INTRODUCING LIVESTOCK GUARDING DOGS TO SHEEP AND GOAT PRODUCERS

Raymond Coppinger, Jay Lorenz and Lorna Coppinger, Hampshire College, Livestock Dog Project, 731 West Street, Amherst, MA 01002

INTRODUCTION

Dogs that protect sheep and goats from predators were relatively unknown as a method of reducing predation in the United States until recently. An estimated several dozen individuals were using guarding dogs with flocks (Newbold 1974), but only a few government officials or industry leaders were aware that the technique might have merit for the long-standing coyote problem. North American ranchers relied mainly on removal of predators, but removal provides only temporary relief and poses ethical questions as well. In strong contrast, on Old World sheep and goat pastures, the method of choice for protecting stock from *Canis, Ursus* and *Felis* spp. has traditionally been livestock guarding dogs. This system keeps the flock relatively safe without removing the predator, and has to be effective to warrant the support of large dogs by subsistence-level farmers.

In the 1970s, inspired in part by restrictions on the use of compound 1080 (Executive Order 11643) and by recommendations of scientific review panels (Leopold et al. 1964, Cain et al. 1972), several scientists began studies on the applicability of Old World guarding dog breeds to New World pastures (Coppinger and Coppinger 1978, Linhart et al. 1979, Green and Woodruff 1980).

Two important problems needed immediate attention, however. First, only three traditional guarding breeds (Great Pyrenees, Komondor, Kuvasz; Parker 1979) were present in this country in great enough numbers to provide a viable breeding stock. The good Old World stocks, if any were left, were in far-off pastures of Europe, Turkey and Tibet. Second, several major differences between Old and New World ruminant management precluded a simple transferral of traditional techniques to North America. Coyotes *(C. latrans)*, for example, the major predator here, do not exist across the Atlantic Ocean. Neither are freeranging dogs *(C. familiaris)* as numerous there as they are in the U.S. Also, most U.S. flocks are unattended by a shepherd, and when they are, the shepherd is usually distrustful of a large guardian. In the U.S., both shepherds and sheep producers lack familiarity with a culture where guarding dogs are part of family lore. U.S. sheep are often from British ancestry, breeds that tend not to flock and are managed so that they scatter over their grazing range and provide an elusive body for the dog to watch. Finally, Europeans tend to spend more time managing their sheep, training both dogs and sheep in order to gain the most protection.

The Livestock Dog Project began in 1976 under the auspices of the Winrock International Livestock Research and Training Center, the Rockefeller Brothers Fund, and Hampshire College. It was designed as a long-term, in-depth study with practical and theoretical applications. Its goal was to test effectiveness of livestock guarding dogs as an alternate method of reducing predation that would be appropriate for protecting livestock as well as predatory species (Coggins and Evans 1982). Its immediate objective was to introduce, on an experimental basis, livestock guarding dogs to North American sheep and goat producers.

This paper summarizes results from the first five years of the study, and assesses progress based on two categories: numerical and estimated ratings of each dog's performance, and reduction in predatory attacks. Field testing and ethological studies are still in progress.

METHODS

A nationwide program of testing dogs in the field is the backbone of this project (Lorenz and Coppinger 1981). Application of dogs in every-day operation of livestock enterprises provides realistic information on performance as quickly and accurately as could be expected. Supporting programs add dimension to the field work: 1) controlled studies at Hampshire College into comparative breed behavior, developmental behavior, genetics, endocrinology, and other biological components; 2) genetic records correlated with performance; 3) frequent contact with producers using dogs, either on site, by phone or letter, or with an annual questionnaire; 4) feedback via a newsletter, and articles in popular, trade and scientific publications.

For the cooperator program, two dozen dogs of traditional Old World guarding breeds indigenous to three countries were collected and imported in 1977. Selected primarily as pups exhibiting a variety of sizes and colors, these dogs represented strains of the Anatolian Shepherd (Turkey), Maremma (Italy), and Shar Planinetz (Yugoslavia). In 1980, three Castro Laboreiro pups (Portugal) were added to the sample. This stock was bred within and between strains, and all pups between eight and 12 weeks of age were placed out on sheep farms. Results were tabulated from the first 450 dogs and parental stock.

Cooperating farmers were a self-selected group who expressed a willingness to try a dog for an annual $50 lease fee and who would report back on an annual questionnaire. They had heard of the project from colleagues, extension agents, or in the media. After contacting project personnel, potential cooperators were screened for need and size of flock. A variety of management systems was represented, from small flocks (15) in fenced pastures to large flocks (>1000) on open ranges. By August 1983, 260 producers in 31 states had received at least one guarding dog. Cooperators were instructed with written and oral information on use and management of their dog.

The annual questionnaire for each dog contained questions on the producer's system of management (flock size, location, etc.), sheep and dog behavior, rating of dog's performance, and frequency of predatory attacks. In 1981 and 1982, 200 and 230 questionnaires were sent out; data were analyzed only for dogs at least one year old. Results reported for 1982 dogs included surviving dogs from 1981 plus those dogs attaining year-old status by January 1982. Checks on accuracy of responses were made by the authors who visited, between 1981 and 1983, most of the sites where dogs were working. Other details on this program appeared in Coppinger et al. (1983).

To understand the mode by which dogs protect the flock, we proposed a model of dog behavior based on three necessary attributes: trustworthy, attentive and protective (Coppinger and Coppinger 1978). Trustworthy implies non-injurious and non-disruptive behavior with livestock; attentive results in a dog maintaining a proximity to livestock; protective provides interruption of a potential attack by means of a variety of aggressive or non-aggressive behaviors by the dog, including approach-withdrawal, barking, chasing, occasionally fighting, but most often by the simple avoidance of the dog by the would-be predator.

RESULTS

Ratings of performance by breed in each of the three behavioral attributes of the model are presented in Table 1.

Significant breed difference in trustworthiness and attentiveness (ANOVA $p < .05$) appeared in 1981 but not in 1982. The 1982 ratings showed improvements over 1981 ratings. (See Coppinger et al. 1983 for an earlier report on 1981 data.)

Ratings of performance were also analyzed by flock size (Table 1). Dogs were rated equally well in small flocks as in large. Again, the 1982 ratings show improvement over 1981.

For an individual producer, successful introduction of a guarding dog is measured by his perception of a reduction in predation. Data from the 1982 questionnaire were used to compare frequency of predator attacks before and after getting the dog (Table 2). Cooperators reported that 63% (98) of the dogs were present with flocks that experienced reduced predatory attacks. Of the flocks that had experienced frequent attacks (≥ 6 per year), 79% (59) enjoyed a reduction in predation, while 33% (25) sustained no losses in 1982.

Table 2. Number adult of dogs reported according to annual frequency of predator attacks before and after acquiring guarding dog.

Before Dog	After Dog				
	0	<2	3-5	≥6	Totals
0	17	2	1	0	20
<2	17	9	5	0	31
3-5	20	4	4	4	32
≥6	25	16	18	16	75
Totals	79	31	28	20	158

Table 1. Dogs receiving good or excellent ratings by cooperators according to behavior with sheep.

Breed	Trustworthy %(N)		Attentive %(N)		Protective %(N)	
	1981	1982	1981	1982	1981	1982
Anatolian	50(22)	80(41)	37(19)	58(41)	50(18)	73(41)
Maremma	96(25)	81(31)	81(26)	71(31)	84(25)	81(31)
Shar Planinetz	72(18)	88(26)	42(19)	58(26)	44(18)	81(26)
Cross breed	79(34)	69(48)	68(34)	67(48)	73(30)	69(48)
Total	76(99)	78(146)	60(98)	64(146)	66(91)	75(146)
Flock size						
<100	79(39)	71(58)	55(40)	59(58)	70(37)	67(58)
100-1000	72(46)	77(99)	61(46)	65(99)	59(44)	72(99)
>1000	71(17)	100(7)	63(16)	57(7)	69(13)	71(7)

N changes between categories because not all cooperators responded to all questions.

Data also revealed a relationship between attentive dogs and fewer attacks. Of adult dogs rated excellent or good in attentiveness, 66% were associated with fewer attacks and 93% with reduced or no increase in predation.

DISCUSSION

At this point in the project, determining how well the introduction of livestock guarding dogs is progressing is based primarily on user satisfaction. This in turn depends on a number of factors, two of which are addressed in this paper: top scores in behavior and reduced frequency of predation. Although these gauges are often correlated, they sometimes occur in distinct sequences. Also, genetic and environmental components influence these factors, and again, can be temporal.

Information on predation provided by farmers has always been questionned, because of sampling problems and inclusion of other kinds of losses. Farmers on the other hand do have an estimate on their losses and were asked simply how that estimate compared with their losses after obtaining a dog. To overestimate the effectiveness of the dog would reduce their chances of getting other kinds of relief for depredation. Therefore we assumed that in cases where a farmer was having depredatory losses, his estimate for a new system would be conservative.

By setting a model or standard for assessing the dog's performance we could also test the farmer's assessment of losses against the dog's behavior. A correlation between trustworthy and attentive behavior, for instance, and a reduction of sheep losses, enhances our understanding of how dogs protect livestock. Using dogs to protect sheep is self-defeating unless the dogs are themselves trustworthy with their flocks. We found that 75% and 78% were rated trustworthy in 1981 and 1982, respectively. These figures are similar to those reported by Green and Woodruff 1980 for Great Pyrenees and Komondors. Of those trustworthy dogs, 72% and 74% were attentive in 1981 and 1982. Since dogs are often left unattended with flocks, they must be trusted before given the opportunity to be attentive. Some dogs were not attentive because they were restained because they were untrustworthy.

An interesting change from 1981 to 1982 appears in ratings of trustworthy and attentive behavior. In 1981, difference between breeds was significant (ANOVA $p < .05$). In 1982 the scores improved with no significant differences found between breeds. Improved scores are in part a result of culling for untrustworthy behavior. A genetic component to this behavior is suggested by differential cull rates that have been observed between strains (Lorenz et al. in prep.). Environmental components to trustworthy behavior have also been suggested (Coppinger et al. 1983).

Attentiveness is a key indicator of success because of its correlation to both trustworthiness and reduced predation. The 1981 and 1982 ratings of attentiveness to sheep, 59% and 64%, respectively, are similar to those reported by Green and Woodruff (1980) and similar to dogs in Italy (Coppinger et al. 1983). The importance of attentiveness is further seen in the 66% of flocks with reduced predation that had an attentive dog.

This is not to say that an inattentive dog is necessarily ineffective. Some dogs are inattentive to sheep, but attentive to farm or people (Coppinger et al. 1983). Confined in a fenced pasture or working in association with a shepherd, these dogs, too, may be effective guardians. Looking at the effect of flock size on guardian behavior, we found that trustworthy, attentive and protective ratings were similar for small flocks as well as large (Table 1). While behavior of sheep may influence the response of the dog, the number of sheep, *per se*, seems to be of little consequence.

The reduced predation reported for a majority of dogs is another important signal of success for this transported tradition. That 63% of the dogs were associated with fewer attacks on their flocks indicates that a majority of producers can expect reduced predation when using guarding dogs. Only in rare instances (7%) did predation increase. Most notable were the 25 dogs that were present with flocks that enjoyed a decrease in the number of attacks from ≥ 6 per year to zero. Some individuals reported reduction in losses of up to 250 lambs.

Beyond these numbers, other events in the field pointed to guarding dogs as a singularly effective alternate method for protecting livestock. If a dog did not perform according to the behavioral model, a replacement was provided either by shifting a dog from another farm or introducing a new pup. The data is not complete at this time because of the immaturity of the latter sample. However, switching an adult dog to a different farm is often successful in improving the dog's performance. Furthermore, a dog's failure on a farm does not predict that a different dog would also fail on that farm. Indeed, mistakes made in the rearing or training of the initial dogs, plus the selection of better strains, seem to increase a farmer's chances of being successful in a subsequent trial.

To date we have not found a management system where dogs could not provide some relief from predation. In some instances, effectiveness has been seasonal or confined to special groups such as orphaned lambs. Still, savings appear to be substantial. Recently, emphasis in the cooperator program has focused on difficult terrains with unusual predators (e.g., the puma, *Felis concolor*). In this manner, the scope of the project, the expertise gained and techniques discovered, will enhance the effectiveness of dogs for reducing depredations on livestock.

CONCLUSIONS

Results of this study confirm that introduction of livestock guarding dogs to North American livestock enterprises is feasible. Two parameters used to test the effectiveness of the dogs, ratings of performance and reduction in predatory attacks, both showed positive results from a large sample of experimental dogs.

Besides being effective, new methods for reducing damage by wildlife should be safe, selective, cost-efficient, socially acceptable, easily used, and adaptable (Sterner and Shumake 1978, Timm 1979). Data in all these categories are being collected as part of the Livestock Dog Project, and will be reported in the future.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the statistical advice of Michael Sutherland (Statistical Consulting Center, University of Massachusetts).

This study was funded by grants to Hampshire College from the U.S. Department of Agriculture (USDA/SEA #59-2259-0-2-119-0), the Rockefeller Brothers Fund, and the Geraldine Rockefeller Dodge Foundation.

LITERATURE CITED

Cain, S.A., J.A. Kadlec, D.L. Allen, R.A. Cooley, M.G. Hornocker, A.S. Leopold, and F.W. Wagner. 1972. Predator control - 1971, Report to the Council on Environmental Quality and the Department of Interior by the Advisory Committee on Predator Control. Inst. Environ. Qual., Univ. of Michigan.

Coggins, G.C. and P.B. Evans. 1982. Predators' rights and American wildlife law. Arizona Law Review 24(4):821-879.

Coppinger, R. and L. Coppinger. 1978. Livestock guarding dogs for U.S. Agriculture. Hampshire College, Amherst, MA. 25 pp.

Coppinger, R., J. Lorenz, J. Glendinning, and P. Pinardi. 1983. Attentiveness of guarding dogs for reducing predation on domestic sheep. J. Range Manage. 36:275-279.

Green, J. and R. Woodruff. 1980. Is predator control going to the dogs? Rangelands 2:187-189.

Leopold, A.S., S.A. Cain, C.M. Cottam, I.N. Gabrielson, and T.L. Kimball. 1964. Predator and rodent control in the United States. Trans. 29th N. Amer. Wildl. Conf. 29: 27-49.

Linhart, S.B., R.T. Sterner, T.C. Carrigan, and D.R. Henne. 1979. Komondor guard dogs reduce sheep losses to coyotes: a preliminary evaluation. J. Range Manage. 32:238-241.

Lorenz, J.R. and L. Coppinger. 1981. Field-testing livestock guarding dogs. Animal Behavior Society Abstracts (Knoxville, TN).

Newbold, V. 1974. Dogs. National Wool Grower 64(12):8.

Parker, J.L. 1979. Three livestock guard breeds that work!! Kuvasz Newsletter (January):2-5.

Sterner, R.T. and S.A. Shumake. 1978. Coyote damage-control research: a review and analysis. In: Coyotes: biology, behavior and management, M. Bekoff, ed. Academic Press, NY.

Timm, R.M. 1979. How to evaluate wildlife damage control programs - rodents. Proc. 4th Great Plains Wildlife Damage Control Workshop (Manhattan, KS):253-256.