Focus

HOW TO REDUCE WOLF PREDATION ON WILD PONIES IN GALICIA?

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1. Introduction

1.1 A tradition in peril

In uplands near Europe's Atlantic coast, from the British Isles to the Iberian Peninsula, free-ranging populations of wild ponies *(Equus ferus atlanticus)* live (Bárcena, 2012; Nuñez et al., 2016). In Galicia and NW Portugal, local people utilise them as a natural resource under a traditional system of minimal intervention. In the past the manes and tails of mares were cut to make rope or mattresses and ponies were removed from the mountains to be tamed and used as working animals and for transportation. Since the 1960s, foals have been taken for meat, which has become the main use of these ponies (Iglesia, 1973).

The traditional husbandry system is valued due to strong cultural ties between local communities, their ponies and social gatherings (Lagos, 2019; Nuñez et al., 2016), as well as anthropologic interest and copious symbolic aspects (Hartigan, 2020). During the annual *curro or rapa das bestas* (Shave of the Beasts festival), ponies are rounded up and driven into enclosures *(curros)* where the manes and tails of mares are sheared, foals are fire branded and some are taken for meat. For the rest of the year, they live in the mountains.

There is intrinsic value in wild horses living under natural dynamics and social organisation. Furthermore, the presence of Galician wild ponies in the mountains offers multiple ecosystem services. Native pony grazing is recognised as valuable for the conservation of habitats (Bárcena, 2020; Fraser et al., 2019). In particular, wet heathlands grazed by ponies (Fig. 1) have higher levels of plant biodiversity (Fagúndez, 2016). Ponies also contribute to wildfire prevention due to their consumption of inflammable shrubs such as gorse *(Ulex europaeus)* (Rigueiro et al., 2012).

Fig. 1 Galician ponies on Atlantic wet heathland, an EU priority habitat. *(Photo: Laura Lagos)*

For various reasons, the traditional system is in decline. Today, there are around 10,000 free-roaming wild ponies in Galicia (Lagos et al., 2020), whereas in the 1970s there were about 22,000 (Iglesia, 1973). One of the factors contributing to this situation is predation, but the situation is complicated by bureaucracy, political decision-making and several other factors.

1.2 Wild ponies, wolves and regulations

Throughout history, Galician wild ponies have coexisted with Iberian wolves *(Canis lupus signatus)*. Their free-roaming lifestyle in the mountains is vulnerable to predation, especially on foals, and wherever both species coexist ponies constitute the main prey of wolves (Álvares, 2012; Lagos and Bárcena, 2018; López-Bao et al., 2013). The impact of predation, which can be especially high where wild prey populations are depleted, has been estimated at 33 foals per 100 mares (Lagos, 2013). This could entail a loss of € 2,000–5,000, depending on current market prices each year (see the article by Freitas and Álvares in this issue).

In the past, pony exploitation was not regulated and had no administrative charges, so management costs were low, which to some extent compensated for economic losses due to predation. Under national and regional laws from 2008, the system has been regulated as livestock production, with hardly any consideration of its peculiar system. Local people who exploit ponies, called *besteiros* in Galicia, are now considered professional farmers. They have to register their animals and identify them with an electronic transponder according to the European regulation for the identification of equids (Commission Implementing Regulation (EU) 2015/262)[1]. The derogation considered by this regulation for equids living in wild or semi-wild conditions in certain areas, establishing that they shall be identified only when they are removed from such areas or brought into domestic use, has not been applied in Galicia.

If ponies are duly registered and identified they, like all horses, are included in the Galician system for compensating damage to livestock by wolves, which started in 2003. As is customary in such schemes, compensation is only paid if carcasses are located and the cause of death determined. However, finding the remains of foals that were predated by wolves in the mountains is a difficult task.

Under these circumstances, the perception of loss by *besteiros* has increased since ponies are now associated with a higher bureaucratic and economic burden and, at the same time, they often do not receive compensation for losses since predated foals are difficult to locate. As a result, in some areas the wolf is now considered by pony owners as the main impediment to the survival of this traditional system of equine exploitation (Lagos et al., 2019). In addition, the significant reduction in numbers of wild ponies in Galicia (Fagúndez et al., 2017), which had a range of causes[2], may have led to a concentration of damage on those animals still dwelling in the mountains.

Despite recognition of the benefits of Galician wild ponies on the landscape, when looking for solutions to reduce losses to wolves, the only prevention measures that are suggested and subsidised are the same as for cattle, sheep and goats: electric fences and livestock guarding dogs (LGDs). However, these methods are not compatible with free-ranging animals in large mountain landscapes without the regular human presence that is characteristic of livestock husbandry. Owning LGDs implies a cost and attention that has never been devoted to this activity and that is not worthwhile because of its low profitability. In addition, pony herds or 'bands' inhabit remote places that are not frequently visited, which poses a problem for feeding LGDs. Often, multiple bands live in the same area, each of which would have to be accompanied by dogs. Furthermore, bands are formed of ponies from several different owners. Mares changing bands, or stallions attempting to steal mares from other bands, could make it difficult for LGDs to protect all the animals in a band effectively. Even the process of socialising LGDs with ponies is difficult to manage as it necessitates a period of confinement that hardly fits with wild pony behaviour and management. Therefore, both electric fences and LGDs could entail a change in management towards the confinement of ponies or their rotation among fenced pastures, resulting in the loss of a traditional system and the ecosystem services associated with it.

Finding ways to make pony bands less vulnerable to wolf predation can improve coexistence of humans and wolves without necessitating the abandonment of the free-roaming system. This could be beneficial for wolf conservation and, at the same time, may allow an increase of pony populations in areas where their presence is important for habitat conservation.

[1] https://eur-lex.europa.eu/legal-content/GA/TXT/?uri=CELEX:32015R0262

[2] These include the disappearance of most of the traditional uses of ponies, conflicts with other land uses (forestry, intensive livestock production systems that mean the transformation of heathlands into improved pastures where ponies are excluded), collisions with vehicles, administrative burdens and an aging and declining rural population (Lagos et al. 2020).

1.3 Identifying best management practices

Within this context, it is necessary to find solutions based on scientific knowledge to reduce the vulnerability of Galician ponies to wolves without radically changing the husbandry system. Best management practices therefore have to go beyond simply dogs and fences. Other measures are needed to help maintain the traditional system including improving the administrative consideration of wild ponies, reducing conflicts with other land uses and preventing vehicle collisions with ponies.

Here, we summarise the findings of a study on the ecology of wolf predation on wild ponies in Galicia (Lagos, 2013), including an assessment of variables that may be managed in order to reduce predation risk. On the basis of these results, we suggest management practices aimed at achieving a pony band social structure that is likely to be more resilient when faced with wolves.

2. Predator-prey ecology

The ecological relationship between wolves and horses is little known worldwide, because a large proportion of current populations of free-roaming or wild horses, such as mustangs in North America, feral horses in Australia and ponies in the British Isles, inhabit areas outside the occupied wolf range (Bureau of Land Management, 2014; Boitani et al., 2018; Nuñez et al., 2016). We therefore conducted research in Galicia, NW Spain, with the aim of improving knowledge of predator-prey interactions between wolves and Galician ponies (Lagos, 2013).

2.1 Study area and methods

We assessed births and deaths in a population of 74 adult ponies in the Dorsal Galega mountains (Fig. 2) using an individual-based approach. The ponies formed six bands, with 12–28 adults in each, in three mountain areas 3 km apart. There were 1–2 wolf packs in the area and the total number of adults fluctuated in the range of 9–22 during the three years of the study, 2006–2008. The wider region has c.5–10 wolves/100 km^2, which is among the highest densities in Europe. Wolf diet is centred on ponies (34% of occurrence in scats), extensively and semi-extensively grazed cattle (32%) and carrion from pig farms (14%) (Lagos and Bárcena, 2018). Roe deer *(Capreolus capreolus)* and wild boar *(Sus scrofa)* are present but scarce.

We visited bands once every 15 days to check for new-born foals and search for carcasses. We used VHF ear-tag transmitters with mortality sensors (Fig. 3) to assess foal survival and, if they died, to find their carcasses and determine cause of death. Pony bands were gathered in early summer to fit transmitters to 15 foals in 2007 and 12 in 2008.

We estimated levels of wolf predation and assessed pony characteristics that could influence survival rates. We considered foal sex, coat colour and birth date as well as the sociability of mares. Social structure was analysed using associations; individuals were considered associated if they were in the same group (Whitehead, 2008; Franks et al., 2010). We used the Simple Ratio Index (SRI) as a measure of the proportion of time each dyad (pair of individuals) was associated (Whitehead and Dufault, 1999). We analysed the temporal pattern of associations using the Lagged Association Rate (LAR) (Whitehead, 2009). More details on methods can be found in Lagos (2013).

Fig. 2 Study area in Galicia, NW Spain.

2.2 Main results

We documented a total of 149 foals born, of which 45–74% (average = 59%) died each year due to predation. No adult ponies were killed by wolves during the study. We located the carcasses of 42% of known foal mortalities.

Fig. 3 Foal with ear tag radio transmitter with mortality sensor. *(Photo: Felipe Bárcena)*

In all but one case, the cause of death was wolf predation. Foals younger than two months were consumed in one night leaving hardly any remains. Carcasses of older, larger foals were easier to find. As a result, the proportion of carcasses found compared to total known mortality increased with foal age (Fig. 4).

Birth date and coat colour influenced foal survival. Foals born at the start of the foaling season (March–April) had double the survival index of those born later. At the same time, fewer bay-coloured foals (Fig. 5) survived compared to black and chestnut foals.

The size and stability of their group also seemed to influence foal survival (Fig. 6). Our results indicated higher survival of foals from mares integrated in groups larger than nine adult individuals. At the same time, mares with a higher index of productivity (a combination of foal birth and survival) had a well-defined group size of around ten. Therefore, results suggest that mares integrated in medium-sized groups of around ten adults achieve a higher survival rate of their foals. The LAR analysis showed that the foals of mares which maintained more stable relationships had higher survival rates, whereas mares that changed

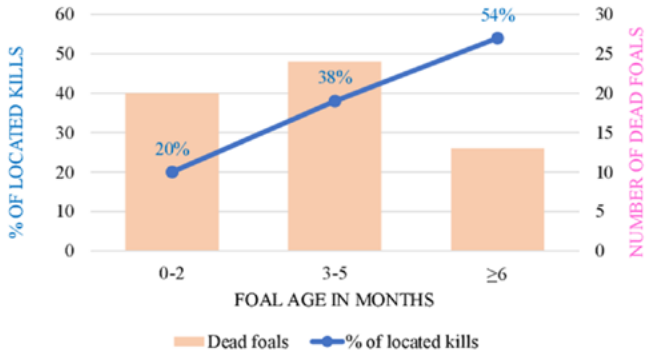

Fig. 4 Percentage of dead foals that could be located for each age class (blue line) and number of dead foals of each age (pink bars).

bands were more likely to lose their foals. This highlights the importance of social ties and group cooperation in the defence of foals.

3. Recommendations to reduce losses

Of all the variables found to influence the vulnerability of foals to wolf predation, the ones that can be managed are those related to social structure, i.e. group size and stability of associations. Selective breeding to reduce the frequency of bay coat colour is not recommended as it is characteristic of Galician wild ponies. Thus, management practices to reduce wolf predation on wild ponies should focus on stable groups of intermediate size. Horses exhibit a polygynous

Fig. 5 Foal with bay coat and born early in the season which survived. *(Photo: Felipe Bárcena)*

Fig. 6 Example of mares integrated in a cohesive band. *(Photo: Felipe Bárcena)*

mating system. Therefore, in order to achieve the desired band size, owners can manipulate the overall sex ratio of the pony population in their area, allowing a sufficient number of males in a certain mountain range so bands of one stallion and around nine mares can form.

Regarding stability, some practices, such as changing stallions or bringing new mares from other mountain ranges, spawn instability in bands causing some mares to change groups, and hence should be avoided. Splitting bands to move some individuals to pastures could also decrease social cohesion and increase instability, so movements should include the whole band. Good management for increasing band stability includes minimising changes of stallion or introduction of mares from other areas and avoiding moving individual ponies from their bands or home ranges in the mountains. However, these recommendations should be taken with caution as they are based on work carried out in specific conditions of wolf density.

Knowing the importance of free-ranging ponies to preserving mountain habitats, and as prey for wolves in parts of Galicia as well as northern Portugal, and the difficulties of finding carcasses of foals, a new system of financial support is recommended. Instead of the current system of compensation based on finding and documenting predated foals, a positive payment system linked to the number of mares in the mountains and related to the ecosystem services they provide should be designed and implemented. In addition, providing wolves with more alternative prey through regulation of hunting to increase wild ungulates in the area is also highly recommended.

Some ponies meet the morphological criteria to be classified as the official breed *Cabalo de Pura Raza Galega*, basically brown or black coat and absence of white markings. Owners of these animals receive subsidies for rare breed conservation under the EU Common Agricultural Policy and may have a higher market price. New management practices have emerged for these ponies, such as more vigilance and confinement in fenced areas. In this case, other damage prevention measures could be applied, such as LGDs (see the article by Lagos and Blanco in this issue). Besides this, the emergence of new management practices by which ponies are moved to lowland pastures may render other protection systems both necessary and viable, but they are not applicable to the traditional husbandry system.

The desirability for environmental and cultural reasons of maintaining free-roaming ponies in the mountains of NW Iberia calls for protection measures compatible with the traditional system. Stable bands of the desired size can be achieved with minimal human intervention. However, this requires awareness-raising and training, including demonstrations to show pony owners that such an approach can result in bands of ponies that are more resilient to wolf predation.

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