

Research

DESIGNING AND TESTING AN ELECTRIFIED FLADRY-TYPE SYSTEM PROTECTING CALVES FROM WOLVES IN SPAIN

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1. Introduction

Asturias is a largely mountainous autonomous community in northwest Spain. A variety of settings are used for livestock production, with optimal areas for grazing ranging from meadows near the coast to pastures in the Cantabrian mountains over 2,000 metres above sea level (Fig. 1). Livestock farmers share the landscape with brown bears (*Ursus arctos*) and, especially, wolves (*Canis lupus*).

There are wolves in more than 75% of Asturias, with nearly 40 packs documented in the last census (GPA, 2019; MAGRAMA, 2015). They feed on both wild and domestic prey and their diet varies across Asturias. In some western areas, roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*) and other wild prey comprise more than three quarters of wolf diet. In other areas, livestock (mainly horses) are the main



Fig. 1 Typical landscape of middle mountains in central Asturias.

(All photos: FAPAS)



Fig. 2 Spanish Mastiff guarding cattle and horses in the Cantabrian mountains.

prey (CARA, 2015). There are nearly 16,000 cattle farms with more than 400,000 head, typically for meat production and mostly of the local Asturiana de los Valles breed (SADEI, 2017). Wolf damage has been compensated since 1997 by the regional administration. According to official records, in recent years an average of 3,000 animals have been killed annually (CARA, 2015).

In rural middle mountain areas, at elevations from 500 to 900 metres, the most important economic activity is extensive cattle grazing. This is vulnerable to predation and suffers the highest level of damage by wolves due to the husbandry system, which lacks adequate protection measures. Young calves graze with their mothers during summer on private lands, usually of a couple of hectares in size, and may not always be confined in stables during the night. The owners live far from their livestock, which is not supervised on a daily basis, and they are mostly dependant on financial support from the EU's Common Agricultural Policy. This management system is completely different from that in the high mountains, where cattle graze freely and without young calves, which are kept in lower areas and protected by livestock guarding dogs (Fig. 2).

Wolves are not a game species in Asturias, but population management is based on culling, with annual quotas set according to wolf abundance, complaints of livestock depredation and social conflicts. North of the River Duero, wolves are included in annex V of the European Union's Habitats Directive, which permits a more flexible regime of lethal control. Each year 6–32 wolves (mean = 16) are culled as part of the regional management plan (CARA, 2015). However, this strategy does not eliminate predation on

livestock. Although a period with no damage may follow the killing of wolves, the problem soon recurs when new wolves reoccupy the territory.

To prevent wolf damage to extensively grazed cattle in Asturias, the Fund for the Protection of Wildlife (FAPAS) has been studying wolf predatory behaviour in order to identify the most suitable husbandry system and to develop new damage prevention measures. Specifically, the goal was to devise a type of fencing that is practical to use in mountainous terrain and can protect young calves during their first few weeks of life, when they are most vulnerable to wolf predation, thus reducing losses to the livestock sector and mitigating conflicts with wolves in the region.

2. Study of wolf predatory behaviour

In 2016, FAPAS started using camera traps and video monitoring, complemented with direct observations, to study wolves in areas with donkeys and Asturcon horses. A total of 16 cameras were set up in pastures of 0.5–2 hectares at elevations of around 900 metres. During a 4-year period, a total of 3,500 images were obtained, which were used to analyse wolf behavioural patterns linked to attacking and feeding on livestock. From these records it was evident that, when hunting large livestock, wolves exhibited more wary, vigilant and elusive behaviour than when hunting wild ungulates, presumably in order to remain undetected and avoid potential danger (Fig. 3). In contrast to those on wild prey, attacks on livestock were slower and took place after a cautious approach (e.g. moving slowly with the body close to the ground and tail between legs). Wolves abandoned their attacks in all cases in which they were disturbed or startled.



Fig. 3 Wolves are typically very wary when approaching livestock or carcasses. This image from a camera trap shows a wolf reacting to movement in the vicinity of a carcass.



Fig. 4 A young calf bitten by a wolf on the hind leg.

No group attacks or high-speed stalking were observed and on many occasions interactions between wolves and cattle did not involve attacks, i.e. wolves approached or walked through a group of animals without disturbing them, or the livestock chased them away. This behaviour may result from the fact that in this area there are mostly small groups of 2–3 wolves. This is probably because the population is depleted by culling, although of course wolf numbers increase again after breeding. It could be helpful to know more about local wolf population dynamics and how these small family groups use the area. Unfortunately, the regional government in Asturias does not allow FAPAS to capture wolves for telemetry studies in areas with livestock.

3. Pilot experiment to protect calves

In March 2019 we enclosed an area of one hectare (perimeter 100 × 100 m) with a fence to develop and field-test a system that could prevent wolf attacks. To

this end, we reached an agreement with the owner of a small family-run cattle ranch in the Council of Grado (in the centre of Asturias) which has suffered losses of cattle to wolves. The owner lives in town, 60 km away from the ranch, so controlling and managing his cattle due to wolf presence implies a considerable daily effort. Between January and April, three of his calves were attacked (wounded or killed) by wolves. It was clear from the wounds on the young calves (Fig. 4) that a single wolf was responsible: multiple wolves could have killed the calves and a larger pack would have consumed it completely. We therefore faced a typical situation of wolf attacks on cattle in these middle mountain areas in Asturias.

A fence was used to enclose nine calves and their mothers in the pasture during the day. The herd was confined in stables at night. The fence was developed based on our observations of wolf predatory behaviour, which suggested that a design involving unpredictable and erratic movements could deter wolves. Using PVC poles at 3-metre intervals, we installed an electric tape for horses at a height of one metre above the ground, from which 80 cm long pieces of the same tape were stapled every 25 cm so that they moved freely in the wind. A ‘gate’ was made with a plastic handle for electric fences, allowing a section of the fence to be opened easily (Fig. 5). To prevent calves passing under the fence, a metal wire was added below the tape, 30 centimetres above the ground, attached to the same PVC poles (Fig. 6). The entire fence (tapes and metal wire) was electrified with a voltage of 3–5 kilovolts using a 12V battery.

Five cameras were set up around the fence to monitor any wolf approaches during the monitoring period, from April until the calves were sold in July (calves are usually sold when 4–6 months old) and the herd was moved to another pasture. While the



Fig. 5 General view of the fladry fence, showing the handle (red) used to open the ‘gate’.

fence was installed, no wolf passed it and no damage occurred inside the fence, although an adult cow was found dead nearby.

4. Improving the fence

We have reached a new agreement with the cattle breeder to allow us to improve the fence and make it simpler to use whilst also resolving issues that arose during the first trial. For example, some of the hanging tapes tangled in the metal wire, although they usually disentangled themselves and this was not considered a major problem for the efficacy of the fence. Some hanging tapes were torn off by strong wind and subsequently tied onto the horizontal tape. Shortening these tapes could help avoid loss of power in the fence due to touching tall grass.

We plan to test the fence with only the metal wire electrified in order to determine whether wolves are deterred by the movement of the hanging tapes or the electric shock received when fence elements are touched. A further trial will also enable us to gather more data about the duration of the deterrent effect



Fig. 6 A cow and calf inside the electric fence. The arrows indicate the position of a metal wire that prevents calves from passing under the fence.

on wolves. With similar types of barriers such as turbo-fladry, an initial period of neophobia (see Nuninger et al., 2017 in *CDPnews* issue 13) is likely to be followed by habituation (e.g. Lance et al., 2010).

Acknowledgements

I would like to thank FAPAS biologist Doriana Pando for many hours spent analysing photographs and videos; my colleagues Luis, Monchu and Cristina for their work building the fence; and Antonio, a cattle breeder of Restiello, who allowed us to conduct trials at his farm.

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