.13, df=11, p= 0.00) was significantly different.

Places of conflict : The places of attack on human by wild animals were categorized into three categories i.e. forests, villages and houses. In Marwahi range 72.5% incidences of human mauling were occurred in villages followed by 18.5% and 9.0% in forests and houses respectively (Fig. 3). In Gaurela range 49.5% incidences were occurred in forests followed by 31.8% and 18.7% in village and houses respectively. Whereas in Pendra range, 44.5% incidences occurred in houses followed by 38.5% and 17.0% in forests and villages respectively.

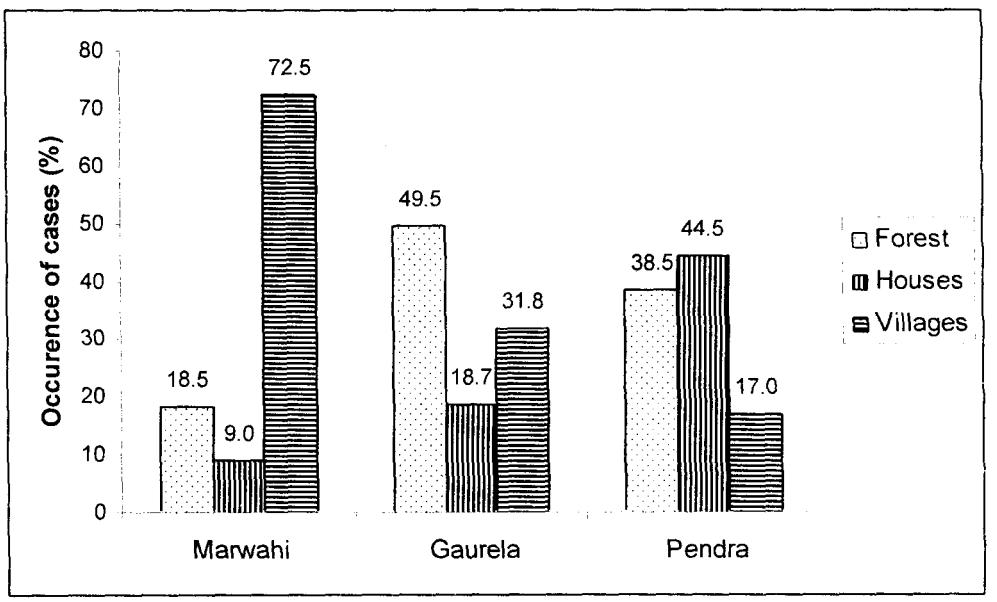
Pattern of livestock lifting by wild animals (Fig. 4) showed that maximum 68.0% incidences occurred in villages

Fig. 2



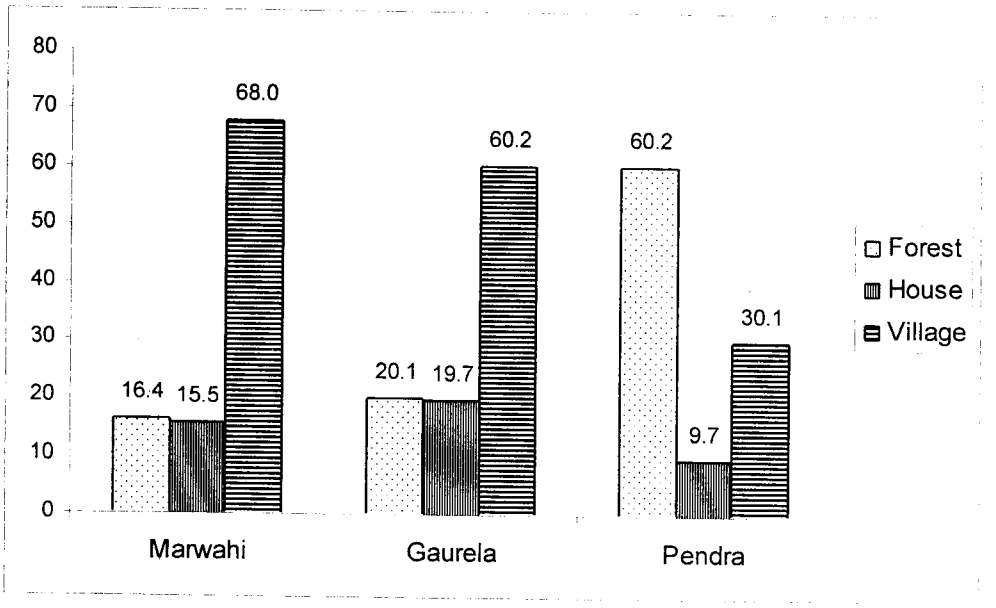
Status of human mauling incidences caused by other wild animals

Fig. 3



Occurrence of human mauling incidences by wild animals.

Fig. 4



Occurrence of animal lifting incidences by wild animals

followed by 16.4% and 15.5% in forests and houses respectively. In Gaurela range 60.2% incidences were occurred in villages followed 20.1% and 19.7% in forests and houses respectively.

Current status of sloth bear population in Marwahi Forest Division : It has been observed that sloth bear population was on decline during the last few years. This was evident by the low number of sloth bear attack on people during last few years. Based on the latest count and estimation, Marwahi Forest Division was harbouring 186 ± 92 sloth bear which is 57.1% of the last census i.e. 326 ± 90 (Table 2).

Status of livestock vis-à-vis wild animal conflict : Altogether 1,453 incidences of livestock lifting were recorded in Marwahi Forest Division. Maximum 1,351 incidences were found in Marwahi range followed by 46 and 56 in Pendra and Gaurela range respectively. Annual pattern of incidences of livestock lifting showed that maximum incidences occurred between 1996-2003.

Current status of biotic pressure in Marwahi Forest Division : No major changes were observed in extent of biotic pressure as compared to last study. It was estimated that there were 83.5 ± 12.3 SD felled and 129.2 ± 15.3 SD lop trees per hectare. Grazing pressure was recorded as 95.6 ± 18.2 SD per hectare which is more or less same to previous study (Table 3). However, extraction of stones from bear den sites had been increased considerably. Bear den sites at Masurikhar, Barbasan, Silpahri, Lityasarai, Tauli, Marakot and Karangra were at grave danger of elimination due to high intensity of stone extraction. Road network (metallic and non-metallic)

Table 2

Population estimation of sloth bear in NBFD during 1999.

Year	No. of bear den sites	Population		Test of significance		Population [N x (mean ± L)]
		No. of bears (Mean)	Standard error (SE)	T-value (p>0.05)	Confidence limit (L)	
1999	56	5.83	0.65	2.45	1.60	326 ± 90
2006	56	3.33	0.67	2.45	1.64	186 ± 92 (57.1%)

Table 3

Comparative status of biotic pressure in Marwahi Forest Division

Sl. No.	Type of pressure	During 2000	In 2006
1	No. felled trees	71.84 ± 14.3	83.5 ± 12.3
2	No. of lopped trees	120.9 ± 15.3	129.2 ± 15.3
3	No. of dung	89.6 ±21.2	95.6 ± 18.2

expansion across the Marwahi Forest Division apparently disturbed the bear movement. Non-timber forest produce (> 42 items) extraction is still going on. Bears visit villages to feed on *Ziziphus mauritiana* and Guava (*Syzygium guajawa*) but this time we observed that most of the villagers have removed these trees to avoid arrival of bear in their kitchen garden. Apparently a big source of food had been eliminated from the villages by villagers.

Discussion

Due to connectivity of Marwahi Forest Division to Achanakmar Wildlife Sanctuary and historic record of good forest cover, many species of wild animals have been causing conflict with people. Fragmentation of forests, loss of habitats and expansion of agriculture and human settlements have been the major reason behind this existing human-wildlife conflict. Although tiger, leopard, sloth bear, hyena, jackal, jungle cat and wolf had been causing conflict but sloth bear and jackal were mainly responsibly for attacked on people whereas leopard hyena and jackal have been responsible for livestock casualties. Human settlement, and agricultural fields are not as much scattered in Pendra and Gaurela range as in Marwahi range. Hence most of the villages in Marwahi range are surrounded by forests or *vice versa*. Due to this reason people and livestock of Marwahi range have always been an easy target for wild animals, thus extent of conflict has been highest in this range. Irrespective of sex, people were attacked by wild animals. Intensity attack on humans by animals

was found highest between 1998 to 2004. It was the period when large scale stone extraction, deforestation and expansion of road network took place which perhaps misbalanced the ecosystem and animal requirement for food and shelter. The jackal human conflict was surprisingly very new in this division and first time reported in 1998 and seemingly high in recent time. In fact it had left behind the sloth bear conflict. Data of livestock lifting showed that maximum incidences happened between 1996 to 2002. Marwahi was found the worst affected range in terms of livestock lifting followed by Gaurela and Pendra. Latest total bear count at six bear den sites revealed the presence of 20 bear comprised of 7 males, 3 females, 4 cubs and 6 unidentified. Extrapolation of this census of bear population estimates 186 ± 92 sloth bear in entire study area which was 57.1% of last study i.e. 326 ± 90. This indicates sharp decline in sloth bear population which may be beginning of extinction of sloth bear from this area if conservation measure are not taken. Decline in sloth bear population has occurred significantly due to loss of habitat, less food availability in the forests as well as in village area. During the movement in village area, sloth bears had been observed to feed on *Ziziphus* and Guava (*Psidium guajawa*) fruit in kitchen garden of villagers. But due to frequent movement of bear in their kitchen gardens, villagers have been removing the trees to stop sloth bear movement. This practice apparently had created further loss in food availability for sloth bear. Nature and place of human-wildlife conflict in Marwahi range revealed that maximum cases of attack happened in village area due to highly fragmented forests and interspersion. Gaurela and Pendra ranges have large contiguous patches of forests so have minimum incidences in village area. Attack on livestock was found very high in village areas because leopard, jackal and hyena inhabit the denning sites which were very adjacent to the village area. However, in Pendra range, most of incidences occurred at the time of grazing.

Dependence of people on forest for the collection of produces is still very high. Apparently, no management practice was done for the restoration of habitats and check in deforestation. Now many wild species are facing serious threats for their conservation. Bouldary hillocks not only provide shelter to sloth bear but also to other animals such as jackal, hyena and leopard. Stone extraction has been observed in and around many denning sites which is a serious threat for the sloth bear and others species survival.

Human-wildlife conflict is neither good for people who lose their lives and agriculture crops nor animals themselves whose life remains at stake during movement outside the forests. Wild animal survival has been become precarious in such conflict areas. Due to this conflict scenario many species are becoming locally extinct and many are on the verge of extinction.

Management implications

Sloth bear, jackals and leopard are found to be most problematic animals so most of the recommendations given below revolve around these animals :

1. People should walk in groups to avoid attack while taking their cattle for grazing in the forests. Grazing

animals should be guarded in the forest as well as in the village area.

2. People need to be aware about behaviour of problematic animals such as sloth bear, jackal, hyena and leopard so that confrontation can be avoided.

3. People should be discouraged to collect NTFP from bear locations.

4. Stone extraction from all bear areas or forests land e.g. Masurikhar, Barbasan, Silpahri, Lityasarai, Tauli, Marakot and Karangra should be immediately stopped to protect sloth bear and other animal habitats.

5. Efforts should be made to restore wild animal habitats especially sloth bear and jackals through planting of native fruiting species such as *Ziziphus mauritiana*, *Ficus* sp. (Bar, Pipal, Gular) in forest areas.

6. It has been observed that most of the villagers do not have proper cattle shelters. Rather, their cattle roam in the street of villages and thus become easy targets for predators. Hence, livestock should be properly protected by building enclosures made up of rubble walls.

7. Human-jackal conflict is just new in this area so there is an urgent need to assess the status and distribution of jackal, nature and extent of conflict, social organization, reproductive biology, food habits and movement pattern so strategy could be planed to deal human-jackal conflict on long term basis.

8. Sloth bear population has been declined by 40% during last six years so there is need to monitor the status of sloth bear population in the area.

SUMMARY

Marwahi Forest Division is well known for human-sloth bear conflict. Available forest cover is highly degraded, fragmented and interspersed with agricultural crop fields, and small townships. Data since 1990 onwards reveal 28 cases of human death by wild animals, comprising of 13 men and 15 women. Except 2, all casualties were caused by sloth bear. 801 incidences of human mauling comprised of 591 men and 210 women were registered by Forest Department. A maximum of 528 incidences of mauling were caused by sloth bear followed by 220 and 53 by jackals and other wild animals respectively. Range of incidences per month varied from 51-93 with a mean 66.8 ± 14.8. In Marwahi range 72.5% incidences of human mauling occurred in village area followed by 18.5% and 9.0% in forest and house respectively. Altogether 1453 incidences of livestock lifting were recorded in Marwahi forest division. No major changes were observed in extent of biotic pressure. However, extraction of stones from bear den sites has increased considerably. People need to be educated and made aware of ecology, feeding habits, movement and behaviour of problematic animals such as sloth bear, jackal, hyena and leopard through seminars and workshop so that people can avoid confrontation and play an active role in conservation. Livestock should be properly protected by villagers in enclosures made up of rubble wall. Sloth bear population has declined by 40% during last six years so there is a need to monitor the status of sloth bear population in the area.

Key words : **Human-wildlife conflict, Mitigation strategies, Sloth bear, Marwahi Forest Division, Chhattisgarh.**

मारवाही वन मण्डल, बिलासपुर, छत्तीसगढ़ में मानव–वन्यप्राणी संघर्ष की स्थिति तथा उसे कम करने की समरनीतियां

नईम अख्तर व एन०पी०एस० चौहान

सारांश

मारवाही वन मण्डल अपने मानव–मंद ऋक्ष संघर्ष के कारण सभी को पर्याप्त परिचित है। यहां का वन आवरण अत्यधिक व्याहासित, विखण्डित और बीच–बीच में पड़ते फसल लगे खेतों और छोटे कस्बों से विश्रृंखलित बना हुआ है। 1990 से आगे मिलते आंकड़ों से यहां जंगली पशुओं द्वारा मानवों के मारे जाने की 28 घटनाओं का पता लगता है जिनमें 13 पुरुष और 15 स्त्रियां थी। इनमें से 2 को छोड़ बाकी लोगों को मन्द ऋक्ष ने मारा। मानवों को भंभोड़ने की 801 घटनाएं हुई जिनमें 591 पुरुष और 210 स्त्रियाँ इनमें वन विभाग में दर्ज की गई। अधिकतम घटनाएं, 528 मन्द ऋक्ष द्वारा भंभोड़े जाने की हैं इसके बाद गीदड़ और अन्य जंगली जानवरों से सम्बधित क्रमशः 220 और 53 घटनाएं हैं। प्रतिमास हुई घटनाएं 51–93 तक रही जिनका औसत 66.8±14.8 निकलता है। मारवाही वन मंडल में जंगली जानवरों द्वारा मानवों के भंभोड़े जाने की 72.5% घटनाएं ग्राम क्षेत्र में घटी इसके बाद 18.5% और 9.0% घटनाएं क्रमशः वन और घरों में घटी। कुल मिलाकर पालतू पशुओं के उठाकर ले जाने की 1453 घटनाएं मारवाही वन मण्डल में अभिलिखित की गई। जैविक दबाव में कोई खास परिवर्तन होता परिलक्षित नहीं हुआ। तथापि, ऋक्षों की मांद वाले स्थलों से पत्थरों की निकासी काफी ज्यादा बढ़ गई है। लोगों को समस्या बने जानवरों जैसे मन्द ऋक्ष, गीदड़ लकड़भग्गा और तेन्दुआ की परिस्थितिकी, भोजन आदतों, चलने फिरने और व्यवहार के बारे में शिक्षित और जागरूक बनाए जाने की जरूरत है, जिसके लिए सेमिनार और कार्यशालाएं आयोजित की जानी चाहिएं ताकि लोगबाग उनकी भिड़न्त से बच सकें और उनके संरक्षण में भी सक्रिय भूमिका निबाह सकें। पालतू पशुओं को भी गारे मिट्टी की दीवारों से बनाए बाड़ों में भलीभांति सुरक्षित करके गांव वालों द्वारा रखना चाहिए। विगत छह वर्षो में मन्द ऋक्षों की संख्या 40% कम हो गई है, इसलिए इस क्षेत्र में मंद ऋक्षों की संख्या को नियमपूर्वक पड़तालत रहने की भी आवश्यकता है।

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