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# THE BEHAVIOUR OF ENTIRE BULLS OF DIFFERENT AGES AT PASTURE

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## SUMMARY

Six dawn-to-dusk observation periods were spent recording paddock positions, grazing patterns and social interactions among Friesian bulls of three age groups at an artificial breeding centre. Forty-one 2½ to 3-year-olds were constituted as a group and left for 2 weeks before observations were begun. Thirty-three 3½ to 4½-year-old bulls had been at the centre for over a year, and nineteen bulls (5½ to 6½ years) were awaiting final assessment. The young bulls showed grazing cycles, rumination and rest periods and were generally "amicable" in their social interactions. The middle age group showed greatly increased mounting and head fighting activity, while the old bulls were territorial with greatly reduced social contact. Findings are discussed in relation to the injury rate of bulls of each age group, and the practical management problems which arise when behaviour patterns change with age.

## INTRODUCTION

The recent upsurge of interest in farming non-castrated male animals for beef has highlighted the problems of management already apparent from handling bulls in artificial breeding stations in New Zealand. Data from one A.B. centre classed injuries to bulls as slight, when the bulls would recover to be used for semen collection at a later age, and serious, in which future use of the bull was prejudiced. Preliminary observations indicated that both classes of injury rose from a low level at 2½ years to a peak at 4 years of age and then declined. The present study was undertaken to discover why the injury rate of bulls run at pasture increases after 2½ years. Dalton *et al.* (1967) reported that bulls at pasture exhibit 4 to 5 regular grazing periods per day and that these patterns are easily upset by small changes in routine. Disturbances increase idling time at the expense of grazing time and this leads to increased fighting and sexual activity. In this study the grazing patterns of older bulls were examined. Very little published information is available on the behaviour of old bulls.

Schloeth (1958, 1961) has detailed their behaviour in feral cattle in the Camargue in France, and Hunter and Edwards (1964) have described the behaviour problems arising when bulls are held in an inactive state at a breeding centre in Britain.

#### THE PRESENT STUDY

Three age groupings of bulls were selected: a group of 41 newly bought bulls aged  $2\frac{1}{2}$  to 3 years was allowed 12 to 14 days to establish itself before data were collected (designated group Y); a group of 33 middle age bulls of  $3\frac{1}{2}$  to  $4\frac{1}{2}$  years (designated group M); and an older group of 19 bulls  $5\frac{1}{2}$  to  $6\frac{1}{2}$  years of age (designated group O). Groups O and M were Friesians and group Y was mixed Friesians and Jerseys. The bulls were shifted from paddock to paddock each 7 to 10 days though group O had been set-stocked in a 10 ha paddock for several months before the first observation was made.

Group O was observed in two paddocks of 10 and 4.4 ha; group M was observed in two paddocks of 6.4 and 6.0 ha, and group Y was in a 6.0 ha paddock. During the winter, hay was fed to group O while set-stocked in the 10 ha block, but no supplementary feed was provided during the period when observations were made in the other two groups.

On flat paddocks a hide mounted on a trailer was used for observations and photographs with group Y and group O, but use was made of high buildings and barns and nearby hills for observation points whenever possible. The hide was assembled in these positions. Two days of observations from before daylight until late evening were undertaken by two or three observers at a time.

#### DATA COLLECTION

The occurrence of a number of social interactions as representing certain types of behaviour were recorded as follows:

- (1) Mounting behaviour by one bull of another whether head or tail mounts.
- (2) Fighting, pawing the ground and horning the ground as representative of aggressive and agonistic behaviour including threat.
- (3) The lip-curl or flehmen and licking and grooming as types of "amicable" behaviour.

The frequency of these activities for each hour of the day was drawn up for each group of bulls.

Field photography was used to determine the exact position of each bull in the paddock each 20 to 30 minutes throughout the day. From these prints the daily movement pattern of selected bulls was extrapolated. A half-hourly survey was taken of grazing, idling, resting or other activity for each bull in the group. To augment these data on activity pattern, standard 8-day recording clocks made for industrial use were slung on the necks of two 4-year-old bulls which recorded in detail the exact time spent grazing by each bull over an 8-day period. A representative grazing pattern is shown in Fig. 1.

## RESULTS AND DISCUSSION

The flehmen response (Schneider, 1930) was shown by a bull after directly approaching another and sniffing under the prepuccial region. The head was lifted and the top lip curled back for several seconds before the act was repeated or the bulls moved to another activity. The sniffed bull may urinate. Several cases of mutual flehmen were observed where bulls sniffed under from the head to tail or "cinch" position (Schein and Fohrman, 1955). More than one bull could be in the group sniffing under a particular bull and sometimes nearby bulls ran across to engage in this activity.

Head-to-head sparring in older bulls invariably occurred in or near the sparring holes in the paddock. As such encounters were confined to these areas, it appears unlikely that they were dust bath areas, but rather areas where agonistic threat, butting and sparring regularly occurred.

The threat posture of the bull is quite characteristic and, though termed the "state of fight or flight" in the bull by Fraser (1957), on no occasion was it associated with "flight" in a bull at pasture. Bulls threaten in this manner on being approached by another bull or by a human on foot or in a vehicle.

Mounting of bulls at pasture was shown from both the head and the tail. In a head mount the bull usually rode up over the head and neck after head-to-head pushing. In this case the bull underneath heaved its head into the soft part of the belly. There was in addition the tail mount with penis protruding and dribbling.

### 1. YOUNG BULLS (2½ TO 3 YEARS OF AGE) — GROUP Y

The observations were made after the bulls had been in a common group for from 12 to 14 days. The total group, consisting of 21 Friesians and 20 Jerseys, was used for data gathering, but only Friesians were tracked at pasture. The bulls ranged freely over 6.0 ha, though one slightly lame bull

remained restricted to one corner area until going to water late in the afternoon. Bulls made a direct movement towards the trough once or twice a day. Young bulls gathered to drink in groups at the trough. Grazing movements occurred twice during the day, involving up to 60% of the bulls, and the midday rest period involved the same number of bulls.

A small number of mounts was recorded from 10 a.m. onwards rising to a maximum of 8 between 2 and 3 p.m. but Jersey bulls were the mounters in all cases. From 7 a.m. onwards several short-lived head-to-head encounters occurred among the bulls but in only 5 of these throughout the day was there any serious straining of the body muscles. More head-to-head "playful tossings" were recorded and in some cases these encounters developed into grooming sessions with licking of the head and neck regions.

The flehmen response occurred among bulls with regularity throughout the day. The number of "amicable" (Barnett, 1963) approach responses—*i.e.*, flehmen and grooming—peaked in the early morning between 6 and 9 a.m. and then again in the midday period.

#### *Tentative Conclusions from Observations of Young Bulls*

- (1) Regular grazing cycles and grazing movements with 60% of the bulls clearly oriented in one direction during grazing were found. The midday rest period was also pronounced.
- (2) The most frequent social encounters at this age could be termed "amicable" and included grooming, sometimes mutual, and the flehmen response.
- (3) The Jersey bulls were more active, indulged in more mounting, and appeared more involved with head butting than the Friesians in the same group.

#### 2. MIDDLE AGE BULLS (3½ TO 4½ YEARS OF AGE) — GROUP M

At first light two distinct groupings of M bulls were observed involving 25 bulls and the 8 remaining animals were spaced evenly around the paddock, each bull near a corner or gate.

The majority of bulls got up at 8.00 a.m. and a grazing cycle began at 8.30 a.m. For 60% of these bulls this cycle continued with small breaks until between noon and 1 p.m. when they entered a resting phase.

The grazing pattern typical of this group of bulls is seen for a period of eight days in Fig. 1 taken during April, when

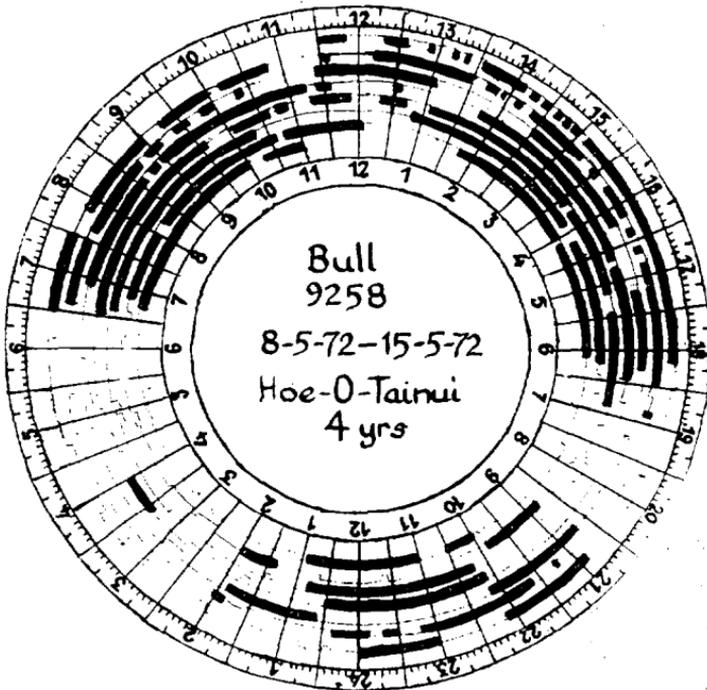


FIG. 1: Records of grazing activity of a Friesian bull for a week in autumn. Each complete revolution of the clock represents one day.

feed was a little short. Grazing began at sunrise and proceeded through the day until 30 minutes after sunset at 5.58 p.m. With a small variability from day to day, the major rest phase occurred between 11 a.m. and 1.30 p.m. and averaged about 2 hours in duration. Throughout the rest of the day, short periods usually less than 30 minutes were interposed between regular grazing bouts, the longest of which was 3 hours without a break.

During the night between 9 p.m. and 2 a.m. an additional  $2\frac{1}{2}$  to 3 hours was spent grazing, which contrasts with similar records for dairy cows during the same month where the night grazing is from 1 to  $1\frac{1}{2}$  hours only. Bull 9258 was at this time age 3 years and 8 months of age and is typical of the records so far obtained from bulls of this age group. Few of these records have been taken as the clocks can be severely damaged by bulls during agonistic encounters.

The daylight-to-dark grazing times were rather similar to the times given by Dalton *et al.* (1967) for Friesian bulls aged 4 to 5 years. The 4 or 5 grazing periods found in their study

TABLE 1: SUMMARY TABLE OF BEHAVIOURAL ACTIVITY RECORDED HOURLY OF BULLS OF THREE AGE GROUPS AT PASTURE

Time of Day	Head or Tail Mounting				Agonistic Head-to-head Fighting				Pawing the Ground				Amicable Lip-curl (flehmen)				Grooming and Licking			
	Y	M1	M2	O	Y	M1	M2	O	Y	M1	M2	O	Y	M1	M2	O	Y	M1	M2	O
	5-6 a.m.	1	—	—	—	2	—	2	—	—	—	—	8	1	—	—	1	—	—	1
6-7	—	—	—	1	—	—	2	8	2	—	—	29	14	—	1	6	11	—	1	—
7-8	1	2	2	—	7	2	3	11	9	—	—	—	11	—	7	1	14	—	—	—
8-9	—	4	3	—	1	4	4	3	1	—	—	9	18	1	3	—	4	—	4	—
9-10	—	20	6	—	6	21	2	2	2	1	1	—	3	1	2	—	1	—	1	—
10-11	—	36	1	—	6	39	4	1	4	—	—	—	3	—	7	—	1	—	—	—
11-12	4	33	2	2	11	34	10	2	6	—	1	—	23	—	10	—	13	—	—	—
12-1 p.m.	3	45	1	2	10	46	13	8	3	1	—	—	6	1	4	—	2	—	—	—
1-2	6	66	—	—	9	66	4	2	8	—	—	4	10	1	2	1	2	—	—	1
2-3	8	86	—	—	3	45	4	2	2	1	—	4	6	—	1	2	—	—	—	—
3-4	5	85	—	—	5	45	4	5	3	—	—	2	14	1	5	—	2	—	—	—
4-5	1	86	—	1	7	30	2	3	—	1	—	—	—	—	1	—	6	—	1	—
5-6	4	—	2	—	3	—	2	6	2	—	5	2	10	—	2	5	3	—	1	1
6-7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	5	—	—	2	—
Total	33	463	17	6	70	332	56	53	42	4	7	63	119	5	47	21	59	—	11	2
Adjusted for group size (19)	15	275	11	6	32	197	33	53	19	2	4	63	55	4	21	21	27	—	6	2

M1 = 1st observation on 3½- to 4½-year-old bulls.  
M2 = 2nd observation undertaken 6 months later.

were not clearly shown by the clock records and night grazing was not available from the English study for comparisons to be drawn.

A group of 12 to 13 animals in the M group followed a very different pattern for the day from that described above. They began in pairs soon after 8.45 a.m. to butt, push and mount. Between 8 and 9 a.m., 4 mounts and 4 sparring contests were recorded and this rose to 20 mounts and 20 head-to-head pushes in the next hour. As Table 1 indicates, this activity continued at an increasing level unabated throughout the day. Between 1 and 2 p.m. the agonistic encounters reached a plateau but sexual mounting continued to rise to approximately 85 mounts per hour among these 13 bulls. The head mounting reached a plateau at 10 to 15 mounts per hour throughout the day while the tail mounting increased in frequency.

Virtually no grazing was done by this group of bulls. Up till 10 a.m. the mounting and sparring were done in pairs but larger groups were formed after this time. At 1 p.m., two of the main groups came together (Fig. 2) and the melee that resulted was confusing. The bulls involved could easily sustain injury as sparring in groups of 4 or 8 occurred with considerable impact. Jersey bulls from an adjacent paddock moved across to stand at the fence line and this increased the excitability of the group. The bulls began to move as one group at a steady pace across and around the paddock and at water one bull was tossed and another was pushed across the concrete trough. During this period the bulls attempted to push an opponent head-to-head and then to mount, but after 3 p.m. the head pushing began to decline and licking briefly along the mid-top of the back preceded each attempt to mount. This was the general pattern from 4 p.m. onwards.

Between 2.30 and 3 p.m. the other 20 bulls moved systematically across the paddock in a grazing movement apparently unaffected by the vigorous activity of the mounting and fighting group.

Figure 2 shows the changes of position throughout the day in the fighting-mounting group, showing the early morning positions of the two main formations for pair fighting and their coming together at 1 p.m. This group had no particular attachment for any one portion of the paddock. Likewise the grazing group, apart from the dispersed resting positions, showed no preferred areas of the paddock but grazed it like a herd of cows but dispersed over a greater area. Any pawing or horning of the ground occurred where the bulls happened to be at the time.

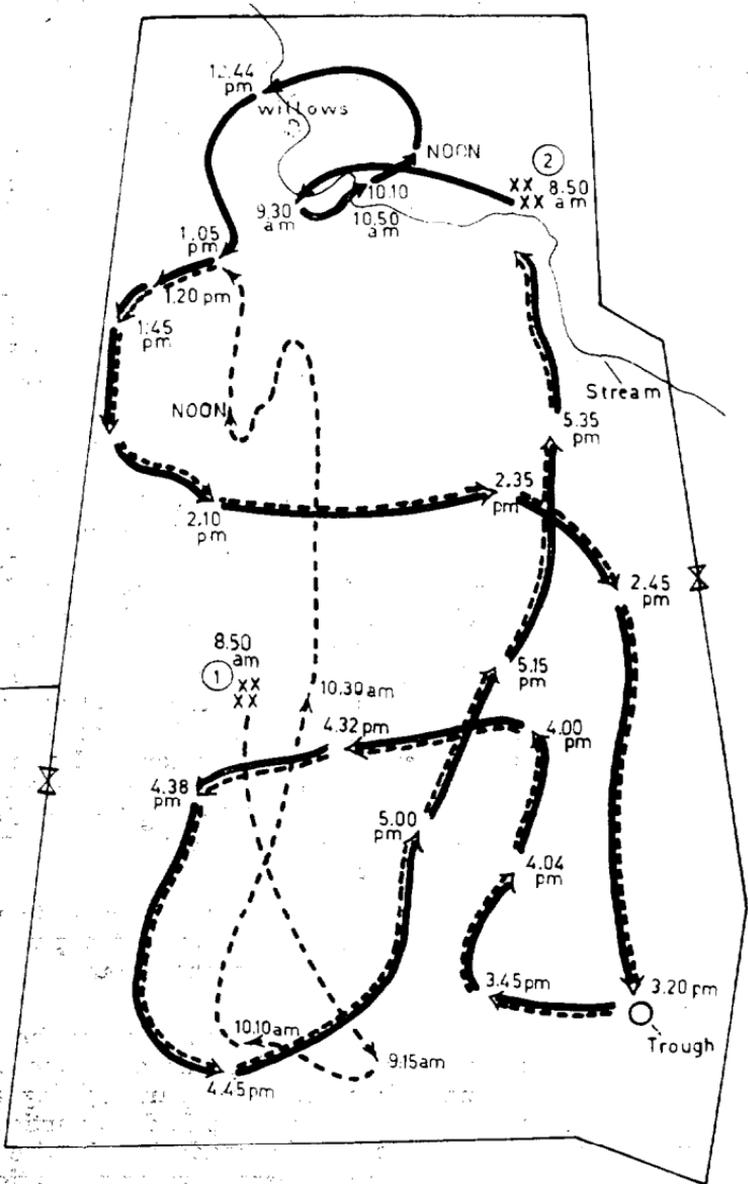


FIG. 2: The movement pattern of active M group bulls for one day as determined from paddock photographs (6.4 ha paddock).

The robust, active behaviour of a portion of M group indicated that the social dominance hierarchy was in the process of formation. Some bulls persisted in head pushing until the opponent avoided contact. However, the loser did not retreat from the group but was chosen more and more as the animal to be mounted. Then the midday patterns of head-to-head agonistic encounter slowly gave way to the persistent attempts at tail mounting. Initially it was thought that the younger bulls would constitute the group that were following normal "cow" type grazing, resting and ruminating patterns, but the division of the M bulls into the two groups was not simply one of age. At least some of the injury apparent from the statistics in the age bracket  $3\frac{1}{2}$  to  $4\frac{1}{2}$  years could occur at pasture during the vigorous group fighting which occurred in M group Friesian bulls.

A second day of observation 6 months later on the same group of bulls (Column M2 in Table 1), indicated that the transition to a later adult pattern had commenced. The bulls tracked during the day had rather specific areas of movement with a direct movement to the water trough. Specific sparring holes had either been set up or were in use from the last occupants and seven of the bulls made direct movements to a high corner area of the paddock to paw, horn and threaten from a high vantage point.

#### *Tentative Conclusions from Bulls of Middle Age*

- (1) Vigorous agonistic and mounting activity characterized members of this group at some time after the age of  $3\frac{1}{2}$  years, possibly during the formation of a social dominance hierarchy.
- (2) With the establishment of a dominance order, changes in behaviour occurred, such as the use of specific paddock areas for display and threat behaviour.
- (3) At a breeding centre with large numbers of bulls grouped together, the additional stimulus from bulls in adjacent paddocks may heighten the vigorous head-to-head encounters to the point where some bulls could be seriously injured.

### 3. OLD BULLS ( $5\frac{1}{2}$ TO $6\frac{1}{2}$ YEARS OF AGE) — GROUP O

When the daily movement pattern of the 19 bulls observed in this group was plotted on the ground it became evident that they did not move randomly across the 10 ha but kept to very well-defined territory. Figure 3 plots these well-defined

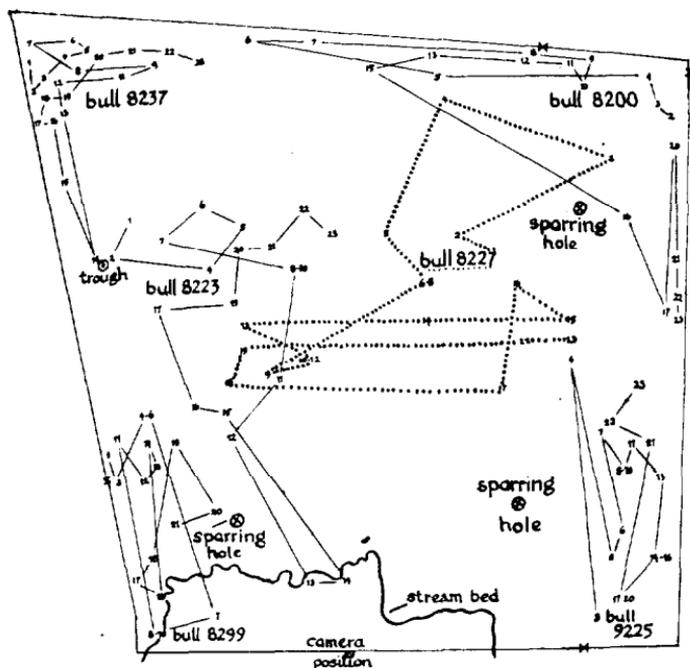


FIG. 3: The paddock positions of six O group bulls determined by photographs taken during one day of observation (10 ha paddock). Numerals correspond to photographs taken at regular times from 7.00 a.m. to 5.45 p.m.

areas for 6 of the 19 bulls with a selection of animals drawn from those keeping near outside paddock fencelines and those moving in the central areas of the field. When hay was being fed out on this block, the bulls would eat a few feet apart but after eating they would return to their own areas.

In the paddock three well-defined sparring holes were regularly used for pawing the ground, horning the ground and for head-to-head pushing, and, even when these holes were filled when the paddock was shut up for hay, they were dug in similar positions by the next lot of similar age group bulls in the paddock.

As the bulls were restricting themselves to clearly-defined areas at pasture, the number of social interactions during the day was not high. When these encounters did occur, few of them were amicable and little mounting was shown. Head-to-head sparring was most common, but even this was more threatening than serious. If a bull required some sparring

exercise, he would walk to a hole and paw earth. Another bull might answer and head-to-head pushing would occur until one of the bulls retired to its territorial area. No sparring was recorded outside the sparring holes in the O group of bulls.

It has been postulated from reviews of agonistic encounters in other species that the ritualization of threats and fighting postures in older males means that agonistic encounters can occur without fear of injury to the contestants of the same species (Eibl-Eibesfeldt, 1970). In the records of the wild white cattle of Chillingham over the last 50 years, only 1 bull has received serious injury in this "wild" herd despite frequent male encounters. It is by such encounters that the dominance hierarchy is maintained in a viable condition among males (The Earl of Tankerville, pers. comm.).

The bulls with the most clearly defined territory in general were the most difficult to shift from these areas and in some cases were culled on this property as being too dangerous to be handled by two men on horseback. The animals which could roam with greater freedom (presumably with higher dominance status) did not provide the same risk.

The second period of observations was made in the same group of bulls 8 months later but this time in a 4.4 ha paddock. After being in the paddock several days the same regularity of position of each bull became clear.

Although in less than half the area of their former 10 ha paddock, the bulls required similar spatial areas to those in the larger paddock. When the bull movements were plotted on the ground there was a greater intermingling of bulls at pasture but the spatial distances between bulls was carefully maintained at all times. More of the bulls came together in the sparring holes which, in this paddock, were situated near fencelines and from where threat displays were made to bulls in the adjoining paddock.

#### *Tentative Conclusions from Bulls of Old Age*

- (1) These bulls acted independently within the group and were not herd-like in grazing or resting.
- (2) They preferred to keep to a set area of ground, but this could be affected by paddock size and available area per bull. Under set-stocking in a larger paddock these areas became virtual territories and some exclusively territorial bulls would be dangerous to shift from these positions.
- (3) Supplementary feed and water took bulls from these areas but bulls soon returned to their favoured positions.

- (4) Agonistic tussles with ritual threat postures occurred at the sparring holes in the paddock. Such holes, which may be large and deep, were dug in elevated positions if available to aid the threat display.
- (5) If space was adequate and bulls were settled, there would be little fear of paddock injury as social dominance hierarchies have been established.

#### AGE GROUP COMPARISONS

The frequency of mounting, agonistic fighting, flehmen responses and grooming totalled for hourly intervals during the day for the three groups of bulls are shown in Table 1.

The vigorous mounting and head-to-head fighting shown in the middle age group M was not characteristic of the other two groups and was contrasted with the amicable behaviour patterns of group Y. The second observation on group M indicated that levels of mounting had declined to group O levels and fighting had dropped to group Y levels when each group of bulls was equated for similar group size. There was virtually no grooming recorded among group O bulls.

By the age of 5 years a greater focus on territorial areas meant that the interactions among bulls at pasture were more ritualized as shown in the high incidence of pawing the ground in O bulls and when encounters did occur in the sparring holes they were seldom serious encounters. Very few cases of mounting were recorded among O bulls and most of these were head rather than tail mounts.

Once a Y group of bulls had been established and the early mounting had declined and the group settled, the interactions between bulls were positive and amicable. This was reflected in the flehmen responses for group Y. Few injuries would be expected in stable groups of this age. Group M bulls appeared to go through a period of much increased activity with groups of bulls fighting and mounting for long periods of the day. Under such heightened activity some injury was almost inevitable.

Injuries which arise in Y or O bulls would appear to be related to yard handling, particularly in O bulls where space requirements are critical. Yard handling should be kept to a minimum, and should not be necessary when handling of one or two bulls from the mob is required. Good identification of bulls from a distance and the use of tranquillizer guns could be considered if these bulls cannot be separated by men on horseback and dogs. The yard spaces were too confined for "ritualized" threat and fighting sequences to take place.

The Y bulls showed similar grazing movement patterns to that of dairy cows, with 60% acting together, grazing in certain directions. There was less cohesion in the group than in cows. Group M bulls showed similar patterns except for those bulls in the active fighting and mounting group when grazing must have occurred only at night and in the very early morning. Group O bulls began and ended grazing periods independently without relating to other bulls in the group but kept a strict space between animals both during grazing and watering.

#### OVERALL TENTATIVE CONCLUSIONS

- (1) The older bulls required a certain area for free movements and they tended to find this space even when they were shifted into smaller paddocks. In theory there should be an optimum number of bulls in a mob for the available paddock space so that social interactions are kept to the minimum.
- (2) In the one mixed breed group studied, social behaviour patterns seemed to occur earlier and with greater vigour in Jerseys than in Friesians. Mounting and butting were frequent and the injury rate was higher than for Friesians.
- (3) As bulls age, they shift from amicable to aggressive behaviour patterns and become territorial. A few territorial bulls become positively dangerous to humans should attempts be made to shift them from their accustomed areas at pasture. This change in behaviour with age may account for the sudden turning of an amenable bull on his human handlers and the injuries and deaths that can result.
- (4) The changing patterns of behaviour with the growth and development of bulls warrant further study and it is proposed to monitor such changes in one group of Friesian bulls over the next four years.

#### ACKNOWLEDGEMENT AND THANKS

The Farm Manager and staff at Hoe-O-Tainui Station; the staff at Newstead; Misses Whateley, Bremner, Bunnell and G. Syme and M. Mullord have helped during this study; assistance and advice on photographic records have been received from D. H. B. Macqueen. Assistance with photographic material and travel grants was obtained from the University of Waikato by the second author. D. M. Duganzich provided assistance on the planning and execution of the work.

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