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Nilgai (*Boselaphus tragocamelus*) - A Menace to the farmers of the villages around Ecopark Hamirgarh, Bhilwara

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Abstract
Crop-raiding or crop-depredation involves damage to agricultural produce by foraging either on standing crops in agricultural fields, post-harvest stages or stored agricultural produce. A few studies focussed on various factors responsible for crop depredation as well. Interestingly, there are some popular thoughts regarding a fundamental question, 'why animals raid crops? In India, apart from Elephant (*Elephas maximus*), One-horned Rhinoceros (Rhinoceros unicornis), and large-to-medium-sized herbivores like Gaur (*Bos gaurus*), Nilgai (Boselaphus *tragocamelus*), Blackbuck (*Antilope cervicapra*), Sambar (*Rusa* unicolor), Chital or Spotted Deer (Axis axis), Wild Pigs (Sus scrofa) and Wild Ass (*Equus hemionus* khur) are reported to cause economic loss to farms (Bhattarai and Basnet, 2004; Bhattta, 2008; Dave, 2010). In India particularly, nilgai is considered as 'pest' and in many states, declared as vermin (Mathur et al. 2015). The damage to field crops caused by nilgai is a major problem in Ecopark and around the village of Hamirgarh in Bhilwara district of Rajasthan. Wildlife raids by nilgai inflicts heavy losses on farm produce with the cost borne by the local farmers (Sridhar,2006, Sukumar,1991). During the present investigation there were losses in the economically important crops like maize, wheat, potato, pulses and peas etc. (Thuppil and Richman,2015), It was established that, damage to crops may be influenced by numerous factors, including animal habituation, availability of native forage, local weather conditions and animal nutritional state (Hill *et, al,2002*).

Keywords: Crop-raiding, Nilgai, Vermin, Habituation, Nutritional

Introduction

Nilgai, (Boselaphus tragocamelus), also called bluebuck, the largest Asian antelope (family Bovidae). is indigenous to the Indian subcontinent the nilgai is the only one of the four Indian antelopes that are still abundant. Nilgai is regarded as a serious mammalian crop pest due to eating less but destroying more by trampling and cause crop damage. Nilgai is the Hindustani word for "blue cow," which describes the blue-gray of adult bulls. The nilgai's conformation, however, is more horselike than cow like: it has a long neck with a short upright mane, a bony narrow head, a barrel-like chest, strong legs, and high withers sloping back to the croup. On the other hand, it has a hock-length cow's tail that ends in a black tuft. Both sexes have similar markings; white areas include the cheek spots, ear tips, large throat bib, brisket, belly, rump patch, and underside of the tail. Its lower legs are banded black and white.

Crop damage by deer, nilgai, blackbuck, wild boar, and porcupine has been widely reported from almost all corners of India (Prater 1980, Majupuria 1982, Schultz 1986 and Rajpurohit, 1988). The nilgai causes extensive damage to agricultural crops; among these Wheat, Barley. Gram, Mustard, Bajra, Jowar, Moong, Guar are most preferred. Farmers want to get rid of this unconventional mammalian crop pest. The crop damage by nilgai is large due to their increasing number, deforestation, the lake of open vegetation area. The increased population number was reported in a crop field in Rajasthan (Rajpurohit and Mohnot, 1997; Goyal and Rajpurohit, 2000).Nilgai is highly adaptive antelope. Naturally diurnal, it goes for crop raiding in evening and at night . Nilgai caused extensive damage to most agricultural crops.

Study Area

The ecopark wildlife reserve (the study area) is in Hamirgarh, an old princely town in district of Bhilwara, Rajasthan, India. It stands at on altitude of 425 meters above the sea-level between 250 11' 0" North & 740 38' 0" East, and is spread in 567 hectares. It was declared an 'ecopark' by the government of Rajasthan in the year 2012 to conserve the mammalian fauna present in the reserve, specially chinkara or Indian gazelle (Gazella bennetti). It is located 20KM towards south of the district headquarter and lies on four-lane highway NH79, which gives a good enough opportunity to general public to have a glimpse of wild life. This ecopark is home to various kinds of mammalian fauna, namely, fox(Vulpes bengalesis), jackal (Canis acereus), nilgai or blue bull (Boselaphus tragocamelus), chinkara (Gazella bennetti), wild boar (Sus scrofa) porcupine (Hystrix indica indica) and hyena (Hyaena hyaena).

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The configuration of land at ecopark includes small hills, hillocks, flat areas, riverlets & valleys. The temperature remains average throughout the year, though very high at times in summer and has average kind of rainfall. The forest type is tropical dry deciduous and has many types of hybrid fodder species, like salar (Bose wellia serrata), kherni (Wrightia tincteria), kher(acacia catechu), ber (Ziziphus mauritiana), palas (Butea monosperma), dhawda (Anogeissus pendula), gory dhawan (Anogeissus latifolia) and many types of wild grass. There is only a negligible natural habitat left for nilgai in Rajasthan, and virtually none of it has a Protected Area status. Tree cover is in small patches and consists mainly of Acacia plantations with scattered Prosopis juliflora. capparus apphvla and Zyzyphus sp. The plantations are either under the control of the forest department.

The study area has two broad crop seasons viz. Rabi season and Kharif season . Rabi crops are raised in winter and harvested in spring and these crops require low temperature e.g., Barley, Peas, Oil seeds etc. Kharif crops are sown in summer and are harvested in autumn e.g. Jawar, Pulses, Maize etc. Zaid crops are grown throughout the year e.g. Leafy and tuber vegetables.

Methodology

In order to get a fair knowledge of the area, exploration surveys were carried out in the early months of the study period . Some conventional methods of observations, like trail sampling, sign surveys such as, pug-marks, faeces, digging and territorial markings, showing the evidence of mammal presence and also interviewing the forest staff and the locals around about the wildlife present at the ecopark, and to create awareness about the mammal diversity of the study area (Mishra et al. 2006). They were shown photographs of the mammal species (Prater ,1971) and their knowledge on mammalian species & history were recorded.

Pilot survey

A pilot survey was conducted in three selected villages of study area, based on the information gathered during the preliminary survey. During the pilot survey , farmers were randomly selected and interviewed. The aim of the pilot survey was to evaluate the questionnaire and to check whether it was applicable and suitable in the study area. Based on the pilot survey results, the questionnaire was revised in each village. The current status of crop damage was studied in the study area through observations. The collected data is primary data as well as secondary. Primary data was collected by the field visits and questionnaire survey. The secondary data was collected from wildlife department of Bhilwara district . The collected data was analyzed. The expected and actual yield of maize, potato, peas and wheat was recorded during the study period via questionnaire survey from local farmers

I selected villages on the western boundary of the study site. Data on population of each village and total number of families of the village was obtained from each village head or Gram Panchayat. I sampled 20% families (in turn 20% farmers) from each selected village randomly using predesigned questionnaire. Before conducting the surveys, I obtained informal consent from village head of each village. I interviewed farmers for understanding the extent of human-wildlife conflict (both herbivore and carnivore) at the western boundary. Additionally, while sampling for crop damage estimation, I interviewed farmers along the transects perpendicular to forest cover farmers having their farms surrounded by forest for the crop-raiding and perception about the same .

Questionnaires were used for crop-raiding and for livestock depredation . They included questions about the agricultural practices, cropping patterns, perception about interaction with wild herbivores, crop-raiding patterns, raider animals, crop protection measures and guarding. The farmers were also interviewed for their opinion about crop loss and their estimates of crop loss, risk perception and attitude towards raider herbivore species. It also involved the attitude towards the carnivores they may encounter with, their estimates of loss owing to livestock depredation, and their views on conservation of wild carnivores. I involved three local farmers for carrying out the questionnaire surveys. With appropriate training and demonstration, the trained individuals were able to carry out surveys as per required standards. All the data were filled in questionnaire forms.

Results

The damage of agricultural crops by this wild animal has been a major menace that farmers are facing in the study site. Farming was found to be done in traditional way, though modern techniques and equipment were sometimes adopted, e.g. use of tractor and rotary tillers to plough the farms. Local farmers preferred pair of bullocks for basic agricultural

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practices such as ploughing and sowing as it was thought to give better results compared to tractors. Kharif crop was by-and-large completely rain-fed. Traditionally, water was stored in what is locally called as baawdi which is essentially a temporary and small-scale dam , If necessary water is pumped in from wells, natural pits or canals, however, use of irrigation equipment was scarce.

The main protection measure employed by farmers to avoid crop raiding by nilgai was manual guarding by staying vigilant at night to scare off the raiders. Farmers constructed a 10 to 12 feet tall watchtower or guarding platform or Machan, Location of agricultural farms near the forest boundaries explains the susceptibility of that farm to crop damage. Most of the cultivated crops are vulnerable to crop raiding [5,6]. While many species raid cultivated crops, nilgai in particular are known to be the most frequent crop raiders (Rajpurohit and Munhot,1987) . Crop depredation has a relation to the nutritional content are grown (Chauhan,2011). Crop raiding by wild nilgai sometimes resulted into conflict between humans and wild animals.

Crop raiding by wild animals is most frequent especially along the boundaries of agricultural fields are grown. Farmers also constructed a roof over the platform as partial protection from rain and wind which is usually made out of flexible sheets of bamboo. The raider individuals were scared off using torches, LED searchlights, loud scream, rarely using firecrackers and throwing stones at animals. Many times raiders were chased for long distances. During the study period there was no case of any animal being injured because of the guarding operations. Active guarding was thought to be necessary every night since a single unguarded night was perceived to be sufficient for complete loss.

Fencing the crop lands was thought to provide additional protection and farmers, predominantly those closer to the park made fences. The type of fence varied as per the severity of raiding incidences. This type of fence was also modified by using thorny plants like Acacia sp., Prosopis sp. and Zizipus sp. These fences were reconstructed almost every season.

The extent of damage to different crop species was different and so was the vulnerability. Also, different animal species showed choice for different crop species. Out of two predominant kharif crops, rice is raided least by animals. Only wild pigs were reported to feed on rice and in very rare circumstances were said to raid the fields which were close to forest cover. Early flowering and fruiting were the preferred stages for raiding.

Crop damage compensation

Farmers generally did not make compensation claims although they were aware of the government compensation schemes for crop damage. Out of the total farmers, we interacted with, there were only six cases of compensation claims. The main perceived reasons for the reluctance to claim compensation were the compensation amount being highly inadequate, the procedure being too tedious and corruption prone and the way of estimating damage being grossly inappropriate. Farmers often felt that the damage was not evident enough to be noticed and measured visibly during any inspection. The currently practiced procedure of estimating damage during a single inspection visit after claiming compensation therefore was not perceived to offer a justifiable compensation.

Discussion and suggestions

It is found that crop varieties, population of wild animals, distance of the farm from the forest and the surrounding ecology are the main factors in crop damage. This highlights the need for site-specific management techniques to minimize the crop damage problem by wild animals. At present it is almost impossible to bring down crop damage by wild animals like nilgai without management. People need to be educated to live with the situation by awareness programmes to deal with the incidences of attack on human beings and livestock.

Crop damage would differ according to the crop species, agricultural practices and microeconomics of farmers, the major damaging herbivore species, their habits, habituation and prevalent laws. Guarding crop fields during harvesting is most effective methods of preventing crop damage. Crop cultivator's guarding is the primary effective means of preventing crop raiding by wild vertebrate (Kate, 2012). The farmers need to mitigate crop raiding by wildlife is significant from the first day of sowing until they put the harvest into granaries. Farmers use traditional crop protection methods such as staying in field watching, throwing objects, producing noise by beating drums or shouting loudly to reduce crop raiding and these methods are mostly successful.

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Nilgai have become serious pests of agricultural crops and are competing for resource utilization with domestic stock (Caughley 1981, Howard and Dutta 1982, and Ghosh et al. 1987). There is also an increased use of cultivated lands on reserve peripheries by wild animals. Crop damage by nilgai has been widely reported from almost all corners of India (Prater 1980, Majupuria 1982, Schultz 1986, and Rajpurohit 1988). Rural societies existing on subsistence agriculture can ill afford to have their cultivations raided by these animals.

Realizing the seriousness of the problem, poor farmers or otherwise are now becoming increasingly intolerant to crop raiding. Some have developed outright hostile attitudes toward the animals and want to get rid of these pests. It has now become important that administrators and wildlife managers take the initiative to actively control the wildlife damage to mitigate this problem, which is also in the larger conservation interest.

Human-wildlife conflict is a complex issue. Not only the wildlife but also the human dimension of this problem needs to be addressed appropriately. Without understanding the perception and attitude of local people towards the wildlife, the actual magnitude of conflict may remain unnoticed. Most importantly, effective long-term wildlife conservation needs support of local people (Gillingham & Lee 2003) and to get their support, various problems faced by them should be addressed appropriately. The people living in conflicting situations often develop various assumptions based on their own observations and coping strategies to reduce the conflict. It is thus imperative to consider their observations and interpretations as hypotheses and test them scientifically.

Different ways has been practiced across northern-Western part and northern parts of India by farmers and different Organization bring this problem under implementation and the same can be suggested here as well.

Chemical Spraying :The unique method of keeping animals away from crops, farmers prepare a chemical the stench of which keeps Nilgai or other animals away from the farm. The chemical tied to a wooden pole keeps Nilgai and wild boar away from the farm for 10 to 15 days at a time chemicals are a great boon to these Crop Loss which are faced by farmers.

Enclosure : Corrals are constructed to confine a large proportion of Nilgai and Black buck in selected patch of forest .The population thus isolated should be subjected to fertility control to keep the numbers down

The ministry invoked the seldom used Section 62 of the Wildlife (Protection) Act, 1972, to declare the blue bull and wild pig vermin in Bihar for a year. Following this, approximately 250 Nilgais were killed in the past six months by professional hunters.

Solar or Electric Fencing:
This acts as an active deterrent, a physical barrier, and a reliable protection system for the villagers. The fence system produces a high voltage to deter, detect and deny physical intrusion by giving the Animal a short, sharp and painful shock which including Earthing Mechanism.

Light and Sound:
Nilgai has a sensitive rod when it comes to night vision animals eyesight are more than six times compared to we Humans and Sensored based sound devices are implemented in many regions across Bihar, Gujarath, Madhya Pradesh, Uttar Pradesh in which devices activate whenever there is a movement within Sensor Specified Range where different animals sounds are played in order to safeguard Crops by Farmers

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