Calf grazing patterns and performance under virtual fence management

Sallie Sherman[1], Miranda Meehan[1], Christopher Byrd[2], Travis Seaborn[1], Christopher Augustin[3] and Kevin Sedivec[1,4]

When utilizing virtual fence to manage cow-calf pairs, we found no difference in containment within the virtual fence boundary between collared cows and their uncollared calves. However, the distance that calves grazed from their dams increased as the grazing season progressed. Additionally, calves in the virtual fence patch graze treatment group had increased average daily gains than calves in a continuous grazing system.

Summary

Virtual fence systems are a growing option for livestock grazing management, but there is little information on how efficient they are at managing cows with calves and the distance calves will creep graze without physical fences restricting their movement. A subset of cow-calf pairs in a virtual fence-managed patch grazing trial was tagged with 701x ear tags to track cow and calf movement throughout the grazing season. There was no difference between containment with the virtual fence boundary between the dam and calf overall, but there was a significant difference between cow-calf pair containment and period within the grazing season, indicating an uptick in creep grazing. Calves did graze significantly farther from their dams as the grazing season progressed. Calves in the virtual fence treatment group also gained approximately 0.57 lbs. more per day compared to continuous-graze calves. While more research is needed to better understand how the cow/calf relationship interacts with virtual fence management, our data indicate improved calf performance in a virtual fence patch-grazing system compared to a continuous-grazing system.

Introduction

Virtual fencing systems utilize digital fence boundaries and global positioning system (GPS) that enable collars or ear tags to manage the movement of grazing animals. Auditory and electrical stimuli are used to keep individual animals within the boundaries designated by virtual fences. Most virtual fence technologies are not recommended for calves because they would require constant monitoring and adjustment to account for their growth, and the electrical stimuli is designed for animals over 500 lbs. Therefore, virtual fence technologies are commonly evaluated to determine their effects on livestock production outcomes on stocker or dairy cattle.

There is minimal information on the behavior of calves grazing with their dams managed by virtual fence. Preliminary research from Utsumi et al (2023) found that cows managed by virtual fence received more virtual fence cues preweaning and were more responsive to virtual fence cues postweaning (Utsumi et al. 2023). The purpose of this study is to understand calf creep-grazing behavior when managing cows with virtual fence and to document the performance of calves during creep grazing by utilizing virtual fence collars on cows and GPS ear tags on calves.

Procedures

One hundred and ten cow/calf pairs were turned out in three replications of patch grazing with virtual fence from June 11 to Oct. 6 (116 days) during the 2025 grazing season at Schnell Recreation Area. Cows were trained on the virtual fence system for four days prior to turnout using a standardized system training protocol. Three pastures were divided into quadrants using virtual fence, and cows were permitted to graze ¼ of the pasture for the first 50 days, ½ the next 50 days and ¾ of the pasture for the remainder of the grazing season, resting ¼ of the pasture (Figure 1). This pattern created a gradient of disturbance by varying grazing intensity over space and time, impacting vegetation structure. Pastures ranged from 440 to 532 acres, and within the pastures, the patches ranged from 110 to 133 acres. Forty-six cow/calf pairs were

[1]School of Natural Resource Sciences, NDSU
[2]Department of Animal Sciences, NDSU
[3]Dickinson Research Extension Center, NDSU
[4]Central Grasslands Research Extension Center, NDSU

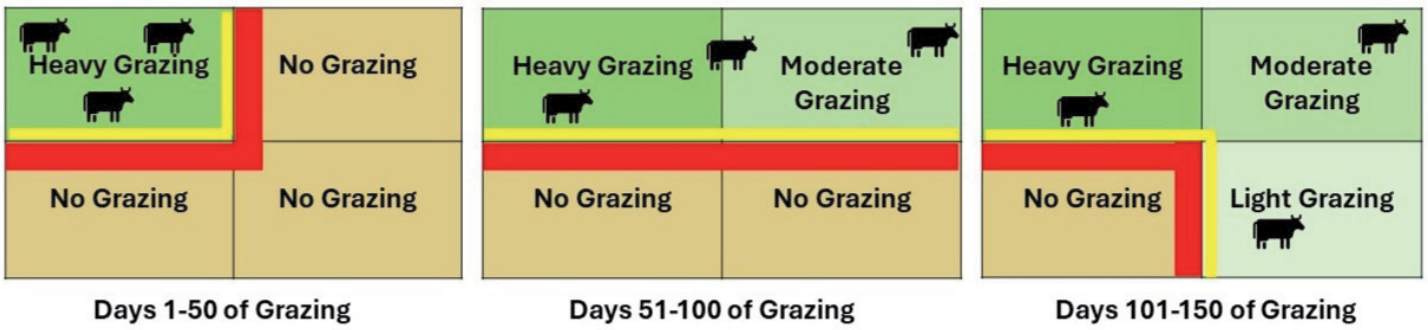

Figure 1. Patch grazing with virtual fence. Yellow and red lines indicate the virtual fence for the period, with yellow lines indicating the sound stimulus barrier, and red lines indicate the shock stimulus barrier.

continuously grazed as a control treatment.

According to protocol, only the cows were collared, as collars are not recommended for calves because of growth and weight restrictions. Of the 110 cows, a subset of 38 cows received 701xPro ear tags and their calves received 701xLite ear tags. Of the cow/calf pairs tagged, GPS data for the entire grazing season was recorded and recovered for 12 sets of tags.

All data cleaning and analysis was conducted in R Studio. Containment within the virtual fence boundary was determined by the time spent inside and outside the boundary, based on GPS points and timestamps. The daily containment averages were used in a t-test after testing for assumptions to identify differences in cow and calf containment within the virtual fence boundary.

To determine the degree to which calves engaged in creep grazing, GPS points were used to determine the average distance of a calf from its dam over time. The first GPS point for each hour was used to determine the distance between each dam and her calf to overcome inconsistencies in datapoint timestamps. These data were used in a linear model to capture any change in that occurred outside of the virtual fence boundary as the grazing season progressed. An ANOVA and Tukey test determined variance between months.

Two-day weights were collected pre- and postgrazing for all calves in the virtual fence patch graze treatment group (n = 104) as well as for calves continuously grazed at the same site (n = 46). The impact of virtual fence patch grazing on calf performance was determined by comparing average daily gain between the two groups using an ANOVA.

Results and Discussion

The difference in containment time between cow and calf containment was used to determine how much cow-calf pairs spent inside and outside of the virtual fence boundary. Positive differences indicate that the calf spent less time within the virtual fence boundary and, therefore, presumably creep grazing, and negative values indicate the time the calf spent within the virtual fence boundary while the dam was not contained. Values closer to zero indicate similar grazing behavior in cow and calf. Cow-calf containment between pairs did not differ across the grazing season. The majority of variance in cow containment is driven by individual cow behavior ($P < 0.001$) and timepoint during the grazing season ($P = 0.003$) (Figure 2). Variance in cow containment was not related to

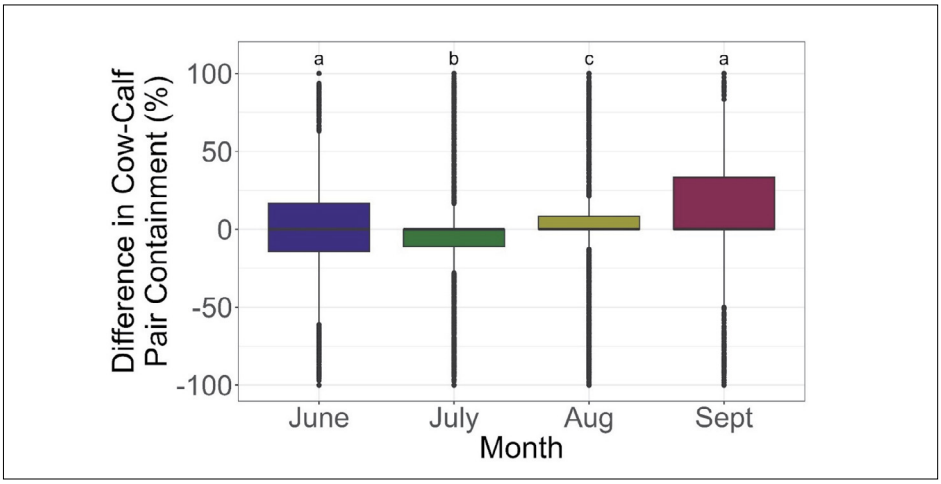

Figure 2. Difference in cow-calf pair containment with virtual fence boundaries over time on the Schnell Recreation Area near Richardton, North Dakota, in 2025. Letters denote significant differences ($P < 0.05$) between months. Positive values indicate greater incidence of creep grazing.

calf containment ($P = 0.34$). Calves spent more time outside of the virtual fence boundary than their dams every month, with the highest incidence of creep grazing occurring in August.

The distance between calves and their dams increased as the grazing season progressed ($P < 0.001$). On average, calves grazed 289.9 feet from their dam in June, 413.3 feet in July, 434.0 feet in August and 380.5 feet in September (Figure 3). Calves continued to graze farther from their dams over time.

Calves in the virtual fence patch graze treatment performed better than those in the continuous grazing group ($P < 0.001$) (Figure 4). Virtual fence treatment calves gained approximately 0.57 lbs/day more than calves in the continuous grazing group.

In this study, we found no difference ($P > 0.05$) in containment within the virtual fence boundary between cows and calves. Calves did creep graze more and farther from their dams as the grazing season progressed, even as cows were granted a larger virtual fence boundary over time. This complements preliminary findings from Utsumi et al (2023) that calves of cows managed by virtual fence graze further away from their dams as the grazing season progresses.

Our results indicate that patch grazing with virtual fence can improve calf performance outcomes. Additionally, our results align with previously published literature that reported creep feeding, including creep grazing, is correlated with improved calf weight gain (Lardy et al. 2007). While virtual fence patch grazing has been shown to improve calf performance, further research is needed to better understand the cow and calf drivers to cross a virtual fence boundary, to better inform virtual fence management decision-making and to further improve production outcomes.

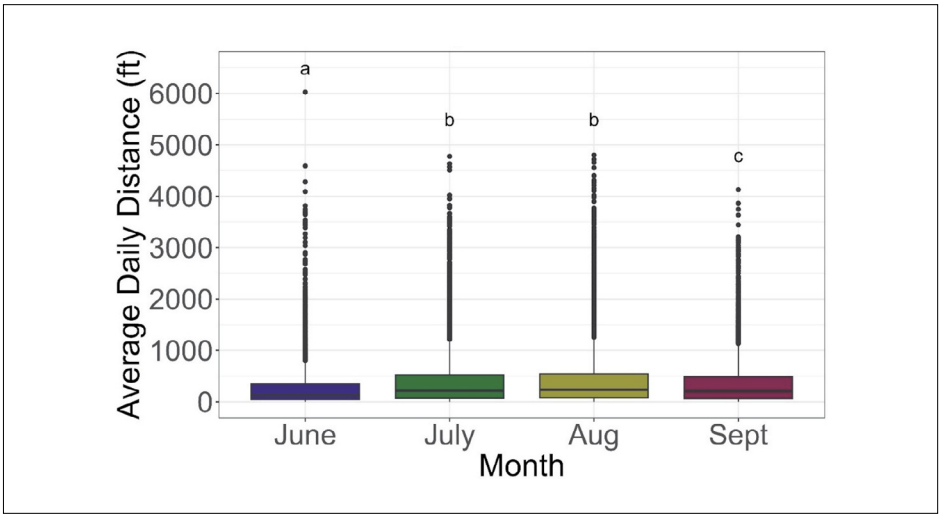

Figure 3. Calf grazing distance from dam by month on the Schnell Recreation Area near Richardton, North Dakota, in 2025. Letters indicate significant differences ($P < 0.05$) between months.

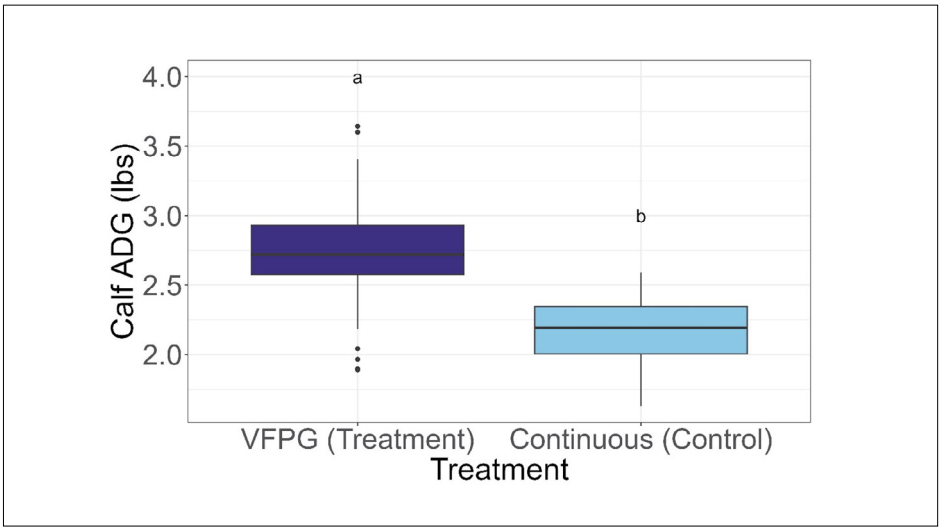

Figure 4. Calf average daily gain by treatment on the Schnell Recreation Area near Richardton, North Dakota, in 2025. Comparison between calves in the virtual fence patch graze group (VFPG) and the continuous graze group (Control). Letters denote significant differences ($P < 0.05$) between treatments.

Acknowledgments

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