Guardian animals for the protection of sheep in Western Australia

Report by the Western Australian Animal Welfare Advisory Committee

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Report by the Western Australia Animal Welfare Advisory Committee to the Minister for Agriculture and Food

"Maremma Shepherd at work" Photo courtesy of Talba is licensed under CC BY-NC-SA 2.0.

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Date of the report: 10 October 2022
Author: Professor Clive Phillips, Chairman

Minister's request: Investigate the use of guardian animals for livestock protection

Summary of key findings

The study found that guardian animals are sometimes used to protect sheep from predators, including in Australia. Animals used include domestic dogs, llamas and alpacas, donkeys and cattle. Most successful are guardian dogs, primarily of the Maremma breed. They do not stop predators invading the territory of sheep but they corral them, particularly at night. The presence of a guardian dog makes sheep more vigilant, which may indicate an ongoing challenge to their welfare; to the best of the Committee's knowledge, this has not been investigated scientifically.

Methodology

Clive Phillips, on behalf of the Animal Welfare Advisory Committee (the Committee) undertook a literature search, supported by several websites provided by the Committee secretary, and discussed the issue with the Western Australian Farmers Federation livestock committee. The initial literature review and this report were presented to the Committee for consideration.

Results

Many species can be used to guard sheep, but dogs are more commonly used than donkeys, llamas and other animals. Guarding of sheep by dogs is an ancient practise going back to the finding of sheep and dogs' skeletons together from BC 3685. Guardian Maremma dogs have successfully protected large sheep flocks in Australia, reducing predation to a very low level. They work by circling the perimeter of a rotating flock, when threatened by predators. Several Maremma dogs are usually required and they can work co-operatively.

Predators still invade the home range of Maremmas and attack, but the defensive work by the Maremmas is sufficient to prevent the sheep from scattering and presenting an easy target for

the predators. Maremmas do not work by establishing exclusive home ranges, which predators fear to enter. Predatory wild dogs will enter sheep territory, but shepherding of the sheep by the Maremmas, aided by the flocking behaviour of sheep including boisterous vocalisations, deter the predators from attacking. Sheep graze in tighter formation when protected by a guardian dog, and they appear more vigilant. It is important that the Maremmas and sheep are never separated, for example at shearing time. Training is likely to be required, for example so that dogs do not harass the livestock, and retraining may also be necessary. Other problems include dogs not guarding stock, being aggressive to humans, dogs roaming, dogs interfering with working dogs and dogs reducing the growth rates of the sheep (Smith et al., 2000).

According to Smith et al. (2000), guardian dogs should be selected to be 'permanent adolescents', so not actually attacking the sheep. Guardian animals, although expensive to maintain and not an easy option, may be cheaper than fences, unless government pays for the latter. Most farmers using guardian dogs report being highly satisfied (Marker et al., 2005) and nearly all regard them as economic asset (Smith et al., 2000). Not all dogs selected as guardians will be suitable, between 10 and 33% may be rejected (Smith et al., 2000).

Llamas and alpacas have also been used successfully as guardian animals to protect sheep (Cavalcanti and Knowlton, 1998; Matthews et al., 2020). These camelids adopt a similar grazing pattern to the sheep and particularly stay close to the sheep at night. Potential problems include a failure to protect sheep, aggressiveness towards humans, high cost and themselves being predated upon.
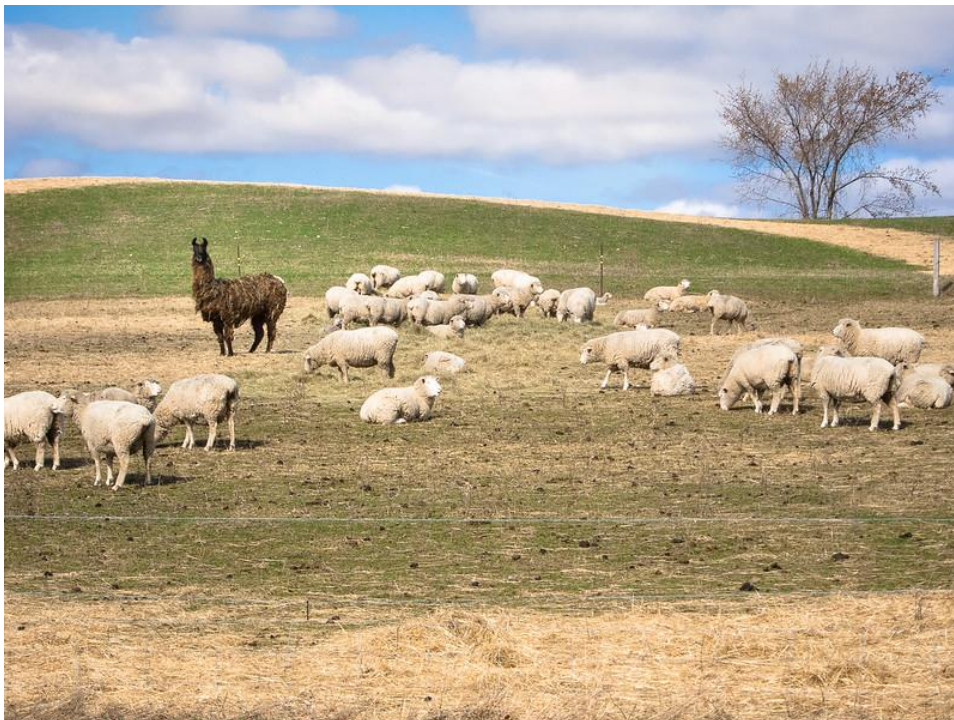
Guard llama and sheep, Wisconsin" Photo courtesy of Citizen 4474; licensed under CC BY 2.0.

"[Llamas and sheep](#)" Photo courtesy of Steven Maher, licensed under [CC BY-NC-ND 2.0](#).

Donkeys have been effectively used as guardians in the USA, with about 10% of Texan sheep and goat ranchers using them. They have the advantage of low purchase cost, no need for special feed, a long life expectancy and little need for training. However, they are believed to be less valuable than dogs in their protective capabilities (Smith et al., 2000). Cattle have also been used and do readily bond with sheep, with the added advantage of improved pasture utilisation to produce a valuable output. However, this has been little investigated.

The situation in Western Australia

As most sheep farmers in Western Australia are located in the south east, away from the problems presented by wild dogs and protected, at least partially, by a dog-proof fence, the value of guardian animals will be limited. The significant investment announced by the government in 2020 for control by fence of wild dogs in the southeast (https://www.agric.wa.gov.au/invasive-species/western-australian-wild-dog-action-plan-2016-2021) will further diminish the necessity of using guardian animals in that region, but there could be significant benefit to small flocks outside of this region. Further engagement with industry will determine whether large flocks could benefit from the protection offered by guardian animals.

Summary: advantages and disadvantages of using guardian animals

The research conducted in other parts of Australia and overseas suggests that some flocks may benefit from the protection provided by the use of guardian animals, but the heightened alertness of sheep protected by guardian animals may mean that their welfare is adversely affected, compared to sheep protected from predators by fences or by removal of the predators by baiting or culling. Sheep flocks in the south of WA are believed to be already largely protected by these alternative means, but further research would be necessary to determine if there are any potential benefits of using guardian animals in the Midwest region.

Advantages

Potential control of most attacks on sheep flocks by wild dogs.

Disadvantages

Cost of purchasing, maintaining and monitoring guardian animals, particularly in the case of guardian dogs.

Sheep welfare may be impaired by the presence of guardian dogs, but not other mammals (e.g. donkeys, llamas, alpacas).

Summary of relevant discussions within the Committee

The Committee believed that guardian animals are likely to be less useful to large flocks kept on large areas than to small flocks. Further engagement with industry might provide information on the potential value of guardian animals in large flocks.

Supporting documents

Supporting documents are attached:

Appendix 1: Report on discussions with WA Farmers Federation

Appendix 2: Literature reviewed

Advice to the Minister

Based on the research, the Committee recommends that the use of guardian dogs be encouraged in regions where there is a risk of predation.

The Committee recommends that the efficacy of guardian dogs on stations be investigated.

The Committee recommends investigating the potential for cattle to bond with, and protect, sheep.

The Committee notes that economic evaluations of the cost of protecting sheep using guardian animals could be compared with protecting them with a fence.

Recommendation

- That the Minister **notes** the information above.
- That the Minister **notes** the advice above.

Appendix 1

Report on discussions by Clive Phillips with Western Australian Farmers Federation regarding the use of guardian animals in Western Australia

Clive Phillips:

At the meeting earlier this month, I raised the issue of guardian animals, because my conversation with the Minister had indicated that this might be something where further information was needed. Several of your members indicated that they believed they could be successfully used to protect large sheep flocks. I wondered if it was possible to get any further information from these members about this – have they used them themselves, what were their experiences, do they know anyone using them?

Trevor Whittington (secretary):

Scale of use

Yes a few have used them but as most sheep farmers are located in the SW away from the major dog problem only a handful of farmers have gone down this path. My guess is 2000 sheep farmers on average 10 paddocks of sheep = 20,000 paddocks and there be 20 – 50 guardian animals out there.

Along the barrier fence or in the station country my guess is there is almost none. Why? Cost and time to deal with yet another animal eg feeding and shearing and breeding and efficiency. The market has spoken and does not rank them. Easier to buy a new big John Deere and crop the lot or move into cattle. (Been more month in cropping for the past 30 years)

The solution is fences and doggers.

Barrier fence has been a good investment. Station ring fences are yet to be proven. Talk to Rawalinda Station on the Nullarbor they have had a fence for 70 years around 50,000 sheep. Ask Peter Cooke to cookes@iinet.net.au walk you through it – he was the consultant that did all the modelling work his group is called Agknowledge)

High wool and meat prices will see the market solve the dog problem. I suspect guardian animals are like hemp – one of the … good ideas that does not work in the real world

Appendix 2 Literature reviewed

<u>Article 1</u>

Martin E. Smith , John D. C. Linnell , John Odden & Jon E. Swenson (2000) Review of Methods to Reduce Livestock Depradation: I. Guardian Animals, Acta Agriculturae Scandinavica, Section A - Animal Science, 50:4, 279-290

The use of domestic animals to protect livestock was reviewed through visits to actual users, discussions with experts and a thorough literature search. Costs and benefits were analysed in terms of reduced livestock losses. The most common guardian animals are dogs, which have been shown to reduce predation (documented mostly for coyote) by 11-100%. Livestock guardian dogs have also been used effectively against bear, wolf and cheetah. Donkeys are also used as guardian animals, and their effectiveness lies in their natural herding behaviour and aggression, especially against canids. The effectiveness of donkeys varies considerably dependent upon the predator species and the temperament of the individual donkey. Llamas are also used as a guardian animal, with approximately the same characteristics as the donkeys, and will defend themselves against most predators. The use of guardian animals appears to be an effective tool for reducing livestock depredation and should be evaluated in areas with high predation losses against the cost of changing production systems.

<u>Article 2</u>

Allen, LR; Stewart-Moore, N; (...); Allen, BL (2017) Guardian dogs protect sheep by guarding sheep, not by establishing territories and excluding predators, Animal Production Science, 57:6, 1118-1127

Guardian animals have been a common non-lethal method for reducing predator impacts on livestock for centuries in Europe. But elsewhere, livestock producers sometimes doubt whether such methods work or are compatible with modern livestock husbandry practices in extensive grazing systems. In this study we evaluate the hypothesis that guardian dogs primarily 'work' by establishing and defending territories from which canid predators are excluded. Eight maremmas and six free-ranging wild dogs of different sexes were fitted with GPS collars and monitored for 7 months on a large sheep property in north Queensland, Australia. Wild dog incursions into the territories of adjacent wild dogs and maremmas were recorded. Wild dog territories never overlapped and their home ranges infrequently overlapped. In contrast, 713 hourly locations from 120 wild dog incursions into maremma territories were recorded, mostly from three wild dogs. These three wild dogs spent a mean of 2.5-5.9 h inside maremma territories during incursions. At this location, maremmas worked by guarding sheep and prohibiting fine-scale interaction between wild dogs and sheep, not by establishing a territory respected by wild dogs. Guardian dogs protect goats better than sheep and both better than a mixture of sheep and goats. They stay closer to the goats.

We conclude that shepherding behaviour and boisterous vocalisations of guardian dogs combined with the flocking behaviour of sheep circumvents attacks on sheep but does not prevent nor discourage wild dogs from foraging in close proximity. Certain husbandry practices and the behaviour of sheep at parturition may incur greater predation risk.

<u>Article 3</u>

Gipson, TA; Sahlu, T; (...); Goetsch, AL (2012) Use of global positioning system collars to monitor spatial-temporal movements of co-grazing goats and sheep and their common guardian dog, Journal of Applied Animal Research, 40:4, 354-369

Goats and sheep often graze together and guardian dogs are commonly used for protection from predators. The objective of this experiment was to characterise how goats, sheep and guardian dogs interact spatially when grazing the same pasture by use of global positioning system (GPS) collars as an unobtrusive means of behaviour monitoring. In 2002 and 2003, three meat goats and two sheep in a group of 12 of each species were randomly chosen and, along with a guard dog, fitted with GPS collars. Minimum distance travelled between consecutive 30-min fixes and distance between any two animals at the same fix time were calculated using spherical geometry. In 2002, the dog travelled the least between fixes during the day but more at night than either goats or sheep. However, in 2003, there was not a significant species difference in distance travelled in 24 h or during the day or night. All species travelled significantly more during day than night but none were stationary at night. Distance amongst goats and between sheep tended to be greater during day than night; distance between goats and sheep was greater than the distance amongst goats or between sheep. Hence, goats and sheep interacted as two separate entities rather than as one large herd/flock. Distance between the dog and goats was closer than between the dog and sheep, indicating a clear preference of the dog for goats that could relate to a difference in previous exposure to the two species. In summary, based on these findings protection by a guardian dog would be greater for a small group of goats than sheep and much greater than for a mixed species group. Or, with a large group of grazing animals, the number of dogs required for a certain level of protection would rank goats < sheep < mixture of goats and sheep.

Article 4

Yusti-Munoz, AP and Simonetti, JA (2021) Domestic Sheep Behavior and Habitat Selection in Presence of Livestock Guardian Dogs, Rangeland Ecology & Management, 79:1, 28-35

Livestock guardian dogs (LGDs) are efficient at controlling predation upon livestock. LGDs create a safer landscape for livestock through accompaniment and the reduction of the abundance and distribution of wild carnivores. However, the effects of LGDs on livestock behavior, group dynamics, and use of space remain understudied. To understand LGDs' impact on sheep behavior and group dynamics, and using a natural experiment approach, we worked on two sheep farms that differed in the use of LGDs to control predation. We used the focal sampling technique to observe sheep behavior; in addition, we obtained information about group size and nearest neighbor distance. Nutritional quality and habitat selection were also assessed. For each individual, we calculated the proportion of time invested in behavioral categories (scanning, feeding, resting, and traveling), and categories between properties were contrasted with the nonparametric U-test, as well as features related to group dynamics, vegetation structure, and food quality. Furthermore, we investigated the effect of LGDs and other management and biological variables on sheep behavior and group properties. In close proximity to LGDs, sheep spent more time in scanning while time allocated to feeding decreased; however, feeding time did not change based on its presence. Moreover, LGDs' company led to the formation of larger sheep groups and individuals closer to each other. Sheep together with LGDs selected habitats with limited plant cover, which allows animals greater visibility. Lastly, we suggest that the ability of LGDs to maintain larger and more cohesive groups in open areas, as well as with more vigilant animals, could increase

livestock responsiveness to predator presence, thus helping to reduce probability of predation on sheep and, in consequence, reducing the necessity of killing wild species in retaliation.

Article 5

Cavalcanti, SMC and Knowlton, FF (1998) Evaluation of physical and behavioral traits of llamas associated with aggressiveness toward sheep-threatening canids, Applied Animal Behaviour Science, 61:2, 143-158

Llamas (Lama glama) are frequently used as guard animals by sheep producers as part of their predation management programs. However, few data are available concerning physical and behavioral attributes that distinguish between effective and ineffective guardian llamas. Our study addressed this issue and evaluated aggressiveness of llamas toward dogs. Initially, we identified physical and behavioral traits of individual llamas. Twenty llamas were randomly assigned to one of four groups (n = 5 per group). We used focal group sampling techniques to rank individual llamas according to frequencies with which they displayed alertness, leadership, dominant, aggressive, and threatening behaviors as well as postures indicating dominance or subordination. We then examined the behavior of individual llamas with sheep. Finally, we documented interactions among llamas, sheep, and a surrogate predator (border collie). Our results showed that leadership, alertness, and weight of llamas were correlated with aggressiveness displayed toward the dog ($p(s) = 0.064, 0.012$, and 0.039 respectively). These traits are easily recognized and can be used by producers to select llamas as livestock guardians.

Article 6

Matthews, PT; Barwick, J; (...); Brown, WY (2020) Alpaca Field Behaviour When Cohabiting with Lambing Ewes, Animals, 10:9

Simple Summary

In order to appreciate how alpacas function as guardian animals and how suitable they are in protecting a herd we first need to better understand how these animals behave while coexisting with other livestock. This study examined the field behaviour of two alpacas placed with 180 lambing ewes, including the level of diurnal activity, distances travelled and activity budgets. Alpacas generally behaved similarly in relation to diurnal activity levels and time spent on behaviours such as grazing, walking and standing. Alpacas and lambing ewes shared similar diurnal patterns in relation to levels of activity and were observed to flock together at night and camp in the same location. As a result of this study we were able to catalogue the range and frequency of field behaviours exhibited by alpacas cohabiting with lambing ewes. This data provides insight into how alpacas might behave in a guardian role, adds to the limited body of research in this area and may assist producers reduce predator-related livestock loss.

A common strategy to reduce predator attack on livestock is the deployment of guardian alpacas. However, little research has been conducted on the behaviour of this species while housed with other livestock. This study monitored two male alpacas cohabiting with 180 lambing ewes in order to quantify field behaviour in two phases. Phase one assessed diurnal patterns of alpacas and lambing ewes using Global Navigation Satellite System (GNSS) collars recording data over 41 days, in combination with observational recordings. Phase two developed an alpaca behavioural ethogram through continuous observations from 05:30 to

19:30 h over a 3-day period. The two alpacas shared similar behaviours with commonality of distance travelled, and both species exhibited an increase in activity level based on speed between the times of 05:00 and 17:00 h. The GNSS data indicated that the alpacas flocked with the ewes at night sharing the same resting location, however, would spend time during the day on the outskirts of the paddock. Alpacas were observed to spend the majority of the observation period in two behavioural states: grazing (57%) and resting (27%). As a result of this study we were able to catalogue a range and frequency of field behaviours which alpacas exhibit while cohabitating with lambing ewes. However, further research is needed to determine in more detail how these behaviours correspond with the effectiveness of this species as a livestock guardian.

Article 7

Marker, LL; Dickman, AJ and Macdonald, DW (2005) Perceived effectiveness of livestock-guardian dogs placed on Namibian farms, Rangeland Ecology & Management, 58:4, 329-336

Evaluations of 117 livestock-guarding dogs placed on Namibian farms between January 1994 and November 2001 were conducted as part of a study aimed at reducing livestock depredation rates on both commercial and communal farmland. The perceptions of livestock farmers were evaluated in terms of their satisfaction with the guarding dogs, the level of care given to the dogs, and the attentiveness, trustworthiness, and protectiveness of the dogs. Guarding dogs were very successful in terms of reducing livestock losses, with 73% of responding farmers reporting a large decline in losses since acquisition of a guarding dog, and the same percentage seeing an economic benefit to having the dog. Farmer satisfaction with the dogs was high, with 93% of farmers willing to recommend the program, and the care given to the dogs was also good. The dogs exhibited high levels of protectiveness and attentiveness, although trustworthiness was relatively low. The level of care provided by farmers was lower for older dogs than for younger dogs, and older dogs appeared to be less trustworthy than young dogs. There were no obvious differences in effectiveness between the sexes, or between dogs placed on communal farms and those on commercial ranches. The majority of dogs exhibited behavioral problems at some stage, particularly chasing game, staying at home, and harassing livestock, but corrective training solved 61% of the reported problems. We conclude that with the correct training and care, livestock-guarding dogs can be an effective method of livestock protection on Namibian farmlands.