



## Reducing conflict between livestock owners and predators in Costa Rica

July 2018

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### Introduction

When people and wild carnivores live in proximity to each other, interactions between the two groups can occur. These interactions may include conflict if predation of domestic animals occurs. Livestock owners in the Rivas Valley, Costa Rica have recorded wild animals on their land and have attributed some livestock deaths to wild carnivores. This can lead to resentment towards carnivores and a reduction in tolerating them.

The Rivas Valley is a matrix of forest and agriculture, as well as being home to several species of carnivore threatened with extinction. These include the Jaguar (*Panthera onca*), Oncilla (*Leopardus tigrinus*) and Margay (*Leopardus wiedii*). To help maintain stable carnivore populations, it is beneficial to restrict the use of lethal control, as this can impact negatively on their numbers. This study therefore aimed to identify attitudes and practices which allow people to coexist with wild carnivores, thereby lessening the conflict. This was undertaken by interviewing residents of the Rivas Valley area, including livestock owners, to gauge their tolerance of wild carnivores. In this report, the term 'livestock' will refer to all domestic animals, including poultry, which are kept for domestic use or profit. This excludes animals kept as pets. 'Chicken' will refer to hens, broilers and cockerels.

### Method

Livestock owners in the study area, as potentially suitable participants for this research, were identified through contacts in the area and by approaching people at local agricultural markets. Participants who resided in the Rivas Valley, but did not own livestock, were found by randomly sampling people approached in the community centres, markets and centres of the villages in the district.

Participants were interviewed or given a questionnaire concerning their animal ownership practices, experiences with predation (if applicable) and attitudes towards carnivores, along with optional socio-economic questions. Participants were given the opportunity to share their views on lethal predator control and comment on their perception of wildlife and conservation in the area.

Upon completion of data collection, the qualitative responses to the questions were then analysed to identify common themes in participants' responses. These themes were compared amongst the three participant groups: those with livestock who experienced predation, those with livestock who did not experience predation, and those without livestock, to investigate if predation effected people's tolerance of predators.

### Results

In total, 54 people took part in the study, half (27) being owners of livestock. Of those 27, 11 stated that they had experienced predation by wild carnivores in the 12 months preceding this study (May 2017 - May 2018).

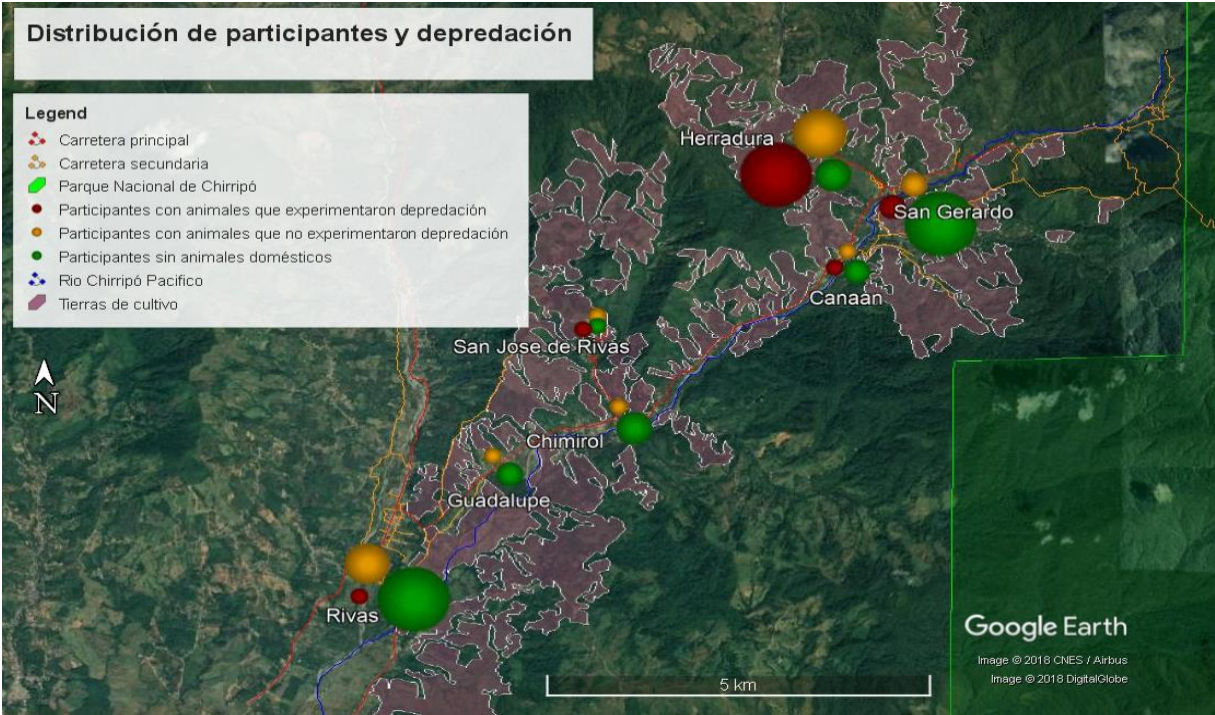
The 27 participants with livestock owned 823 chickens and 151 cattle between them, as well as other livestock and pets (Table 1). In total, 48 chicken deaths and 13 cattle deaths were attributed to wild carnivores. Two participants also lost livestock to feral dogs (*Canis lupus familiaris*). Most predations occurred in the Herradura area (Figure 1). Attacks on chickens were most common during the day whilst cattle were predated mostly during the evenings (Figure 2). All participants who experienced cattle predation stated that the attacks occurred near the forest. Of the 27 livestock owners, 24 implemented measures to deter predators, principally secure fencing and keeping dogs (Table 2).

**Table 1.** Total ownership of livestock across participants and the number of attacks on livestock by wild carnivores in the past 12 months. Attacks by feral dogs and unknown predators are excluded.

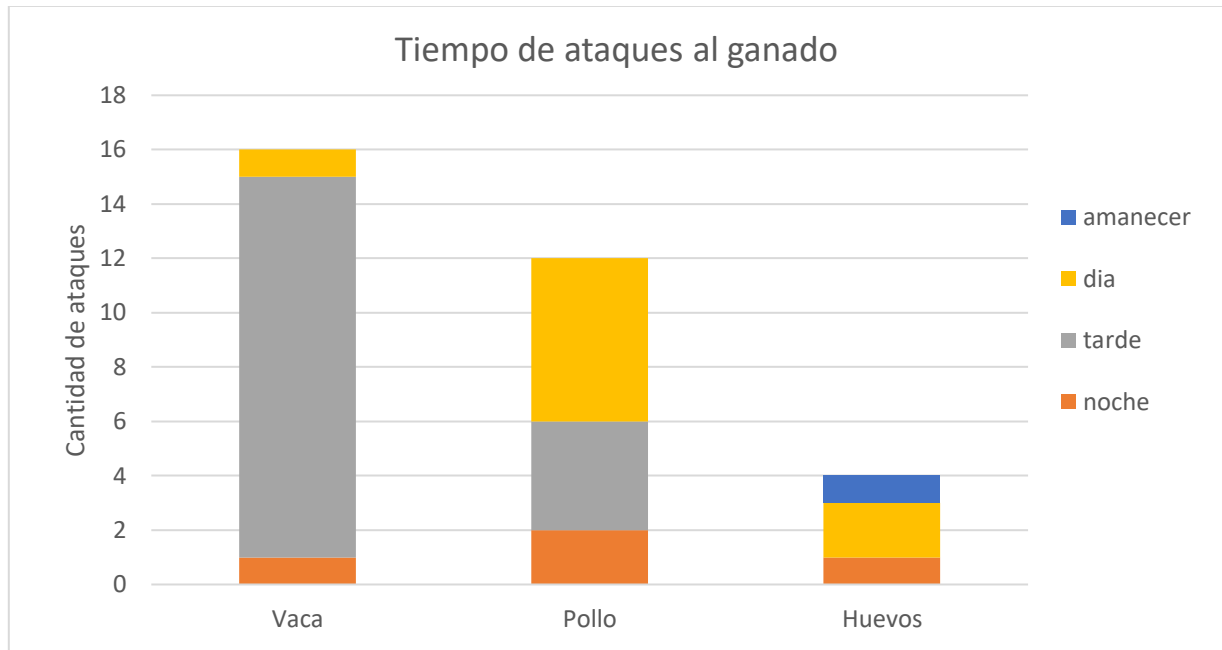
	Chicken	Other poultry	Rabbit	Dog	Cat	Horse	Sheep	Goat	Pig	Cow
<b>Total owned</b>	823	30	7	67	29	27	4	9	5	151
<b>Number killed</b>	48	0	0	0	0	0	0	0	0	13
<b>Number attacked (non-fatal)</b>	8	0	0	0	0	0	0	0	0	2

**Table 2.** Methods used by participants to deter predation.

Deterrent	Number of participants with livestock using deterrence
Securing animals at night	20
The presence of dogs	21
Lights	2
Vigilance	1
Lethal control	0
No deterrent used	3

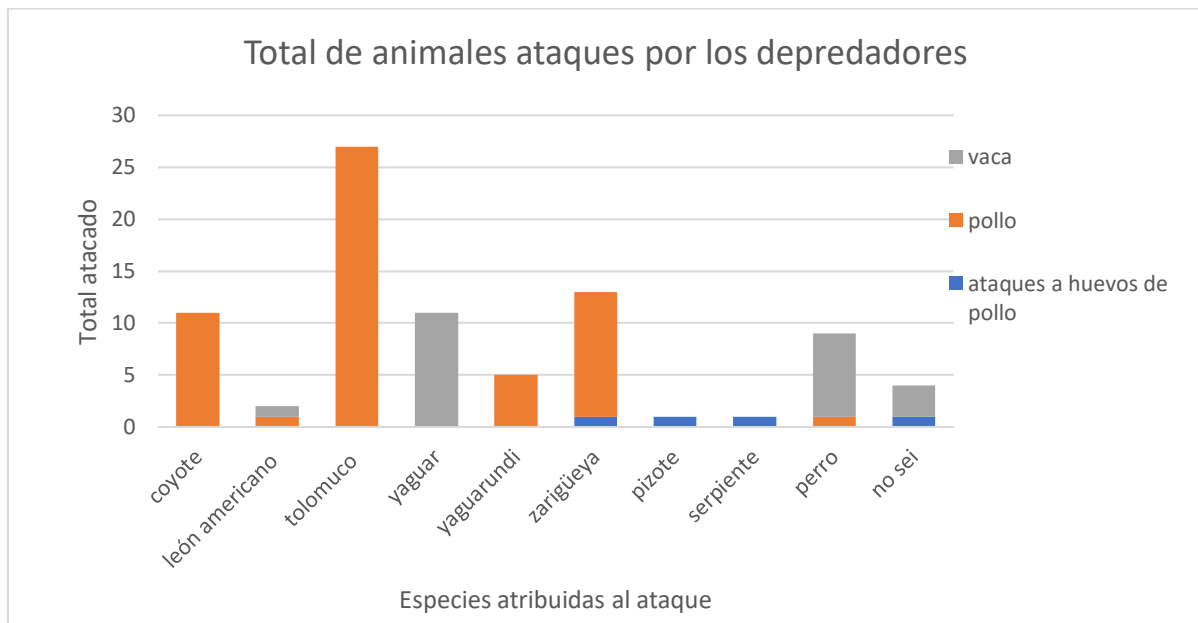


**Figure 1.** Distribution of study participants and attacks on livestock. The size of circles is representative of the number of participants (between one and eight).



**Figure 2.** Approximate time of day of attacks on livestock and chicken eggs by predators.

Wild carnivore species which had livestock deaths attributed to them were: Common Opossum (*Didelphis marsupialis*), Coyote (*Canis latrans*), Jaguar (*Panthera onca*), Jaguarundi (*Herpailurus yagouarundi*), Puma (*Puma concolor*) and Tayra (*Eira barbara*). Feral dogs were implicated in attacks on both chickens and calves. Although present in the Rivas Valley, no livestock predations were attributed to the Ocelot (*Leopardus pardalis*), Margay (*Leopardus wiedii*) or Oncilla (*Leopardus tigrinus*). Two participants stated that they had lost chicken eggs to a White-nosed Coati (*Nasua narica*) and an unidentified snake species (Figure 3).



**Figure 3.** Total number of livestock attacked (both fatally and non-fatally) by predators between May 2017 and May 2018. Attacks on eggs are recorded as one attack per event.

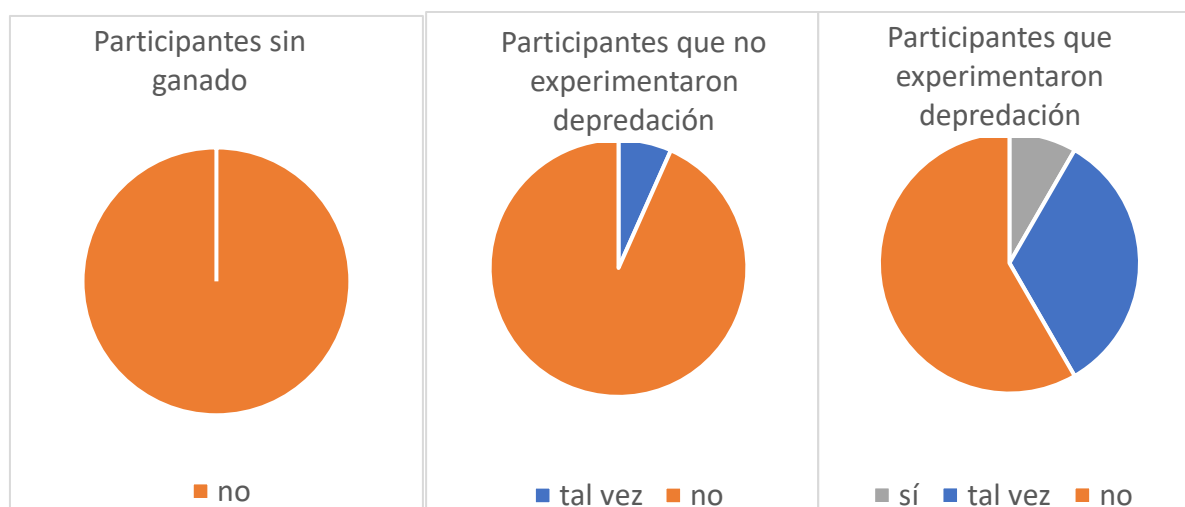
When asked how they felt about wild carnivores in general, 31 out of the 54 participants declared positive feelings. Eight identified as being fearful or apprehensive about carnivores, whilst 15 were indifferent or had mixed feelings (Table 3).

Concerning their attitude towards wild carnivores on their property, 10 of the 54 participants said they were accepting of the idea, 19 were indifferent or had mixed feelings, whilst 25 participants said they did not want carnivores on their land (Table 3). Participants who were less tolerant primarily cited fear of potential interactions or conflict with predators as the reason why. A perceived threat to themselves or their children and damage to their property were also mentioned.

**Table 3.** Tolerance of wild carnivores by residents of the Rivas Valley, Costa Rica.

	General attitude towards carnivores		Attitude to carnivores on participant's land	
	Participants with livestock	Participants without	Participants with livestock	Participants without
<b>Positive</b>	16	15	4	6
<b>Scared</b>	3	5	2	2
<b>Other negative</b>	0	0	11	12
<b>Indifferent or mixed</b>	8	7	10	9

In response to asking their views on lethal predator control, 48 of the 54 participants were against using it, five said they might use it, and one participant said they would use it, if they felt it necessary for protecting their livestock (Figures 4 to 6). No participant claimed to have used lethal control measures to date. Participants were opposed to lethal control measures for ethical reasons and because of a lack of faith in its effectiveness. Some participants suggested alternate ways to managing conflict between people and carnivores. These included translocating 'problem' carnivores, erecting fences between natural and agricultural habitat, and financial compensation for livestock predated by carnivores.



**Figures 4-6.** Participants' responses to the acceptability of lethal measures to control wild carnivores.

### Discussion of the Results and Recommendations

The results of this study indicated that people without livestock were more tolerant of wild carnivores (Figures 4 to 6), although a larger sample size would be needed to say for certain. Many participants who stated that they had positive feelings about carnivores said it was because they did not have any conflict with them, whilst those who disliked wild carnivores said the opposite. This implies that conflict can affect people's tolerance to wild carnivores and therefore should be addressed.

The difference in responses of participants who experienced predation and those who did not is likely influenced by the differing impacts carnivores can have. Many participants with livestock made their

living this way and, in these cases, the impact of predation can be financially devastating. This indicates the importance of reducing predation to improve people's tolerance of carnivores.

Following certain management strategies may help to reduce the risk of predation. Securing animals at night was identified by participants as being a successful deterrent for wild carnivores. As all the cattle deaths attributed to wild carnivores occurred in the evening or night (Figure 2), locking up cattle securely, particularly calves, before dark may be beneficial at reducing predation and conflict.

All cattle predation recorded in this study occurred adjacent to the forest. Therefore, stopping livestock from grazing near the boundary of the forest could be effective at reducing attacks. In areas with high amounts of predation, land adjacent to the forest could be used for purposes besides cattle grazing, where possible. This would help form a natural barrier between the forest and livestock and could help to decrease predation.

Participants stated the importance of fencing for securing their livestock. In circumstances where grazing next to carnivores' natural habitat is unavoidable, erecting fences between carnivores' natural habitat and farmland could therefore be advantageous in reducing predation. However, participants who owned large areas of land near wild carnivores' natural habitat said that they were unable to implement fencing on all borders of their land owing to the vastness and financial expense. Since calves were more likely to be predated than full-sized cattle, priority should be given to fencing calves. Taking measures to reduce predation before it occurs would mitigate potential conflict.

Several of the suggested methods by participants for reducing conflict, such as translocating carnivores, large scale fencing and financial compensation, would all require monetary and logistical support from large bodies, such as governments or NGOs. This indicates that livestock owners would like support in reducing the risk of livestock predation. This does not mean, however, that carnivore management is the sole responsibility of these organisations. Non-lethal control measures were instrumental in reducing livestock predation (Table 2) and, therefore, should be utilised as part of a carnivore management scheme with shared responsibility amongst stakeholder groups.

Contrary to what was expected, more participants who did not own livestock were afraid of predators than participants who did (Table 3). One possible explanation for this result is that people without livestock have been less exposed to wild carnivores, and therefore perceive the threat of carnivores more strongly. This implies a disconnect between the actual and perceived threat of predators. Education concerning behaviours and benefits of wild carnivores may help to reduce these fears.

The results of this study indicate that environmental awareness can help to increase people's tolerance to wild carnivores. Without being prompted, participants expressed the importance of wildlife conservation and the value of wild carnivores to them. Even participants who had experienced predation, and did not want wild carnivores on their land, still voiced respect for these predators. Participants who appeared knowledgeable about the natural environment, for example by noting the importance of apex predators in an ecosystem, were generally tolerant of wild carnivores. This demonstrates how vital education is for increasing tolerance of wild carnivores.

## Conclusions

Tolerance to carnivores was found to be dictated by numerous factors. However, awareness of wildlife conservation and taking precautions to reduce predation were found to increase tolerance. Most participants were tolerant of wild carnivores unless they had, or anticipated, a problem with them. Therefore, the importance of reducing conflict cannot be undervalued.

The term 'conflict' implies a problem. However, this study demonstrated that people typically want wild carnivores to remain part of the landscape. The people of the Rivas Valley have helped show that coexistence between people and wild carnivores is not only possible, but also instrumental in maintaining wild carnivore populations.

### **Further research**

It is recommended that future research on carnivore tolerance focus more specifically on what has contributed to people's attitudes towards carnivores. For example, people sharing their experiences with wild carnivores and what has influenced their behaviour towards predators would be useful for understanding people's attitudes. Since people without conflict are more likely to be tolerant of wild carnivores, an area of focus should be on those who have experienced multiple depredations by carnivores.

### **Acknowledgements**

Thank you to all the participants of this study for making the research possible. Thanks also go to people in the Rivas Valley who found participants for this study. Finally, thank you to Jennifer Powell, Casey McConnell and Cloudbridge Nature Reserve for helping to implement this project.