Komondor Guard Dogs Reduce Sheep Losses to Coyotes: A Preliminary Evaluation

SAMUEL B. LINHART, RAY T. STERNER, TIMOTHY C. CARRIGAN, AND DONALD R. HENNE

Abstract

Four Komondor dogs were trained to attack captive coyotes and to stay within fenced sheep pastures. The dogs, used in pairs, were then evaluated on three ranches (65 to 330-ha pastures) to determine their potential in protecting sheep from coyote predation. Daily checks of sheep losses were made on each ranch for three consecutive 20-day periods: preceding placement of the dogs, during their time in pastures, and after their removal. Sheep kills by coyotes decreased significantly during and following use of the dogs, suggesting some potential for the deterrence of coyote predation—at least under fenced-grazing conditions.

Coyote (*Canis latrans*) predation upon sheep poses serious problems to stockmen in certain parts of North America (Cain et al. 1972; Gee et al. 1977; Sterner and Shumake 1978). Public concern over the nature and extent of predator-control activities has led to increased efforts to develop nonlethal methods of coyote-damage control (Sterner and Shumake 1978). One nonlethal approach which has received little scientific attention is the use of guard dogs.

Historically, dogs such as the Great Pyrenees (France, Spain), Kangal (Turkey, Iran), and Komondor (Hungary) had been used by Old World shepherds to protect sheep and goats from predation by wolves and bears. All three dogs are large (35-55 kg), aggressive toward intruders, and recognized as distinct breeds, although their ancestral origins are obscure. Evidence regarding the effectiveness of these dogs consists solely of testimonial accounts (Anonymous 1974; Gerber 1974; Newbold 1974), and empirical data to verify claims of reduced flock losses are lacking. In this report, we present the results of a preliminary field study which sought to evaluate Komondor dogs as a means of reducing coyote predation upon sheep in fenced-grazing situations. The Komondor was selected because more information regarding its use as a guard dog was available to us and because the Kangal is an extremely rare breed in the United States.[1]

Methods

Our research was conducted in two phases: (i) Dog-Training Phase and (ii) Field-Study Phase. The Dog-Training and Field-Study Phases lasted approximately 3 and 4 months, respectively.

During the Dog-Training Phase, we attempted to train three male and one female Komondors (age range, 10 to 22 months; weight range, 34 to 45 kg) to respond to obedience commands (Dog-Obedience Training), be with sheep without disturbing them (Dog-Sheep Training), respond aggressively towards coyotes (Dog-Coyote Training), and stay within fenced pastures for extended periods (Dog-Field Training). Two of us (TCC and DRH) served as trainers and were each responsible for the care, training, and evaluation of two Komondors throughout the course of the project. Training involved a series of reward and punishment procedures designed to "shape" specific behaviors of the dogs.

The purpose of Dog-Obedience Training was to teach each dog the proper response to four voice and hand commands: "sit" (sit on ground indefinitely with trainer in sight), "down" (lie on ground indefinitely with trainer in sight), "come" (move to trainer), "stay" (sit on ground for a least 5 minutes with trainer in sight and 3 minutes with trainer out of sight). During obedience training, each trainer
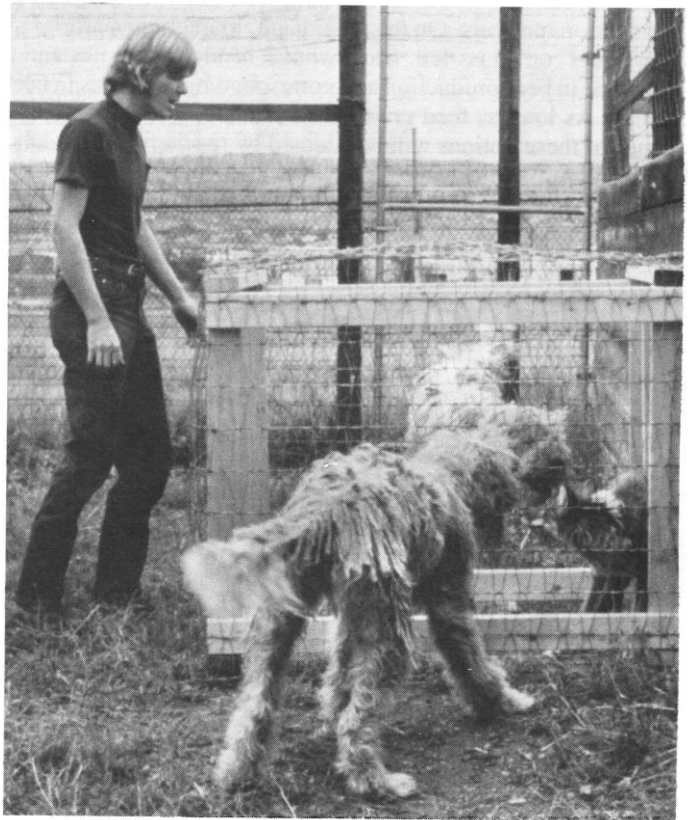

Fig. 1. *Trainer (DRH) demonstrating one aspect of dog-coyote training (i.e., encouraging his dogs to bark and close with a caged coyote during successive 2-min bouts in order to shape aggressiveness). (Photo reprinted courtesy of Academic Press.)*

repeatedly commanded and then positively (e.g., verbal praise, dog biscuit) or negatively reinforced (e.g., verbal scold, slap) individual dogs for their responses during two 1-hour sessions each day. This regimen continued until each dog achieved 5 out of 5 correct responses for the "sit," "down," and "come" commands and a minimum of 3 successive minutes for the "stay" command during a daily obedience test.

The purpose of the Dog-Sheep Training was to familiarize the dogs with sheep. Each dog underwent a three-step procedure involving: several daily one-half hour pairings with a few sheep (i.e., three to four) in a 1-ha fenced area near the kennels while leashed and the trainer(s) present; several 4-hr pairings with a few sheep while unleashed and the trainer(s) present; and finally, several 24-hr pairings of each dog with sheep while unleashed and the trainer(s) absent.

The aim of Dog-Coyote Training was to shape each dog's aggressiveness towards coyotes (see Fig. 1). This training consisted of several 2-minute trials in which each trainer praised and encouraged his dogs to bark and move toward a caged coyote, two to four 15-minute trials in which each trainer encourage his dogs to chase, bark, and bite at an uncaged, muzzled coyote in a 3- × 9-m fenced enclosure, and one 15-minute trial in which each pair of dogs was exposed to an uncaged, unmuzzled coyote in a 30- × 33-m fenced enclosure.

Finally, our Dog-Field Training procedure was intended to teach each pair of dogs to roam, but remain within fenced pastures. This involved a series of progressive training activities including: walking each pair of dogs in and around the periphery of pastures for extended periods; observing each pair of dogs for several hours visually during daylight or by use of a collar-mounted strobe light and radio-transmitter at night; and placing each pair of dogs with several sheep in pastures for 48- to 72-hr periods (i.e., dogs checked daily and nightly). During this procedure, each trainer rewarded his dogs for remaining in the pastures or punished them for wandering across the fence line.

The Field-Study Phase of our research was conducted on three ranches from early July to early October 1976. All ranches utilized barbed and/or woven-wire, fenced-pasture grazing without herders. Ranch A was in western Montana and involved tests with Trainer TCC's dogs. The test site consisted of several sparsely wooded ravines and hilly forb-grass pastureland. Our test was conducted in a 330-ha pasture containing approximately 1,100 ewes and lambs. Ranches B and C were in south-central North Dakota and involved tests with Trainer DRH's dogs. Vegetation was similar at both sites, consisting of mixed grasses and forbs with few or no trees. Tests at these ranches were conducted in 65-ha and 130-ha pastures containing approximately 225 and 250 ewes and lambs, respectively. Sheep on all three ranches grazed throughout the pastures during the day and generally bedded down at night on the same bedgrounds—areas about 50 to 75m in diameter. Human activity in all pastures was limited to between 8:00 a.m. and 6:00 p.m. daily in order to minimize interference with the nocturnal predation pattern of coyotes.

Our field test consisted of 60 successive days of monitoring sheep deaths on each ranch. This involved a 20-day "pre-dog" period to measure the frequency of predation associated with each sheep flock; a 20-day "dog" period while two Komondors were continuously present in respective pastures to measure the effect(s) of the dogs on coyote predation; and a 20-day "post-dog" period (following removal of the Komondors) to measure post-treatment predation. Throughout these periods, all known coyote-control activities were suspended in the vicinity of test sites, and cooperating ranchers were compensated for all coyote-killed sheep based on market value. During the pre-dog and dog periods, each trainer systematically searched pastures on foot or horseback for dead sheep between 9:00 a.m. and 6:00 p.m. daily. All carcasses were necropsied "on site" to determine cause of death and then removed from the pasture. Sheep mortality was categorized as coyote-caused or other. Determinations of coyote-killed sheep were based on the procedures outlined by Davenport et al. (1973); Henne (1975); Nass (1977); and Tigner and Larson (1977). During the post-dog period, searches of these pastures and determination of sheep mortality were carried out by cooperating ranchers or researchers.

Trainers familiarized their dogs with each test pasture at the start of the "dog" period by walking them through the pasture and around the perimeter of the fence. Food was placed on or adjacent to sheep bedgrounds. Dogs were given the "stay" command when the trainers left the pasture in late afternoon (before 6:00 p.m.). Dog activity was checked occasionally by radio-telemetry; this method also was used to locate dogs that left a pasture. We sometimes tethered one of the two dogs on the bedgrounds or along a coyote-travel route to increase the probability of dog-coyote encounters. No attempt was made to keep our dogs with the sheep after they left the bedgrounds in the early morning. The dogs frequently followed the trainers on daily searches of the pastures for dead sheep. Trainers continued to reward and punish their dogs throughout the Field-Study Phase.

Results and Discussion

The numbers of coyote-killed sheep observed during each of the pre-dog, dog, and post-dog periods were converted to kills/day. We used this estimate because scheduling permitted data collection on only days 11 through 20 of the pre-dog period on Ranch C. We reasoned that daily rate data offered the most appropriate estimates for this unequal sampling period. A one-way analysis of variance, having one observation per cell and periods treated as a repeated measures factor, was computed (Winer 1971).

Analysis of variance of the daily number of coyote-killed sheep observed for the pre-dog, dog, and post-dog periods proved significant ($F=9.97$; $df=2/4$; $P<.05$). Post-hoc mean comparisons based on Duncan's multiple range tests (Duncan 1955) showed sheep losses to coyotes were: (i) significantly less during the dog and post-dog periods as compared to the pre-dog period (see Fig. 2a and 2b), but (ii) not significantly different between the dog and post-dog periods. Whether the reduced rate of killing during the post-dog period was due to a "residual" effect from the dogs or to less intensive searches for dead sheep by our cooperators could not be determined. Nonetheless, the significant reduction of sheep killed by coyotes while dogs were in pastures strongly suggests their potential for curtailing predation—at least under the fenced-pasture grazing situations described in our report.

During our study, we made a number of observations regarding the behavior of Komondors. All of our dogs quickly adapted to the training regimen, responded well to their trainers, but remained wary of other persons. In the Field-Study Phase, it took 10 to 15 days for our dogs to really "settle down" in a given test pasture. We observed gradually increasing food consumption, defense of food and water from sheep, barking and approach towards strange trucks and individuals, and nighttime barkings as the "dog" periods progressed. It took about 7 to 10 days for the sheep to become accustomed to our dogs, and after several days the sheep resumed bedding on or near their customary bedgrounds. Contrary to views expressed by some ranchers and researchers, the sheep rarely bolted or bunched when the Komondors approached.

At all three ranches, our dogs seldom roamed the entire test pasture. Untethered dogs roamed about 20% of the 130-ha (approximately 0.5 square mile) pasture on Ranch B. Upon completing the test on Ranch A, we monitored the movements of TCC's dogs for three nights using collar-mounted strobe lights and radio transmitters. The dogs generally stayed within about 200 m of the food, water, and bedgrounds, except for one dog that traveled about 2 km down and back a ravine between 6:00 a.m. and 9:00 a.m. on all three mornings. Dog movements within pastures were apparently related to the location of food, water, shade, whether the other dog was tethered, and where we gave the "stay" command (i.e., bed ground). We usually found the dogs together in the morning near their food buckets. During
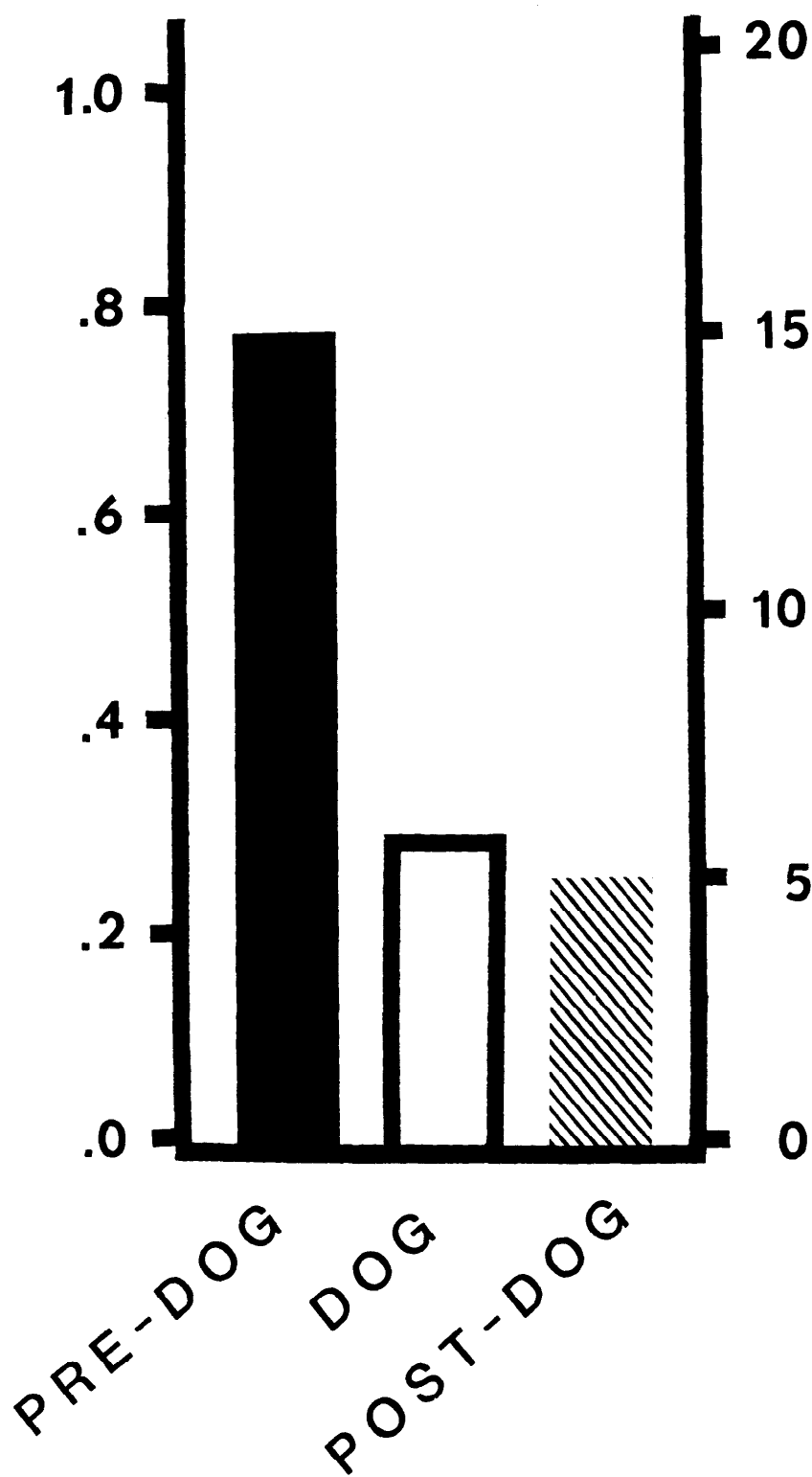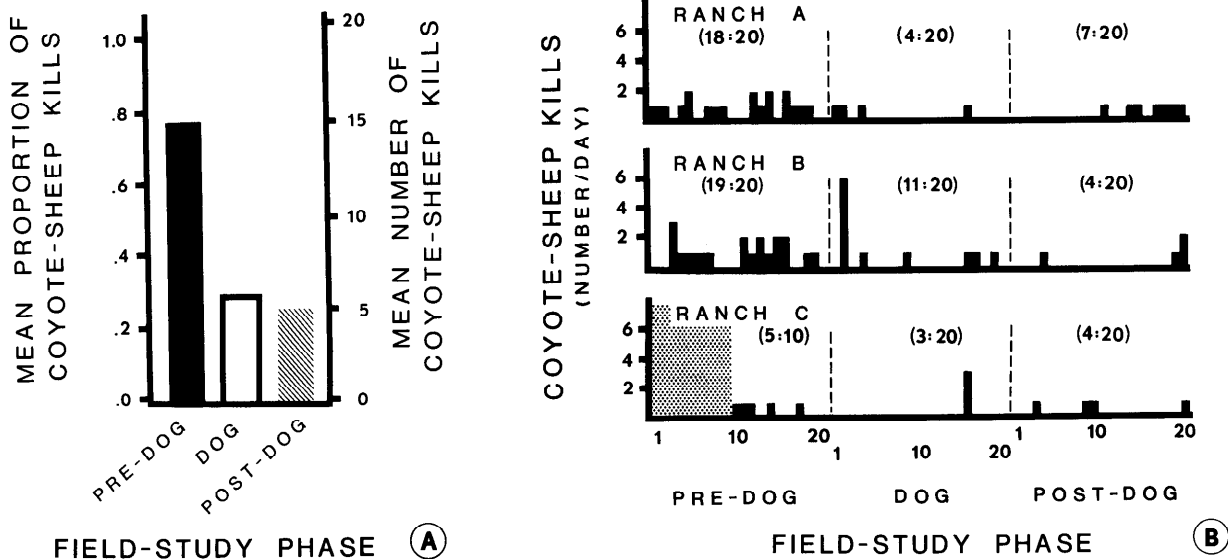
Fig. 2. *(A) Graph of the coyote-caused sheep deaths on all ranches during the "pre-dog," "dog," and "post-dog" periods (mean number of coyote-kills per period are shown on ordinate at right). (B) Graph showing the pattern of daily coyote-caused sheep deaths on each ranch during the "pre-dog," "dog," and "post-dog" periods (numbers in parenthesis are the actual sheep kills relative to the days of observation recorded for each ranch; the dotted segment for Ranch C indicates that no field observations of sheep mortality were recorded for the first 10 days of the "pre-dog" period for this ranch).*

the day, both dogs usually stayed near water or shade, occasionally returning to the food buckets on or near the bedgrounds.

As expected, coyotes typically killed sheep at night or in the early morning hours, usually on or near sheep bedgrounds. When our dogs were present in the pastures, kills generally occurred farther from the bedgrounds, although one sheep carcass was found within 60 m of a tethered dog. We have no evidence to indicate that the dogs actively defended sheep from coyotes, or that the dogs followed sheep as they grazed during the day.

Although the presence of Komondors in sheep pastures reduced coyote predation, several field observations must be considered in our results. First, considerable time and effort were spent training the dogs. However, during the Field-Study Phase it was still necessary to continue Dog-Obedience Training and reinstate efforts to keep the dogs within test pastures. We found it useful to provide dogs with food and water, as well as to tether one dog, on or near the sheep bedgrounds in order to keep them near the sheep at night. Second, dog movements were generally limited to about 20 percent of the test pastures (tethering the dogs during some phases of the study may have contributed to lethargy and restricted movement). When trainers returned to pastures on mornings of the "dog" period(s), they occasionally were able to approach within 20 to 25 m before alerting the dogs. Third, several incidents of Komondor attacks on sheep were noted. The pair of dogs on Ranches B and C (Trainer DRH) appeared "indifferent" to sheep; however, the dogs on Ranch A (Trainer TCC) chased and harassed sheep on numerous occasions during their 20 days in the pasture, wounding and killing several head. TCC observed seven incidents of sheep harassment, and believes others occurred. TCC attempted to eliminate this behavior by verbal reprimand, physical punishment, electrical shock (use of a dog-training collar while the dog was chasing sheep), isolation of the dogs, and tying each dog to a large ewe for approximately 1 hour on several occasions. We believe that Fetu, the older dog, initially began harassing sheep and that Jay, the younger dog, then

followed suit. These results point out the need for careful screening, selection, observation of initial dog-sheep interactions, and shaping of Komondors (probably before 1 year of age) for use as flock guard dogs. We believe that periodic contact between dogs and handlers may be required in field situations to maintain the performance of these animals.

Our design called for dogs to be moved from one test site to another. We think this adversely affected our dogs' performances. The dog (Fetu) that initially harassed sheep on Ranch A had at least four owner/trainers in 2 ½ years; this dog was somewhat more difficult to train and had nipped at sheep on several occasions during the dog-sheep training sessions. The performance of the dogs should be enhanced when trained and raised on the ranches where they would be used. In addition, several sheep kills by coyotes occurred within close proximity to our dogs (i.e., <60 to 100 m of sheep bedgrounds—common locations of our dogs), indicating a possible limitation of the dogs' effectiveness. Improved breeding, rearing, and training practices should alleviate at least some of these problems. Still, the mode by which our dogs' presence reduced predation remains uncertain; pheromones, barking, coyote neophobia, and actual coyote-dog encounters are only a few possible explanations.

In conclusion, sheep-management practices, rancher motivation to curb predation, and the severity of coyote-caused losses vary greatly throughout the western United States. Because many behavioral, environmental, and sheep-management factors influence the nature of coyote predation, any damage-control technique, including guard dogs, may be effective in some situations but not others. Moreoever, short-term studies cannot assess the coyote's capability to circumvent control techniques over time. We recommend long-term studies of at least 2 or more years to assess the potential of guard dogs for protecting sheep. Evaluation of dogs should be made under both fenced- and herded-management practices. Preferably, dogs should be raised with sheep from an early age, and trained and reared on the ranch where they will be evaluated. At about 12 to 18 months, dogs should be fed and housed in

pastures where coyote predation occurs. We plan future work aimed at more clearly defining the parameters and conditions that affect the use of guard dogs for protecting sheep from predators.

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