ISSN 0970-9274 ONLINE: ISSN 2456-6608
J Hum Ecol, 55(1,2): 104-110 (2016)
DOI: 10.31901/24566608.2016/55.1-2.12

Human-wildlife Conflict in the Forest Fringe Villages of Barak Valley, Assam, India

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KEYWORDS Economic loss. Reserve Forest. Wild Animal. Depredation. South Assam. Wildlife Sanctuary

ABSTRACT Human-wildlife conflict is a challenge to both mankind and wildlife and is a severe conservation issue. Villages located adjacent to protected forests are the most vulnerable sites as human and wildlife needs intersect each other in these areas. There are 12 reserve forests and one wildlife sanctuary in Barak Valley, South Assam, but no proper study has been undertaken on this aspect in their fringes. In view of this, a close-ended questionnaire survey was conducted to study the problem in such areas of the region. Four main conflict animals, viz., jackal, civet, wild boar and monkey were documented. Some other mammals, including a few endangered species were also found to cause depredation. The outcome is expected to aid conservationists for further study of the problem as well as for the management of wildlife.

INTRODUCTION

Human-wildlife conflict is a negative interaction between humans and wildlife that includes situations in which either any one of the two or both are harmed. According to Knight (2000), conflicting circumstances occur when wild animals attack people and livestock, raid crops, damage forest resources, compete for wild forage with humans, livestock or with game animals, compete for prey with hunters, damage infrastructure and become threats to other natural species and to biodiversity. Consequently, significant losses are incurred to the lives and livelihoods which results in a negative attitude towards wildlife (Thirgood et al. 2005). Vice-versa the impact of such conflicts not only affect wild populations but also the entire ecosystem (Woodroffe et al. 2005).

Many species have been increasingly competing with people for space and resources (Pimm et al. 1995; Balmford et al. 2001) and therefore this has emerged as an important issue in the present times. Particularly, large mammals have been increasingly involved in conflicts with human beings in the present times (Sitati et al. 2003). However, small mammals are also detrimental to human livestock and crops and thus come into conflict with man (Dutta et al. 2015). Such problems are more frequent in human settlements in forest-edge regions (Knight 2000), a fact which makes people residing near forests as well as in forest fragments more prone to its impacts (Sukumar 1990). In other words, villages adjacent to the protected areas are the most vulnerable to man-animal conflict. Mitigation of man-animal conflict at the boundaries of forest areas have been identified as the primary requisite of conservation efforts (Blackburn et al. 2016). Therefore, there is a need to study the issue in such areas and devise appropriate control measure.

Barak Valley, located in the southern part of Assam, India, has several protected forests, and people residing in their fringe areas are continuously exposed to conflicts with wildlife. Dutta et al. (2015) documented human-wildlife conflicts in the forest villages of Barak Valley; however,

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no study has yet been done in the fringes of the protected areas. This makes forest fringe villages of the Valley potential sites for research on the problem so that an overall picture of the issue can be depicted.

Objectives

The research work aims to study man-wildlife conflicts prevalent in the fringes of the protected areas of Barak Valley. The objectives are to document the various wild animal species which are involved in negative interactions with humans in these areas and how they exert their depredations.

METHODOLOGY

Study Area

Cachar, Hailakandi and Karimganj districts collectively form the Barak Valley (24^0802 N and 25^0802 N latitudes and 92^0152 E and 93^0152 E longitudes) and cover an area of 6962 km^2. The valley is situated in southern Assam and represents nine percent of the geographical area of the state. The main river of the region is Barak, with its tributaries and distributaries (hence the region is referred to as Barak Valley). The region includes the Barak plains, tropical evergreen and semi-evergreen forests, tropical deciduous forests, tea planted areas, secondary forests, wetlands, monoculture orchards, and crop fields (Choudhury 2013). The fauna of Barak Valley includes the Indian elephant, porcupine, leopard, slow loris, macaques, squirrels, hollock gibbon, sloth bear, Asiatic black bear, civets, Indian grey mongoose, wild boar, and goral (Choudhury 1997, 2013).

There are three forest divisions namely; Cachar, Hailakandi and Karimganj in this Valley. The Valley has one wildlife sanctuary; namely: Barail Wildlife Sanctuary and 12 reserve forests; namely: Innerline, Katakhal, Sonai, Barak, Upper Jiri, Lower Jiri, Longai, Tilbhoom, Patheria Hills, Singla, Duhalia and Badshahtilla (Source: Forest Division, Cachar, Hailakandi and Karimganj 2013). The distribution of the protected areas among the ranges of the three divisions is depicted in Table 1.

Table 1: Distribution of protected areas among the various ranges of the three divisions of Barak Valley

Division	*Ranges*	*Name of protected area*
Cachar	Jirighat	Upper Jiri, Lower Jiri, Barak, Innerline
	Monierkhal	Sonai, Innerline, Barak
	Hawaithang	Innerline, Sonai
	Sadar	Katakhal, Innerline
	Udharbond	Borail
Hailakandi	Gharmurah	Innerline
	Kukicherra	Innerline
	Matijuri	Innerline, Katakhal
Karimganj	Kalain	Borail
	Patharkandi	Patheria Hills, Tilbhoom
	Duhalia	Duhalia, Badshahtilla
	Lowairpoa	Longai, Badshahtilla
	Cheragi	Singla, Badshahtilla

Source: Forest Division, Cachar, Hailakandi and Karimganj, 2013

METHODOLOGY

The study was conducted during the year 2014. Two fringe villages located adjacent to each of the protected areas of Barak Valley (12 Reserve Forests and one Wildlife Sanctuary) were surveyed (Fig. 1 and Table 2). The surveyed villages were located in the fringes of Innerline, Sonai, Upper Jiri and Lower Jiri reserve forests and Barail Wildlife sanctuary under Cachar Division; Patheria Hills, Tilbhoom, Longai, Duhalia, Singla and Badshahtilla reserve forests under Karimganj Division as well as Katakhal reserve forest under Hailakandi Division. However, among the reserve forests, the Barak Reserve Forest does not have any immediate fringe village as it is surrounded by the river Barak and its tributaries. Hence, a total of 24 fringe villages located in the fringes of 11 reserve forests and the wildlife sanctuary were surveyed. Ten surveyed villages were located in the fringes of the protected forests of Cachar Division; two surveyed villages were located in the fringe areas of the protected forests of Hailakandi Divisionand the highest number of surveyed fringe villages (12) was located in the vicinity of the protected forests under Karimganj Division.

A closed-ended questionnaire (Fanning 2005; Anonymous 2012) was used to survey randomly selected 10 houses from every village. The data from every village was later combined to yield the data of 240 households representing the fringe villages of the region. The sampling unit was every household and therefore the sample size was 240. However, regarding the wild animal species, the questions were open-ended. The occurrence of conflict animal spe-

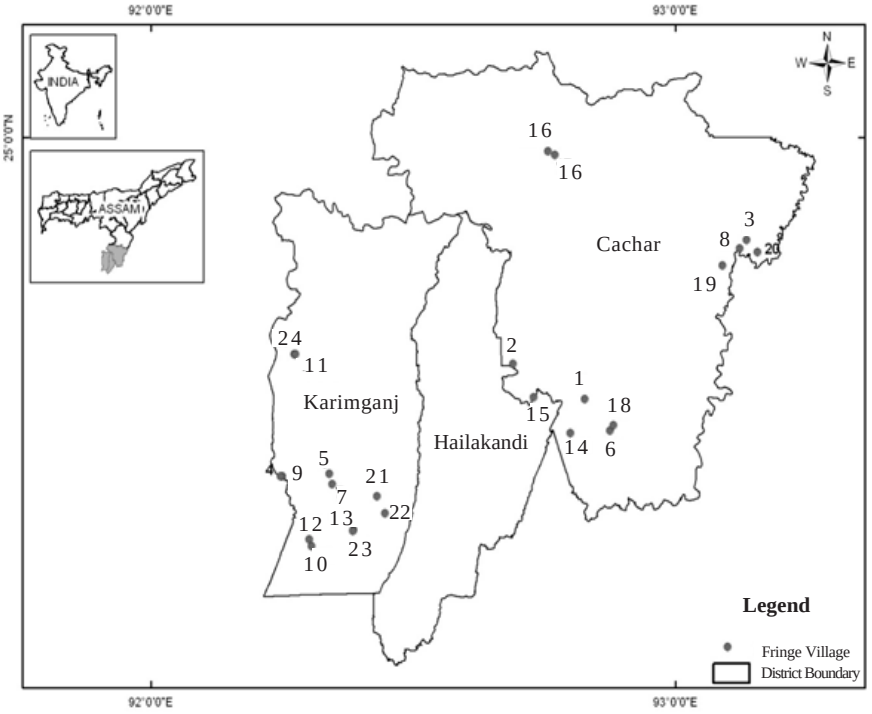

Fig. 1. Forest-fringe villages (in black dots) surveyed in Barak Valley. Numbers in the map correspond to the names of the villages listed in Table 2

cies was listed separately and in different combinations (see Tables 2 and 4) (Dutta et al. 2015). Only the prominent species, which could be identified by a villager were listed up to species level. For instance, as four civet species have been recorded from this Valley (Choudhury 1997), there was problem to identify each of them; in this case, the researchers referred to the conflict animal as 'civet'.

RESULTS

The forest fringe village dwellers mainly suffered from conflicts with Golden Jackal (*Canis aureus*), Civets (*Viverricula indica, Paradoxus hamiltonis, Paguma larvata, Viverra zibetha)*, Rhesus monkey (*Macacamulata*) and Wild Boar (*Sus scrofa*) (Table 2). The former two caused livestock depredation whereas the latter two raided agricultural fields, resulting in economic losses. However, human death and injury due to wild boar attack in 2009 was documented from Hatirgool which is located in the fringe of the Patheria Hills Reserve Forest of Karimganj Division (Karimganj Forest Division 2013).

Apart from these four common mammals, the researcher also recorded such as porcupine (damaged agricultural fields and betel-leaf gardens by burrowing activities), serow (fed upon betel leaf plantations of pan jhum fields in the fringes of Barail Wildlife Sanctuary), otter (caused economic losses to fisheries by hunting fish), squirrel (damaged home garden plants and fruits; especially betel-nut and coconut), Phayre's Leaf Monkey (damaged home garden plants and fruits) and mongoose (caused livestock depredation). In addition, there was historical record of elephant depredation in West Lakhipur (located in the fringes of Patheria Hills Reserve Forest), which was traced through records of the Forest department as well as interviews with local people. These animals had destroyed property in the village in 2010. This is, however, not a regular problem, although elephants cause severe depredation in and around some tea estates and human settlements near Patheria Hills Reserve Forest.

Predators (jackals and civets) were found to be involved in conflicts in all the fringe villages except Digli (Upper Jiri Reserve Forest) and

Marwacherra I (Borail Wildlife Sanctuary) of Cachar Forest Divsion. Rhesus macaques caused depredation in Mirpur (Lower Jiri Reserve Forest) and Digli (Upper Jiri Reserve Forest). On the other hand, human-wild boar conflict was documented from Marwacherra I and III (Borail Wildlife Sanctuary) as well as Arjanpur and Lailapur (Innerline reserve forest) (Table 2).

Human-monkey conflict was prevalent in both the villages of Hailakandi Division (Baghbahar and Loharbond), whereas jackals and civets caused depredation only in Baghbahar near Katakhal reserve forest. Human conflict with wild boars was not documented from either of the villages (Table 2).

Jackals and civets caused depredation in all the 12 villages of Karimganj Division. Human-monkey conflict was prevalent also prevalent in all the surveyed villages except Jerjeri located in the fringes of Longai Reserve Rorest. On the other hand, wild boar depredation was absent only from two villages; namely: Dubagbasti (Tilbhoom Reserve Forest) and Chandrapur (Duhalia Reserve forest).

All the conflict animals were present in all the three Forest Divisions (Table 3). Jackal and civet depredation dominated in Cachar (eight villages each) as well as Karimganj (12 villages each), whereas monkey depredation dominated in the two villages of Hailakandi Division. Jackals and civets have been found to be the most

Table 3: Occurrence of four conflict animals in 24 fringe villages under three forest divisions in Barak Valley, Assam

	Cachar (10)	*Haila-kandi (2)*	*Karim-ganj (12)*	*Total (24)*
Jackal depredation	8	1	12	21
Civet depredation	8	1	12	21
Monkey depredation	2	2	11	15
Wild boar depredation	4	0	9	13

*Numbers in parentheses indicate the number of fringe villages surveyed

Table 2: Presence of conflict animals in the fringe villages surveyed in Barak Valley (a total of 24 forest villages surveyed)

Sl. No.	*Village Name*	*Protected area*	*Division*	*Name of conflict animal*			
				Golden Jackal	*Civets*	*Rhesus Monkey*	*Wild boar*
1.	Arjanpur	Innerline	Cachar	+	+	-	+
2.	Baghbahar (KhasiaPunji)	Katakhal	Hailakandi	+	+	+	-
3.	Bahadurpur	Upper Jiri	Cachar	+	+	-	-
4.	Banglatal	Tilbhoom	Karimganj	+	+	+	-
5.	Bhadragool	Duhalia	Karimganj	+	+	+	+
6.	Bidyaratanpur	Sonai	Cachar	+	+	-	-
7.	Chandrapur	Duhalia	Karimganj	+	+	+	-
8.	Digli	Upper Jiri	Cachar	-	-	+	-
9.	DubagBasti	Tilbhoom	Karimganj	+	+	+	-
10.	Hatairbond	Longai	Karimganj	+	+	+	+
11.	Hatirgool	Patheria Hills	Karimganj	+	+	+	+
12.	Jerjeri	Longai	Karimganj	+	+	-	+
13.	Kashinathpur	Badshahtilla	Karimganj	+	+	+	+
14.	Lailapur	Innerline	Cachar	+	+	-	+
15.	Loharbond	Katakhal	Hailakandi	-	-	+	-
16.	Marwacherra I	Barail	Cachar	-	-	-	+
17.	Marwacherra III	Barail	Cachar	+	+	-	+
18.	Mathurapur	Sonai	Cachar	+	+	-	-
19.	Mirpur	Lower Jiri	Cachar	+	+	+	-
20.	North Lalpani	Lower Jiri	Cachar	+	+	-	-
21.	North Raipur	Singla	Karimganj	+	+	+	+
22.	South Raipur	Singla	Karimganj	+	+	+	+
23.	West Cheragi	Badshahtilla	Karimganj	+	+	+	+
24.	West Lakhipur	Patheria Hills	Karimganj	+	+	+	+

Golden jackal (*Canis aureus*), Civets (*Viverricula indica, Paradoxus hamiltonis, Paguma larvata, Viverra zibetha)*, Rhesus Monkey (*Macacamulata*) and Wild Boar (*Sus scorfa*)
'+' indicates the presence of conflict with a particular animal in a particular village.
'-' indicates the absence of conflict with a particular animal in a particular village

common conflict animals in 21 villages. The residents of all the villages (except Digli and Loharbond) faced depredation by more than one conflict animal (Table 4). However, the villages where composite depredation of all the four conflict animals at a time was prevalent were located only in the fringes of reserve forests under the Karimganj Division. Combined depredation by jackals, civets, monkeys and wild boars was prevalent in the highest number of villages (eight villages) (Table 3). All of these eight villages were located in the fringes of the reserve forests under Karimganj Division namely, West Lakhipur, Hatirgool, Bhadragool, South Hatairbond, West Cheragi, Kashinathpur, North Raipur and South Raipur.

In addition to the main conflict animals, a few other conflict animals were also documented (as mentioned earlier); namely, otters from Baghbahar, West lakhipur and Hatirgool villages; serowsfrom Marwacherra I and Marwacherra III; porcupines from West Lakhipur, Marwacherra I and Marwacherra III; Phayre's leaf mokey from West Lakhipur and Hatirgooland squirrels from Hatirgool and West Lakhipur.

DISCUSSION

Human conflicts with wild life arise from territorial proximity, reliance on the same resources or threat to human livelihoods and safety (Knight 2000), and all these factors were found to prevail in the fringe areas of protected forests. This is the reason why villagers residing in such areas of the Barak Valley suffered from immense economic losses, mainly due to the livestock depredation and the crop raid by wild animals. It is a serious issue, which, along with this region, affects many parts of the world and instigates negative human attitudes towards wildlife (Kellert 1996; Nyhus et al. 2000), and can hamper conservation programmes by affecting the support of local communities (Williams et al. 2001).

Conflicts with humans are an important factor that challenges the existence of carnivores. Golden jackals (*Canis aureus*), which are regarded as pests in Southeast Asia (Jenks et al. 2015) as well as civets were the most common carnivores involved in livestock depredation. However, in most of the cases, combined depredation by these carnivores was prevalent. The presence of a large population of livestock in fringe villages, provides ample scope for predation and arising consequences which result in severe economic losses. Similar cases of livestock depredation have been also reported from the vicinities of Gir National Park (Asian lion and leopard hunt buffalo, cattle, pigs and dogs) (Vijayan and Pati 2002) and Bhadra Tiger Reserve (overall annual damages caused by large tigers and leopards are reported to be approximately 12 percent of total family livestock holdings) (Madhusudan 2003).

Crop raid by different wild animals and in particular mammals have been reported from different parts of India (Chhangani and Mohnot 2004). Crop raiding is also a big issue in fringe villages in the present study. Rhesus macaques raid paddy fields and home gardens and are also involved in creating menace inside households. They not only result in economic losses but also lead to several inconveniences. The impact of conflicts with such primates has also been highlighted by Dutta (2012). On the other hand, wild boars raid paddy fields in winters although in some cases they were involved in damaging home-gardens as well as betel-nut and betel-leaf plantations by digging. Thus, crop raiding by wild boar is a serious problem in the forest-fringe villages of the Barak valley. Similar cases have been reported from the state of Kerala in

Table 4: Occurrence of four conflict animals in 24 fringe villages under three forest divisions in Barak Valley, Assam

Division	*Monkey*	*Wild boar*	*Jackal and civet*	*Jackal, civet and monkey*	*Jackal, civet and wild boar*	*Jackal, civet, monkey and wild boar*
Cachar	1	1	4	1	3	0
Hailakndi	1	0	0	1	0	0
Karimganj	0	0	0	3	1	8
Total	2	1	4	5	4	8

South India (Gopakumar et al. 2012) as well as Youyang County, China (Hua et al. 2016).

Depredation by multiple conflict animals was prevalent in most of the fringe villages. However, eight villages from Karimganj Division suffered from conflicts, resulting due to all the four commonly occurring conflict animals. There was infact no village where this problem was absent and this very well indicates intersection of human and animal requirements in the forest fringe areas. In addition, there has also been an increase of human population in the villages that has resulted in the expansion of such villages into protected forests and greater pressure in forest resources and wild habitats. Certain wildlife adapt themselves in modified landscapes whereas others suffer lethal consequences due to negative interactions with humans (Bateman and Fleming 2012; Northrup et al. 2012).

Thus, the conflict animals exert their consequences on the forest-fringe villages of Barak Valley mainly through livestock depredation and crop-raid. The residents of the forest villages of the Valley also face similar problems (Dutta et al. 2015). The situation in this case can be compared to Thailand, where there has been a surge in human-wildlife conflicts due to extension of agriculture, and livestock management (Bateman and Fleming 2012). In many cases, the intensity of wildlife depredations in the Valley surpasses the economic threshold of the victims, leading to numerous socio-economic impacts, even though the conflict animals are not endangered. In addition, a few endangered species have also been found to cause economic losses and inconveniences. In response, affected villagers apply a number of control measures to prevent wild animal depredation; however, in most of the cases these are either ineffective or inappropriate. Therefore the victims continue to suffer from the problem resulting in a severe conservation issue in the region which needs to be studied so that proper control measures can be devised. In this context, the National Wildlife Research Center (NWRC) of the United States Department of Agriculture Wildlife Services (USDA-WS) and Animal and Plant Health Inspection Service (APHIS) have done a remarkable work in devising biologically sound, feasible and efficient solutions to mitigate human-wildlife conflicts (USDA 2016). The initiatives taken by this Centre could be studied and appropriately modified to device proper mitigation measures for the Barak Valley as well as in order to undertake future research.

CONCLUSION

Man-wildlife conflict is a serious problem in the forest fringe villages of Barak Valley. This issue that has remained undressed in the fringe areas of Barak Valley is likely to disrupt the coexistence of humans and wild life in these areas. Therefore there is an urgent need to study the human wildlife interactions in these areas so that appropriate mitigation measures can be devised. In this regard, it must be mentioned that very little is known about the habitat use and movements of jackals, which are a major conflict animals in the Valley. Studies in this direction can be helpful in devising mitigation measures. During the study, it was also found that jackals, civets and monkeys are also involved in conflicts in urban areas. Research in this context could aid in developing control measures through comparison. With regards to wild boars, diversory feeding by plantation of plants that could divert boars from agricultural fields is suggested. In addition, initiatives to create awareness among public and elevating public perceptions towards wildlife should be undertaken.

ACKNOWLEDGEMENT

We are greatly thankful to the Forest Departments of the three Divisions of Barak Valley for providing necessary permission for research as well as for providing necessary assistance during fieldwork. The co-operation received from the local residents of the surveyed forest villages is also highly acknowledged.

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Paper received for publication on July 2015
Paper accepted for publication on July 2016