

Pro-active Livestock Management -- Capitalizing on Animal Behavior

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Abstract - This paper describes a technique for modifying sheep and or goat behavior to reduce canine predation, management time and fencing requirements under mixed-species stocking. Procedures to modify behavior of individual animals are outlined. The concept involves bonding small ruminants to cattle to produce a cohesive group termed a flerd. A flerd acts as a single interdependent cohesive livestock unit under free-ranging conditions rather than as distinct flocks and herds coexisting in the same area.

Key Words: Livestock behavior, canine predation, flerds

Introduction

In 1983, the 78,000 ha (193,000 ac) Jornada Experimental Range (JER), located within the Chihuahuan Desert in southwestern New Mexico, and operated by the United States Department of Agriculture, Agriculture Research Service, expanded its range livestock research program by introducing sheep with the existing cattle. As a result of this introduction, the JER was by necessity catapulted into predator control research. Hulet et al. (1987a) found 63 (66%) aged Rambouillet-type ewes out of a range flock of 96 were lost principally to coyotes (*Canis latrans*). From this initial loss, the JER has developed a multifaceted approach to coyote control. Turkish Akbash guard dogs in conjunction with modified sheep behavior have essentially eliminated predation caused by this wily and opportunistic canine. This paper summarizes research conducted between 1983 and 1996 to modify the behavior of small ruminants in order to enhance mixed-stocking management.

Mixed-stocking with livestock

Casual observation of free-ranging sheep and cattle reveal sheep do not consistently stay near cattle. In fact, interactions may occur < 6% of the time during daylight hours (Hulet et al., 1992a). Furthermore, most cattle exhibit physical hostility toward canines, especially when cow-calf pairs consider themselves threatened or trapped in their presence. Therefore, our research team reasoned if we could get sheep to remain with cattle when threatened under free-ranging conditions, this might afford protection from coyotes because of intimidation or physical aggression by cattle. First we had to address the question "How do we modify sheep behavior to exhibit an uncommon behavior and consistently remain near cattle under free-ranging conditions?"

From bond to flerd Bonding behavior research began on the JER in December 1985. A flock of Rambouillet x Polypay sheep were produced that consistently remained within ≤ 20 m (66 ft) of *Bos taurus* cattle. This was accomplished by penning 45, 62 and 90 day old lambs in close confinement with heifers for 60 days to form a bond. In contrast, non-bonded sheep maintained a distance of 600 to 1,000 m (1,968 to 3,280 ft) from cattle when the bonded and non-bonded groups were observed in a 120-ha (296-ac) paddock (Anderson et al., 1987a). These bonded animals were consistently within line-of-sight to one or more cattle. The animal aggregation in which small predator-susceptible ruminants consistently remained with one or more tolerant cattle under free-ranging conditions was termed a **flerd** (flock + herd; Anderson et al., 1988).

Behavior of cattle with bonded and non-bonded sheep was observed in the presence of a 6-year-old female border collie trained to voice and hand signals to simulate a threatening canine (Anderson et al., 1988). Non-bonded sheep consistently bunched together and ran independently of cattle, while bonded sheep ran and consistently crowded together among the cattle until the canine threat ended. When the flerd stopped moving, cattle consistently turned to face the threatening dog.

In a 163 day (d) study, no bonded sheep were lost to coyotes, while coyotes killed non-bonded control sheep at a rate of one every five days (Hulet et al., 1987b). Bonded sheep apparently were protected from coyote predation because cattle numbers and their size intimidated the coyotes. Furthermore, observations since 1986 suggest predator protection is not compromised by formation of subgroups within a flerd as long as sheep consistently remain with cattle.

The bond appears unidirectional, i.e. the smaller ruminants' behavior is modified while cattle simply tolerate the presence of sheep. We attempted to bond 90-day-old heifers to 18-month-old ewes during 80 days of pen confinement. However, only when a single heifer was kept with the sheep would it follow the ewes, if given the opportunity to associate with other cattle, the heifer separated from the sheep and acted independently of them (Anderson et al., 1992).

Management benefits In addition to providing protection from canine predation, flerds offer other management benefits without compromising grazing/browsing benefits from mixed-species stocking. Even though sheep consistently remain near cattle under free-ranging conditions, sheep diets and cattle diets in a flerd are essentially similar to those for flocks and herds respectively (Anderson et al., 1990; Hulet et al., 1992a).

Special situations such as during parturition occur in which individual sheep may leave a flock or flerd, therefore, "sheep-proof" boundary fences are recommended. However, "sheep-proof" fencing within a property may not be required because bonded sheep consistently remain near cattle during periods of foraging and rest (Anderson et al., 1994). Fencing adequate to prevent unwanted cattle movement will prevent sheep movement if paddocks adjoining the flerd are free of cattle since bonded sheep associate with cattle, not with specific animals. This indiscriminate bonding is an advantage since flerd integrity is retained even after culling of cattle based on management decisions.

Locating animals comprising a flerd may be faster than locating separate flocks and herds. Locating bonded animals in dense brush or during periods of fog and snow requires less time because cattle are larger and are usually recognized first compared to smaller ruminants. The potential savings when needing to locate bonded animals compared to similar non-bonded animals can be substantial and has been estimated at \$0.10 $\text{hd}^{-1} \text{d}^{-1}$ in 1992 U. S. dollars (Anderson et al., 1994).

Flerds need not be limited to sheep and cattle. We have used pen confinement to bond 5-month-old mohair kid goats (Hulet et al., 1989) and 100-day-old Spanish kids (Hulet et al., 1991) to cattle. Both breeds of goats were of mixed gender but the Spanish goats were predominantly castrated males. Our Spanish goats demonstrated minimal flocking tendencies. However, it may be possible to create a cohesive Spanish goat flerd if rigorous selection is used to eliminate individual animals that refuse to remain as cohesive members of a flerd. In contrast, mohair goats readily flocked and when confined with cattle and sheep, bonded to both cattle and sheep.

Flerd characteristics Bond strength refers to the distance of separation between predator-susceptible animals and the animal species to which they are bonded. Strong bonds have the shortest distance of separation between species. A strongly-bonded animal will act as a "bridge" for those with a weak bond or no bond because of the flocking instinct of most small ruminants. For example, we found 12 bonded sheep can control movement of 12 non-bonded sheep (Anderson et al., 1988). The optimal ratio of cattle to sheep may differ in flat vs. undulating topography because line-of-sight will vary depending on landscape. Therefore, to optimize the opportunity for a cohesive flerd, all small ruminants should be given the opportunity to bond to cattle.

Capitalizing on among-animal variation may be useful in developing flerds. Bonded wethers were found to maintain a stronger bond (shorter distance of separation) to cattle compared to bonded ewes (Anderson et al., 1996). Cattle, irrespective of physiological state, age and breeding, provide sheep equal protection from coyote predation based on 11 years of JER bonding research.

How to bond an animal

A bonded animal appears “consistently aware” of the location of the species to which it is bonded. Sheep and or goats appear to synchronously “echo” the movement of cattle as the flerd “flows” across the landscape. The bond can be produced through any reasonable method to socialize animals through close association. The mean distance between bonded small ruminants and cattle does not appear related to length of pen confinement (30 vs 60 days). Once established, the bond will endure over time even though the distance of separation between bonded sheep and cattle has been observed to increase over a three year period (Anderson et al., 1996).

Pen confinement Repeated experiments conducted since 1985 have involved confining cattle and lambs to pens for a period of uninterrupted time between 14 and 60 d. A negative aspect of this procedure is labor and feed costs during confinement, estimated to be \$0.51 sheep⁻¹ d⁻¹ in 1992 U.S. dollars (Anderson et al., 1994). Because of high predation losses, JER lambing is carried out in a corral. This management routine can provide an opportunity to produce bonded animals. By incorporating pen bonding into ongoing management such as lambing, winter feeding or a feedlot program, the costs associated with confining sheep just to produce a bond can be eliminated.

We have successfully created bonds using rectangular and triangular pens with solid sides having mean areas ranging from 4.8 m² animal⁻¹ (52 ft² animal⁻¹) to 17.5 m² animal⁻¹ (188 ft² animal⁻¹) with the ratio of cattle to small ruminants in these two size pens ranging from 1:3 to 1:1, respectively. Baled hay and a mineral block were provided in a feeder located in each pen at the end opposite the drinking water. A creep area in each pen provided a safe area where lambs could escape from cattle if they became physically abusive and an area for supplementing the growing lambs. The creep can also serve as an initial interface between cattle and the animals to be bonded by penning small ruminants in the creep during the first 24 hours and feeding hay on both sides of the creep. The following day, the small ruminants to be bonded can be released into the pen and socialization resulting from animals eating together at a common feeder can begin. An animal’s location in the pen can focus attention on potential problems. Lambs penned with physically abusive heifers tend to spend twice the amount of time in the creep area compared to lambs penned with gentle, tolerant heifers (Anderson et al., 1987b).

Length of pen confinement appears to affect bond consistency. Lambs have been observed to associate with cattle within 24 hours following birth and some bonding occurs after only 7 days of uninterrupted pen confinement. However, as a rule of thumb, to produce sheep and or goats that bond to cattle, research from the JER suggests penning recently weaned small ruminants with docile, gentle cattle for a minimum of 40 to 50 consecutive days of uninterrupted confinement, this will result in a consistent bond. The procedure appears simple yet is not always successful. Following 60 d of pen confinement, a consistent cohesive bond to cattle did not develop using 60 day-old purebred Rambouillet and 1/4 Finn, 3/4 Columbia or 3/4 Targee crossbred lambs (Anderson et al., 1993).

Once a bond is created, its maturation should be fostered by initially releasing the bonded group into a small paddock in which line-of-sight among animals is consistently optimal. As the flerd matures to paddock conditions, situations such as dense brush that may limit the line-of-sight among livestock does not appear to adversely influence bond integrity. However, always provide only a single source of drinking water at any point in time, and be innovative and capitalize on animal senses when possible to bring animals together, especially in undulating topography. For example, sound can be used to help orient sheep toward cattle by placing a bell on docile cattle.

Pen confinement plus field socialization Under current JER management parturient bonded ewes are removed from the range and cattle and allowed to give birth in a corral. The ewe-lamb pairs remain in the corral for approximately 2 months during which time the lambs grow and gain strength. Following this period of corral confinement the ewe-lamb pairs are reunited with cattle. The ewes immediately re-associate with and follow the cattle as a result of having been previously bonded.

Lambs are weaned approximately 5 months after birth by removing the dams for a period of 5 days. During this 5 d separation, if lambs are evaluated for bond strength, they do not appear to have formed bonds during the previous 3 months they and their dams have followed the cattle on the range. On day 6 when the dams are returned to the flerd, though the lambs have been weaned they continued to follow their dams. The lambs raised with bonded ewes, when evaluated after 217 d with the flerd, demonstrated a bond to cattle comparable in strength and similar to pen-bonded lambs that had been weaned at 50 days of age and penned with heifers for 34 d before being placed into the flerd (Hulet et al., 1992b).

Implications It may be possible to create bonded sheep and or goats by combining short periods (3 to 7 d based on unpublished data) of socialization in pens with extended (proposed several weeks) periods of confinement in a paddock that provides optimum line-of-sight opportunities among animals. Because JER sheep bunch together when threatened, once these sheep have become socialized to cattle, it may be possible to shorten the period of small paddock confinement by periodically using a threatening canine to force the sheep to return to the cattle when they are observed to have separated. Unpublished research conducted on the JER indicates a threatening canine used to “dog” sheep that have separated from cattle may be a valuable tool to foster bond formation. One aspect of current animal behavior research on the JER is focused on how to produce bonded animals in the shortest possible time.

Conclusions

Several management costs including predation losses from coyotes, labor and fencing can be reduced when raising small ruminants with cattle. This is accomplished by modifying the individual behaviors of sheep and goats that will ultimately alter their group behavior. Molding behavior to create fherds by socializing sheep and goats to cattle requires the keen eye and consistent innovative input of a pro-active manager. Flexibility is essential when operating a mixed-species livestock operation, especially when one of the multifaceted approaches involves manipulating animal behavior.

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