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Cattle-Carnivore Conflict: A Case Study of Pakke Tiger Reserve in Arunachal Pradesh, India

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ABSTRACT

A case study on cattle- carnivores conflict was carried out at Pakke Tiger Reserve (PTR) in Arunachal Pradesh, Northeast India during 2001-2003. Number of villages on the eastern periphery of PTR are 14, comprised of the total number of 395 household, 2322 human population and 1392 domestic cattle population. A total of nineteen incidences of conflicts were recorded on the eastern part of buffer zone of PTR. Out of nineteen, in four incidences of conflict cattle were injured and on fifteen incidence cattle were killed and eaten by large carnivores. The incident rate was not related to proximity of village with protected area. The livestock number was the factor for higher number of conflicts. The maximum six incidences of conflict were reported from Jolly Village. 79% conflicts were recorded during dry season, September-February, when agricultural lands are occupied by crops. The most villagers (75%) agreed on the presence of tigers in the periphery of PTR during that period.

Key Words: Tiger-cattle Conflict, Season of Conflicts, Pakke Tiger Reserve, Conservation.

INTRODUCTION

The establishment of protected areas is very important for conservation of natural resources including wildlife, its proper management then becomes very crucial. The indigenous peoples in developing countries including India inhabit inside the protected area (MacKinnon et al. 1986, Ali and Pai 2001, Rao et al., 2002, Musavi et al. 2006). The livelihood option for the forest dwellers and conservation of wildlife are the major challenges for the management (Kothari et al. 1989, Sarabhai et al. 1991).The protected areas in India provide livelihood support to the local people, directly and indirectly (Berkmuller et al.1986, Ali and Pai 2001, Musavi et al. 2006). But the disproportionate biotic pressure on the protected areas has adverse impact on them in terms of habitat quality and the wildlife therein.

Livestock grazing inside the protected area has been a husbandry practice in different parts of India (Berkmuller et al. 1986, Kothari et al. 1989, Mishra and Rawat 1998, Ali and Pai 2001, Sinha et al. 2004, Musavi et al. 2006), 73% wildlife sanctuaries and 39% National Parks affected by livestock grazing and their density that may goes up to 1500 heads/ km^2 in some of the National Park (Kothari et al. 1989). The close interspersion of local people and their livestock in the protected areas often results in conflicts between man and wildlife (Rodgers 1989). Human–carnivores conflict has also been reported at the fringes of the protected areas during livestock depredation by carnivores (Saberwal et al. 1994, Mishra 1997, Rao et al. 2002, Karanth 2003, Treves and Karanth 2003, Musavi et al. 2006).

The conflicts become more sensitive when the species involved is critically imperiled while its presence in an area poses a significant threat to the life and

property of man. Tiger is globally threatened, and an endangered species as per the Schedule I of Indian Wildlife (Protection) Act, 1972. Most of the studies of carnivores-livestock conflict covered the species variation in tiger-livestock conflict, the degree of conflict, availability of cattle versus degree of conflict, and site specific problems. There is another socio-economic dimension like agriculture crops, cropping pattern, and the livestock grazing in and around the protected area. that we observed during our study; also leads to conflicts with the carnivores. Therefore, this study is aimed to correlate the frequency of attack by carnivore on cattle with special reference to availability of agricultural crops and grazing areas near the villages around the Pakke Tiger Reserve. The suggestions for reducing the incidence and conservation of tiger are also recommended based this study.

Study Area

Pakke Tiger Reserve (PTR) is geographically located between longitude 92º 35' - 93º 09' E and latitude 26º 55' - 27º 15' N and covers 861.95 km^2 in East Kameng district of Arunachal Pradesh (Figure 1). This protected area was declared as Pakhui Wildlife Sanctuary in 1977 and due to rich tiger population; it was declared as Tiger Reserve and renamed as "Pakke Tiger Reserve" on April 2002. PTR is boarded by perennial rivers namely Kameng River in north and west, the Pakke River in the east and Nameri National Park/Nameri Tiger Reserve of Assam in the south. The topography of the reserve is undulating and hilly. The altitudinal variation ranges from 200m. to 2040m.

Climate and Soil

The PTR has a tropical and subtropical climate, cold weather extends form November to February. It receives rainfall from the south-west monsoon (May-September) and the northeast monsoon (December-April). October to March is a relatively dry period. May and June are the hottest months. An average annual rainfall 2599 mm. it is an average of three years (2001-2003). The annual mean maximum temperature was recorded 31± 1.1 ^{0}C and the mean minimum temperature was 18± 1.2 ^{0}C (Kumar 2006). The soil is loamy on the hills; moderately deep, moist and fertile, upper layer is stained with humus. The sub-soil in the foothills consists of mostly boulder and gravel superimposed by a layer of sandy loam of varying depth.

Vegetation

The general vegetation type of PTR is classified as Assam Valley tropical semi-evergreen 2B/C1 (Champion and Seth 1968). The forests are multi-storied and rich in epiphytic flora and woody lianas. The vegetation is dense with a high diversity of trees, woody lianas and climbers. A total of 234 plant species (angiosperms) have been recorded with a high representation of species from family Euphorbiaceae and Lauraceae in low lying areas (Datta and Goyal 1997). The forest has a typical layered structure and the major emergent species are *Tetrameles nudiflora* and *Altingia excelsa* (Singh 1991).

Animals

The Pakke TR has a great diversity of mammalian fauna. The ungulates occurs in PTR are *Bos frontalis,*, Muntiacus muntjak, *Cervus unicolor*, *Naemorhedus goral*, *Capricornus sumatraensis* that constitute natural food of carnivores. In addition, the reserve has four species of primates (*Macaca mulatta, M. assamensis, Trachypithecus pileatus* and *Nycticebus bengalensis*) and *Sus scrofa*. Datta (1999, 2000) has reported seven species of small carnivores, three species of pheasant and four species of squirrels from the study area. The reserve is rich in avifauna with more 257 bird species including four species of hornbills (Singh 1991, 1994, Datta et al. 1998). Tiger and Common leopard are main carnivores that have been reported in conflicts. However, Clouded leopard and various lesser cats also occurs there but never been reported in conflicts.

Settlements around the PTR

Seven villages (rural and semi-urban nature) within the range of 10-12 km from the boundary of tiger reserve constitute ethnic population (Figure 1). Total population (4,787 individuals) of the villages comes from 815 houses. The Nyishi tribe (earlier known as Dafla) is Anglo-Mongoloid origin, dominates the population. Among other groups, the Nepalies, Kulibengali and Bodo tribes are the major ones. The villages on eastern boundary of the PTR are in close proximity and involve in agriculture and husbandry activities. The major part of agricultural land (70%) is on the eastern periphery. Fourteen villages constitute the population in that area.

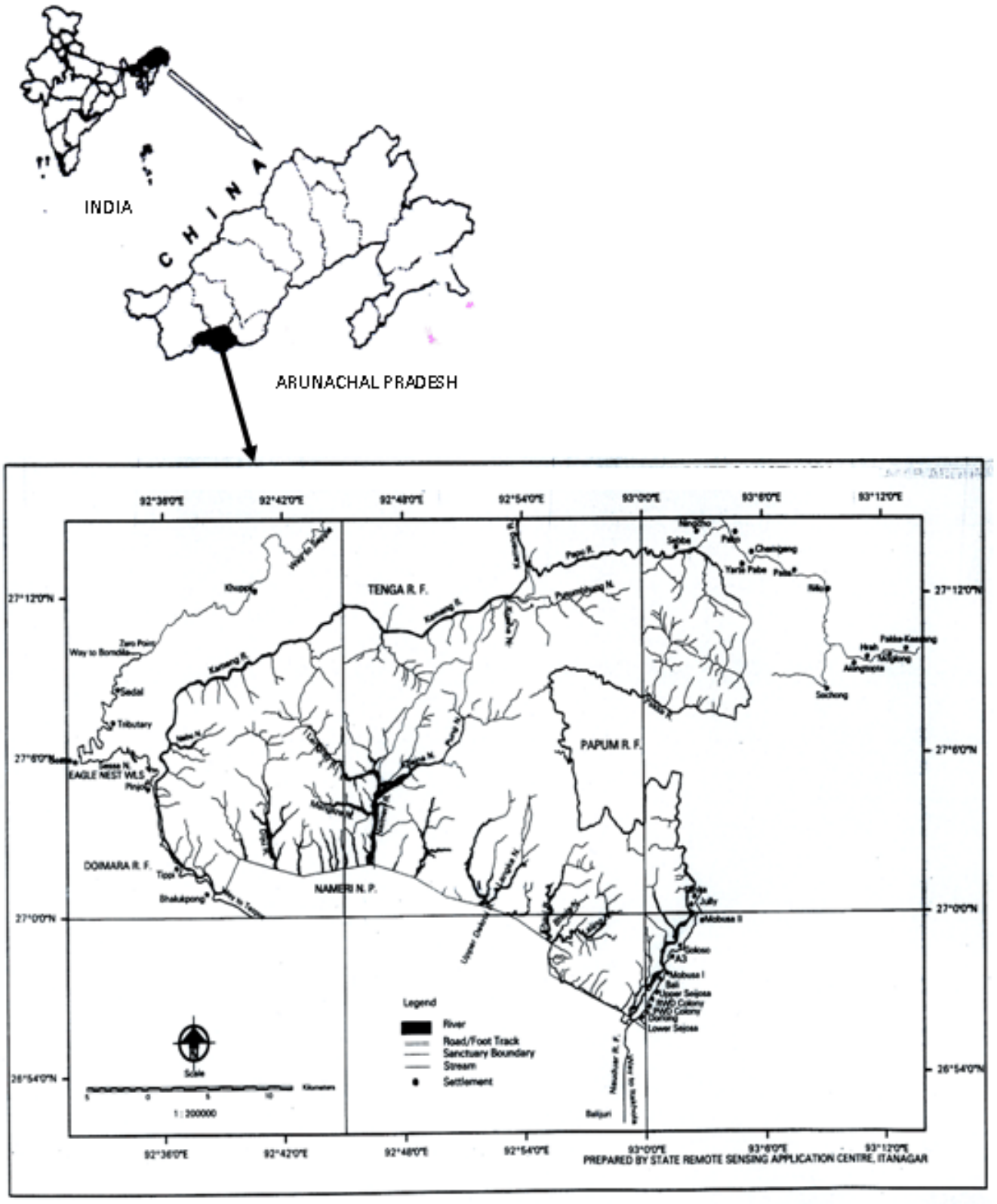

Figure 1. Location of villages around the Pakke Tiger Reserve, Arunachal Pradesh

Table 1. Demography of human and cattle population in the villages located in the Eastern flank of PTR

Village	No. of Household	Human Population	Cattle Population	Number of cattle per household	Distance (km)
Murgaso	8	44	43	5.38	7.0
Mabusa II	9	44	71	7.89	3.0
Lanka	10	55	18	1.80	1.5
Jolly	18	122	156	8.67	1.0
Goloso	22	116	225	10.23	0.5
A3	5	44	79	15.80	0.4
Mabusa I /A2	29	148	174	6.00	0.4
Upper Bali	18	87	74	4.11	0.3
Lower Bali	13	88	94	7.33	0.3
Upper Seijosa	120	800	133	1.11	0.4
RWD Colony	15	45	25	1.67	0.3
Dorlong	53	323	178	3.36	0.3
Lower Seijosa	55	350	90	1.64	0.4
West Dekorai	20	56	32	1.64	0.2
Total	395	2322	1392	76.63	
Average	28.2	165.9	99.4	5.47	

Total number of houses is 395, with 2322 human and 1392 cattle population. Average number of cattle /household was 5.47. Details about the total number of houses and the human population, cattle population and number of cattle per household, and distance of the villages from the boundary of the PTR is given in Table 1.The available agricultural land in these villages is very meager; the average holding of agricultural land is 1.22 ha per family. The major crops cultivated in the area are paddy, millet and vegetables; single crop is grown in a year. The People practices permanent as well as slash and burn system of agricultural. Agriculture and livestock produce are major source of income of the people. Cattle from these villages enter in to the tiger reserve area for grazing.

METHODS

In the period of three years (2001-2003) all the villages around the tiger reserve were surveyed and 300 villagers were interviewed to address the following about tiger-cattle conflict around PTR: (1) number of cattle per household, (2) whether they lost any cattle earlier (3) cattle killed or lifted by carnivores, (4) did they apply for and received any compensation from the office of Forest Department for loss of cattles, (5) major crops and cropping pattern in the village (6) the frequency of tiger or leopards sightings in the periphery of PTR, (7) measures taken for prevention of livestock killing/lifting, (8) attitude of local people for conservation of tiger. The data on the incidence of cattle-carnivore conflicts that took place during 1997-2000, was obtained from official record of PTR. All villagers interviewed were male, village headmen (*Goanburha*), and owners of cattle who lost their animals.

RESULTS

Total Number and Month-wise Conflicts

Total 19 conflicts occurred during 1997-2003; on four events cattle were only injured and on fifteen events cattle were killed. The maximum of six events of conflicts were reported from Jolly Village followed by four events in Mebuso-II, three events in Darlong and two events in both Goloso and upper Seijosa and one event in Mebuso-I/ A-2 and RWD Colony. The number of incidence of killing is directly proportional to number of cattle. Distance of the village from the tiger reserve did not affect the number of incidents. Greater

conflict had been recorded from the villages which had larger number of cattles (Figure 2). The incidences of conflicts were reported only in certain months in the year. Majority of conflicts (63% of the total) were recorded during September to November and remaining were random in different months between December and August (Figure 3). Maximum conflicts took place during dry season (September-February), 79% of the total conflicts were recorded during this period and 80% of the dry season incidences were took place in three months only, September, October and November.

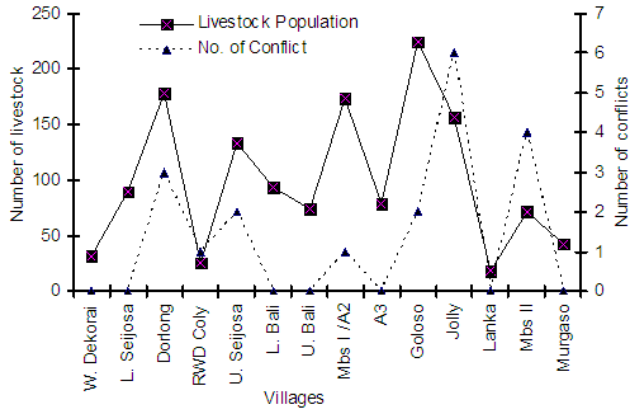

Figure 2. Relationship between conflicts and cattle numbers at PTR.

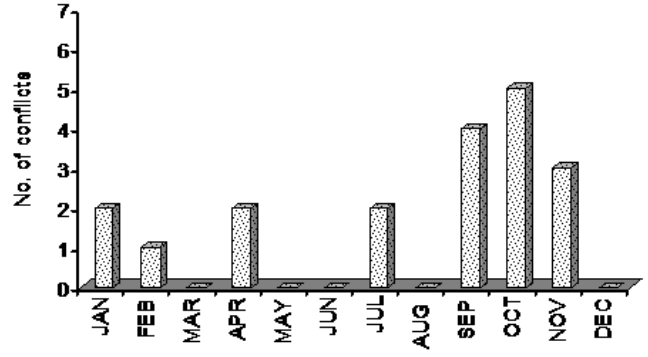

Figure 3. Cattle-carnivore conflicts in different months

Attitudes of the Local People Towards Large Carnivores

We tried to understand the perception of the villagers, 300 individuals who were interviewed, about the tigers and leopards in their surroundings. 65 % expressed aggression on their presence near the villages owning to the threat of injury and killing of cattle which leads to economic loss. The most villagers (75%) agreed on the panic environment due to them and sense of threat among the grazers. On the matter of compensation they expressed their disappointment on the lukewarm attitude of Department of Forest, a nodal department for the purpose; compensation is not given for loss of cattle. The grazers also did not agree not to release the livestock in tiger reserve area.

DISCUSSION

The conflicts between humans and wildlife in India are escalating due to increasing human populations, loss of natural habitats, and in some regions, increasing populations as result of successful tiger conservation programmes (Rodgers 1989, Saberwal et al. 1994, Wang and MacDonald, 2006). Mishra (1997) reported that the cattle killing by large carnivore has been escalated due to increase livestock population in Trans-Himalaya the region in India. Similarly, the killing of cattle by large carnivores in PTR is not a recent phenomenon; the number of kills has increased in the last five years (personal communication with local residents). Human population in the villages under study has slightly increased during the last one decade. But the rapid increase in cattle population during the last five years because they meet the requirement of milk and meat, has led to the conflict with tigers. This reflects the change in livelihood pattern, subsistence to commercial agriculture and animal husbandry. Tigers and leopards are the most common predator in PTR. Cow, Mithun and Ox suffered the highest level of predation. Our participatory discussion with local people revealed that most killing occurred when cattles are left for grazing inside the buffer zone of PTR particularly during the cultivation of crops.

Increasing incidence of conflicts could be related to number of cattle in the area, agriculture pattern, and crop & cropping seasons. When the crop is sown in agriculture land, and non-crop area left without food in dry seasons the cattle left with no place to graze. Consequently, cattle's have to go inside the buffer zone in search of food there they become victim of the tiger or leopard. Secondly, the tall grasses in the basin of Pakke River, which is part of PTR, become a common place to be visited by cattles and tiger, the maximum case of cattle-carnivore conflicts were recorded there

(Figure 2). The local people living in proximity to PTR have been using diverse natural resources such bamboo and cane, medicinal plants, wild vegetables, etc. other than wildlife meat from the reserve area. These local people claim that they have the right to utilize natural resources in their localities as long as they are pastoralists. So the release of cattle in the tiger reserve area becomes a right of local peoples. During the interview, they reported that the management plan of PTR has provision to provide financial compensation for damage of houses, agricultural crops, horticultural produce and human death but not for killing the cattles. The yield of agricultural products is not sufficient to meet the requirement of the local people, therefore they depends on domestic cattles for milk and meat production to get some cash income. In this way, the large carnivore-cattle conflicts severely affect the socio-economy of the local peoples that could directly influence people participation in tiger conservation programme.

Impact on Tiger Conservation Programme

Cattle-carnivores conflict may have far reaching adverse impact on tiger conservation program. Major are visualizes as follows:

1) Often domestic animals act as carriers of certain diseases like rabies, anthrax, foot and mouth disease which get transmitted to the wild animals; it may be vice-versa too.

2) Practices of releasing cattles for grazing in the PTR area and preying upon them may lead to change in habit of tiger or leopard. In absence of natural pray in the buffer zone these carnivores may come out from its natural habitat and enter to residential area in search of easy prey, the cattle. It may become very dangerous for the tiger from its conservation point of view.

3) Increasing frequency of preying upon domestic cattle will lead the tiger to stay outside the natural habitat, in a particular area where poacher may take the advantage of the situation and killing of the tiger may be intensified.

4) Cattle grazing in buffer zone put excessive pressure over the area as the same is shared by wild ungulates. This may be lead to change the quality and quantity of the habitat by changing types of food resource, resources composition, and make the soil more compact thus regeneration of the vegetation will also be affected.

Recommendations

The following management and conservation actions are recommended to reduce the predation of livestock in the region on the long-term basis.

1. Peripheral forests or corridors ease the pressure from grazing, NTFPs and fuelwood collection on the tiger reserve area. These peripheral forests need to be restored for the benefits of local people and their cattles, ultimately to the tigers and other carnivores.
2. The patchy peripheral forest areas can be developed as nurseries for fruit plants and other fast growing multi purposes trees to meet the people's fuelwood demands.
3. Agroforestry system, involving some local fruit and fodder species could be encouraged around the PTR. This would boost the local economy and also help to maintain the soil moisture regime in the area. The plantation could link the corridors and forested landscape between different peripheral forests around PTR.
4. The corridor forest between PTR and Papum Reserve forest will provide animal specially tigers and elephants a free movement/migration.
5. Peoples around the tiger reserve should be made aware about the cattle insurance policy and be encouraged to go for that.
6. A proper grazing land should be developed nearby the villages to reduce the conflicts with carnivores particularly during the cropping season.
7. Local peoples should be encouraged and aware to adopt multiple crops including fodder crops so that fodder can be available to the cattle for stall feeding. The stall feeding could be an alternative for free grazing. Concept of fodder bank could be introduced in the area; the fodder could be available through the banks during lean period.

Volunteer form the every villages should keep track of the movement of large cornivores in their areas and inform the authority of PTR on time so that appropriate measures can be taken to prevent livestock predation, poaching of tiger , and loss to the local people.

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