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# MATING MANAGEMENT AND REPRODUCTIVE ACTIVITY OF INTENSIVELY FARMED RED DEER

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## SUMMARY

Aspects of mating behaviour and calving performance as influenced by age of hind and composition of mating groups are presented. All observations relate to herds joined in paddocks of 10 ha or less. At mating, definite dominant-subordinate relationships existed between stags. In herds with fewer than six stags present, one stag controlled a harem containing the majority of hinds and performed all observed mating. In herds with six or more stags, the control exerted over the hind herd by the dominant stag was not so marked but he still performed most of the mating. Calving records indicated that some stags sired more than 70 calves each. Rising 2-year-old hinds were mated later than older hinds, resulting in a mean calving date 6 to 12 days later than older animals, and their calving percentages were 15 to 19% lower than for older hinds.

## INTRODUCTION

Farmers of red deer have few proven guidelines on which to base their management decisions. They have drawn on information from wild deer and other farmed species, but this has not always proved relevant. In relation to mating management, Kelly and Moore (1977) reported that while most deer farmers joined one stag for every 10 or so hinds (a policy influenced by observations on the size of harems of wild stags), calving records indicated that a stag could successfully cover more than 30 hinds in a season.

A study of behaviour at mating in farmed red deer and the influence of management procedures was undertaken in an effort to establish guidelines to be used when formulating mating policies. In this paper, effects on mating behaviour and calving performance of numbers of stags and hinds per herd at mating time, and of age of hind, are examined.

## MATERIALS AND METHODS

The results presented were derived from three sources. Mating and calving records were obtained for eight herds of 13 to 74 hinds and 1 to 5 stags during the 1974 to 1977 breeding

seasons at Invermay. Observations at "Papamoa", a commercial deer farm in South Canterbury, covered nine herds with 77 to 196 hinds and 1 to 6 stags during 1977 and 1978, and those at "Dunrobin", a commercial deer farm in Southland, covered one herd of 182 hinds and 12 stags in 1978. Not all hinds or herds were represented by both mating and calving records.

The stags used at mating were aged 2 years and above. All herds had at least one stag 3 years of age or older. Rising 2-year-old hinds (16 months of age at mating, 2 years old at calving) were mated in separate paddocks from older hinds. Herds of mature hinds were composed of hinds that were 28 months of age and older at mating.

Herds of deer on the commercial farms were kept under continuous observation during daylight hours for 2 to 3 days each week between mid-April and mid-May 1978, the main period of mating. The behaviour of each stag was recorded at 2- or 5-minute intervals, and the locations of hind groups and stags were plotted on paddock maps each hour. Sexual behaviour was defined as searching for, testing and mating hinds. Studies at mating in other herds provided information on harem ownership and harem sizes only.

Calf counts were conducted at intervals during the calving period. Those being conducted at Papamoa during the 1978 season were incomplete at the time of writing and relate to the first 35 days of calving only.

## RESULTS

### MATING BEHAVIOUR

Stags attempted to form harems of hinds from which they excluded other stags. This activity persisted from their introduction into hind groups (late March to mid-April) through to mid-May. The peak period of mating, as indicated by number of services observed per day and confirmed by calf counts, was between April 23 and May 5 in herds of mature hinds in 1977 and 1978 at Papamoa. It was 1 to 2 weeks later in herds of rising 2-year-old hinds.

In nine herds in which there were two to five stags present at mating (mean no. hinds/herd = 112, range 15 to 196), only one stag in each herd maintained a harem over the peak of mating. The harem contained most, if not all, of the hinds (mean 97%, range 77 to 100%) in the herd, and this dominant stag performed all observed mating. Three herds that each had two

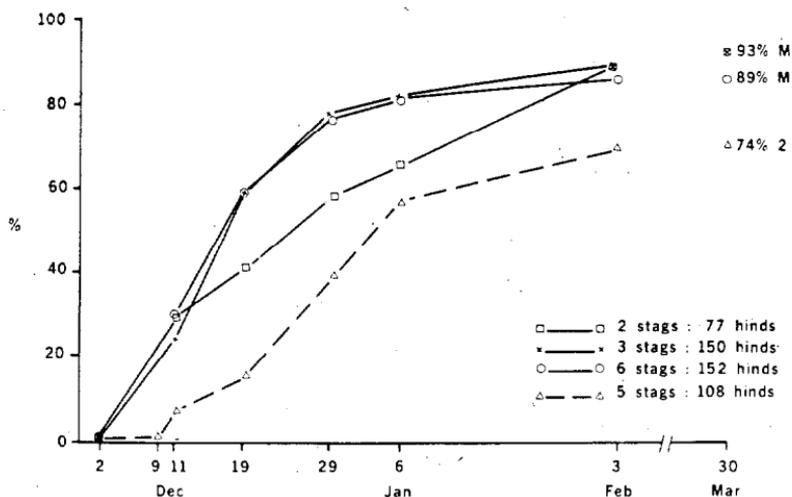


FIG. 1: Cumulative distribution of calves born per 100 hinds present at calving in herds of mature (M) and 2-year-old (2) red deer hinds: Papamoa, 1977.

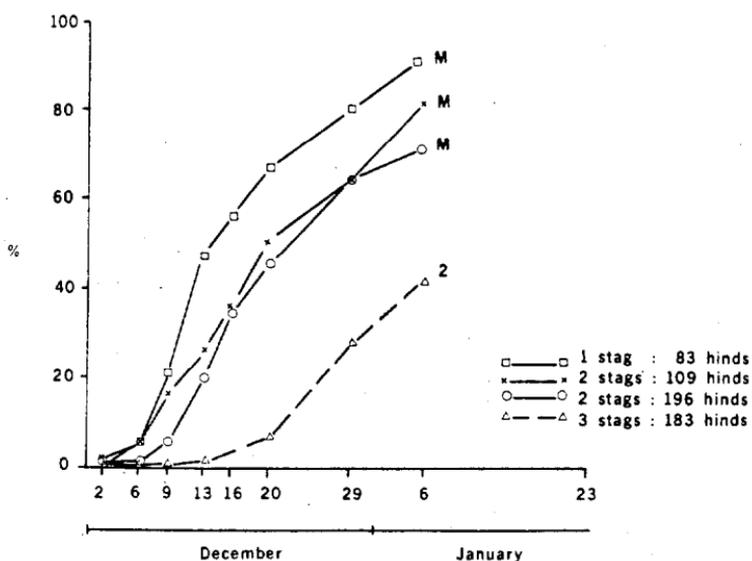


FIG. 2: Cumulative distribution of calves born per 100 hinds present at calving in herds of mature (M) and 2-year-old (2) red deer hinds: Papamoa, 1978.

stags were among those studied in detail at Papamoa in 1978. Dominant stags in these herds exhibited 87 to 92% of sexual behaviour observed and were located closer (average distance 9 to 10 m) to the nearest hind than subordinate stags (40 to 190 m).

The ability of the dominant stag to maintain control of the majority of hinds was reduced in herds with more than five stags. Over the peak period of mating activity in one herd with six stags and 152 hinds, the dominant stag held about 100 hinds, while the second ranked stag held the remainder in another harem. The subordinate stags without harems exhibited little sexual behaviour. In another herd of 182 hinds and 12 stags, harems were not maintained. Stags were spread throughout the hind group during mating, yet one stag still performed 7/12 of observed services.

Signs of sexual exhaustion were seen in some of the stags that held large harems over the peak of mating. Four animals with harems of 77, 109, 183 and 196 hinds had high mount-to-serve ratios but nevertheless were able to maintain their harems and prevent other stags from mating. In contrast, five other stags with harems ranging in size between 83 and 108 hinds showed no evidence of sexual exhaustion.

#### CALVING PERFORMANCE

The calving performances of four herds at Papamoa in 1977 are presented in Fig. 1. In two comparable herds each of 150 mature hinds, the spread of calving and percentage of hinds giving birth was similar, whether mating was to three or six stags. The third herd of mature hinds was composed of 77 "elite" hinds selected by the farmer for large body size and past fertility. The slower calving rate in this herd from mid-December onwards was probably a reflection of the sexual exhaustion of the dominant stag, signs of which were seen during the corresponding period of mating. The fourth herd represented in Fig. 1 is the herd of 2-year-old hinds. Relative to the herds of mature hinds, they began calving later (December 9 vs December 2), and proportionately fewer calved (74% vs 91%,  $P < 0.001$ ).

The results for Papamoa in 1978 are presented in Fig. 2. In the herd of "elite" hinds (1 stag: 83 hinds), relatively more hinds calved in the first 2 weeks of calving than in the other two herds of mature hinds. This may have been because signs of sexual exhaustion were seen during mating in the dominant stags

in the herds with 2 stags : 109 hinds and 2 stags : 196 hinds. The performance of these last two herds was similar despite the difference in numbers of hinds. As in 1977, the 2-year-olds began calving later than the mature hinds (December 9 vs December 2), and proportionately fewer had calved at each calf count.

TABLE 1: MEAN CALVING DATES FOR 2-YEAR-OLD AND MATURE HINDS AT INVERMAY (DECEMBER 1 = DAY 1,  $\pm$  SD WITH NUMBER OF OBSERVATIONS)

	<i>Mature Hinds</i>	<i>2-year-olds</i>	<i>Dif. (days)</i>
1975	9.4 $\pm$ 7.0 (13)	15.1 $\pm$ 8.1 (20)	5.7*
1976	13.0 $\pm$ 8.1 (31)	24.8 $\pm$ 11.5 (12)	11.8***

The calving results from herds of 2-year-old and mature hinds at Invermay showed that over the 1975 to 1977 period the calving percentage of 2-year-old hinds (70%,  $n = 56$ ) was lower than that of the mature hinds (85%,  $n = 79$ ), although the difference was not significant ( $P < 0.10$ ). The mean calving date of the young hinds in 1975 and 1976 was 6 to 12 days later than for mature hinds ( $P < 0.05$ , Table 1). Calving dates were not recorded in 1977.

#### DISCUSSION

As mating and calving were later in 2-year-old red deer hinds and their calving percentages were lower than for mature hinds, it would seem that, as with other farmed animals, preferential treatment of these animals at mating is advisable. This preferential treatment should include pre-mating nutrition adequate to ensure that the hinds weigh more than 70 kg at mating, if high calving percentages are to be attained (Kelly and Moore, 1977).

The dominance of one stag at mating in paddocks up to 10 ha in area was readily apparent. When hinds were joined with fewer than six stags, one stag was able to monopolize almost all of the hinds at mating, irrespective of the number of hinds in the herd (up to 196 hinds). In herds with more stags the influence of the dominant stag was less obvious but still notable. Subordinate stags did not have many opportunities to mate hinds. The stag/hind ratio for a herd does not reflect the mating load of each stag. It is the number of hinds per mating group that is the most important criterion.

Stags appear to be capable of accomplishing more mating than has previously been thought possible. Observations on wild deer have suggested that a stag is capable of serving 12 hinds (Lincoln and Guinness, 1977), and in Scotland results from farmed animals indicated that a single stag is capable of serving up to 17 hinds (Blaxter *et al.*, 1974); yet on Papamoa one stag is known to have sired at least 73 calves (1 stag : 83 hinds; Fig. 2), and three other dominant stags in multiple-sire herds have been estimated to have sired more. While these results indicate that fewer stags can be joined with hinds than the 1 stag per 10 hinds used on many commercial farms at present (Kelly and Moore, 1977), some notice needs to be taken of the sexual exhaustion seen in some of the stags with large harems. It is suggested that if red deer are to be mated in small paddocks there are two practical alternatives: either (1) the number of hinds should be limited to that which a single stag can settle (and the results presented suggest that about 50 hinds is a realistic number per paddock without risking infertility due to stag exhaustion), or (2) if the hind groups are much larger than 50, large numbers of stags should be used to prevent formation of large harems, and so spread the mating load. Whether in a single-sire situation or in a multiple-sire herd with one stag controlling most hinds, the working stag should be replaced at least after one cycle of mating to minimize the effects of any infertility in this stag.

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