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DIMENSIONS OF HUMAN WILDLIFE CONFLICT IN TAMIL NADU

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ABSTRACT

Human Wildlife Conflict is emerging as a significant wildlife management issue in Tamil Nadu in the last decade. The conflict results in severe impacts on communities in the form of crop depredation, property damage, loss of livestock, human injury and human killing. On the part of wild animals, the sufferance finds expression through retaliatory response from the affected people or the accidents leading to injury or death of the animals. There are many dimensions to the whole issue of Human Wildlife Conflict, which can chiefly be understood in two broad categories viz., wildlife and habitat dimensions and human dimensions. The wildlife and habitat dimensions are natural geographical features of animal habitat, increase in wildlife number, migratory pattern of animals, occurrence of stray/isolated animal population, shrinkage/degradation of habitat and corridors, diminution of habitat quality. Human dimensions include cultivation up to boundary of forests, cropping pattern and intensity, higher road density, railway lines and canals in wildlife habitats, development of human habitat space and urban infrastructure, large human presence in animal-dominated landscapes, life style pattern, retaliatory response from people, unscientific restraint measures, lack of awareness and inadequacy of frontline staff. Various management responses from the Forest Department, which include prevention and mitigation measures have been described.

Key words : Human wildlife conflict, Wildlife habitat dimensions, Human dimensions

Introduction

With a geographical spread of 1.30 lakh km^2, constituting 4% of the country's total land area, Tamil Nadu has to support 7.20 crore people, living in its 16,564 villages accounting for 6% of the country's population. The state has 22,877 km^2 of recorded forests, which is 17.6% of its total land mass. It has a livestock population of 314 lakh including 111.0 lakh cattle, 20.1 lakh buffaloes, 79.9 lakh sheep and 92.7 lakh goat.

The escalating demand for land in the neighbourhood of forested landscapes due to overall growth of humanity and its development requirements have caused immense threat to the integrity of wildlife habitats. The increasing geographical spread of human habitations and establishments have inevitably led to a growing number of confrontations between human and wild animal in many parts of the globe – a phenomenon termed as 'Human Wildlife Conflict' (HWC). Though HWC existed since pre-historic times, its extent and severity has increased tremendously in the recent past. In recent times, wildlife populations have not only been left with less habitat to meet their nutritional, behavioural and ecological requirements, but the remaining habitat is also increasingly fragmented, leaving wildlife populations trapped in small insular refugees. Of late, HWC issues across the country have assumed serious proportion that is drawing huge public attention, as seen from frequency of reporting on such issues in both print and electronic media.

It is important to recognize that the human attitudes towards these conflicts differ significantly from place to place, as the type of conflict, the kind of animal involved and the severity of impact vary significantly. Mere occasional presence of wild animal in the human landscape is considered as a conflict in some places, while in certain other areas, where human and animals are sharing a common landscape, serious losses to property or life to already economically and nutritionally vulnerable communities are only considered as conflict. It is estimated that around 6,500 elephants of southern India cost local farmers around $5,00,000 a year (Sukumar, 1990).

Presence of significant HWC in any particular area indicates that there is some serious disturbance to the landscape elements, which occurs in the form of negative human influence on the wild animal population and their habitat. The term 'conflict' is used in incidents only, when there is an element of human suffering by way of economic losses and the negative impacts suffered by the animals and their habitats in the process of confrontation are largely underplayed. The fact that HWC also puts the animals at serious risk which also needs to be recognized.

There are many dimensions to the whole issue of Human Wildlife conflict which can broadly categorized as Wildlife and habitat dimensions and human dimensions.

The present paper attempts to present the magnitude of HWC in Tamil Nadu, elucidate the wildlife and human dimensions to these problems and analyze the various management responses to these human-wildlife interface issues.

Status of Wildlife Protection in Tamil Nadu

Tamil Nadu boasts of three of the ten biogeographic zones of the country viz., the Western Ghats, the Eastern Ghats and the Coromandel Coast. India accounts for one third of the flowering plants recorded on earth, with about 17,672 species, of which about 5,640 species in its 9 major forest types are found in the state, which gives its pre-eminent position in angiosperm diversity. It has unique faunal diversity too with 165 species of fresh water fishes, 76 species of amphibians, 177 species of reptiles, 454 species of birds and 187 species of mammals.

Tamil Nadu has steadily moved towards zealously conserving its forests and protecting its wildlife. It has constituted several forest areas of conservation concern into Protected Areas (PA) like Sanctuaries, National Parks (NP) and few water bodies as Bird sanctuaries. Strengthening the PA network in the state is high on its agenda. The pace of declaration of wildlife rich areas as sanctuary/national park between 1972 and 2000 was rather rapid during which period an extent of 2382.97 km^2 was added to the PA network. This received further impetus in the new millennium with declaration of another 2262.91 km^2 of forests into PAs. As on 2012, the PA network in Tamil Nadu spreads over 5463.28 km^2., accounting for 23.9 % of the state's forest area.

Besides the above step, landscape approach was adopted for biodiversity conservation and management by declaring large extent of terrestrial and marine ecosystems as biosphere reserves (BR). Tamil Nadu has three biosphere reserves viz., Nilgiris BR (1986), Gulf of Mannar Marine BR (1989) and Agasthiamalai BR (1991). Species-specific conservation programmes were also given prominence with the constitution of certain PAs as tiger reserves (Kalakkadu-Mundanthurai 1988, Anamalai and Mudumalai 2007), as elephant reserves (Nilgiri Eastern Ghats, Coimbatore-Silent Valley, Anamalai-Parambikulam and Periyar-Srivilliputhur 2003) focusing principally on the conservation of flagship species like tiger and elephant, respectively. Identification of inviolate areas in the tiger reserves, critical wildlife habitats, buffer zones around the sanctuaries and national parks and the corridors connecting larger habitats of wild animals is also taken up with the object of ensuring integrity of habitats. Focused attention is given for protection of some of the rare and endangered wild animals by forming special conservation areas for species like Nilgiri Tahr (Mukurti NP and Indira Gandhi NP), Lion Tailed Macaque (Kalakkadu sanctuary), Black buck (Vallanadu and Point Calimere sanctuaries) and Grizzled Giant Squirrel (Srivilliputhur sanctuary). Other unique ecological formations like the coastal wetlands, mangroves and coral reefs are also offered adequate protection to assist the State's biodiversity conservation efforts.

Apart from strengthening protected area network across the state, a number of other measures have been taken to ensure strict protection of wildlife. Forest staffs in the wildlife rich area organize continuous patrols and surprise raids. Anti-poaching camps have been established in sensitive locations that are vulnerable for poaching to keep close watch on movement of poachers and anti social elements. Local tribal are engaged for this purpose. As a result of sustained conservation efforts, population of different flagship animal species has been registering continuous increase. The state has 4,015 elephants, 163 tigers, 1250 Nilgiri tahr, 1,107 Lion tailed macaque, besides the other animal species.

Human Wildlife Conflict Situation in Tamil Nadu

Instances of wild animals including elephant, Indian gaur, panther, tiger, sloth bear, etc. straying into the human inhabited areas adjacent to reserve forests are on the increase in recent years. From the experiences gained in Tamil Nadu, conflicts arising out of human-wildlife interface situations may be categorized into various types.

Based on animal involved in the conflict

Conflict arising from wild animals could vary on the basis of animal involved. This is considerably important, as the nature and intensity of conflict, the extent of its impact and the efforts required in resolving the conflict situation would be hugely dependent on the type of animal involved. While the incidents involving mega-herbivores like elephant, Indian gaur and big cats like leopard, tiger could be more dramatic and visible, drawing lot of public attention, those associated with the animals like wild boar, monkey, deer, peafowl, etc. might go unnoticed.

Based on place of occurrence

This way of categorization essentially reflects the spatial violations in the natural home of wild animals from human activities or from the wild animal movement into the human inhabited areas.

In the natural habitats of wild animals

These conflicts could find expression in the form of:

- Wild animals getting affected by road or rail accidents

- Small wild animals being hunted by domestic dogs at the edge of their natural habitat.
- Human getting injured or killed while in forest for firewood collection, grazing, collection of forest produce or just passing through forests.
- Cattle being injured or killed

In the human dominated areas in forest fringes

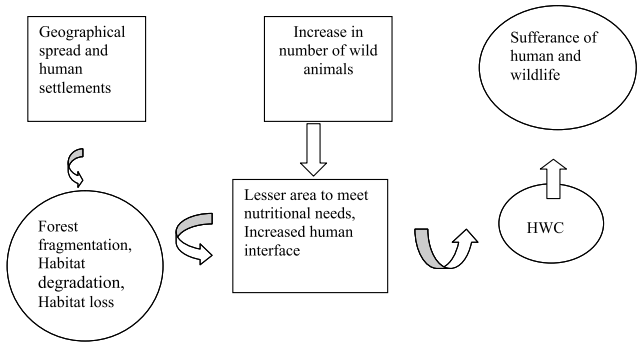
When wild animals come into human dominated areas, largely due to violation of habitat space of wild animals by human activities, conflicts could happen, resulting in distress condition to the animal or human being and his property:

- Animals falling into wells, getting electrocuted, poisoned, snared, trapped, etc.
- Crop damage due to raiding by animals
- Damage to other human property like houses, vehicles or stores
- Predation on livestock
- Injuries to human or death of human being.

In case of conflicts happening in the natural habitats of animals, the blame is not generally placed on the wild animals. However, when conflict incidents occur outside forests and in human habitations, concerned animals are seen as a nuisance / threat and are treated with contempt. Situations of wild animal interface with human, their frequency and districts in which the problem is commonly occurring are as below:

From a general understanding of the issues connected with HWC, the phenomenon can be schematically represented as below.

It is seen that the general results of conflict



situations are sufferance to either human being or the wild animals.

Impacts of Human Wildlife Conflict

Incidents of conflict are in the increase, as seen from the reports about damages caused to crops, property and injury and human death every year in the first decade of the new millennium. Animals getting into distress or facing death are also registering an upward trend. Impacts of HWC are summarized as below:

Animal species	Frequency of conflict	Arising out of	Districts reporting
Elephant	Very frequent	Straying for food and water, Accustomed to cultivated crops, Existence of railway lines, roads, and irrigation canals within forests and/or in their migratory route	Coimbatore, Krishnagiri, Dharmapuri, Nilgiris, Erode, Tiruppur, Dindigul, Theni, Vellore, Tiruvannamalai.
Panther	Very frequent	Predation of domestic livestock in forest fringes, Meat waste dumped in forest vicinity, Roads and labour sheds within forests	Nilgiris, Coimbatore, Krishnagiri, Tiruppur, Tirunelveli, Dindigul, Erode
Indian Gaur	Frequent	Straying for fodder and water, Presence of large swamps in the midst of plantation crops	Nilgiris, Dindigul, Salem
Sloth bear	Less frequent	Orchard and fruit trees in private forests and estates occurring as enclosures or along forest fringes	Nilgiris, Coimbatore
Spotted Deer	Frequent	Agricultural crops along forest boundaries, roads passing through forest areas	Nilgiris, Erode, Coimbatore, Tirunelveli, Vilupuram, Chennai
Wild boar	Frequent	Agricultural crops along forest boundaries	Many districts
Primates	Less frequent	Proliferation in urban areas, adaptation to domestic food.	Many districts
Rock Python	Frequent	Washing down by floods, Occurrence of small isolated hillocks with vegetation	Krishnagiri, Tirunelveli
Crocodile	Less frequent	Fishing activity and other domestic uses in the rivers, canals, village tank s and other water bodies	Cuddalore, Tiruchi Nagapattinam, Thanjavur, Tiruvarur
Pea fowl	Frequent	Population abundance, Dependence on cultivated grain crops	Tiruchi, Pudukottai, Erode, Dharmapuri

Damage inflicted on human

Incidence of crop damage is high in the forest-fringe villages and human enclaves within forest areas, particularly in the Western Ghat and Eastern Ghat divisions. Damage to temporary sheds due to elephant attack is typical of Valparai plateau in Coimbatore district, as the animals could smell items like grains, jaggery, salt, fruits, fermented liquor, etc. stored inside them. Minor injuries and grievous ones leading to permanent debilitation occur to human during chance encounter with elephant, bison, sloth bear, panther, tiger, crocodile, etc. Larger carnivores tend to inflict injuries or death of domestic livestock due to human intrusion in their territories. Maintenance of large numbers of domestic livestock including sheep, goat, cow on private holdings, abutting forest margins also draw the big cats, particularly panthers to these areas. Various kinds of damages sustained by man due to HWC in the past five years is as under:

Impacts on human	Impacts on animals	
	Retaliatory response	Accidents
Crop depredation, Property damage, Loss of livestock, Human injury, Human killing	Shoot to scare/ injure/kill, Electrocution, Poisoning, Crude bomb, Snaring, Trapping	Slips into water troughs, Fall into wells, Trap in quick sand, Sagging HT lines, Road kills, Train run over

Damage sustained by wildlife

Wild animals like elephant, panther, gaur, spotted deer straying into towns and cities make them vulnerable and the animals may sustain injury or face death accidentally or at the hands of the angered public. Animals get electrocuted in inhabited areas. The tendency of farm owners to erect illegal power fences along the farm boundaries in the name of crop protection is emerging as a major threat to wildlife in forest fringes, particularly for elephants.

It has also become common practice to set up snares in the field margins of farm lands to prevent animals like wild boar from enteriing the farm lands. Many a times, panthers, deers etc. get trapped in these snares leading to injury or death of animals. Another very common problem in most of the districts is the presence of numerous active and abandoned wells without proper parapet walls. Many incidents have been reported across the State, where elephant, gaur, panther, deer etc. accidentally fall into such wells. These cause death of animals unless attended to immediately.

Dimensions of HWC

While analyzing the causes for HWC in different parts of the state and its escalation in recent years, following broader dimensions are discernible.

Wildlife and Habitat Dimensions

Geographical features of the animal habitat

In some places, natural geographical features of the area tend to be the chief contributor for constraining the movement of free ranging animals like elephants, thereby bringing them into spatial conflict with man. For instance, Coimbatore Forest division, which is part of the northern Western Ghats of Tamil Nadu and a major constituent of Silent Valley-Coimbatore Elephant Reserve has a total length of 315 km of forest boundary, with most length encountering a highly undulating terrain, steep slopes and very less lowland forests, immediately followed by privately held lands with intensive agriculture and human developments. This leaves only narrow strip of forest for the animals to move from one habitat to habitat in their normal course, exposing them to conflict positions (Personal Communication, 2011). Kallar-Jacanarai elephant corridor is one such narrow strip through which regular elephant movement happens. Similar situation exists in Theni division, where the human-elephant conflict areas of the division and the margins alongside Kodaikanal division encounter steep and hilly terrain or steep escarpments, making the driving of animals very difficult (Bhaskaran *et al*., 2006).

Increase in wildlife numbers

Increase in wildlife population of certain species beyond the carrying capacity of the habitat has caused wild animals to move out of their natural habitat resulting in conflicts. This is especially true of species like wild boar. Stricter enforcement of the Wildlife (Protection) Act, 1972 has reduced the hunting pressure even outside the forests, leading to a surge in population of wild boar through out the state. Several areas like the Yercaud hills in Salem division and the Upper plateau of

Year	No of reported incidents of losses due to HWC					
	Crop damages	Property damages	Cattle death	Human injury	Human death	Total
2007-08	742	12	15	29	25	823
2008-09	1328	22	27	27	35	1439
2009-10	1195	16	22	28	30	1291
2010-11	3257	107	55	40	49	3508
2011-12	2131	101	31	39	47	2349

Nilgiris and the Upper Palani have recorded significant increase in gaur population. Proliferation of the population of bonnet macaque, spotted deer, and peafowl is noticed due to the fact that the natural predators for these animals are in very lesser numbers in such locations. Improved census techniques involving application of camera traps, DNA finger printing, etc. revealed the spilling over of population of tigers to new habitats like Karamadai range of Coimbatore division from the adjacent North Eastern slope of Nilgiris North division and Bhavanisagar areas of Sathyamangalam division.

Spatial and temporal patterns of animal migration

Animals like elephant with large home range tend to move to longer distances for meeting their grazing and browse requirements. They also exhibit certain pattern of seasonal migration (Sekar and Ganesan, 2003).

It is reported that escalated levels of conflict during certain part of the year is driven also by factors like shortage of food, fodder, water in forest areas or adverse conditions prevailing in an adjacent but contiguous landscapes. A distinct trend of elephant migration into Hosur division in Krishnagiri district through Thali RF from the adjacent Bannerghata area of Karnataka occurs in the month of October every year and these migratory herds occupy Hosur division landscape almost for the next six months, during which time their movement from forests into cultivated areas occur almost on a daily basis. The fact that the Hosur division is dotted numerous small, isolated revenue hillocks with some vegetal cover in the midst of farm activity help for the safe return of elephants for day-time stay after extensive crop raids during the nights. These elephant herds are known to involve in a reverse migration towards April and move back to Karnataka (Sekar, 2011). Sukumar (2003) observed that the seasonality of conflict is partly caused by the drop in protein content of wild food plants below the minimum level needed by an elephant for their nutritional needs towards the end of the wet season. At this time, they generally turn to raiding maturing crops particularly paddy, maize and millet, which have much higher protein levels.

Isolated and small animal groups

An isolated, small elephant herd that moved from the Hosur forest division during a major fire incident in the mid-ninteen eighties has been stranded in the Javadhi hills of the Tiruvannamalai and Vellore districts for the past 25 years and is responsible for several cases of crop and property damages, besides many number of human injuries and deaths. Size of this herd has fallen to merely seven animals. This miniscule group was found to be moving into six territorial divisions of the adjoining Vilupuram, Salem, Dharmapuri and Krishnagiri districts, where forests are interupted by large pockets of cultivated areas since April 2012. A GIS analysis of the daily observed movement of this herd over a period of three months between April and June 2012, done by the author reveals that these animals covered nearly 595 km distance in 60 days, logging on an average of about 10 km. Of the total distance travelled, the herd travelled 56% of the distance in areas outside forests, causing considerable crop damange in farm fields. Sukumar (2003) noted that a small population of elephants with a more extensive habitat has better prospects for *in situ* conservation but may pose a real management challenge. He considers that the demographic viability of these populations is still in doubt.

Fragmentation of habitats- developments in the last century

A host of non-forestry activtities such as development of estates, irrigation and power- related infrastructure, construction of buildings, canals, fences and other barriers, increased road density and rail network have led to the fragmentation and disintegration of wild life habitats. This induces large-scale presence of human and their activities in and around the forests, resulting in frequent movement of human being at very odd times in areas, traditionally occupied by the wild animals. Development of a virtual plantation district of coffee, cardamom and tea, replacing verdant evergreen and semi-evergreen jungles in the early 20th century in Valparai plateau of Coimbatore district and in Gudalur region of the Nilgiris and construction of a chain of reservoirs in the post-independent era in many districts have left islands of natural vegetation in the midst of human dominated landscape. An extensive canal system comprising of reservoirs, deep contour canal and feeder canal in the Parambikulam-Aliyar Project complex in the Anamalais built during the 1950s and 1960s almost dissected the crucial animal habitat and their migratory route, particularly of elephants in Anamalais into many segments (Sekar and Ganesan, 2003).

Shrinkage of habitats and loss of habitat quality

Grazing is generally permitted in all forest divisions in the state, except national parks and young forest plantations. Selective grazing by the livestock in forest denies the wild animals of fodder. Competition for fodder resource in the forests by domestic livestock, resulting in the reduction of area available for grazing for herbivores is also considered to be one of the causes for human-elephant conflict (Kenneth Anderson Nature Society, 2011). Ramesh Kumar's study of the elephant habitat in Hosur division indicates that the extraction of forest products by people had the greatest influence in tree population declines, when considered along with fire and damage by elephants (Sukumar, 2003).

Natural wildlife habitats have over a period of time witnessed invasive growth of exotics, particularly species like *Prosopis, Lantana, Eupatorium,* etc. in vast expanse of lower and mid elevation thorn and deciduous forests of the state and *Ulex europeus (*gorse*)* and *Cytisus scoparius* (Scotch broom) in the grass land-shola complex in the upper plateaus of the Nilgiris and Palani hills (Sekar, 2009). Gorse and broom, other than causing the shrinkage of habitat for the high altitude herbivores like Sambhar, Nilgiri tahr, etc. provide cover for the carnivores like tigers and panthers, which in recent years have been indulging in many cattle lifting incidents close to Toda mund or Badga hundi (Sekar, 2004). *Prosopis* occurs in extensive areas along Chinnar river in Pennagaram forests of Dharmapuri division. Abundance of *Prosopis* thickets along the margins of forests and the village tanks some times provide shelter to the straying animals, thus making them stay back outside their natural habitats for a longer period. Such sheltering is reported in case of elephants on many occasions in villages abutting Coimbatore city of Coimbatore division and in villages close to Bhavanisagar in Sathyamangalam division.

Corridor related issues

One of the accepted strategies in wildlife management for offsetting the negative effects of habitat fragmentation is the preservation and restoration of biological corridors or the narrow and linear landmass connecting any two larger habitats. These “linear landscape elements” are intended to increase landscape connectivity by facilitating wild animal movement between habitat fragments and thus minimize the risk of inbreeding and extinction, increase local and regional population persistence and facilitate colonization. A study by Wildlife Trust of India identified a total of 88 elephant corridors in the country that are being currently in use by elephants, of which 20 are in southern India. Any obstruction by way of developmental activities in the corridors is bound to hinder free movement and cause conflicts. These corridors are also saddled with the obstructions like existence of human settlements and the resulting biotic pressures that includes urbanization along the corridors, change of land use from agriculture to housing, educational institutions and industry. For instance, in the six micro-corridors connecting elephant habitats in Coimbatore division, 23 corridor-dependent villages/hamlets have been recorded and existence of many educational institutions and associated construction activities and indiscriminate cultivation practices are noticed (Personal communication, 2011).

Human Dimensions

Cultivation in buffer areas of forestlands

In the State, a 'buffer zone', a belt of land 40.2 m to 60.4 m wide was earlier maintained specially all along the forest boundaries and the margin of cultivation and had to be left unassigned as per Revenue Standing Order-15. Termed as, 'Conservancy areas' these were originally Reserved forests and have been subsequently transferred to poromboke on disforestation during the early decades of the last century as per G.O.1798 (Spl.) dated 9.10.1920. Specific mention has been made in the order that such areas should not be transferred to anyone without consulting the Chief Conservator of Forests and if any of them is assigned for cultivation, the assignee should be warned of the risk of damage to cultivation resulting from its proximity to the forest boundary and that complaints on this account cannot be considered. Over a period of time, buffer areas along forest boundaries were brought under cultivation and lost to development.

As a consequence, crop fields have now been extended up to the boundary of forests. This has brought the wild animals in close proximity to farm fields, resulting in crop damage- related conflicts. Studies reveal that Asian elephants are particularly attracted to food crops along forest fringes because they are more palatable, more nutritious, and have lower secondary defenses than wild browse plants (Sukumar, 1990). The feed in cropland is concentrated, densely planted, and is available at one place in contrast to the situation obtained in the natural habitat. This makes it attractive for the animals to raid the crop fields and they often become habitual crop raiders. As the extent of crop raiding by a population increases, the younger generation of the population adopts the practice as a part of its natural behaviour. This situation is prevalent though out the state along the Western and the Eastern Ghats.

Cropping pattern

Due to bringing of increased extent of cultivated areas under assured irrigation, conventional crops like cereals and millets have given way to cash crops including sugarcane, banana and orchard crops like mango, sapota, coconut etc. Increase in extent of paddy, sugarcane, etc. in Western Ghat and Eastern Ghat districts is a case in point. These more delicious and palatable crops turn out to be a major attraction for elephants and other herbivores, causing crop depredation. An analysis of elephants' crop raiding intensity in Hosur forest division over a period of four years between 2005-06 and 2008-09 reveals that incidents of crop raid in respect of fruit crops, banana and sugarcane are relatively more compared to their cropping extent (Sekar, 2011).

Higher road density, railway lines and canals in wildlife habitats

Due to increase in road density and presence of many busy road and rail sections passing through wildlife habitats, incidents of accidental killing of animals by vehicle over run are occurring frequently. Such deaths are more commonly reported in Hosur, Coimbatore, Kanniyakumari divisions and Anamalai Tiger Reserve (panther), Mudumalai (many species). Hosur division reported a ghastly incident involving the death of five elephants due to run over by a locomotive in the Royakottai- Hosur section during 2003. Coimbatore division also recorded two cases of elephants being run over by trains in the Coimbatore-Walayar section, resulting in the death of four animals in 2008 and 2009. Road run over of panthers in various divisions led to the death of six animals between 2005 and 2009.

Development of urban infrastructure

Large-scale urban development is one of the factors responsible for the conflicts especially in Coimbatore and Hosur forest divisions. Elephant movement into fairly well populated areas has been on the increase, of late, in Coimbatore and its surrounding. Elephants move as deep as Sulur, at least 15-20 km away from the forest boundary. Disturbance to the migratory route of elephants around Bannerghatta forest area close to Bangalore have its spill over effects in the vicinity of Hosur, resulting in higher crop damages. Straying of panthers into urban locations like Hosur town in Krishnagiri district, Udhagamandalam town in the Nilgiris are also frequently reported. Gaur population that has well drenched the tea estates in the Nilgiris plateau around 1500-1800 metres above MSL have almost become part of the landscape, so much so, herds of gaur are seen moving around freely in broad daylight in the tea gardens, where huge number of labourers are engaged in plantation activities. Straying of spotted deer is a common sight in the urban vicinity of Chennai.

Large human presence in animal-dominated landscapes

Presence of many settlements within the forests as enclosures and fringe villages along their boundary render extensive linear landscape, exposed to constant interface with wild animals. When animals come in frequent contact with human, conflicts could happen. Besides, human activity by way of forest encroachments and cultivation in private forest areas are known to escalate the scales of conflict in places like Gudalur in the Nilgiris. In areas of Valparai plateau in Anamalai, stocking of food grains, salt etc. in the temporary sheds particularly attract elephants, which lead to pulling down of such sheds, damage of property, injury and / or loss of human lives.

Availability of natural prey in the wild for big cat species is low in certain habitats. In such areas, availability of easy prey like domestic dog, cattle and poultry along forest fringes causes straying of small and large carnivores outside the forest boundaries. Predation of domestic livestock by the carnivores occurs more frequently in places around labour lines in Valparai estates and in the Nilgiris, where such domestic animals are maintained close to conventional wildlife habitat.

Pattern of lifestyle in forest settlements and fringe villages

Human movement in animal dominated area at odd hours is increasingly emerging to be a cause for HWC. People moving on foot at dawn or dusk hours in the forested environment become highly susceptible for accidental encounters with wild animals. Such incidents are more prevalent in estates with plantation crops like coffee, tea or cardamom in Valparai plateau of Coimbatore district or tea fields in the Upper Nilgiris, where movement of elephants and panthers (in case of Valparai) and Indian Gaur (in the Nilgiris) is recorded.

In many places, young work force have moved out of villages for work, leaving the aged people and women to fend for household needs like grazing, fire wood or fodder collection. However, an analysis of incidents of human death and injury due to elephant attack in Hosur division during the period 2005 to 2008 suggests that more than 90% of the victims were men. Vulnerability of men to elephant attack is understandable, given the situation that men move in more numbers within or close to the forest areas as part of their routine economic and social activities. Further, men are usually involved in protection of agricultural fields or assemble in large groups in the event of the elephants straying out of forests into cropping areas for driving the animals back (Sekar, 2011). A documentation of over 150 cases of human deaths due to elephants reveal that over three out of four people killed were adult men (77.36%) because men venture often into forest and almost exclusively guard cultivated fields at night (Sukumar, 2003).

Retaliatory response by the affected people

Farmers in India in general, revere many animals as vehicles of God and appreciate their importance to humanity. But, heavy economic loss beyond certain threshold level suffered by them induces antagonistic feeling towards the animals as well as the Forest Department. In the face of continuous loss, people loose their compassion for wild animals. The increase in crop damage due to wild boar in particular in some areas and has caused widespread demand for permitting them to shoot wild boar. Injuring or killing of wildlife by the affected persons has been also reported. It is common to see gunshot injuries on the bodies of crop raiding elephants indicating the clandestine use of country guns by farmers to chase them away. Tamil Nadu Forest Department captured a makhna elephant in 1999 that

was proclaimed as a known man killer in Gudalur region in the Nilgiris and the adjacent Wyanad in Kerala. This animal, when brought after capture to the Mudumalai camp was found to bear scores of bullet wounds and the pellets throughout its body, from the gunshots fired by the farmers of the area (Sekar, 2004).

Keeping country bomb wrapped in some fruits, sugary food or meat as bait is clandestinely practiced in some places to kill the wild animal that tries to consume it. A trend of embedding some crude, powerful country bomb into jack fruits is commonly reported that injure the wild elephants raiding the plantation/farm areas around Gudalur in the Nilgiris, which cause irreversible damage to the elephants and their ultimate death. Poisoning the carcass of domestic livestock hunted by a carnivore is one of the revengeful actions indulged by affected persons, which leads to death of the animal. In the past, two such incidents involving death of panthers were reported, one each from Dindigul and Coimbatore division. Reported killing of one tiger each due to poisoning had occurred in 2008 and 2009 in Coimbatore and Gudalur division, respectively.

Unscientific restraint measures:

Electrocution of wildlife using live wire drawn from the high voltage power supply is another illegal practice adopted by certain farmers to fence field boundaries. Illegal electrification of fence around croplands has killed elephants, spotted deers, wild boars but also caused accidental death of human beings passing by. About 19 elephant deaths due to electrocution have been reported between 2007-08 and 2011-12 in the State. Farmers tend to conceal the electrocution and death of smaller mammals like wild boar or deer, whereas in case of electrocution of elephant, crime is often detected and action taken against the person responsible.

Lack of awareness about the potential impacts due to human-wildlife interface

Deliberate killing of humans by wild animals is usually rare. Lack of understanding about avoidance of wild animals appears to be a cause for concern while dealing with conflict situations. Many times, adverse impact of HWC by way of human death and injury occur due to inadequate appreciation of the potential danger of encountering wild animals. In their eagerness to watch the animals, people approach them at close quarters. Such dangerous situations arise in villages, when people assemble in large numbers to be part of anti-depredation drive. The death or injury could happen, owing primarily due to sudden and chance encounter with wild animals, which are under extreme conditions of irritation and distraction consequent to driving by locals and farmers. Several attacks on human by elephants have been attributed to the fact that the human have moved into elephant dominated landscapes in the odd and unearthly hours. In Valparai area of Coimbatore district, picking of unattended children by leopards from the vicinity of labour lines within estates are reported, which is due to poor lighting around them and the children playing in darkness outside the sheds.

Inadequacy of frontline forest workforce

It is important to recognize that the position of uniformed front line forest staff including Rangers, Foresters, Forest Guards and Forest Watchers is very critical in tackling HWC issues at field level. These staffs are to be in active state of mind with sound physical fitness. They need to possess basic knowledge on animal behaviour, skill in driving/capture operations etc. to cope up with the field duties demanded in resolving the HWC problems. Availability of trained manpower to handle HWC issues is, however insufficient, given the growing requirement for managing such situations. From a questionnaire survey conducted by the author during May/June 2012 among the front line staff of seven forest divisions in Dharmapuri and Vellore Circles, where the elephant depredation is a constant issue, it was observed that more than 15 % of field positions were vacant, 62 % of the field staff were above 50 years of age and 69% of them have not received any formal training in the HWC issues. Here, the staffs are usually supplemented with young and active men from the local population, conversant with anti-depredation operations for better management of HWC conflict situations.

Department's Management Response

The Forest Department is adopting a multi-pronged approach in managing HWC. The Department's response to contain the impacts of conflict is by way of initiating both prevention and mitigation measures, which are summarized as under:

Prevention	Containment efforts	Ensuring habitat/corridor integrity- Acquisition of corridors/relocation from interior habitats, Creation of water hole, Water supply during pinch period, Development of fodder resources inside forests
	Confinement measures	Solar power fence, Elephant Proof Trench
Mitigation	Anti-depredation drives	Driving animals back into forests, Avoidance of human movement, Awareness creation
	Ex-gratia payments	Compensation of economic losses suffered by people
	Animal rescue and rehabilitation	Rescue of animals in distress

Prevention measures

Maintenance of habitat integrity by securing the sanctity of animal corridors is the most crucial step in preventing the animals straying out of their habitats. An important initiative in this regard has been the ongoing voluntary relocation of a community that had been living within the core tiger habitat of Mudumalai Tiger Reserve to an alternate area within the Nilgiris. Action has also been underway to acquire 76.95 acres of patta land in the crucial elephant habitat, which are under private ownership falling in Kallar-Jacanarai corridor in Coimbatore and Nilgiris districts.

Water sources in forest areas dry during peak summer, creating a situation in which animals are forced to enter adjoining agricultural fields in search of water. In order to confine the wild animals inside the forest, water holes are created under various wildlife and other schemes for impounding rainwater to increase water availability within the forest areas. Supply of water in the troughs made in the sites of animal congregation during summer months is also resorted to meet the water requirement of wild animals.

The Department has taken several measures including habitat improvement, augmentation of water sources, erection of physical barriers like Elephant Proof Trench, Solar power fence and awareness creation among the forest dwelling and forest fringe communities at an outlay of ` 11.70 crore during 2011-12. Likewise, development and augmentation of fodder resources within the forest areas has been initiated during 2011-12 under a State Plan programme at a cost of ` 20.87 crore. As a preventive measure and to restrict the movement of wild animals within the forest boundaries, physical barriers like Elephant proof trenches or solar power fences are put up along the forest margins that are highly vulnerable for conflicts.

Physical barriers are generally seen as an enduring and potentially a permanent solution to wild animal conflict. Solar-powered wire fences of a height of over 5' with 5-6 strands along forest boundaries have been mainly tried against elephants. These fences are found to serve its intended purpose, where local population are taking the follow up maintenance of the battery, fence line and keep the area beneath the fence strand free of any fresh ground vegetation. However, elephants tend to break fences with their tusks, which are poor conductors or even push trees over fences. Fence effectiveness at places has been found to fall below expectation owing to deficiencies in meeting the demands of meticulous routine maintenance. Hoare (2003) observed that this reflects a management or institutional problem, not a technical one. Well-implemented electric fencing in strategic locations along with community support involving people in the design, execution and maintenance is essential to positively influence people's attitudes and may go a long way in successful human elephant conflict resolution (Fernando *et al*., 2008).

It is noted that trenches have been used with some success in Asia. About 859.3 km of EPT have been dug in many elephant conflict areas in both the Western Ghat and the Eastern Ghat districts. Nearly 80 km length of EPT established in flat, dry tracts Hosur forest division during 2010 and 2011 has proved useful in reducing the incidents of crop damage by more than 75 % in the villages close to the trench during 2011-12. Large investments required for construction, their vulnerability to soil erosion and their weakness at water crossing points are, however, considered as drawbacks of trenches.

Mitigation measures

Animals straying out of their habitat have to be safely driven back into the forest without causing any injures to the animals as well as to the human being. For these purpose, anti-depredation squads involving the field staff and local people, who are provided with the traps, cages, searchlights, crackers, etc. are stationed for driving the problem animals back to forest. In extreme situations, well-trained elephants (kumkies) are deployed for anti-depredation drives from three of the department's elephant camps. On some occasions, the problematic animals have to be controlled by adopting site-specific rescue and rehabilitation protocol including chemical restraint like tranquilizing the problem animal. The instances of rehabilitation of wild animals in distress in different part of Tamil Nadu have been frequent and often met with successful relocation of problem animals.

There is also a system of paying compensation for loss of human life, injury and damages to crop and property caused by wild animal attack. The compensation paid for wildlife damages was enhanced during 2011. Compensation for human death was raised to ` 3.00 lakh from the previous ` 1.50 lakh, besides enhancing the rates for crop damage, damage to properties and domestic livestock. There has been steady increase in the quantum of amount disbursed as compensation in the last five years.

Year	No of claims sanctioned	` (in lakhs)
2007-08	823	71.93
2008-09	1439	114.97
2009-10	1291	113.87
2010-11	3508	197.81
2011-12	2349	253.00

Timely sanction and payment of compensation amount to the affected persons or kin of the victims in case of deaths will increase tolerance of the people towards wildlife and wildlife related losses. Towards this, a "Contingency Relief Fund" has been constituted in the state during 2011 with sanction of grant of a fund to the tune of ` 2.50 crore that is kept as a corpus to enable immediate release of compensation amount.

From the experience gained in the Department over the past, it is recognized that effective resolution of HWC is best achieved by appropriate mixing of prevention and mitigation strategies. Top on the solution would be to raise the people's awareness on the multi-dimensional aspects of the human-wildlife interface and to help them understand the importance of managing and living with the conflict by following an adaptive lifestyle in landscapes, with large wild animal presence. Appropriate land-use planning must become an integral part of development, which will show the way to potentially save human lives and his economic resources, besides wildlife purely through a more intelligent planning approach.

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तमिलनाडु में मानव वन्यजीव टकराव के आयाम

टी. शेखर

सारांश

तमिलनाडु में पिछले दशक से मानव–वन्यजीव टकराव, वन्यजीव प्रबंधन के लिए मुख्य समस्या बन गया है। टकराव से समुदायों पर फसल के नुकसान, सम्पति के नुकसान, पशुओं की क्षति, मनुष्यों के घायल होने या मारे जाने के रूप में गंभीर समाधान हुआ है। वन्य जीवों को भी प्रभावित लोगों द्वारा घातक रूप से बदला लिये जाने या दुर्घटना में घायल होने या मारे जाने से भारी नुकसान हुआ है। मानव–वन्यजीव टकराव के कई पहलू हैं। जिन्हें मुख्यत: दो श्रेणियों में रखा जा सकता है यथा: वन्यजीव और वासस्थलीय मापदण्ड तथा मानवीय पहलू। वन्यजीव तथा वासस्थलीय मापदण्ड, जीवों के वासस्थल की प्राकृतिक भौगोलिक विशेषतायें है, जिनमें वन्यजीवों की संख्या में वृद्धि, जीवों की विस्थापन पद्धति जीवों का आवारा हो जाना या पृथक्कृत आबादी, वासस्थलों तथा कॉरीडोर्स का सिकुड़ना या निम्नीकृत हो जाना और वासस्थलों की गुणवत्ता में कमी हो जाना शामिल है। मानवीय मापदन्डों में, वनों की सीमाओं तक खेती करना, फसल पद्धति तथा गहनता, उच्च सड़क घनत्व, वन्यजीव वासस्थलों पर रेलवे लाईनों तथा नहरों का दबाव, मानव हेतु वासस्थलों में वृद्धि और शहरी संरचना, वन्यजीवों के मुख्य भू–दृश्यों में मानव की बड़ी संख्या में उपस्थिति, मानवीय जीवन पद्धति, लोगों द्वारा लिया गया प्रतिशोध, अवैज्ञानिक निवारक उपाय जागरूकता की कमी तथा अग्रगामी स्टाफ की कमी शामिल है। वन विभाग द्वारा किये गये विभिन्न प्रबंधकीय उपायों का वर्णन किया गया है। जिनमें निवारक और न्यूनताकारक उपाय शामिल है।

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