

Bonding of Spanish kid goats to cattle and sheep*

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ABSTRACT

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Spanish kid goats, white-face range lambs, and yearling beef heifers were used to study the effects of close interspecies confinement on bonding of the small ruminant species to each other or to cattle. Treatment groups consisted of (1) 3 Spanish kids, 3 heifers and 3 young lambs (43–53 days with no previous exposure to cattle); (2) 3 Spanish kids, 2 heifers and 3 older lambs (74–105 days with some previous exposure to cattle). Each of these treatments was replicated three times. During field testing, following 30 days pen confinement, the older lambs stayed closer ($P < 0.05$) to the heifers than did the younger lambs. However, no difference ($P > 0.05$) existed between young and old lambs following 60 days pen confinement. Spanish kids did not differ ($P > 0.05$) in the degree of bonding from lambs. After testing at 60-days, the groups originally confined together were re-combined and sorted into kid–heifer and lamb–heifer groups and tested at pasture for affinity of kid goats to heifers and lambs to heifers, independent of the other small ruminant species. Lambs separated from cattle during the 3-h test; whereas kid goats consistently stayed with cattle. In an extended field test, kid goats stayed with cattle over a 5-consecutive-day test with no observed separations. It was concluded that Spanish kids can bond to cattle and stay with them under free-ranging conditions. The data also suggest that with lambs, a bond may become stronger as the time of close association is extended beyond 30 days.

INTRODUCTION

Anderson et al. (1987) demonstrated that close confinement of young lambs with yearling cattle for 30–60 days can lead to social bonding of lambs to cattle, which can facilitate multispecies management on desert range and lead to more efficient utilization of the range resource. However, recent studies by D.M. Anderson, C.V. Hulet, J.N. Smith, W.L. Shupe and L.W. Murray (personal communication, 1990) demonstrate that young calves do not bond to

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sheep. Non-bonded sheep do not stay with cattle. Angora kids formed only weak non-enduring bonds to cattle (Taylor et al., 1988), but bonded well to lambs. When these bonded lambs were with cattle, the lambs would stay with the flerd (flock-herd) and derive protection from it (Hulet et al., 1987). Spanish goats are known for their browsing ability, and may greatly complement a multispecies grazing program (Merril, 1985; Taylor, 1985, 1986). However, they are also known for their independence of other species and for their propensity to penetrate all but the most superior fence. Research on the Jornada Experimental Range requires use of range-conditioned goats as browsers to study methods of brush control, and to increase the efficiency of forage utilization. It appeared to us that the only feasible way to maintain Spanish goats on brush-infested rangeland so that predation or immigration losses were not experienced, was to bond them to sheep and cattle.

The primary aim of this research was to determine the feasibility of bonding young Spanish kids ~45–100 days of age (10.5 kg mean liveweight) to lambs and replacement heifers, and thereafter maintain them on a continuous basis in a permanently established flerd. It was of further interest to evaluate the influence lambs had on the formation of the bond of Spanish kid goats to cattle.

ANIMALS, MATERIALS AND METHODS

Animal description and interspecies confinement strategy

Eighty-five young Spanish kid goats about 45–100 days of age were purchased from a ranch in western Texas where they had opportunity for contact with cattle and sheep. Six were female and 79 were male. The male kids were castrated by elastration, and all kids were vaccinated for enterotoxemia and treated for parasites. Eighteen goats with a mean liveweight of 10.5 kg were taken at random from the flock on 5 April 1989, and randomly allotted to each of six adjacent pens, 4.3×13.4 m. Nine young lambs (41–53 days of age) were allotted at random to three of the six pens. Nine older lambs (74–105 days of age) were randomly assigned to the remaining three pens. This provided two age groups each replicated three times. Eighteen crossbred heifers (Brangus and Hereford×Angus) 8–10 months of age, were allotted at random to the six pens. The older lambs (old, exposed) were born to ewes that had previously been bonded and were part of a flerd. These ewe–lamb pairs were moved to a feedlot shortly after birth of the lambs where they and their dams were kept with a cow until randomly assigned to an experimental group. The younger lambs were weaned from their mothers immediately before being penned with the heifers and had no previous exposure to cattle.

Animal care during confinement

Alfalfa hay was fed once per day each evening to the six confinement groups in community feed bunks. Water was supplied from a common trough at the opposite end of the rectangular pens. The lambs and kid goats also had access to whole milo grain in small creeps located opposite the water.

Tests for interspecies cohesiveness

After 30 and 60 days of confinement, the six pen groups were tested for interspecific cohesiveness (bonding). The tests involved taking the groups from the confinement pens, three pens per day, to three corrals adjacent to pastures varying in size from 122 to 488 ha. The animals were left overnight, and released between 07:00 and 08:00 h into three pastures. They were allowed to move freely during a 5-h test period. The pastures allowed the species potentially to separate by 1.2–4.5 km. From time of release, at 15-min intervals, the diameter of the smallest circle that would encompass all animals of each species was observed and recorded and represents within-species cohesiveness. The shortest distance between the perimeter of each of these circles was also recorded and represents between-species cohesiveness. When circles overlapped, there was intermingling of species and the distance between species was zero.

Following the initial tests of the six multispecies pens of animals the livestock were sorted into two groups. One group consisted of all of the goats and half of the heifers. The second group consisted of all of the lambs and the other half of the heifers. This was done to evaluate the cohesiveness of the kid–heifer bond relative to the lamb–heifer bond, independent of the influence of the other small ruminant species. These two groups were tested for 3 h. When the test species in any of the tests became separated for > 15 min, with no indication that they would re-group spontaneously, they were reunited by the observer to permit further testing of the affinity of small ruminants for cattle.

At the conclusion of the combined kid–heifer observations in order to test further the kid goat bond with the cattle, and evaluate its endurance over time, the kids were left with cattle on a continuous (24 h day⁻¹) basis for 7 consecutive days and observed once per day, after the weekend, for location on the pasture with respect to the cattle.

Statistical analysis

The data were summarized by classifying the estimated diameters of each species group into one of three categories: diameter ≤ 15 m; 15 m < diame-

ter ≤ 30 m; diameter > 30 m. Likewise, the estimated shortest distance between perimeters was classified into one of three categories: distances ≤ 15 m: $15 \text{ m} < \text{distances} \leq 30 \text{ m}$; distances $> 30 \text{ m}$. We arbitrarily defined bonding as having occurred if interspecific distances were $\leq 322 \text{ m}$, and bonding was considered to be strong if the distance was $\leq 161 \text{ m}$.

The data were statistically analyzed using the χ^2 test of homogeneity. Age and exposure of lamb was tested for differences in group diameter for each animal species and for each time (30 and 60 days). In addition, lambs and goats were compared for differences in group diameter, also at 30 and 60 days. Interspecific distances were analyzed similarly to group diameters. The combined kid-cattle and lamb-cattle groups were not replicated, and did not lend themselves to conventional statistical analysis, but a description of the behavior is of interest and value in interpreting the bonding propensity of Spanish kid goats.

RESULTS

Weather during the 5-day field test was warm ($21\text{--}35^\circ\text{C}$) and typical of May weather in Las Cruces, NM ($32^\circ 37' \text{N}$, $106^\circ 44' \text{W}$). The skies were clear to hazy with calm to light breezes.

Lamb age and exposure, averaged over pens had no effect on lamb group diameter at either the 30-day ($\chi^2=0$, $P=1.000$) or 60-day ($\chi^2(1)=0.342$, $P=0.559$) test, nor in their affinity (interspecific distance) for the heifers at the 60-day test ($\chi^2(2)=1.403$, $P=0.496$). Kid-group diameter did not differ from lamb-group diameter at either the 30- or 60-day test ($\chi^2(1)=0.851$, $P=0.356$ and $\chi^2(2)=0.225$, $P=0.894$, respectively). Older, exposed lambs stayed closer to the heifers than younger lambs during the 30-day test ($\chi^2(2)=7.502$, $P=0.023$).

Interspecific distance frequencies are shown when tested after 30 and 60 days confinement in Fig. 1. Each of the young lamb groups and the kids in these three groups became separated from the heifers at least once during the 20 observations over the 5-h field test. These separations required observer initiative to get the groups back with the cattle within a relatively short time. Reuniting the test species was done to permit further testing of the affinity of the small ruminants for cattle. None of the 3 older, exposed lamb groups, and only 1 of the goat groups with older, exposed lambs, became separated from the heifers during the 5-h field test. This separation was $\sim 300 \text{ m}$.

The affinity of the young lambs for the heifers appeared to have increased by the 60-day test and there was no difference in affinity between the older, exposed lambs and younger lambs for the heifers ($\chi^2(2)=1.403$, $P=0.496$). There were no separations of lambs from cattle that required reuniting by the observers, and the estimated mean distance, based on all observations of the younger lambs from the heifers appeared much less after 60 days' than after 30 days' confinement with heifers. Closeness of the kid goat groups to the

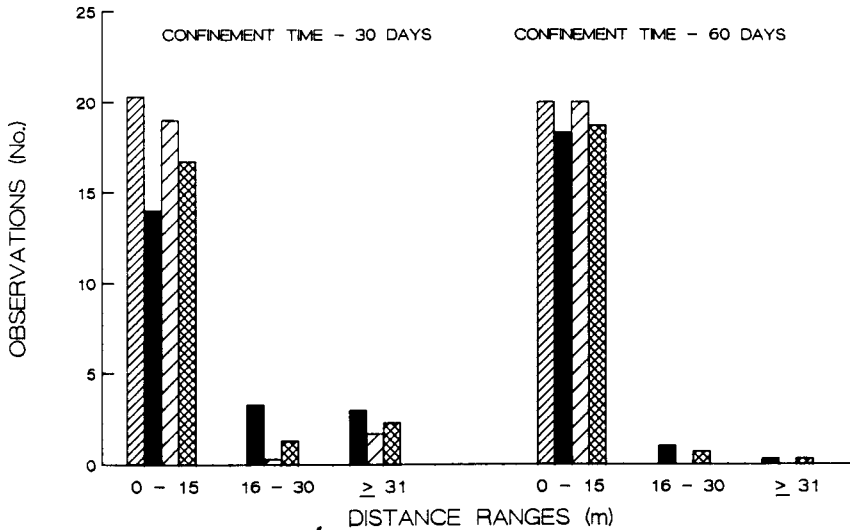


Fig. 1. Frequency that interspecies combinations were observed within three distance ranges under free-ranging conditions following 30 and 60 days of close pen confinement. Comparisons were made between old, exposed lambs and heifers (▨), young lambs and heifers (■), kid goats with old, exposed lambs and heifers (▧), and kid goats with young lambs and heifers (⊠).

heifers did not differ from that of the lambs at either 30 or 60 days. When kid goats were separated from the lambs and observed independently for 3 h, the kids distributed themselves uniformly among the cattle. They grazed and moved with the cattle without separation for the 3-h period of field observations. All the lambs (18 head) followed the cattle as a clustered group in, more or less, a double or triple line behind the cattle. After 1.5 h, all but 3 lambs became separated by > 350 m from the cattle and required the observers to reunite the group to permit further testing.

DISCUSSION

Observed differences in affinity of younger lambs and older lambs to cattle over time in an earlier study (Anderson et al., 1987) were in the same direction as in this study, but were small and not significant. Although it appeared from their following behaviour and occasional vocalization that the kid goats were attracted to the heifers, it was not possible objectively to evaluate the affinity of the kid goats for the cattle, independent of the lambs in these multispecies groups. However, whenever there was a separation of the younger lambs in multispecies groups, most of the kid goats went with the lambs. One or 2 kids would characteristically stay with the cattle. Observations by Hulet

et al. (1988) suggest that Spanish kid goats might stay near cattle because of their affinity for lambs that are bonded to cattle.

During the hot afternoon while the kid goats were being tested with cattle only, they appeared to be hot and tired as they attempted to keep up with the yearling heifers. During this period, we observed ≥ 1 kid goats occasionally stop, and several even lie down in the shade of a mesquite shrub. However, in each case, as the distance between them and the cattle increased, the kid goats would vocalize, then run to catch up with the cattle and other goats.

It is interesting that when individual bond groups containing 6 or 7 lambs in an earlier unpublished study were combined to form larger lamb groups, the integrity of the bond was not maintained under free-ranging conditions until the lambs were ~ 6 months of age. However, the bond holds quite consistently as long as the combined groups remain small (6–7) individuals in size. These earlier separations, as well as the separations in the large combined group in this study may be the result of delayed development of the flocking instinct in sheep. Attempts by the authors to get young lambs (40–50 days old) to stay with mature ewes on the range immediately following weaning were unsuccessful. The lambs ran to the ewes at the initial contact, apparently looking for their mothers. However, they would not follow the mature sheep, but were content to stay with their own peer group, even after repeated attempts to unite them. When small groups of yearling ewes were placed with mature ewes in the range flock, they demonstrated satisfactory flocking instinct. This suggests that flocking, independent of filial attraction to dams, is age dependent.

After completion of the 7-day observation period, the kid goats were maintained with a separate permanent multispecies flerd of about 80 sheep, 65 goats and 70 cattle on a continuing basis. Some goats became separated from the cattle once over a 35-day period when they went to water independently of the other livestock. Since that time, they have been maintained with a flerd of 80 sheep, 71 goats and 49 cows in a demonstration management system with consistent association among the 3 ruminant species. As the Spanish goats have matured, they have demonstrated a greater degree of independence than the sheep, and periodically, some of them separate from the cattle and sheep for short periods of time.

These results indicate that Spanish kid goats can be bonded to cattle and stay with them under free-ranging conditions. The data also suggest that a bond of younger lambs to heifers may become stronger with time in close association with cattle.

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