

Use of predator controls to address human wildlife conflict

Abstract

Conservation professionals are becoming more proactive in collaborating with local communities when developing strategies for coexisting with predators. Community perceptions are, however, often still ignored including the social dynamics underlying residents' relationships with predator species and people's attitudes towards solutions that are suggested within conservation interventions. The effectiveness of interventions to mitigate or eliminate conflict are highly dependent on the context of the conflict, the landscape and communities involved as well as species behavior. Human-predator conflict persists in most landscapes where predators and livestock overlap spatially, and in many regions farmers and pastoralists are experiencing increased losses from felids, bears, and canids. How communities perceive the risk of predators to their livelihoods and the efficacy of methods to reduce risk are important factors for building local support and long-term success of conservation. While researchers often focus on quantitative measures of risk and efficacy of prevention tools, the negative impacts to wildlife stemming from human-predator conflict is emotionally and culturally driven by the communities that are being affected. The importance of perception is often overlooked in human wildlife conflict studies but is crucial to understand for development of long-term success in conflict reduction strategies.

Keywords: human wildlife conflict, carnivore, theory of planned behavior, conflict, compensation, non-lethal deterrent

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Introduction

Humans and large carnivores have coexisted for millennia, but the expanding encroachment of human development, the impact of land-use changes on wild habitats, changes to prey distribution and availability (including climatic effects) and, in some regions, natural recolonization or managed reintroduction of keystone predator species, means that likelihood of conflict continues to increase.¹ A great number of human wildlife interaction studies address problems of large carnivores. These animals tend to be very charismatic, generating large amounts of international support for their conservation,² although for people living alongside the carnivore the experience is a harsher reality. Large carnivores often prey on livestock, which is extremely destructive when the community's livelihood is dependent on agriculture or pastoralism.³ In the absence of practical or effective solutions, farmers often resort to retaliatory killings; using guns, traps, or poison to kill the predator.⁴⁻⁶ This is a lose-lose situation, as it is a threat to wildlife conservation and is not an effective way to reduce predation.⁷

Significant financial impacts of predation are experienced by livestock keepers in locations as geographically, culturally and contextually diverse as the USA,⁸ the Sundarbans of India and Bangladesh,⁹ Mexico,¹⁰ East Africa,^{11,12} the Himalayas,¹³ and the Brazilian Atlantic Forest.¹⁴ In some locations, human communities once somewhat separated from historic predator ranges now overlap with carnivore territories, for example in the high altitude valleys of the Himalayas¹⁵ where herders are losing growing numbers of their animals to snow leopards (*Panthera uncia*). In remote locations such as these, many families rely entirely on livestock for income, so livestock losses are financially devastating, and cause frustration that often prompts farmers to kill the cats in retaliation.⁴

The perceived effectiveness of predator control, namely the views of people in communities affected by predation, is rarely examined

when evaluating an intervention. These perceptions may be congruent with, or contrary to, objectively measured performance of the control and are vital to understand whether people support or commit to long-term use of any method. This is important, since deterrent systems and methods, if appropriately applied, have the potential to improve local attitudes and raise levels of tolerance of wildlife.

Lethal and nonlethal predator control

Killing predators is one option for humans to protect livestock, but alternative non-lethal livestock protection tools, such as the fence, the shepherd, and the scarecrow, have also been used for thousands of years in many communities.¹⁶ Lethal control, like hunting or poison, is used to decrease an area's predator population or completely eliminate the species.¹⁷ In contrast, non-lethal controls manage predation without killing the predator.⁷

While it may seem that lethal control would be more effective, this is not always the case, since seeking to kill the species of focus might require significantly more effort than using available non-lethal methods. A meta-analysis on predator controls found that lethal methods actually increased predation in multiple studies.⁷ Another literature review reported that 80% of non-lethal controls were effective in protecting livestock, versus only 29% of lethal controls.¹⁷

There are also ecological benefits to non-lethal strategies as they allow the predator to remain in the ecosystem, leaving interspecies relationships unharmed and territories intact.^{6,17} Non-lethal strategies work selectively on the animals that are preying livestock, as opposed to lethal controls that impact the entire species.⁶ They also benefit the conservation of endangered predator species by allowing the animals to live. Furthermore, non-lethal techniques will be particularly important in human communities where either social norms towards wildlife prevent killing, or where a community's lack of available resources mean that a lethal control option is not possible. Ohrens et

al.¹⁸ summarize the situation: “nonlethal methods that protect human property hold the greatest promise for finding a balance between the conservation of predator populations and human needs”.

Non-lethal methods include visual and audible alarms, secure covered pens or livestock corrals, guard dogs, human guards or patrols (often community members themselves), trapping and non-lethal removal of predators, and specialist fast response teams.^{1,6,19} Although some techniques, such as fast response teams or translocations of problem animals are highly effective in many conservation situations^{1,20} they may be impractical, or considered unhelpful by communities in the most remote, inaccessible locations.

Compensation and insurance schemes have been widely used to mitigate the impacts of conflict with wildlife^{16,21} but have not been tested in all regions. Rather than prevent livestock losses, these financial and resource-based mechanisms are intended to offset negative attitudes in communities impacted by, or fearful of, wildlife conflict.²² The aim of such schemes is to increase local tolerance, and ultimately reduce the likelihood of retaliatory killings of wildlife.^{16,23} Compensation schemes are an alternative to deterrents but, due to most schemes’ requirement for incident verification, offer a less immediate benefit to the person affected by livestock loss,¹⁶ presenting a particular problem for communities which are isolated from food resources for several months of a year such as in the high-altitude valleys of the Himalayas.^{24,25}

Clearly, however, if non-lethal deterrents which prevent losses are available then there is opportunity to reduce the immediate pressure on farmers, ranchers, pastoralists and resource collectors (e.g. fishers, honey collectors, firewood gatherers) without commonly-encountered conflict that causes direct killing and decline of the predator which may itself already be an endangered species.^{1,12,26,27}

Human wildlife interactions

The term “human wildlife conflict” is commonly used to describe a negative interaction between humans and animals.² However, this phrasing implies that wildlife intentionally acts to provoke people and undermine their interests when this is not the case.²⁸ Negative human wildlife interactions arise naturally when humans and animals inhabit the same environment and use the same resources.⁵ The majority of studies in this field have focused solely on the behavior of animals, neglecting to analyze the social impact on humans²⁹ and how those impacts shape human behavior (positively or negatively) in people’s interactions with wildlife, although there are a few noteworthy exceptions which examine these social factors.^{30–32}

In the past, when mitigating negative human wildlife interactions, conservation programs often ignored the needs of the locals and focused solely on the wildlife.² This resulted in programs that prioritized protecting animals over protecting people.²⁹ Many conservationists have attempted to remedy this in recent years by engaging communities in the decision-making processes of conservation initiatives.^{18,29}

Involvement of local people provides benefits for local stakeholders as they are given a voice, and therefore also aids conservation, as local support has been identified as crucial to the success of conservation initiatives.^{2,16,33,34} After all, local people themselves are in a well-informed position to identify an appropriate conservation approach for their community, rather than relying on the perspectives of outside organizations which have their own interests and agendas.³⁵ A broader basis of knowledge, aligning socio-cultural and scientific

understanding, provides better insight to inform potential solutions,^{36,37} and the goals of both conservationists and stakeholders must be valued and considered in future conservation initiatives.³³

Social dimensions of human wildlife interactions

Collaborations with stakeholder groups directly impacted by wildlife must take into account any social dynamics underlying the human wildlife interaction in question. Attitudes, experiences, and emotions all impact the relationship people have with animals and determine how they interact.^{14,38} Without analyzing this social dimension, a great deal of what is actually catalyzing the conflict could be overlooked when crafting mitigation strategies.²⁹ The socioeconomic group of an individual can influence a person’s opinion of predators. Wealthier people are more able to withstand livestock predation than poorer residents, which could reduce perceptions of overall risk³² while in other settings more educated residents have been found to have a more positive attitude towards wildlife.²³ Resentment between people over inequality or vulnerability can also influence attitudes towards wildlife.³⁹

How a community perceives the relative danger posed by predators appears to be greatly influenced by social dynamics.^{40,41} Societies attach strong connotations to animals based on their role in traditional folklore. This cultural aspect is so intertwined with the “real” animal that it inevitably impacts how threatening the predator is seen. It has even been suggested that a community’s attitude is more influenced by changes in their society than by actual predation.³⁹ An individual’s perception of a predator is also influenced by experiences they have had personally or heard about from others.⁴² Farmers often exaggerate when reporting attacks, which then intensifies the community’s fear.^{28,39}

A predator’s perceived risk is just as crucial for conservationists to understand as the actual risk. A study on community perceptions of lions (*Panthera leo*) in Tanzania found that villagers thought a lion attack was likely, despite there being a far less than 1% chance of it actually happening.⁴² Even though lions were not a genuine risk to the community, since people perceived them to be a threat, it was believed that the animals could be justifiably killed in the name of community protection.^{14,43}

It is easy for conservation practitioners to ignore these social aspects on the pretext that it doesn’t impact their mission, but conservation failures are frequently caused by focusing only on immediate concerns and neglecting to consider the bigger picture.^{29,39} In contrast, the most successful projects have invested time discussing issues with residents, building trust and understanding any social facets of the conflict.^{2,34} Conservationists need to uncover and tackle the social dimension of the conflicts they are trying to mitigate in order to successfully create long-term solutions.^{29,32} Human wildlife conflict issues are highly contextual, and a single species may affect different communities and localities in different ways. Understanding relevant dimensions in the context of the socio-economic situation as well as ecological landscape is therefore important.

Snow leopards in India as a case study in human wildlife conflict

A typical charismatic carnivore that experiences conflict with humans is the snow leopard (*Panthera uncia*) which is listed as vulnerable on the International Union for Conservation of Nature

(IUCN) Red List.⁴⁴ Snow leopards are found throughout central Asia, and travel across wide swathes of mountainous territory.²⁸ Snow leopards' large home-range territories mean the animals cannot be contained in protected areas so human communities living across the range need to be motivated in their conservation.^{33,45}

The land quality in Himalayan regions is typically poor and unproductive, meaning the human population is sparse and relies heavily on livestock farming to survive.^{4,5} Unfortunately, snow leopards are killing livestock with increasing frequency in many areas. Farmers are using a growing amount of snow leopard territory for livestock grazing, increasing the rate of interaction.⁴ There has also been a change in pastoral practices, as children who once were shepherds are now getting the chance to go to school.⁴ This leaves livestock herds unattended during the day, and therefore at increased risk of predation. This unconnected social shift poses new challenges to the relevance to the types of conservation methods available to reduce the threat of predation of livestock herds, emphasizing the contextual importance of effective intervention design. Knowledge of the social-ecological system⁴⁶ is therefore clearly very important.

There are also ecological shifts which are influencing the situation, including a change in the density of the snow leopard's wild prey. In India's northern region of Ladakh, in the state of Jammu and Kashmir, the snow leopard historically hunted animals like the blue sheep (*Pseudois nayaur*) and ibex (*Capra sibirica*), but these herbivores are disappearing due to land degradation and grazing competition from domestic livestock.^{4,47} Livestock now outnumber the wild prey in Ladakh,^{45,48} creating a perfect storm for livestock predation. Studies have shown that a smaller wild prey population results in more livestock killed by snow leopards and other predators.⁴⁹ Ladakhi residents have few alternative sources of revenue, so if their animals are killed, their income severely decreases.⁴ For a family with a herd of 50 animals, losing as few as three can cause financial strain, and snow leopards can kill much more than that.¹⁵ In Jammu and Kashmir, households lose an average of \$190 every year from predation, which equates to about 18% of their total yearly income.⁴⁵

The retaliatory killings undertaken by farmers in response to attacks are the biggest threat to the snow leopard's survival.⁴ While successful conservation programs have been able to boost snow leopard populations, there is concern that more leopards will result in more predation, with more leopards killed.⁴⁵ As livestock predation causes problems for both locals and conservationists, collaboration is necessary to create solutions that satisfy everyone's needs.²³

Ineffective livestock guarding has been identified as the root cause of most livestock loss in the Himalayas, not the presence of predators like snow leopards.⁵⁰ Weak or poorly designed night pens, which house herds overnight, allow snow leopards to enter and kill many livestock in one attack, called a "surplus killing".¹⁵ It is these attacks that anger farmers most and prompt the majority of the area's retaliatory killings.⁴⁵ The Snow Leopard Conservancy – India Trust (SLC-IT) has facilitated the construction of predator-proof night pens in many villages in Ladakh. Building more secure night pens protects both the livestock and snow leopards.⁴

There are many approaches that can be taken to reducing livestock loss. SLC-IT has been at work in Ladakh for many years, helping residents live with snow leopards by implementing livestock insurance schemes, alternate livelihood programs, and promoting better guarding practices.^{4,51} Predator proofing night pens protects livestock once snow leopards have already entered a village, but new predator controls are still needed to keep the cats out of human territory all together.

Perceived and functional effectiveness of predator controls

An individual's perception of a predator is based less on the actual risk they pose and more on social aspects like cultural norms or beliefs.³⁹ Similarly, the way people perceive predator controls is also subjective. In terms of human wildlife conflict, conservation interventions are purposed to reduce retaliatory killings and the long-term reduction of pressure on human communities, which may be measured directly or in the perception of people in those communities.

An effective predator control will prevent livestock losses, and consequentially reduce retaliatory killings of the predator. There are two ways to define effectiveness:⁵²

- a. Functional effectiveness, which measures changes following use of the predator control. This deals with quantitative data, such as the number of predator attacks.
- b. Perceived effectiveness, in contrast, is subjective; it measures whether users perceive the predator control to be decreasing predation, as influenced by three factors: (i) social norms and peer pressure, (ii) the user's belief that the control will work, and (iii) user's confidence in being able to use the method.

Perceived effectiveness is vital to achieve long term use of a predator control, in as much that users have to believe that the control is working.⁵³ Methods with high perceived effectiveness are considered more likely to be adopted by a community than those methods which simply evidence high functional effectiveness, suggesting that local opinion is incredibly important for the success of a predator control.⁵²

The Theory of Planned Behavior⁵⁴ suggests that the likelihood of someone completing a behavior is determined foremost by any social norms concerning that behavior, and then by the actor's personal feelings towards the behavior.⁵⁵ But behaviors that benefit wildlife are not always in line with social norms.⁵⁶ If conservationists are persuading locals to alter their behavior, they could be asking them to go against what is acceptable in their community. For example, a study on jaguar (*Panthera onca*) predation in Brazil discovered there was powerful societal pressure for men in the community to kill jaguars to obtain status.⁵⁷ In this situation, social norms would prevent people from easily adopting non-lethal predator controls. Users need to be confident that specific predator control methods will be tolerated by other members of their community in order to feel comfortable implementing it.⁵²

It is easy for conservationists to dismiss the views of livestock owners as being irrational if their perceived effectiveness of a predator control is less than the functional effectiveness, but the local opinion is valid since the success of conservation programs is likely to rely on community support.³ If there is a difference in perceived and functional effectiveness, that difference should be explored, as it highlights a lack of local satisfaction with the control. This potential block to implementation might otherwise be overlooked if conservationists only evaluated functional effectiveness.^{58,59} In addition, engaging commitment of communities may enable access to local knowledge of the predator species presence and ecology that might not be known and therefore be of direct importance to species conservation.⁶⁰

Conclusion

Humans and predators continue to interact in a range of different contexts across the globe, and conservationists must collaborate with locals to meet the resulting challenges. In order to do so effectively,

the social dynamics at play in the community's relationships with the predator and any predation solutions must be considered, as they may hold crucial information about what is truly causing the issues. The effectiveness of a predator control system is likely to be highly dependent upon cultural norms, social cohesion, resources, economics and the ecological landscape of the human wildlife interaction of concern.

To understand the best predator control intervention for a given context, an understanding of the needs of local people, and their constraints, is needed alongside a consideration of ecological factors. To sustain the commitment of people to tolerate the presence of wildlife over the long term requires a nuanced understanding of their perceptions of the impact of the intervention. Perceived effectiveness is an often-overlooked aspect of predator control studies, but important to understand for the solution to be successful at reducing attacks on livestock and retaliatory predator killings. By establishing the perceived effectiveness of an intervention, conservation professionals can better understand the suitability of a method to achieve successful predator control. Both the perceived and functional effectiveness of a predator control should be measured to ensure long-term success.

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Conflicts of interest

The authors declare there are no conflicts of interest.

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