Wolf Depredation Management

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During the summer of 2008, with the help of handlers and volunteers at the Trust, I embarked upon a research project as part of my final year of studies at the University of Southampton. After a thoroughly enjoyable placement at the Trust, made possible by Clive Readings the wolf keeper, combined with my lifelong interest, I knew I wanted to focus my research on wolves, ideally contributing to Wolf conservation. Yet it still remained for me to find a topic that was both practical, in terms of obtaining data, and productive, being beneficial to conservation efforts. After discussions with Toni Shelbourne and Vicky Hughes, the Trust's education officers, I decided to look into human-wolf conflicts and attempt to test some potential non-lethal solutions to the predation of livestock in the form of simple repellents that could serve to reduce and/or prevent predation of livestock by wolves in areas of the world where more expensive technological scare devices are not available.

Human-Wildlife conflicts arise when activities of wildlife coincide with activities of humans and reach a level that is considered to be unacceptable. Such conflicts are becoming increasingly significant as human populations expand and encroach further into natural habitats, and often result in disproportionate culling of the animals suspected to be involved. The US sheep industry loses 5% of its annual production to predation, part of which is caused by wolves. While these losses may seem small, they cause significant impacts on small scale farmers whose livelihood is based on the income from their herds. In many cases, the majority of losses are incurred by a small number of producers and certain hot-spots, resulting in increased costs and reduced animal performance. Consequently, in these areas "the wolf is still seen as a nuisance... predation upon livestock is the crucial factor in wolf persecution".

"Lethal control has had devastating impacts on some predator populations". In an attempt to reduce rates of predation by wolves, lethal methods are often seen as a final solution both historically and currently. In areas such as the UK, many large carnivores, including wolves, are now extinct and most large mammalian predators have been lost from 95-99% of the US and Mexico. "Protecting livestock reduces the necessity for killing wolves".

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Grey wolves are a top trophic level, keystone predator, responsible for the natural regulation of many populations including elk, moose and coyote amongst many others. By doing so, wolves have wider effects upon other species and the ecosystem as a whole, providing valuable ecosystem services, such as the regulation of river courses, which are of great benefit to humans. In the southern Greater Yellowstone ecosystem a "cascade of ecological events" was triggered when the grizzly bear (Ursus arctos) and the wolf (Canis lupus) became extinct in the local area.

As I am sure most readers already know, wolf conservation is not only moral but in our own best interest, and it is these facts that provided the motivation for my research. My hope was that the repellents I tested would prove to be successful, possibly adding another arrow to the conservational quiver of depredation management techniques currently in use.

There has already been some research into the effectiveness of deterrents and primary stimuli disruptors, such as fladry (thin strips of red fabric placed along fencing), strobe and acoustic devices. However, further research into other objects is needed to determine if they too can successfully disrupt predation.

Primary repellents immediately disrupt a predator's action through a number of mechanisms including neophobia, irritation and pain. Wild animals, especially wolves, appear to be inherently wary of new stimuli (neophobic). As we did not want any risk of causing harm to the wolves at the Trust, the use of neophobic devices presented itself as the most suitable. Disruptive stimulus approaches show potential due to their low cost and simplicity, however, predators rarely form a conditioned response (reaction based upon a stimulus input, which is so strong that negative effects do not always have to be experienced in order for the desired behavioural response to be enacted) and will eventually habituate (become accustomed/used to). As a result, the predator will lose its responsiveness and fear due to a lack of consequence after exposure.

The testing of repellents ran for a period of six consecutive weeks in order to view the effects of continual exposure and levels of habituation and therefore effectiveness of the different scare devices. Some of the wolves at the Trust are easier to work with than others. After investigating the availability of handlers it was decided that I was to have three separate test groups consisting of Mai and Mosi, Duma and Dakota, with Torak being tested alone. Each week the wolves were exposed to fencing with the various simple repellents hanging at intervals. Handlers were informed not to interfere with the wolves' behaviour except in order to prevent contact with the fence. Dakota proved a particular challenge in this, her habit of grabbing things being well known. The

wolves' responses to repellents were observed by myself in the form of an ethogram (behavioural observations) logging the proportions of the wolves' actions that were fearful, inquisitive or simply just oblivious to the potential repellents. I then collated and analysed the data in order to understand how the wolves reacted to each potential repellent and how this reaction changed due to increased exposure. Did the wolves learn to be less fearful of the potential repellents due to a lack of negative reinforcement?

The different test groups and potential repellents affected the levels of fear elicited. Unsurprisingly, the younger and more adventurous Mosi and Mai, given extra confidence by being tested together, did not show statistically significant fear towards any of the potential repellents. Interestingly Mosi, the lower ranking wolf, interacted more with the fencing than Mai did, who was generally more cautious. A similar observation was drawn from the testing of Duma and Dakota (lower ranking). Duma and Dakota showed significant fear towards flagging and wind chimes (seen with Torak also) which were the most effective of the potential repellents tested, showing some level of success which did not decline greatly over the test period but negated habituation. Torak was also found to be fearful of lion scented faecal pellets. Small bells were found to be very ineffective for all groups, and in general CDs and lion scented faecal pellets showed initial signs of success; however the wolves habituated to them with exposure. This culminated in Mosi and Dakota ripping apart the fences in the final test week, arguably showing a great decline in repellent effectiveness. However, this may be interpreted conversely as destructive acts can also be construed as

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behaviours enacted to cope with fear or stress.

Disruptive stimuli work on the basis of being novel and undesirable. Behavioural responses to aversive events vary greatly. The more noxious the stimuli, the stronger the aversion. The animal's ability to predict and control threatening events determines the intensity of emotions exhibited, predators may learn that random firing of repellents have nothing to do with their activity and over time may habituate and learn to cope with the repellent.

There are many factors which are likely to influence the effectiveness and applicability of non-lethal management techniques in the field. The results produced by my research at the Trust do, however, support the inclusion of non-lethal livestock protection devices in integrated predation management. Environmental factors need to be combined with site and farm factors in order to fully understand and predict susceptibility and appropriate management measures.

A wide range of non-lethal methods have been developed to limit predation upon livestock. Regrettably, many have practical limitations and are unlikely to be widely applicable. It is therefore important to incorporate a range of rotatable methods in an adaptable scheme in order to achieve greatest success. The improvement or reinstatement of traditional livestock husbandry techniques such as corralling stock at night should be used alongside repellents in order to achieve success in decreasing livestock depredation.

Value placed on wild animals depends heavily on species knowledge of local peoples; education is a major conservational tool in changing attitudes

and promoting tolerance. Change in human attitudes can be achieved through pro-active co-management plans and stakeholder involvement. Only once human, environmental, carnivore and site specific factors are taken into account can an adaptable management plan be implemented and conservation of large carnivores achieve success. It is of utmost importance to keep striving to discover and test the effectiveness and field application of non-lethal depredation controls if large carnivores and humans are to co-exist peacefully.

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Pete with Mai at the UK
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The complete research dissertation is available on the Trust's website: www.ukwolf.org/dissertations

Images of Fladry use courtesy of Defenders of Wildlife, Washington DC, USA.

Visit www.defenders.org/proactive for more information on Fladry use and other depredation techniques.