

Space and Conflict in Cattle¹

SUSAN L. DONALDSON², JACK L. ALBRIGHT and MARY ANN ROSS

Department of Animal Sciences,

Purdue University, Lafayette, Indiana 47907

Abstract

Agonistic behavior is more pronounced among cattle when they are closely confined in yards or holding areas. Many authors have collected data on social behavior (dominance and temperament) under these conditions rather than when little agonistic behavior is occurring such as when cows are on pasture (1, 2, 3). Sommer (7) has reviewed the literature regarding dominance relationships in which a subject knows where he belongs socially, and territorially with his knowledge of a spatial place. Macmillan (5) reported that reduced fertility and short estrus cycles in young cows were the result of social stress in large herds of 200 or more cows in one group. Kilgour (4) suggested that in closely confined areas, the existence of the social order causes stress to the cows low in the dominance order in that they must constantly violate the space of higher ranking animals and they are attacked.

The purpose of the present study was to determine the amount of agonistic behavior and movement that occurs among animals in relation to rank when the size of available space is changed.

Method

Ten yearling Holstein heifers that weighed between 790 and 1,025 lbs were chosen randomly from a group of 25 maintained under summer pasturing conditions at the Purdue Dairy Center, Cherry Lane, West Lafayette, Indiana. The subjects were then confined in a 40 feet x 25 feet electric fence holding area. Adequate feed bunk space (3 feet x 16 feet) and a watering trough were at one end of the holding area.

The heifers were given 3 days to adjust to the holding area and then were observed 4 hours per day for the next 3 days to determine the social dominance hierarchy within the group, using the technique of Schein and Fohrman (6).

The holding area was lined at 5-foot intervals with a 2-inch strip of powdered lime with the result that the holding area was marked off into 5-foot squares (approximately the heifer's length of body).

One end of the fence was movable so that the size of the holding area could be adjusted by the experimenters.

Heifers were observed for 16 one-half hour periods for the next 2 days. Four observations were made under each of four sizes of the holding area: 40 feet x 25 feet, 30 feet x 25 feet, 20 feet x 25 feet

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²Present address: Indiana State University, Evansville 47712.

and 10 feet x 25 feet. These areas were considered to be 100, 75, 50 and 25%, respectively, of the recommended routine pen size allocation for yearling heifers. The order of size changes were reversed with each successive observation.

During the observational periods, all agonistic behavior was recorded and the dominance order was redetermined using the technique of Schein and Fohrman (6). Also recorded was the number of squares that each subject entered. A heifer was required to put both front feet in a square to be counted as entering that space.

The dominance order was compared with the one determined previously. Data were then analyzed by means of an analysis of variance.

Results and Discussion

Assuming a fixed model, an analysis of variance was computed on the obtained scores in Table 1. A summary of this analysis in Table 2 shows significant differences for both field size and subjects ($P < .01$) in that the three low ranking animals entered the most squares, averaging 1,044, and the five middle animals entered the least squares (469). As had been predicted by Kilgour (4), low ranking animals were observed to be constantly violating the space of other animals and were moving to prevent or avoid being attacked. Surprisingly though, high ranking heifers entered an average of 215 more squares than middle ranking animals. In the smallest enclosure (10 feet x 25 feet) it appeared that high ranking animals followed the escaping low ranking subjects. Subjects in the reduced space showed less total activity ($P < .01$).

TABLE 1. *Number of squares entered by subject, space allocation and rank order.*

Subject	10 X 25 ¹	20 X 25 ²	30 X 25 ³	40 X 25 ⁴	Total	Rank Order
1	113	367	284	214	978	8
2	82	197	197	185	661	1
3	52	129	102	87	370	6
4	153	317	324	314	1,108	10
5	76	194	204	233	707	7
6	47	92	86	100	325	5
7	79	138	119	132	468	4
8	86	231	191	198	706	2
9	72	156	116	133	477	3
10	120	357	258	312	1047	9
Total	880	2,178	1,881	1,908	6,847	

¹25 ft.² per animal, *i.e.*, one 5 feet X 5 feet square per subject.

²50 ft.² per animal, *i.e.*, two 5 feet X 5 feet squares per subject.

³75 ft.² per animal, *i.e.* three 5 feet X 5 feet squares per subject.

⁴100 ft.² per animal, *i.e.*, four 5 feet X 5 feet squares per subject.

TABLE 2. *Analysis of variance of experimental data.*

	df	SS	MS
Subjects	9	44781.26	4975.69
Fields	3	24408.92	8136.30
S X F	27	8897.27	329.52
Replicates	3	8845.02	2948.34
Error	117	58929.73	503.67
Total	159	145862.20	

F (Subjects) = 9.87**

F (S X F) = Non Significant

F (Fields) = 24.69**

** P<.01

Movement can be categorized as another indication of dominance. The behavior and status of animals moving from one area to another area was remarkably similar.

Considerable movement, conflict, competition and agonistic behavior occurred near the feed bunk. This is similar to earlier work with heifers (1, 3) and with cows (2).

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