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LEADERSHIP IN A HERD OF DAIRY COWS

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IN RECENT YEARS there has been increased interest in the social organization of animal herds and groups. Some research has been directed towards the role of dominance and leadership in such organizations (Altmann, 1952; Darling, 1937; Scott, 1945). The present study was carried out in Canterbury using a herd of 30 Friesian cows milked for town supply. The intention was to obtain precise information about the herd leaders. In particular, answers were sought to the following questions—was any one cow a leader always; was there a small group of cows who were always leaders; were the same cows leaders in different situations; were these leaders the most dominant animals? In this study the writers did not concern themselves directly with the nature of leadership as such, *e.g.*, do animals lead in the same sense as humans lead? Leaders were defined as the animals who went out in front of others, those in the more advanced positions in herd movements. Attention was also given to their role in initiating herd movements, and how such movements took place.

Method

Three herd movements were studied systematically: the movement to the bails for milking, the movement away from the bails after milking, and the movements made from paddock to paddock. These first two movements were regular—twice daily. The third movement from paddock to paddock occurred only from time to time. Observations throughout the day covered two fortnightly periods with a month's interval in between. In all herd movements during the four weeks' observation the position of each cow was recorded. A score for each animal was computed for the twenty-eight day period for each of the three movement situations. These were averaged to get a total leadership score and the animals were then ranked according to leadership.

Using the standard technique (Schein and Fohrman, 1955) of observing butting and fighting behaviour, and territorialism in the yard and at constrictions like gateways, etc., a dominance ranking of the herd was also made.

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Results

Cow No. 19 obtained top leadership score. But this does not mean that she was always out in front in any one of the movements, much less in all three of the situations. There was no such animal. It means only that she was rather more consistently oriented towards the advanced position than any other animal. Cow No. 25, for example, occupied the first place going to the yard 12 times out of 56; yet in the leadership ranking for that movement she was only 14th, while cow No. 30, only once in first place, was 6th in the average score, because she was more consistently towards the front than was cow No. 25.

This pattern of orientation shows up most clearly when the frequency with which a cow occupied any given position is plotted graphically. Figure 1 shows a frequency graph of cow No. 19, a leader cow in the movement to the bails. She was always near the front, being never further back than the 16th position in a herd of thirty cows. Figure 2 shows a typical medial cow, No. 33. Her position ranged mainly between the 4th and 20th places with some peaking of position near the middle. Figure 3 shows the behaviour of cow No. 44, typical of the rear group of cows, who was seldom ahead of the 17th position.

A comparison of the three movements of the herd studied shows that it was not the same group of cows who obtained the top leadership score in each. Looking at the first five cows in each of the three different movements, to the bails, from the bails, and from paddock to paddock, 13 different animals occupied the 15 top places and only one cow, No. 19, was common to the first five in each of the three movements. It should not be thought that this makes cow No. 19 the outstanding and most obvious leader of the herd in any strict sense. In the "to bail" order she was first only 13 times in 56, while cow No. 25, though generally less consistent, was 12 times in front. The rear pool of animals occupying the last 15 places, *i.e.*, the last 5 in each of the three movements, contained only 10 individual cows. Thus the herd "structuring" of the rear cows over several situations tended to be more consistent than that of the advanced animals.

When each of the movements was examined it was found, of course, that they differed in many ways. The movement from paddock to bails was not a "free" movement. Normally the herd was rounded up and trailed into the yard by the milker. It was a quick movement with few stops and there was little room

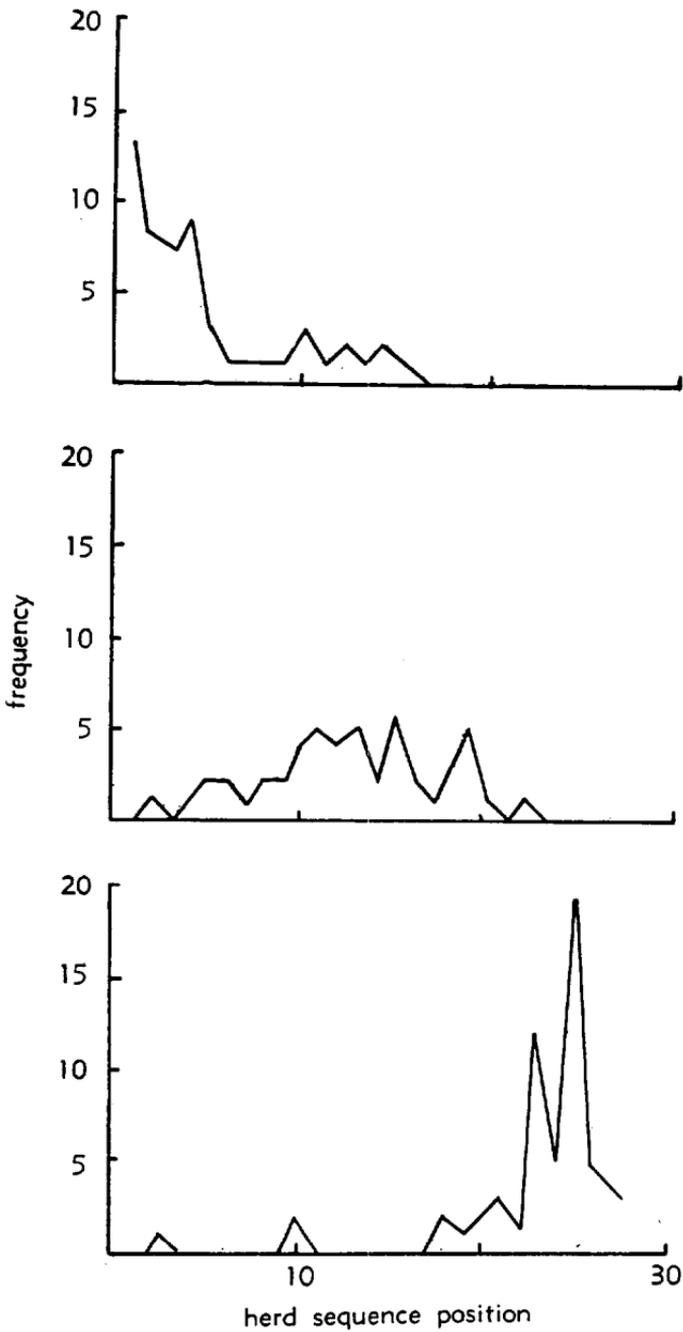


Fig. 1 (opposite top): Frequency of position in herd movement to the bails of a typical "leader" cow.

Fig. 2 (opposite centre): Frequency of position in herd movement to the bails of a typical "medial" cow.

Fig. 3 (opposite bottom): Frequency of position in herd movement to the bails of a typical "rear" cow.

for deviation by any cow. If milking was late the herd began a spontaneous move towards the shed. In the winter the movement to the bails was reinforced by the feeding of meal during the milking process. The movement to the paddock after milking was free. It was not a forced movement but it was affected by the order in which the cows were milked—the bail order. It was found that there was a close correlation between the order of milking and the positions in this movement. When a group of cudding cows had accumulated in the lane, a movement slowly began. Several cows would be strung out, some grazing a little way apart, and then suddenly all the milked cows would walk off as a bunch. Each remaining cow as she was milked would not cud but would move quickly to join up with the herd. The process whereby a movement of the herd was sprung off by a small group of cows moving in advance was termed "drifting". In no case was the movement of one cow sufficient to initiate a herd movement. The movements from paddock to paddock were less regular and they were forced—the cows were actually driven.

One would expect different cows to be in the top places of each of these three movements because they varied widely, and this is what has already been described. It is necessary to consider leadership situations as well as leader animals. But it must be remembered that while the leaders vary from situation to situation they also vary within each situation. Thus in the movement to the bails 9 different cows were in the leading position at least twice in the 56 trials, and in the after milking movement 10 different cows were in the first place at least three times during the period under observation.

Consider now dominance in relation to leading. The correlation between the herd rankings based on the average leadership score and the dominance rankings was +0.1. (Spearman coefficient) indicating that there was little systematic relationship between these two phenomena in this herd.

Figure 4 shows in the column on the left the cows listed by their numbers, in the middle column the rank order for leader-

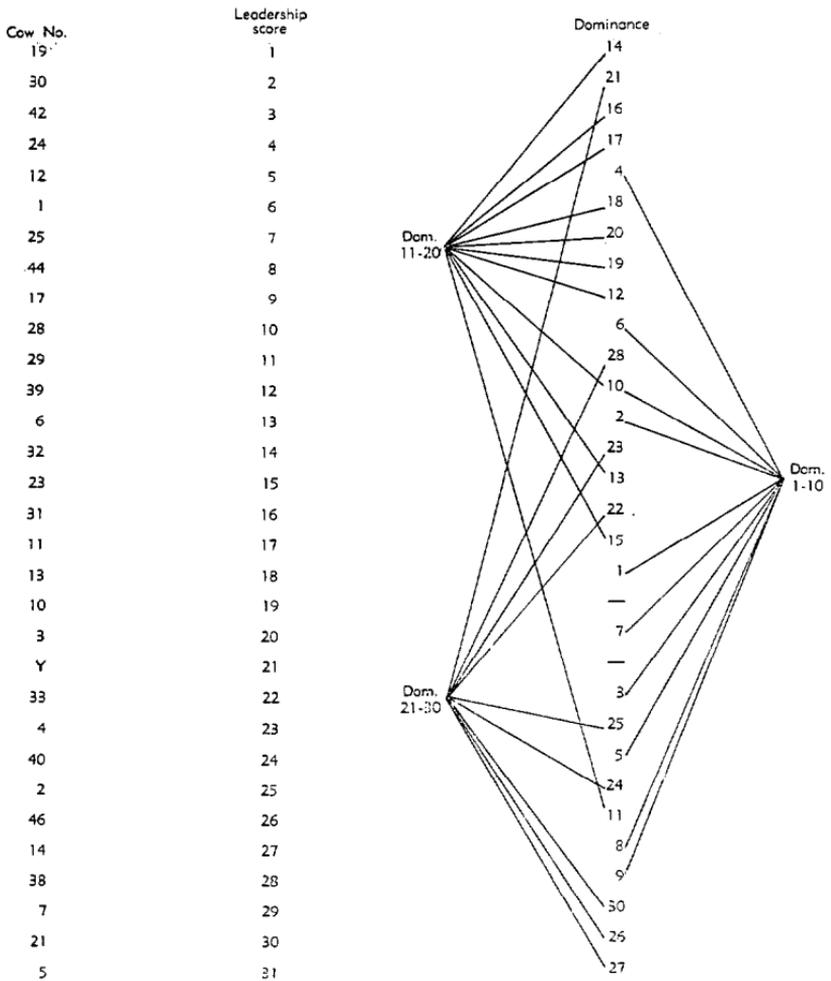


Fig. 4: Comparison between leadership and dominance rankings.

ship, and on the right the same cow's dominance ranking. Cow No. 19, 1st on the leadership ranking, is 14th in the dominance order; cow No. 30 is ranked second on the leadership ranking and 21st on the dominance ranking. The lines on the dominance column link the scores into three groupings:

- Those cows ranked from 1 to 10 are the top dominance animals.
- Those ranked from 11 to 20, the mid-dominance cows.
- Those ranked from 21 to 30, the low dominance cows.

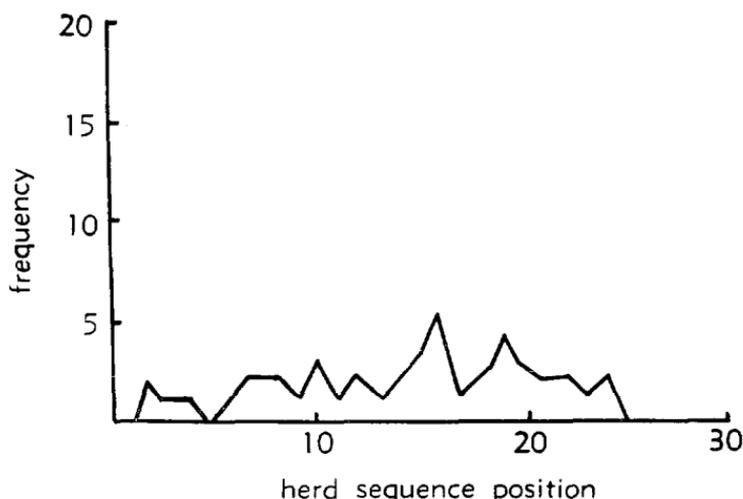


Fig. 5: Frequency of position in herd movement to the bails of the most dominant cow.

It can be seen that the top leader cows, the cows most consistently in advance and thus those who obtain high leadership scores, were from the middle dominance group, the medial cows on their leadership ranking were the most dominant third of the herd, and the rear cows in movements were the cows low in dominance status. It is quite obvious that for the herd studied the idea of the dominant animal being also the leading animal is quite wrong.

Figure 5 shows the frequency for different leadership positions of the most dominant cow, No. 13, in the "to bail" order. This top dominant cow is a fairly typical medial cow for leadership and her average leadership score is 18. She averaged 18th in a herd of 30 cows and her frequency profile shows her to have occupied places between the 2nd and 25th places in movement to the bail. Her positions in the movement after milking show an identical range.

Discussion and Summary

In summary, the study points to a definite though flexible ordering of the herd in each of three movements. The position any animal will take in the movement pattern of the herd presumably depends both on tendencies in the animal and on the different leadership situations. Thus both leading animals and

leading situations can be discussed. One animal may respond very readily to new pasture and will tend to be among the leading bunch of animals, while her response is less ready in movements to the bail.

This "structuring" of the herd in movements is not based simply on a "leadership-followership" principle in which one animal leads and the rest follow in an undifferentiated mob. It is a "structuring" of the whole herd. "Rearship" behaviour is, if anything, more definite and less fluctuating than leadership. It would seem also from the study that much of the meaning that is usually intended by the term leadership is probably not warranted. If a "leader" is one who initiates, then it is not one cow but several in any given situation; if a "leader" is one who gives guidance by going before, then there is a pool of individual beasts which perform this function.

The movement structure of the herd is made up in a different way from the herd's dominance structure though certain similarities do exist. It can be said:

- (a) That mid-dominance cows tend to be in the advance of herd movements,
- (b) That top-dominance cows are seldom in the rear but usually in the middle, and
- (c) That low dominance cows tend to be in the rear of herd movements.

The organization of the herd examined in this study—leading behaviour—involved behaviour which is intermediate between that displayed by the herd in the most confined places, and that shown where the herd is found in larger open spaces. Dominance seems to be the most important phenomenon regulating behaviour in confined spaces, such as in cow yards and places of constriction, gateways, etc. In leading some sort of threshold for response to a particular situation is probably an important feature in governing the position which any cow will take in movement in that situation. When an animal appears consistently in one of the advanced positions in more than one movement situation, this may be due merely to the fact that she has a low specific threshold for response to each of those situations, it may be that she has a general tendency to respond quickly, or it may be that she has a "leadership" tendency in the sense of taking the initiative rather than following. The present study is descriptive rather than experimental and it is not possible to decide with certainty between these possibilities. However, in view of the inconsistency of animals

from situation to situation it seems likely that the behaviour tendencies which result in their being in an advanced position in herd movements are fairly specific for situations.

The phenomenon of leadership is one aspect of the total herd "organization". This organization, which shows itself in various modes of behaviour such as dominance, leadership-followership, etc., the farmer has to deal with day by day. Such behaviour is clearly fairly complicated and Dr. Petersen's idea of a queen cow who is both the dominant animal—the "boss" cow—and the leader would seem to be a misleading oversimplification (Petersen, 1948).

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DISCUSSION

Q.: *Is there any evidence that age is involved in leadership and dominance and is level of butterfat production involved in these characteristics?*

A.: Workers in the U.S.A. found quite a high correlation between dominance and age, and this is confirmed in our work. A correlation between leadership and age obtained in our study is in the positive direction but small and not statistically significant. No data are yet available from our investigation on butterfat production and its relationship to leadership and dominance. Schein and Fohrman found a small but significant positive correlation between butterfat production and dominance.

Q.: *Is it possible to compare the ranking for leadership and the cows' actual behaviour in the shed? Do leaders give trouble in the milking shed from a management point of view?*

A.: The most important thing that regulated behaviour in the restricted yard was dominance. The cows which had not been dehorned gave the most trouble. It is not possible to say anything about leadership in a confined yard; dominance plays a larger role under such conditions.

Q.: *Was there less consistency in this herd for dominance because it was a town supply herd?*

A.: Cows coming into the herd throughout the year had to find their dominance level and this made it necessary to frequently adjust the dominance rankings.

Q.: *Should much importance be given to the ranking of cows leaving the shed since the order in which they were bailed up and milked might influence their ranking for leaving the shed?*

A.: The first four or five cows to enter the bails did so consistently. Cows also took up very similar positions in the yard and followed a sequence up to the bails. The order of cows in the movement from bails to pasture was partly determined by bail order, but only partly since those milked tended to bunch and "drift" before definite movement began.