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# The sexual behaviour of alpacas imported to New Zealand from Chile

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## ABSTRACT

The sexual behaviour of alpacas joined under a selective breeding programme was recorded to assess performance and to examine ways of providing optimal conditions for mating. Groups of 4 females and 1 male were joined in paddocks for 5 days (3 groups) or in pens for 3.5 hours on 2 consecutive mornings (3 groups). Sexual activity was more variable in paddocks compared with pens, and more females were mated in pens. Duration of copulation was longer in pens than in paddocks, and for first compared with subsequent matings. Within pens, sexual activity was more intense during the first hour following joining than for the subsequent 2.5 hours, on Day 1 than on Day 2, and differed between groups. Females became more receptive later in the mating sessions. The study indicated that pen mating using small single-sire groups, over short periods, was a suitable method of breeding alpacas.

**Keywords** Alpacas, sexual behaviour, mating environment, libido, oestrus behaviour.

## INTRODUCTION

In September 1989, 66 female and nine male alpacas (*Lama pacos*) imported from Chile were transported from quarantine to Tara Hills High Country Research Station in North Otago, for evaluation as a new source of fibre to be grown in the high country environment. Selective breeding of stock carrying specific traits, using single-sire mating, is necessary. However in South America alpacas are usually mated within a group of several males and females. Attempts at a more technical approach to breeding have been limited in scale and success (Calle-Escobar, 1984). The aim of this study was to monitor the performance of the animals under single-sire mating conditions, and to examine ways of providing optimal conditions for mating.

## MATERIALS AND METHODS

### Treatments

Six groups of one male alpaca and four non-pregnant female alpacas with cria (offspring) at foot were assigned to joining in either paddocks or pens, three groups to each treatment. Groups with males which had displayed

similar levels of sexual activity in a previous mating period were allocated to each environment.

Three groups were released into separate, adjacent paddocks (approximately 200 m x 100 m), and observed during daylight hours for five days<sup>1</sup>.

Three groups were joined in adjacent pens (6 m x 5 m) for 3.5 hours on two consecutive mornings.

### Behavioural Observations

The following details of all interactions between males and females in pens, and all interactions which occurred during daylight hours in paddocks, were recorded: the day and time with respect to joining, the identity of the individuals, the nature of the interaction (whether chasing or copulation, and whether spits or threats to spit were made), and the duration of the interaction. The identity of any female sitting beside ( $\leq 0.5$  m away) or standing over a mating couple was also recorded. To determine whether females in the paddock groups were mated during darkness, the lower abdomen of each male in the paddock groups was coated with a pigmented grease at dusk and the rumps of females were inspected for grease at dawn.

<sup>1</sup> One of the males in the paddock environment was replaced at the start of the second day of mating because he developed ryegrass staggers.

**TABLE 1** The number of times each male within pen and paddock environments chased and mated on the first day of joining, and the number of females which sat beside mating couples.

Environment	Male Tag	Number of Interactions		Number of females which sat beside mating couples
		Chasing	Mating	
Pen	03	8	5	2
	05	6	4	2
	10	9	9	4
Paddock	02	3	0	0
	04	9	8	1
	06	2	1	0
	08	16	7	0

## Analysis

Data from the first day of joining were inspected to assess the influence of the mating environment on the number of times chasing and copulation occurred, on the duration of mating, and on the number of females sitting beside mating couples. Least squares analysis was used to determine whether environment or mating rank (first vs subsequent mating) affected the duration of copulation, after it had been established using residual maximum likelihood that there was a zero component of between-group variance.

Data from the first two days of observations on the groups mated in pens were summarised and analysed using analysis of variance, fitting the effects of day and male group, for mating behaviour (number of females mated, duration of mating, time spent mating and number of females sitting beside mating couples) and female responses to chasing (chase length, whether they sat and whether they threatened).

## RESULTS

### Effects of Environment and Mating Rank

All females in pens were mated on either Day 1 or Day 2, but after five days, four females in the paddock groups were still not mated. In the paddock groups,

mating during daylight hours was only seen on the first day of joining, but six females were mated during the four nights of the study.

**TABLE 2** Mean duration (+S.E.D.) of copulation in pens and paddocks and for first and subsequent matings.

Duration of Copulation (min)		
Environment	Pen	18.7
	Paddock	11.3
	S.E.D.	2.91
Mating Rank	First	28.3
	Subsequent	12.2
	S.E.D.	3.78

The number of times each male chased and mated during Day 1 is shown in Table 1. There was a tendency towards more variation in both quantities among paddock than pen groups, and only one female sat beside a mating couple in the paddock environment, while eight females did this in pens (Table 1). Both the rank of mating and the mating environment were found to have significant effects on the duration of copulation (Table 2), with the first mating taking longer than subsequent matings and mating in pens taking longer than mating in paddocks.

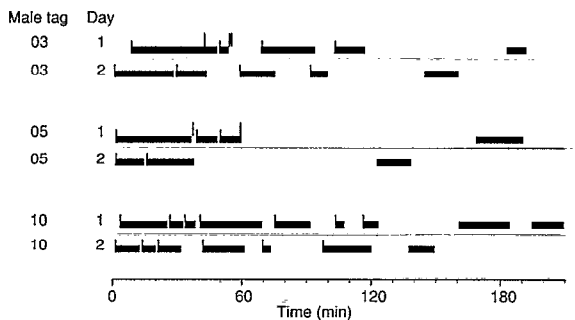
**TABLE 3** Mean number of matings, duration of mating, total time spent mating and number of females sitting beside males, classified by male group.

	Mean number of matings	Mean duration of mating (min)	Total time mating (min)	Mean number of females sitting beside male
Male tag				
03	5.0	17.2	89	1.00
05	3.5	17.9	65	0.58
10	8.0	13.2	112	1.37
SED (2 df)	0.71	0.29	9.6	0.20

## Effects of Time, Day, and Comparison Between Groups in Pens

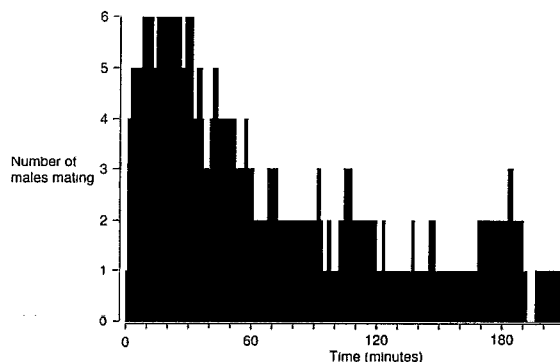
### Mating

The pattern of mating for each group on the first two days is represented in Figure 1. There were on average 6.3 chases and 5.5 matings, with 88% of available females mated, per session. Mean mating duration was 15.5 (range 3.8-39.2) minutes and was 2.2 (SED 0.24) minutes longer on the first day than on the second day, with a trend towards fewer matings and less time spent mating on the second day. There was no tendency for males to favour or neglect any particular females within their group.



**FIG 1** Chases (represented by vertical lines) and time spent mating (horizontal blocks) by males joined in pens, on first and second days of mating (longer vertical lines indicate chases not followed by mating with the chased female).

There was a significant difference between males in the mean number of matings per session and amount of the time available spent mating (Table 3). The male with the highest libido mated individuals for a significantly shorter period ( $P < 0.05$ ). For each group and day almost continuous mating was observed for the first half hour (Figure 2), but activity reduced slightly over the second half hour. After the first hour, the level of mating activity was at a steady but substantially lower rate.



**FIG 2** Number of males mating during 3.5 hours in pens, using combined data from first and second days.

The number of females sitting beside mating pairs was greater during the first hour (1.61/mating) than after the first hour (0.47/mating; S.E.D = 0.31) and was greater for males with higher libido (Table 3).

## Chasing

All copulations which occurred within the first two hours of joining were preceded by a period of chasing. Two of these chases were very long (3.0 and 6.9 minutes), while the others ranged between 3 and 50 (mean=20) seconds. When females were mated after two hours, mating was not preceded by chasing. These matings had been preceded by gaps of mean length 60 (S.E. 33.7) minutes of sexual inactivity. This behaviour occurred on both days in all three groups. The two long chases were followed by short copulations (4.4 and 5.8 minutes, respectively), but there was no overall indication of a relationship between chase length and mating duration.

Female responses to chasing varied during the mating period. During the first half hour following joining all females sat in response to chasing, but in the second half hour 42% of chases ended up with females not sitting. Threatening behaviour was also observed for 26% of females chased in the first hour, but this was not associated with whether mating eventuated. No threatening, or not sitting in response to chasing, was observed after the first hour.

## DISCUSSION

Joining groups of one male and several females in pens, for short periods on consecutive days, was a suitable method of mating alpacas. Two problems commonly experienced by breeders of alpacas and llamas (*Lama glama*), that of inadequate male libido (England *et al.*, 1971; Fowler, 1989a; Freeman, 1990; Sharp, 1990), and incompatibility of certain couples (Fowler, 1989b; Johnson, 1989), were not encountered within the three groups mated in pens, although there was evidence of variation in male libido and attractiveness to females.

The better performance of groups mated in pens compared with paddock groups indicated that the sexual activity of alpacas could be manipulated by altering their mating environment. Mating in pens had the advantage of minimising any inhibitory effects of stress, due to separation from other group members, on sexual behaviour (Price, 1987). It also may have created a more competitive atmosphere, and certainly maximised the exposure of both males and females to stimuli from other mating couples. Extraneous mating stimuli cause sexual arousal in male cattle (Blockey, 1981), goats

(Price *et al.*, 1986), and female pigs (Hughes *et al.*, 1985).

There was a trend towards an increase in female receptivity during the latter part of the mating sessions (the disappearance of threatening behaviour and failure to sit when chased, and the appearance of sitting for mating without being chased). This was in keeping with the observation that female llamas submitted more readily to subsequent copulations during the same day than to the first copulation (England *et al.*, 1971).

From the above discussion it appears that there may be two ways in which behaviour could be manipulated to facilitate the breeding of alpacas. Firstly, it is possible that stimuli from mating couples is a potent stimulator of sexual arousal, and could be used to activate uninterested individuals. Secondly, manipulation of female receptivity by joining females initially with a vasectomised male could prove to be useful, particularly when attempting to breed males which were "put off by a single spit" (Sharp, 1990).

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