The effect of the presence of steers on the behaviour of grazing yearling bulls

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ABSTRACT

Elements of the behaviour of sub-adult grazing bulls can lead to physical damage to animals, pastures and farm structures. We tested whether the presence of steers would modulate bull behaviour. In two experiments, 32 fourteen-month-old Friesian bulls (average liveweight 346kg) and 32 Friesian steers (341kg liveweight) in groups of 10 to 32 animals were rotationally grazed on permanent pasture at a stocking rate of 23 cattle/ha for 12 to 16 days. The incidence of agonistic behaviour (mounting, teasing, butting, pushing, displaying) was monitored by continuous recording during two, 3 hour observation periods each day at 2 day intervals.

Experiment 1, in which the ratio of bulls to steers was established at 100:0, 70:30, 30:70, 0:100 by substituting steers for bulls in groups of 16 bulls, showed that the incidence of agonistic behaviour per bull was reduced from 0.83/bull/hour in 100% bulls to 0.62 and 0.49 for 70 and 30% bulls respectively (SEM ± 0.12). Experiment 2, in which the ratio of bulls to steers was established at 100:0, 70:30, 30:70 by the addition of steers to groups of 10 bulls, showed that the incidence of agonistic behaviour per bull was significantly lower, 0.18/bull/hour, at 30% than at 70% bulls (0.62) or 100% bulls (0.41). The incidence of agonistic behaviour of steers was significantly lower (0.13 and 0.07/steer/hour in experiments 1 and 2 respectively) compared with bulls and was not significantly affected by treatment.

Across experiment regression analysis of the incidence of agonistic behaviour on the number of bulls and steers showed that the incidence (/bull/hour) increased by 0.07 (± 0.03) and decreased by 0.06 (± 0.02) per additional bull and steer, respectively.

Mixing bulls and steers may be a useful approach to decreasing agonistic interactions between bulls.

INTRODUCTION

Agonistic behaviour amongst adolescent bulls can lead to stress and/or injury to the animals themselves and to handlers, as well as damage to farm structures and pasture (Kilgour and Dalton, 1984).

A number of approaches have been taken in New Zealand to modify bull behaviour. These include the use of zeranol (McKenzie, 1983, Bass *et al,* 1984) and immunosuppression of GnRH activity (Jago *et al*, 1995, 1996, Lobley *et al,* 1992, Adams *et al,* 1996). While both of these techniques induce some reduction in behaviours such as mounting, the effect is short-lived and progressive retreatment is required. Recently, Chamove and Grimmer (1993) showed a marked reduction in interactions between bulls in the presence of trees.

In farming practice, the incidence of agonistic behaviour in grazing bulls is minimised through low stocking rates and continuous grazing, both increasing the risk that pasture quality will deteriorate and/or more mechanical control of pasture quality will be required.

In this paper we test an approach, incorporating another class of stock (steers), which does not involve any physiological intervention of animals but allows for a potential increase in stocking rate and may alter the behaviour of bulls.

MATERIAL AND METHODS

In two experiments, 32 fourteen-month old Friesian bulls (346 kg liveweight) and 32 steers (341 kg liveweight) of the same breed and age, in groups of 10 to 32 animals were rotationally grazed on permanent pasture at a stocking rate of 23 head/ha for 12 to 16 day experimental periods. Pre-grazing pasture mass ranged from 4000 to 4500 kg DM/ha with post-grazing masses of around 1300-1800 kg DM/ha.

Agnostic incidents were classified by gender of the initiating and receiving individuals. Observations were made from a hide mounted on a trailer about 30m away from each paddock. Observers were present 15 minutes before observation began.

The incidence of agonistic behaviour - mounting, teasing, butting, pushing, displaying (vocalising, pawing) was monitored by continuous recording during two, three hour periods each day (beginning at 8.45 am and 1.15 pm), at two day intervals beginning three days after groups were established. Within each experiment all groups were formed at the same time.

In Experiment 1, the ratio of bulls to steers was established as nominally 100:0, 70:30, 30:70 by the substitution of steers for bulls in a group of 16 bulls (Table 1). Four grazing areas were used and all experimental groups grazed each area in sequence of 3-4 days duration. The areas were arranged in two blocks of two, such that each group of cattle shared one common boundary within each block.

For Experiment 2, ratios of bulls of steers of 100:0, 70:30, 30:70 were achieved by the addition of steers to groups of 10 bulls (Table 1). Again all three groups grazed over the entire experimental area during the observation period.

The incidence of agonistic behaviours was expressed per animal per hour and the significance of main treatment

TABLE 1: Number of bulls and steers allocated to experimental groups.

	Treatment (Bulls:steers)			
	100:0	70:30	30:70	0:100
Experiment 1				
Bulls	16	11	5	0
Steers	0	5	11	16
Experiment 2				
Bulls	10	10	10	-
Steers	0	4	22	-

effects of group, sex, paddock and observation day (from group establishment) tested in an analysis of variance for each experiment. The results of both experiments were combined in a multiple regression with incidence of behaviour as the dependent variable, and number of bulls, number of steers and ratio of bulls to steers as independent variables.

RESULTS

In both experiments the mean incidence of agonistic behaviour of 100% bulls was high (0.4 to 0.8 per bull/hour) compared with that for 100% steers (0.18 per steer/hour). Consequently, any substitution or addition of steers for/to bulls would reduce the incidence of agnostic behaviour per animal in the group independently of any influence of steers on bull behaviour or vice versa.

Bull behaviour, but not steer behaviour was significantly affected by the presence of the alternate gender. In Experiment 1, the incidence of bull agonistic behaviour was reduced to 0.69/bull/hour (17%) by substitution of 30% steers and by a significant 40% (0.49/bull/hour) in the 30:70 bull:steer group (Figure 1). Similarly, in Experiment 2, incidence of agonistic behaviour of bulls decreased 56% (0.18/bull/hour) in the 30:70 bull:steer group,

FIGURE 1: The incidence of agonistic behaviour of bulls and steers grazing in differing ratios (Experiment 1).

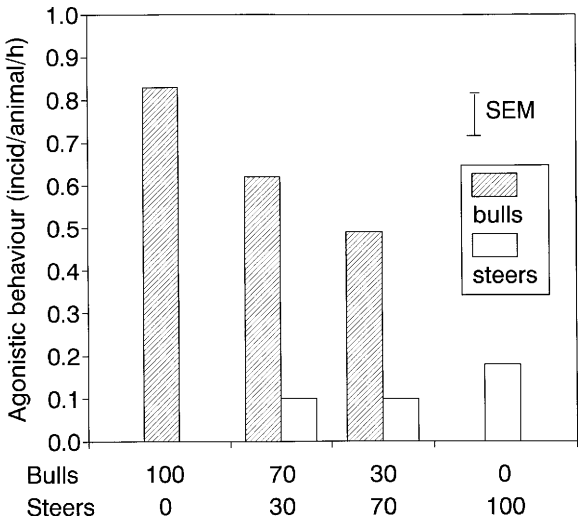

FIGURE 2: The incidence of agonistic behaviour of bulls grazing in differing ratios with steers (Experiment 2).

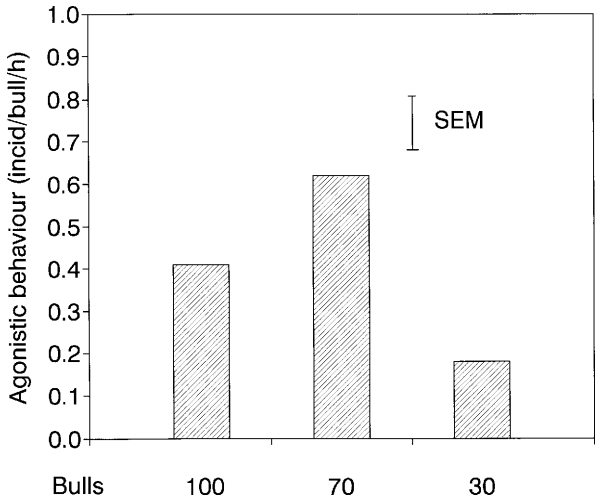

TABLE 2: Regression of agonistic behaviour/bull on number of bulls, (^{N}bulls) number of steers (^{N}steers) and ratio of bulls:steers.

Dependent variable	Independent variable	Regression coefficient	Constant	R^2 (%)
Agonistic behaviour (incidence/bull/hour)	^{N}bulls	0.0344 (± 0.017)	0.168 (± 0.183)	8.2
	^{N}steers	-0.0196 (± 0.007)	0.661 (± 0.070)	15.4
	^{N}bulls + ^{N}steers	0.0171 (± 0.0161) -0.0166 (±0.007)	0.462 (±0.222)	17.1
	^{N}bulls + Nsteers + B:S	0.0704 (± 0.0275) - 0.0584 (± 0.0183) -0.0154 (±0.0062)	1.229 (±0.374)	27.2

significantly below values for the other two treatment groups (Figure 2).

The incidence of agonistic behaviour of bulls, but not that of steers was significantly affected by the elapsed time since establishment of the groups. Bulls showed an almost (Figure 3) linear decline in the incidence of agonistic behaviour from day 2 to day 10, after which values stabilised at approximate twice that of steers.

The output of a series of regressions of the incidence of agonistic behaviour on the main experimental variables is in Table 2. Although the number of bulls and/or steers in the group did explain a proportion of the variance in incidence of bull agonistic behaviour, addition of the ratio of bulls:steers further increased the proportion of variance accounted for. In this regression, the incidence of bull agonistic behaviour increased by 0.0704/bull/hour/additional bull and decreased by 0.0584/bull/hour/additional steer. The effect of an independent decrease in the ratio of bulls:steers (ie more steers/bull) at constant stocking rate and group size was to increase bull agonistic behaviour.

FIGURE 3: Influence of time after mob establishment and declining pasture mass on the incidence of agonistic behaviour of bulls and steers.

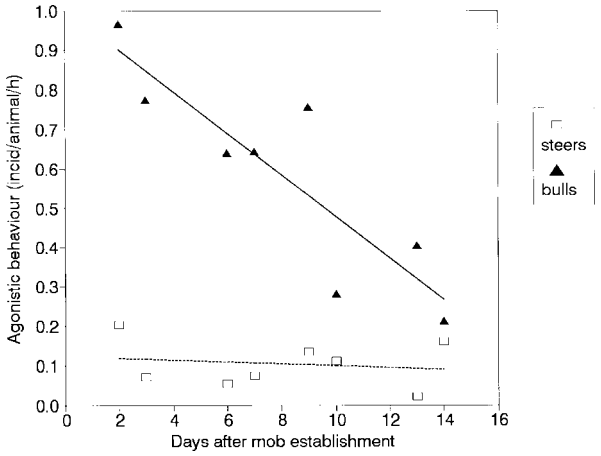

TABLE 3: The proportion of agonistic behaviours of bulls and steers directed to like or alternate gender (all treatments combined)

		Proportion of agonistic behaviour towards	
Behaviour	Initiator	Bulls	Steers
Mounting	Bulls	0.96	0.04
	Steers	0.58	0.42
Teasing	Bulls	0.94	0.06
	Steers	0.44	0.56
Butting	Bulls	0.74	0.26
	Steers	0.25	0.75

There was no similar relationship between animal number or gender ratio and incidence of steer agonistic behaviour.

Data in Table 3 shows that the majority of agonistic behaviours of bulls (as initiators) were towards other bulls, whereas those of steers were more equally divided between the genders.

DISCUSSION

The presence of steers modified the behaviour of bulls with the degree of modification dependent on both the number of animals and the gender ratio.

The incidence of agonistic behaviours declined by 50% at ratios of 30:70, bulls to steers. This level of behaviour modification was relatively as great as that achieved by altering the endocrinological melieu of bulls (McKenzie *et al*, 1983, Bass *et al*, 1984, Jago *et al*, 1996), but not as large (reduction of 80%) as that achieved by grazing bulls amongst trees (Chamove and Grimmer, 1993).

These data show that by changing the ratio of bulls to steers, there was a reduction in incidence of agonistic behaviour in bulls by both reducing the number of bulls or increasing the number of steers. Experiment 1 both decreased the number of bulls and increased the number of steers as the ratio changed, whereas in Experiment 2 only the number of steers increased. Consequently substitution of steers for bulls (Experiment 1) rather than addition of steers to bulls (Experiment 2), was more effective in modifying bull behaviour.

It is not possible to change the ratio of bulls to steers without changing either or both, the number of bulls per mob or the total mob size. Therefore we cannot fully resolve whether the reduction in agonistic behaviour of bulls is due to a reduction in the number of bulls in the group (Experiment 1) or increase in total mob size (Experiment 2), both effectively providing more area per bull when stocking density is held constant. Increasing group size *per se* is known to increase agonistic behaviour in adult cattle (Kondo *et al*, 1987) and grazing bulls in smaller groups is considered a method of reducing the problems associated with bulls. Our work suggests that it is the mob size of bulls, not the total mob size (eg bulls and steers), which changes the incidence of agonistic behaviour. Grazing larger mobs of mixed gender would therefore reduce the need for pasture subdivision. Increasing space allowance is also known to reduce agonistic behaviour (Kondo *et al*, 1987). In the current experiments, although space for each animal was constant, space per bull increased as the ratio of steers:bulls increased which may be a contributing explanation for the decline in agonistic behaviour.

The important contribution of bull:steer ratio to explaining variance in the incidence of agonistic behaviour, suggests a role for gender ratio *per se* which may help to explain the trend towards increased agonistic behaviour between bulls with the addition of a few steers (70:30 bulls to steer ratio, Experiment 2, Figure 2). The addition of females or 'female type' stimuli to bachelor groups can result in increased libido (Frazer and Broom, 1990) with an associated increase in agonistic behaviour. Steers may represent such a 'female' stimulus thus contributing to the increase in agonistic behaviour of bulls as the bull:steer ratio declined.

Because of the contradictory effect of declining bull:steer ratio on bull agonistic behaviour, a high proportion of steers (70%) was required before the "beneficial" affects of increasing steer and decreasing bull numbers, dominated the negative effect of the bull:steer ratio and produced a significant reductions in bull agonistic behaviour. The requirement for such high proportions of steers may limit the attractiveness of this approach to modifying bull behaviour. However, the overall incidence of agonistic behaviour in this work was low (c.f. Chamove and Grimmer, 1993, Jago *et al*, 1995) and in situations where the levels are higher, lower proportions of steers may have significant effects.

There was no suggestion in this work (Table 3) that the addition of steers to a group of bulls would induce agonistic behaviour by bulls to steers. A very high proportion (74-96%) of bull agonistic behaviour was directed to other bulls.

The interpretation of the decline in incidence of bull agonistic behaviour with time within an experiment (Figure 3) was confounded by a simultaneous decline in pasture mass. Thus this decline may represent either or, both a carryover effect from the establishment of a new group of bulls or to a decline in pasture availability, increase in grazing time and reduction in agonistic behaviour due to reduced idling time (Dalton, Pearson and Sheard, 1967).

CONCLUSIONS

In this work the presence of steers reduced the incidence of agonistic behaviour among bulls particularly when steers substituted for bulls. Thus the mixing of steers with bulls provides another available strategy to alleviate the additional costs in repairs and maintenance to structures and pastures associated with grazing bulls and to improve the welfare of animals involved.

The reduction in agonistic behaviour of bulls by introducing steers is probably associated with both decreasing the size of the mob of bulls and increasing the area per bull. The proportion of steers added needs to be sufficiently great to overcome any negative effect of declining bulls:steer ratio. The impact of this change in behaviour on liveweight gain and meat quality require study. The use of other classes of stock with compatible grazing behaviour may produce even greater effects if they could avoid the apparently detrimental effect of introducing steers to decreasing the bull:steer ratio.

This approach to modifying behaviour may have application in other situations where single sex groups of entire males cause concern (eg live shipment of rams (Black pers com)).

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