

Short Communication

LIVESTOCK GUARDIAN DOGS: AN OLD WORLD TOOL USED FOR CONSERVATION IN CHILEAN PATAGONIA

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1. Introduction

Historically, the conflict between predators and ranchers, both worldwide and in Chilean Patagonia, has been managed through culling predator populations including the use of traps, hunting, and indiscriminate and nonselective poisoning, methods which are often cruel and inefficient. Despite this the conflict has not been resolved, and in many cases has even been aggravated by such practices (Cooley et al., 2009; Stoner et al., 2006). One of the greatest challenges lies in successfully implementing effective measures that mitigate the negative impacts of this conflict. It is imperative to ensure the protection of livestock without compromising the conservation of native biodiversity. Numerous experiments have found that biodiversity influences the primary productivity of ecosystems and other aspects of ecosystem functioning (Tilman et al., 2012). As such, the survival of the flora and fauna contributing to Patagonian biodiversity must be protected. Additionally, it is important to note that the majority of native species, such as culpeo foxes (*Lycalopex culpaeus*)

and puma (*Puma concolor*), are under legal protection by the state of Chile.

Recently, the use of non-lethal, predator-friendly methods, such as livestock guardian dogs (LGDs), an ancient tool, have gained increased acceptance in many parts of the world in parallel with the recovery of large and medium-sized carnivores and the establishment of protected areas (Gehring et al., 2010). LGDs originated thousands of years ago in Mediterranean Europe and Asia to help herders protect their sheep and goats from predators such as bears and wolves (Dawydiak and Sims, 2004). These medium- to large-sized dogs live permanently with the flock, which they regard as their companions or family, protecting them against all threats. The guardian dog is largely effective as a deterrent (van Bommel, 2010). The dog will routinely mark its territory with urine and faeces, circle the herd and inspect the limits of its territory in order to alert predators that those areas are visited regularly. This is a very effective and powerful tool for communication between carnivores (Vorwald, 2007).

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Over the years in Patagonia, due to overgrazing, livestock productivity decreased significantly. This, in addition to the existing unfavourable conditions of the sheep market, due in large part to the low international price of wool, caused the owners of the Estancia Valle Chacabuco (80,000 ha) to put their land up for sale in 2004. It was bought by Conservación Patagónica in order to begin the transition of the land from a livestock ranch to a national park. This transition meant developing a plan that considered the gradual reduction and sale of livestock, the removal of hundreds of miles of fencing and the eradication of any practice that caused the death of native predators. Here, we describe a programme for the implementation of LGDs to protect sheep from predators, the results obtained and the promotion of this tool among neighbouring ranchers in Chilean Patagonia during the transition from a livestock ranch toward the future Patagonia National Park as an example of the challenges faced by modern conservation.

2. Study area

Chacabuco Valley, situated in the Aysén region of Chile, is part of the Patagonian steppe biome (Fig. 1).

The Valley is surrounded by mountains with southern beech (*Nothofagus*) forest and the ecotone between steppe and forest. For nearly a century, the economy of the Chacabuco Valley region was characterized by extensive Corriedale sheep grazing, for the production of wool and meat (Fig. 2). The farmers of the region primarily make their living through sheep husbandry. The sheep graze on “coiron” (*Festuca pallescens* and *Stipa sp.*) as the primary food source. This also contributes to the natural habitat of healthy populations of guanacos (*Lama guanicoe*), which graze on a variety



Fig. 1. Future Patagonia National Park area in southern Chile.



Fig. 2. Corriedale sheep production at Patagonian steppe.

of plant species, including coiron, neneo (*Mulinum spinosum*) and calafate (*Berberis buxifolia*). The Valley, in the Capitán Prat province of the Aysén region, is a priority conservation site (CONAMA, 2008) because

the Patagonian steppe does not have any kind of conservation status and the endemic huemul deer verges on extinction due to habitat loss and competition with livestock. Many other species are also threatened.



Fig. 3. Patagonia Park highlighting Cuadro de las Vacas and Puesto Baño livestock areas.

3. Materials and Methods

3.1. Livestock and damages

It was through the implementation of the above mentioned plan that, between 2004 and 2009, the number of sheep was reduced by 96% from 25,000 to 1,000 and of cattle by 93% from 3,000 to 200. It was decided to maintain a stock of meat animals for internal consumption to feed workers, ranchers and park rangers, as was traditionally done for ranch workers. Two areas of the park, Puesto Baño and Cuadro de las Vacas, maintained a low stocking density, occupying only 1.4% (1,151 ha) of the total area of the park and taking advantage of the natural conditions and existing pastures, corrals and sheds (Fig. 3). In 2010 we began incorporating Texel and Suffolk sheep to improve the quality of meat. The sheep are managed in plots (called “cuadros”) of up to several hundred hectares separated by fences and they graze on native grasses as previously mentioned. In each “cuadro” the sheep are separated by category: lambs are placed with their mothers, yearling ewes in another “cuadro” and rams in others. Sheep production is divided into two sectors, each managed by a “gaucho” (the local word for a Patagonian shepherd), who have

their own small homes (“puesto”) located next to the “cuadros”. From here, they manage the flocks checking the sheep with the herding dogs every day. We do not provide extra food for herds since we work at low stocking densities.

We lost between 30 and 50 sheep per month to predation between 2004 and 2009. Despite drastic reductions in sheep numbers (due to stock reduction), yearly fatalities due to predators, such as puma and culpeo fox, remained the same in that period. But with only 1,000 sheep left in 2009, such level of losses would make sheep production economically unviable. It is illegal to hunt the puma or culpeo fox in Chile. Studies conducted in 2008–2015 within Chacabuco Valley, estimated 30–35 pumas residing within the valley. They predate on guanacos (80%), hares and other small mammals (16%) and sheep (4%) (Elbroch and Wittmer, 2012) (Figs. 4, 5).

3.2. Programme and dog acquisition

The challenge became how to maintain livestock without resorting to lethal control of predators. Different alternatives were investigated and evaluated. Among these alternatives was the use of LGDs: a technique that, though used in Europe and Asia for centuries, was not well-known in Patagonia. After con-



Fig. 4. Patagonian puma in the Park



Fig. 5. Culpeo fox in the Park.

sulting the available literature and becoming familiar with the theory of this technique, Conservación Patagónica began searching for suitable dogs.

It was not easy to find LGDs in Chile, as historically they are not very common in the region. Luckily, halfway through 2009, a litter of Great Pyrenees companion dogs was found in the city of Osorno in southern Chile. Two 2.5 month old littermates, a male and a female, were acquired with the goal of immediately starting to bond them with sheep. The female was named Brisa and the male Puelche (named after winds, because of the heavy winds in the sheep-grazing area).

3.3. Puppy management

One key aspect was ensuring that the pups were exposed to ewes, rams and lambs, and their sounds and smells, from as young an age as possible. They were even suckled on sheep, as Darwin observed in

South America in the 19th century (Darwin, 1845), although it has been established by modern researchers and practitioners that this is not necessary for successful bonding. Another quite difficult aspect of the programme's initiation was ensuring that the gauchos were able to care of the pups, as the breeding, feeding, and obedience training of guardian dogs is quite different from that of the herding dogs the gauchos were accustomed to. For example, guardian dog pups should eat where the sheep are, ensuring the greatest possible contact between them. Additionally, gauchos must spare no effort in ensuring that pups do not approach their houses. During the first stage of the programme, these recommendations were met with scepticism and resistance from the livestock staff and curiosity from others.

On arrival, the pups were placed in paddocks where they slept in sheds with around 10 lambs (Fig. 6.). In

less than a month, Brisa (the female) grasped what her role was and was taken to the grounds where the sheep are kept. It took Puelche (the male) a little longer: after roughly two months he dug a hole under the fence where he was with the lambs and followed in Brisa's footsteps to watch over the sheep. The shepherds brought food every day for the dogs inside the "cuadros". They left the food dish inside the dog houses, to be protected from the rain and



the sheep. Then the shepherd checked the flock for dead and sick animals or other problems. Each night the gaucho, riding on horseback and working with the shepherd dogs, herds together the entire flock of sheep in their "cuadro", so they are packed tightly together for the guardian dogs to watch over them during the night (Fig. 7). We worked with the gauchos to correct any bad behaviour, such as pups going back to the "puestos". After the incorporation of the guardian dogs into the herds, we monitored the effect of their presence. A range of indicators were evaluated; from the observed behaviour of the dogs to the losses suffered during key seasonal times, such as the weeks after the lambs were born.

4. Results and Discussion

4.1. Dog behaviour and dis-

Fig. 6. Pyrenean pups with lambs in paddock.



Fig. 7. Gaucho herding the flock for the guardian dogs.

tribution in the field

As the days and weeks passed and the gauchos were able to observe the behaviour of the pups around the sheep, they began to trust in the programme and change their attitude. The staff ultimately agreed to take on the challenges of this programme which, though seemingly odd and untraditional, had the potential to work. By the time the pups were six months old (Fig. 8), there was a decrease in monthly sheep losses to predators. At the end of the first year the losses fell by 500 to 144 animals. With this positive feedback, before the first year's end we bought a third pup: a 4-month old male Great Pyrenees named Lolo, from a project run by the University of Chile and the Instituto Pirenaico of Spain, which was promoting the use of the breed in Chile (Lagos Torres, 2012). While Brisa and Puelche initially dedicated themselves to the care and protection of sheep, yearling ewes and lambs, Lolo was, from the onset, incorporated into the care of the rams. The latter are usually managed separately from the sheep and lambs and apparently due to their strong odour they are more attractive to predators and are a favoured prey compared to the other types of sheep.

At the end of 2011, Brisa and Lolo had their first litter of pups (Fig. 9), leaving us with an additional working pup, named Chica. In 2012 another was born, leaving us with a male named Puelche Chico. We divided these five working dogs into two main areas of the Chacabuco Valley. Cuadro de las Vacas (825 ha) has two dogs protecting approximately 500 sheep and 200 cows (Fig 10.) and Puesto Baño (326 ha) has three dogs protecting around 1,500 sheep. Although Cuadro de las Vacas has less total livestock, the flora consists of

more shrubs that provide cover for potential predators, requiring more guard dogs to protect the flock. Puesto Baño, on the other hand, is flat grassland without trees obstructing the dogs' line of sight. The two groups of dogs are organized to work together as a family unit.

4.2. Effect of LGDs on sheep survival rates

Mortality caused by predators in the Chacabuco



Fig. 8. Brisa at six months old with the flock in the field.



Fig. 9. Lolo, Brisa and pup at Puesto Baño.



Fig. 10. Puelche Chico in the field with the flock.

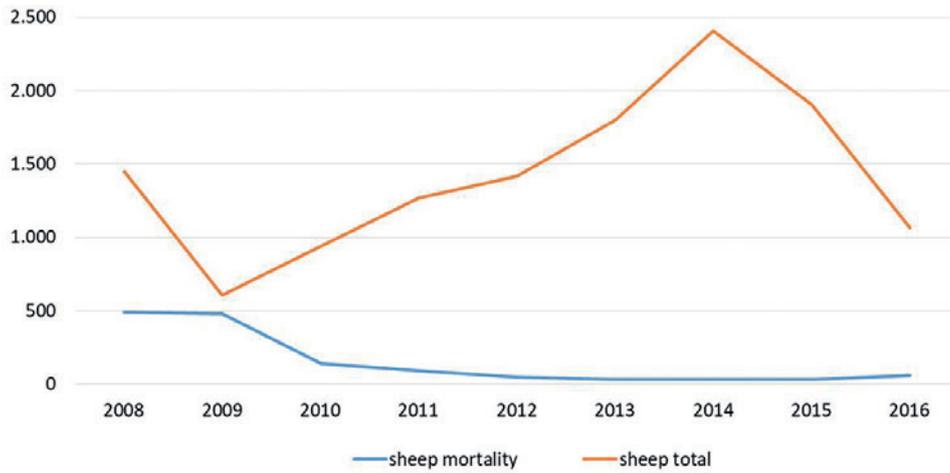


Fig. 11. Sheep mortality and total number of sheep in the Chacabuco Valley from 2008 to 2016, before and after the incorporation of LGDs that started in March 2009. The reduction in sheep numbers from 2014 to 2016 was due to sales.

Valley sheep flock has significantly decreased since the incorporation of the Conservación Patagónica guardian dogs from 2009 to date (Fig. 11). Before that no prevention measures were in place which accounted for the very high predation rates. The use of guardian dogs, combined with adequate sanitary management (Fig. 12), vaccination and deworming, has allowed for a significant increase in sheep retention numbers. In addition, studies have shown that dewormed sheep growth is faster and larger than untreated sheep. Thus, the sanitary management improved the health of the flock and reduce the occurrence of diseases (Gallo et al., 1994).

The data show that losses due to predation were reduced significantly over the past five years of the study (2011–2015) with dogs working, averaging 1.3% of total stock per year. This was just over half of the total annual loss including natural death, accidents and illness (Table 1). The guardian dogs have allowed for an increase in the “señalada” (docking, castration, tagging and first counting the lambs from the season) because of a reduction in lamb losses, with a 115% increase in the number of lambs surviving past two



Fig. 12. Livestock sanitary management at the sheep corrals.

months of age. These high numbers are also achieved due to the fact that some of the sheep can birth multiple (two even three) lambs at once.

4.3. Programme impact and perspectives

Thanks to the LGDs, we have managed not only to

Table 1. Percentages of lambs tagged per year (relative to the number of ewes), total annual losses* and total losses due to predation.

Tagging Year	Sector	Nr. Sheep	Nr. Lambs	% Tagged	Annual Losses	Annual Losses to Predators
2013	Puesto Baño	488	569	117%	48	31
	Cuadro de las Vacas	203	211	104%		
2014	Puesto Baño	625	689	110%	50	30
	Cuadro de las Vacas	218	270	124%		
2015	Puesto Baño	513	529	103%	54	33
	Cuadro de las Vacas	133	158	119%		
Average for the 3 years					2%	1.3%

* Total annual losses include predation, natural death, accidents and illness.



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Fig. 13. Wildlife Friendly Enterprise Network certification logo for Patagonia Park.

programme has become a model, demonstrating that livestock can be grazed sustainably within and in the immediate vicinity of a protected area, cohabitating with natural predators without illegal hunting or poisoning. Additionally, the programme delivers added value to our products through the Wildlife Friendly Enterprise Network (wildlifefriendly.org) international certification and promotes changes in traditional breeding practices, as well as in the management of livestock and native predators (Fig. 13).

From 2011 to February 2017, with two female dogs, we produced four litters and delivered 30 pups to ranchers in order to spread the use of this technique for the care and protection of herds. Today, the dogs can be found working in Chile from Villarrica in the north to Villa O'Higgins in the south, and in Argentina from Río Negro to Calafate, they are found in all places with sheep. We constantly strive to promote responsible management of LGDs. Pups are delivered to ranchers along with a technical manual, which

produce the meat necessary to feed the workers, but also to profit from the sale of sheep and wool. Over the past seven years, the dogs have become ambassadors of Patagonia Park, demonstrating an alternative method of livestock production that exists in harmony with nature and wild predators. The Patagonia Park's LGD



Fig. 14. Lolo with pups and sheep.

contains advice on the process of bonding the dogs to sheep. In order to obtain the best possible results, Programme professionals advise ranchers to adapt their recommendations depending on the conditions of the ranch where the dogs will work. We delivered most of these pups sterilized (at the owner's request) at 3–6 months of age, as it allowed the dogs to work with fewer distractions. Sterilization also ensures that females do not need to be taken out of the herd and confined in a kennel for three weeks while they are in heat: an absence which predators can exploit (Fig. 14).

In parallel to the dissemination of pups, we participated in the development of a documentary film: *Livestock Guardian Dogs in Aysén: The Beginning of a History*¹. The story is told through interviews with Aysén ranchers, detailing their experiences with the management of these dogs and the results that they have observed.

5. Conclusions

¹ <https://www.youtube.com/watch?v=NEeXyVDwYKg>

The LGD programme's achievements in Chilean Patagonia to date have allowed the validation of an old livestock management tool (not well known in Patagonia) for which Patagonia Park has become a local and national reference. The implementation of the livestock guardian dog programme in Chacabuco Valley influenced the National Institute of Agrarian Innovation (INIA) to start breeding Pyrenees pups to sell to local ranchers. We have seen a 90% reduction in losses from predation in the flocks of the Patagonia Park, allowing for a growth in sheep production of up to 125% (115% on average), which has made it possible to meet the annual consumption needs of 500 sheep per year and to sell products such as wool, meat and livestock. The use of LGDs has allowed us to maintain natural predator populations, thereby conserving the local wildlife's ecological equilibrium. These predators consume the weakest, sickest or least adapted individuals, thereby improving the condition of populations of guanaco, huemul, and other wildlife (Elbroch and Wittmer, 2013).

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