# Effects of weaning date on hind and calf productivity

*J.C. Pollard, G.W. Asher, K. O'Neill, D.R. Stevens, A.J.T. Pearse, R.P. Littlejohn*


## Abstract

To determine how weaning date affected calf growth rate, hind conception date, and hind condition, 550 hind-calf pairs were studied on six Otago and Southland deer farms from February/March until September. On each farm, half of the hind-calf pairs were separated for weaning on March 11 (SE 6.4 days, early-weaned group), while half of the pairs remained together until May 30 (SE 9.8 days, late weaned group). Deer in both treatments on each farm were of similar age and genotype and stags of the same experience and genotype were added to hind groups on the same day in March. Calves were weighed in February/March, May/June and September, hinds were examined using rectal ultrasound to determine date of conception in June, and pasture assessments (biomass and quality) were carried out on each farm on the first two weighing dates.

Calves weaned early gained less weight (99 g/day) than the late-weaned calves (125 g/day) between February/March and September (SED 2.5 g/day, P<0.001), largely due to poorer growth rates from February/March to May/June. However, mean conception dates were earlier in the early-weaned hinds (day 89 of the year) compared with the late-weaned hinds (day 101, SED 1.7, P<0.001). Hind condition scores in May/June were higher for the early-weaned hinds compared with the late-weaned hinds (3.8 and 3.3 respectively, SED 0.03, P<0.001). It was concluded that results from the 1999 season (which followed a summer drought) showed positive effects of pre-rut weaning on hind conception date and winter hind condition but the weaned calves grew more slowly than the unweaned calves during the autumn. A further year's data collection and studies of optimal nutrition for hind conception and calf growth are warranted.


## Introduction

Approximately three-quarters of Otago/Southland deer farmers who responded to a survey on weaning management practices weaned their calves prior to the rut, in late February or early March (Pollard & Pearse, 1998). A major reason for this was the belief that hinds conceived earlier if weaning was carried out prior to mating. Studies on the effects of pre- versus post-rut weaning on hind conception have yielded conflicting results, ranging from an increased spread in calving date in pre-rut weaned red deer (Blaxter *et al.*, 1988), to no effect of weaning date on the onset of oestrus in fallow deer (Mulley *et al.*, 1984), to earlier conception dates in pre-rut weaned elk hinds compared with those weaned after the rut (Friedel & Hudson, 1994).

The aim of this study was to quantify the effects of pre- and post- rut weaning on hind conception dates and other components of production (calf growth rates and winter hind condition scores) on commercial red/red x wapiti farms in Otago and Southland. The following presents results from the first year of the study.

## Methods

Six commercial farms in Otago and Southland regions were used. On each farm, approximately 100 hind-calf pairs (mean=92, range=38-116) of similar genotype (mainly red deer) were allocated randomly to weaning in either late February/March (25$^{th}$ February-17$^{th}$ March) or May-June (12$^{th}$ May- 10$^{th}$ June). On most farms, weaned hinds, weaned calves, and the unweaned hind-calf pairs remained in three separate mobs from February/March until May/June. Stags of similar genotype and experience were added to the hind mobs in March.

All calves were weighed at the first weaning date in late February/March, at the second weaning date in May/June, and in September. Rectal ultrasonography (Aloka 210 SD; 5 MHz linear array probe) was performed by a single operator on all hinds in June to assess pregnancy status and foetal age estimation based on size and development of the foetus and cotyledons (Revol & Wilson 1991). Any hinds with no visible pregnancy had plastic collars fitted and were scanned again in July. A random sample of the hinds (mean = 52 per farm) were condition scored (Audige *et al.*, 1998) at the first weaning date, and all hinds were condition scored by the same person at pregnancy scanning

On both weaning dates, pasture length and quality was assessed for all paddocks on each deer farm. Pasture length was determined using a rising plate meter placed down at least 40 times at equal intervals across an estimated diagonal transect of each whole paddock, while pasture quality was assessed by determining the percentage grass, weeds, legumes and dead material in samples (approximately 100 g) cut at ground level at intervals across the same transect.

On the first weaning date farmers were provided with recording sheets and asked to record paddock identity and pasture length when any of the groups in the trial started grazing a paddock, and pasture length at the end of the grazing period for that paddock The type, weight and date of any supplements fed, and any health treatments used or animal health problems encountered were recorded by the farmer Records were maintained from February/March until May/June

Liveweight and growth data were analysed by least squares, fitting terms for farm, weaning date (early or late) and their interaction, with an adjustment for calf sex for calf variables Hind conception date was analysed as a binomial generalised linear model (McCullagh & Nelder, 1989). Bartlett's test for homogeneity of variance was used for conception dates grouped by treatment (Snedcor & Cochran, 1980).

## Results

### *Calf weights*

Calves in the two weaning date treatments entered the trial at similar weights (respective means were 52.3 and 52.2, SED 0.75) Between February/March and May/June, calves which were weaned early gained less weight (142 g/day) on average than the unweaned calves (210 g/day, SED 3.3 g/day, P<0.001, Table 1) From May/June to September, the late-weaned calves grew more slowly (41 g/day) on average than the early-weaned calves (55 g/day, SED 3.8, P<0.001, Table 1). Nevertheless over the full period of the study, from February/March to September, mean growth rates were highest for the early-weaned calves (125 g/day compared with 99 g/day for the late-weaned calves, SED 2.5; P<0.001; Table 1). The interaction between sex of calf and weaning date treatment was not significant.

**Table 1 No. of calves in each weaning date treatment and mean growth rates for each farm between February/March and September, plus SED between farms. The level of significance of differences between treatments (Sig. 1), farms (Sig. 2), and interaction between treatment and farm (Sig. 3) is indicated (*** P<0.001).**

| Weaning treatment | Farm no. | No. calves | Growth rate (g/day) | | |
|---|---|---|---|---|---|
| | | | Feb./March-June | May/June-Sept. | March-Sept. |
| Early | 1 | 51 | 126 | 52 | 84 |
| | 2 | 62 | 177 | 88 | 135 |
| | 3 | 59 | 202 | 27 | 120 |
| | 4 | 20 | 237 | 108 | 170 |
| | 5 | 58 | 23 | 42 | 34 |
| | 6 | 34 | 134 | 50 | 91 |
| Late | 1 | 48 | 229 | 46 | 128 |
| | 2 | 54 | 176 | 103 | 143 |
| | 3 | 56 | 289 | -4 | 151 |
| | 4 | 18 | 293 | 107 | 195 |
| | 5 | 53 | 129 | 5 | 65 |
| | 6 | 38 | 184 | 34 | 105 |
| SED | | | 10.9 | 12.4 | 8.1 |
| Sig 1 | | | *** | *** | *** |
| Sig 2 | | | *** | *** | *** |
| Sig 3 | | | *** | *** | *** |

The amount of difference between growth rates in the different weaning date treatments varied between farms (P<0.001), for instance growth rates from Febraury/March to May/June did not differ between the two treatments on farm 2, while on farms 1 and 5 the difference was more than 100g (Table 1). On farm 5 calf growth rates were very poor overall (Table 1) On this farm a lungworm problem was identified and treated in mid April, but many of the early-weaned calves lost weight, and seven died. None of the calves still with their mothers lost weight or died

### Hind conception

Only 4% of early-weaned hinds and 3% of late-weaned hinds failed to conceive (P>0.05). On farm 1 the first stag used with the early-weaned hinds mated with very few hinds and conception data from this farm has been omitted.

Mean conception dates were earlier (day 89 of the year) for the early-weaned hinds compared with the late-weaned hinds (day 101, SED 1.7, P<0.001; Table 2). A farm x weaning date interaction was seen, whereby the amount of difference in conception dates between treatments differed between farms (P<0.001; Table 2). There was no significant difference between treatments in the spread of conception dates (P>0.05)

**Table 2. Mean conception dates (relative to January 1) and February/March and May/June condition scores for each weaning date treatment, on each farm, plus SED between farms. The level of significance of differences between treatments (Sig. 1), farms (Sig. 2), and interaction between treatment and farm (Sig. 3) is indicated (Ns not significant, *** P<0.001).**

| Weaning treatment | Farm No. | Day of conception | Feb./March condition score | May/June condition score |
|---|---|---|---|---|
| Early | 1 | - | 3.1 | 3.4 |
| | 2 | 98 | 3.2 | 3.4 |
| | 3 | 89 | 3.9 | 4.4 |
| | 4 | 82 | 3.3 | 4.0 |
| | 5 | 82 | 3.5 | 3.8 |
| | 6 | 90 | 3.2 | 3.4 |
| Late | 1 | - | 3.2 | 3.2 |
| | 2 | 110 | 3.3 | 2.8 |
| | 3 | 101 | 3.9 | 3.8 |
| | 4 | 99 | 3.5 | 3.9 |
| | 5 | 98 | 3.4 | 3.1 |
| | 6 | 97 | 3.2 | 3.1 |
| SED | | 5.0 | 0.21 | 0.11 |
| Sig 1 | | *** | Ns | *** |
| Sig 2 | | *** | *** | *** |
| Sig 3 | | *** | Ns | *** |

### Hind condition scores

Hinds in the two weaning date treatments entered the trial at similar condition scores (means for both treatments were 3.5, Table 2) At pregnancy scanning in June, the hinds which had been weaned early were in better condition than those which had been left with their calves (respective mean scores were 3.8 and 3.3, SED 0.034; P<0.001), although the extent of this trend varied between farms (P<0.001; Table 2).

### Pasture and grazing conditions

Pasture conditions varied widely, with biomass in February/March ranging from 1463 to 2000 kg/ha between farms (Table 3) Drought conditions in late summer/autumn were reflected in the high proportion of dead vegetation in the pasture, which had lowered substantially by winter (Table 3)

**Table 3. Mean pasture biomass (kg DM/ha) and composition (percentage grass, legumes and dead material) in February/March and May/June, for each farm.**

| | Dry matter (kg/ha) | | % grass | | % legumes | | % dead | |
|---|---|---|---|---|---|---|---|---|
| *Farm* | *Feb / March* | *May/ June* | *Feb / March* | *May/ June* | *Feb / March* | *May/ June* | *Feb./ March* | *May/ June* |
| 1 | 1463 | 996 | 44 | 61 | 2 | 2 | 53 | 35 |
| 2 | 2000 | 1500 | 50 | 82 | 16 | 3 | 32 | 14 |
| 3 | 1748 | 1619 | 52 | 77 | 14 | 7 | 32 | 16 |
| 4 | 1993 | 1573 | 62 | 83 | 6 | 2 | 31 | 15 |
| 5 | 1820 | 1542 | 55 | 74 | 3 | 3 | 38 | 23 |
| 6 | 1517 | 1164 | 48 | 80 | 6 | 3 | 45 | 14 |

A wide range of stocking densities were used across farms and between different groups within the same farm For example, the stocking density used for the early-weaned calves, was 7.5/ha on farm 2, and 35/ha on farm 5 (Table 4) In general, the early-weaned calves were grazed on longer pastures than the early-weaned hinds or the late-weaned deer (Table 4).

**Table 4. Mean stocking density (calves (C) or hinds (H) per hectare) and pasture height (cm) at the start and end of grazing periods from February/March to May/June, for each group on each farm.**

| | Mean stocking rate per ha | | | Mean pasture height at start of grazing (cm) | | | Mean pasture height at end of grazing (cm) | | |
|---|---|---|---|---|---|---|---|---|---|
| *Farm no* | *Feb./ March* | | *May/ June* | *Feb./ March* | | *May/ June* | *Feb / March* | | *May/ June* |
| | C | H | C + H | C | H | C + H | C | H | C + H |
| 1 | 12 8 | 3 6 | 3 5 C<br>3 6 H | 7 0 (1) | 2 5 (1) | 3 8 (1) | 4 0 | 3 0 (1) | 2 0 (1) |
| 2 | 7 5 | 6 1 | 7 4 C<br>7 4 H | * | * | * | * | * | * |
| 3 | 24 0 | 21 0 | 7 1 C<br>7 1 H | 7 6 | 6 3 | 7 8 | 5 9 | 2 8 | 3 5 (1) |
| 4 | 17 0 | 6 8 C<br>17 3 H | 8 3 C<br>17 2 H | 10 6 | 5 8 | 5 9 | 7 3 | 2 3 | 2 2 |
| 5 | 35 0 | 6 8 | 6 4 C<br>7 4 H | 12.4 | 6 (1) | 5 8 | 7 7 | * | 3 5 |
| 6 | 12 4 | 11 2 | 4 0 C<br>5 2 H | 6.8 | 6 3 | 5 0 (1) | 6 0 | 4 0 | 3 0 (1) |

(1) One measurement only

Farm 1 carried out the most intensive supplemental feeding, with baleage fed to the weaned calves throughout most of April and May. Baleage was also fed to the weaned hinds (in late May/early June) and the unweaned deer (from April to June) on farm 2, and to the weaned hinds from May to June on farm 3. Barley was fed on farm 4 over a seven day period in early May, to prepare calves for winter confinement

## Discussion

During autumn, growth rates of calves which remained with their mothers were significantly greater than those of calves which had been weaned. This finding was consistent with a study on fallow deer (Mulley *et al*, 1994), and with the contention, based on lactational data, that pre-rut weaning may compromise calf growth rates (Loudon *et al.*, 1984). At the age of three months, calves receive approximately 0.6-1.2 kg of milk per day (Arman *et al.*, 1974; Loudon *et al*, 1983; 1984). Therefore weaning at this age removes a substantial source of food and it is not surprising that growth rates decline As red deer calves naturally stay with their mothers for a year or more (Guinness *et al*, 1979, Lowe, 1966), psychological stress from separation probably also contributes to the lower growth rate seen in weaned calves Weaning late is preferable from a nutritional viewpoint as dependence on the milk supply is lower (Arman *et al*, 1974), and in the present study late weaning resulted in heavier calves overall. Nevertheless the late-weaned calves showed evidence of weaning stress, with lower May/June-September growth rates (on average) than their earlier-weaned counterparts.

Calf growth rates, and the effect of the weaning date treatment on growth rates, were highly variable between farms Some farms achieved high growth rates even after weaning (for example farm 2), indicating the importance of farm management in optimising production. Although not the main focus of the present study, the nutritional and grazing data collected should help to identify good management techniques, and efforts will be made to increase the accuracy of these records as the study progresses into a second year In a production sense, nutrition of young stock is not only important for reaching target weights for slaughter, but may also affect the subsequent productivity of replacement breeding hinds, as found in fallow deer (Kelly & Culleton, 1994)

Winter condition scores were lower in the late-weaned hinds, showing that the gain to calf weight was not without cost The condition of the pregnant hind is an important component of production For instance recent studies have shown that the nutritional state of the pregnant hind affects both gestation length and subsequent milk production (Asher 1999) There was significant variability between farms in the effect of the weaning date treatment on hind condition, indicating that appropriate management could overcome detrimental effects of a longer lactation

Earlier conception dates in the early-weaned hinds, compared with the late-weaned hinds, were consistent with farmers' beliefs (Pollard & Pearse, 1998) and a Canadian survey on elk, in which farms where pre-rut weaning was carried out had a mean calving date 5 days earlier than farms which weaned after the rut (Friedel & Hudson, 1994) In contrast, an experimental study of pre- versus post-rut weaning found no difference in mean calving date, but a greater spread in calving date in the pre-rut weaned hinds (Blaxter *et al.*, 1988) Furthermore lactational studies indicated that levels of milk yield had little influence on hind fertility (Loudon *et al*, 1984), and Mulley *et al* (1994) found no difference in the date of onset of oestrus between pre- and post- rut weaned fallow deer.

Perhaps the variability in the above studies on weaning and hind reproduction (and the variation in results from different farms in the present study) is related to variation in hind nutrition. For example, hinds on poor quality pasture had lower milk yields and higher prolactin levels than hinds on better quality pasture (Loudon *et al*, 1983). The higher prolactin levels were associated with a greater suckling frequency and a later return to oestrus compared with the hinds on better pastures (Loudon *et al*, 1983). Therefore in the present study, drought conditions may have led to a higher suckling frequency than normal, and delayed oestrus in the hinds which were left with their calves It is important that this possibility is examined by repeating the study in a range of nutritional environments.

In conclusion, delaying weaning until mid-winter had positive effects on calf growth rates but was associated with later conception dates and poorer winter hind condition scores. High variability between farms (and in published literature) in the effects of the different weaning date treatments indicated that detrimental effects of later weaning could be overcome using appropriate management techniques Alternatively, it may be possible to achieve higher growth rates in early-weaned calves by reducing their nutritional dependence on the hinds, for instance by providing them with a high quality supplementary feed

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