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HUMAN-WILDLIFE CONFLICT (HWC) - AN OVERVIEW

India has a rich repository of wildlife and a remarkable biological diversity of flora and fauna. Among wild mammals, India has the highest population of elephants, tigers, lions and wild pigs, with the largest population of wild Asian elephants (Elephas maximus), around 29,000, found in the country (Ministry of Environment and Forests, GoI, 2015). Presently, India has 70 per cent of the tiger population of the world with an estimated 2,226 big cats (Meena, 2015). Tamil Nadu, one of the southern states of India, shelters a significant number of elephants, tigers, Indian gaur, leopards, wild dogs and wild pigs.

Human-wildlife conflict (HWC) arises when there is a compulsion to share common limited resources, such as land, game, livestock or fish (Schwerdtner and Brend, 2007; Graham et al., 2012).

History of HWC

There is evidence that HWC exists right from Gajasastra (350 B.C.) period in which it was narrated that the Kingdom of Anga was invaded by wild elephants and caused considerable damage (Sukumar, 1994).

Effects of HWC

For humans, commensalism with wildlife poses apparent problems such as increased damage to crops via raiding by non-human primates (Naughton-Treves, 1998) and loss of livestock due to lion (Panthera leo) - predation (Hemsonet al., 2009). Further, hidden or subtle problems were found to exist, such as disease acquisition, opportunity costs and transactional costs, while pursuing compensation for depleted resources (Ogra, 2008).

Taxonomically, the animals and the crops raided by wild animals are varied (Karanth and Madhusudan, 2002) and these associate often elephants (grain crops, sugarcane, fruits), wild pigs (almost all crops), Nilgai and black buck antelopes (sorghum, wheat and millet), gaur (rice and rubber), sloth bear and black bear (maize, sugarcane, peanuts), jackals (sugarcane, maize and fruits), bonnet and rhesus macaques (most of the crops and vegetables), giant fruit bats (all orchard crops and areca nuts) and porcupines (arecanuts, coconuts, vegetables).

Killing of domesticated stock by carnivores is often a serious problem. Such instances of conflict included killing of domesticated bovids, equids, sheep and goats by tigers, lions, leopards, snow leopards, wolves, dholes, striped hyenas, brown bears and black bears (Mishra, 1997). Retaliatory killing of “problem predators” by humans is a major consequence of this conflict.

Human-wildlife conflict attains its most serious form when people are injured or killed by wild animals. Although big cats, bears and wolves in southern Asia are readily recognized and targeted for such man slaughter, wild elephants probably were also associated by killing more people than large carnivores in this region (Sukumar, 1994). Persistent predation on human is the most severe category of conflict. Man-eating tigers, leopards and (rarely) child-lifting wolves (Rajpurohit, 1999) caused panic over the entire regions, inducing massive retaliatory killings and antagonism against wildlife (Jhala and Sharma, 1997).

In the buffer zones surrounding national parks and other protected areas, borders between ‘human’ and ‘wild’ spaces have become blurred and narrowed. Intense pressure on the land has resulted in loss and fragmentation of the habitat base available to wild animals, forcing them to seek alternate means of survival outside the forests (Chartieret al., 2011 and Wilson et al., 2015). Wild animals

frequently leave protected areas and enter nearby human settlements and members of forest-dependent villages may enter protected areas, where they come into close proximity with wildlife. The resulting HWC in the form of crop damage, livestock predation, property damage and attack on humans, often undermines local support for conservation. Such lack of support is evinced by damage inflicted upon wildlife by humans, including habitat degradation or 'retaliation' killings in which waterholes, crops baited carcasses etc., and wild animals were deliberately poisoned (Sifuna, 2005 and Bagchi and Mishra, 2006).

Reasons for HWC

According to Distefano (2005), a set of global trends has contributed to the escalation of HWC worldwide. These can be grouped into increasing wildlife population as a result of conservation programmes, abundance and distribution of wild prey, climatic factors and stochastic events, increasing livestock populations and competitive exclusion of wild herbivores, growing interest in ecotourism and increasing access to nature reserves, degradation and fragmentation, human population growth, habitat loss of wild species and land use transformation.

HWC mitigation methods

Effective and economically viable mitigation methods are required to minimize elephant–human conflicts to provide relief to suffering farmers as well as promoting more positive attitudes towards elephant conservation (Chelliahet al., 2010).

The potential remedies available to local people and authorities vary in scope from the "softest" option of stoically tolerating the damage caused by wildlife, to the "hardest" option of killing the problem animal. Because of the wide variety of tactics employed, the techniques used to mitigate HWC are placed under three general strategies: modifying human behaviour, modifying wild animal behavior and conflict prevention through spatial separation.

The farmers also frequently use several traditional methods in their day-to-day practice, which come in their way of efficient management of HWC. Since time immemorial, wild animals damage the agricultural and plantation yields of the forest buffer zone cultivable area. These intrusions are being controlled by personal farmer's efforts. In order to control devastation caused by wild animals, the farmers use short and long term measures. Under short term measures, biofencings of planting barriers (Anhaltet al., 2014) use of bio and chemical repellants (Osborn and Parker, 2003) and mechanical barriers (Lenin and, 2008), shining reflectants (Meenaet al., 2014) and special mechanical sounds proved best in managing human-wildlife conflict as they are cheap, free of cost, eco-friendly and locally available.

Similarly, scientific methods such as scaring squads (Lenin and Sukumar, 2008), elephant proof trenches (Osborn and Parker, 2003) and animal translocation may also be studied to find its feasibility and efficacy in controlling HWC. In addition to this, in few areas, use of honey bee to prevent the intrusion of elephant into cropping area is being practiced.

Suggestions to mitigate HWC

Human–wildlife conflict (HWC) management in Tamil Nadu requires in-depth understanding of the various factors contributing towards HWC. Some of the common factors include:

- Fragmentation of corridors especially with regard to elephants
- Invasion of alien plant species
- Disappearance of perennial water sources
- Proliferation of productive sectors
- Impact of fire and livestock and
- Lack of food resources during summer and drought conditions

Considering the above-said points, the following suggestions are offered to allay HWC:

Community participation

Lack of community participation is a major cause of failure in human–elephant conflict mitigation efforts. The primary reason for failure in HWC is that the stakeholders are not taken into consideration, while implementing remedial measures. Without consulting the affected people and in the absence of their full cooperation / participation, the mitigation measures will not succeed. Therefore, the local people should be involved in handling such issues by forming local-level village committees, which should be empowered in decision making. Also, night guarding by the community people must be emphasized, which are meant to reduce HWC.

Physical barriers

Providing physical barriers to elephant movement is an important control measure to contain damage, but they require careful planning, good execution and maintenance. In the absence of these, barriers may have little or no positive impact. Quality of constructions and maintenance are key for success or failure of such barriers. Well-designed elephant-proof trenches or electric fences should be constructed with periodic maintenance to help prohibit the passage of wildlife into human habitats.

Preventing corridor fragmentation

Land-use policies in elephant habitats, especially corridors, must be formulated clearly to prevent further fragmentation of habitats, which leads to the escalation of human–elephant conflict. The policies should be pragmatic enough to enable the protection of corridors. Developmental activities in elephant habitats should be thoroughly discussed among various stakeholders to prevent further fragmentation and degradation of wildlife habitats and corridors, thereby leading to increase in human–elephant conflicts. Like any other mega vertebrates, elephants can have a secure future, only if landscapes containing viable populations are managed in a holistic and ecologically sound manner. The long-term survival of these populations rests on consolidating their habitats and maintaining the integrity of corridors.

Control the growth of weeds

Lantana camara, one of the most troublesome invasive weeds, has become a menace in most of the protected areas. The lantana-infested landscapes not only impoverish habitats of wildlife but also contribute to HWC owing to diminished biodiversity. Hence, the removal of Lantana camara in a phased manner is necessary to allow the native species to establish in their natural habitats which in turn help in reducing HWC.

Research and development

Elephant reserves should promote long-term dedicated research through Elephant Reserve Research Stations established at every reserve forest, attracting all committed researchers and scholars. Encouragement of apiculture around the areas of elephant-human conflict at villages shall be given more weightage as one of the effective mitigation measures in our country. A Wildlife Veterinary Wing should be established within the Protected Area with incentives and facility for the veterinarians. Human–elephant conflict requires immediate payment of compensation/ex-gratia for the losses incurred by the affected families by creation of division-level corpus fund for conflict management.

Information network

Early information about the elephants and their movements could reduce human–elephant conflicts drastically; fatal accidents involving human causing death could be minimized by providing advance information to people about elephants' presence and their movements. Constructing in-house toilet facility in forest fringe villages will minimize the need for human to confront wildlife while attending to nature's call in the open. Developing an Elephant Information Network (EIN) is vital to manage HEC.

Mobile food storage

Considering the fact that one of the main reasons for HWC is the lack of food resources and wildlife enter human territory in search of food, securing the food storage places assumes importance, especially ration shops where food is stored for public distribution. Ration materials should be placed in a centralized location protected by a solar-powered fence or by an elephant-proof trench. A mobile ration van should be used to mitigate the conflict area in the place of permanent ration shops.

Frontline forest staff should be well equipped not only with basic needs, but also with modern equipment and training should be imparted in the use and application of modern equipment. They should also be aware of the state-of-the-art techniques in patrolling and communication. The staff who are in charge of mitigation measures to avoid HWC have to be confident and enthusiastic to handle the situation and hence they need to be motivated by rewards.

To know the references for the article, the author may be contacted in the email: senthilkumar.k.wls@tanuvas.ac.in

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RESEARCH HIGHLIGHTS
(2015-16)

Assessment of immune response to experimental Leptospira vaccine and detection of carrier status by Real - Time Polymerase Chain Reaction in Bovines

- Lateral flow assay developed for rapid screening of bovine leptospirosis.
- Inactivated experimental leptospira vaccine with Montanide adjuvant was developed.
- Standardization of real-time PCR to detect the carrier status of leptospirosis in bovine.
- Standardization of PCR with virulent marker Loa22 gene to detect the pathogenic leptospires in clinical samples.

Research Scholar: K. Senthil Kumar
Department of Veterinary Microbiology, MVC, Chennai
Chairman: Dr. G. Ravikumar

Nanovehicle mediated progesterone delivery

- Zein nanofibers and nanoparticles loaded with progesterone were synthesized for application in synchronization of estrus in bovine.
- *In vitro* release kinetics from nanofibres loaded with 1.2 G progesterone ensured more than 80% release within 7 days.
- Progesterone nanofibre implantation induced estrus symptoms in cows by 7-8 days post implantation without the need for removal of implants.

Research Scholar: I. Ganesh Kumar
TRPVB, MMC, Chennai
Chairman: Dr. G. Dhinakar Raj

Assessment of mineral profile and their associated deficiency diseases in sheep

- A significant difference in soil and plant mineral profile was noticed among the districts of North Eastern Agro Climatic Zone (Kanchipuram, Thiruvallur, Thiruvannamalai, Vellore and Villupuram). Sheep in the Kanchipuram district were having significantly high serum mineral level

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followed by sheep in Thiruvallur, Thiruvannamalai, Villupuram and Vellore districts.

- Better production and reproduction performances were noticed in sheep with higher levels of serum minerals. The appropriate interventions such as supplementary feeding or area specific mineral mixture were suggested for the sheep reared in the North Eastern Agro Climatic Zone of Tamil Nadu.

Research Scholar: C. Inbaraj
Department of Veterinary Clinical Medicine, MVC, Chennai
Chairman: Dr. M. Balagangatharathilagar

Development of protein based edible coating incorporated with essential oils to extend the shelf life of paneer

- Whey protein edible coating was prepared by using whey protein concentrate (6 per cent), glycerol (7 per cent) as plasticizer and 3 different plant essential oils (ginger, garlic and cinnamon) as anti microbial agent.
- The shelf life of paneer can be extended from 6 days to 12 days at refrigeration temperature by employing whey protein based edible coating incorporated with 1 per cent essential oil (ginger, garlic, cinnamaon and garlic).
- The textural parameters were significantly increased without altering the sensory acceptability of product.

Research Scholar: A. Punnagaiarasi,
Department of Livestock Product Technology (Dairy Science), MVC, Chennai
Chairman: Dr. A. Elango

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