Effects of management at weaning on behaviour and weight gain of farmed red deer calves

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Abstract

Two studies were performed to determine whether there were behavioural or productive differences arising from two contrasting weaning practices for red deer: proximate vs. distant separation of dams and calves. In Experiment 1, 80 calves across two replicates were used. For each replicate, calves were separated from their mothers, weighed and allocated to one of two treatments (n = 20 calves), either confinement in an unfamiliar paddock 100 m from their mothers for 2 weeks following weaning (treatment N), or transportation 2 km to a different farm (treatment F). Groups were observed during the following 6 days and weighed 14 days after weaning. In Experiment 2, the same procedure was performed out on two commercial farms, but using 40 calves per treatment group, without replication or weight recording. In Experiment 1 running, fenceline pacing and vocalising declined following weaning, with steeper declines for F than N calves for running and vocalising (P < 0.01). Similar trends, with an indication of less vocalising and movement overall, were seen in Experiment 2. In contrast, mean post-weaning weight gains for N calves were higher than for F calves (3.0 compared with 2.4 kg, SED 0.48 kg; P < 0.05). Weather variables (cloud, temperature and wind) were associated with behaviour in both studies (P < 0.05), with a trend for pacing, calling and running to increase as conditions deteriorated (cloud cover and wind speed increased, and temperature decreased). It was concluded that distant separation appeared beneficial to the calves but more research was required to determine optimal weaning management. The study supported previous evidence that weaning should be carried out in good weather. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

Weaning of red deer \((Cervus elaphus scoticus)\) calves from their mothers at 3–4 months of age is a common practice on deer farms in New Zealand (Moore et al., 1985; Pollard and Pearse, 1998). Calves and their mothers respond to weaning separation by calling and pacing along fencelines (Haigh et al., 1997; Pollard et al., 1998). Previous research on red deer has shown that the weaning environment can influence weight gain, behaviour and immunocompetence (Griffin et al., 1988; Pollard et al., 1992).

One aspect of weaning management which deserves attention is the hind: calf separation distance. A survey of 59 deer farmers revealed that while most kept the animals only a few paddocks apart, some transported their calves to more than a kilometre away and a few kept the hinds and calves in adjacent paddocks (Pollard and Pearse, 1998). The latter treatment was investigated experimentally in North American wapiti \((Cervus elaphus)\) spp. and it was found that separation into adjacent rather than nearby paddocks reduced behavioural disturbance (Haigh et al., 1997). The aim of the present experiment was to determine whether separating the deer by a large distance, rather than keeping them in nearby paddocks, was also effective in reducing behavioural disturbance in calves. As post-weaning productivity is important to deer farmers, weight gain was also compared between the two treatments. Weather conditions were also recorded as previous studies indicated that stress following weaning is exacerbated by poor weather (Griffin et al., 1988; Pollard and Pearse, 1998).

2. Methods

Calves were studied at four different locations in two separate experiments. Experiment 1 was performed on two research farms, where on two occasions (replicates 1 and 2) 40 pasture-reared calves aged 3–4 months were separated from their mothers in a deer yard, weighed and allocated randomly into two groups of 20 calves balanced for weight and sex. One group (F) was transported 2 km in a deer trailer to a different farm, while the other group (N) was walked quietly to a paddock which was unfamiliar to the calves, but within 500 m of their usual environment. These calves were separated by approximately 100 m from the paddock containing their mothers. The mothers were not visible to N calves but their calls were clearly audible over several hundred metres. The calves were weighed again 14 days after weaning. For all calves, the predominantly ryegrass pasture was supplemented with lucerne hay fed ad libitum throughout the trial.

Experiment 2 was performed on two commercial farms. Eighty calves were separated from their mothers and allocated randomly to two groups of 40 balanced for weight and sex. One group (F) was transported 15 km in a deer trailer to a different farm, while the other (N) remained on the same farm, in an unfamiliar paddock. As with Experiment 1, N calves could not see their mothers, but were well within auditory range.

In Experiment 1, N and F calves were observed from inside a car parked beside the paddock for 3 h in the afternoon immediately following separation for weaning (period 1), from 0800 to 1100 h and from 1700 to 2000 h on the following 2 days (periods 2–5).
and from 1700 to 2000 h on the next 3 days (periods 6–8). Every 5 min, the observer recorded the number of calves running (moving faster than a walk) and pacing (moving parallel to, within 1 m of, the fence or gate), and the number of vocalisations made within a 2-min period. Every 5 min, the number of deer looking at the observer, and any disturbances associated with half or more of the group looking at the source of disturbance, were also recorded. The observation method used in Experiment 2 was the same, except the afternoon observation period was from 1600 to 1900 h, the number of deer walking was recorded, and vocalisations were counted over 1 min.

Weather variables were recorded on subjective ordinal scales at the start of each hour during observation periods as follows: cloud 0–3 (none–full cover), temperature 0–4 (very cold–hot), rain 0–5 (none–hail), wind 0–4 (none–very strong).

3. Statistical analysis

Behaviour scores were accumulated over 3 h sample periods and analysed as binomial (running, pacing and looking) or Poisson (vocalization) generalised linear models (McCullagh and Nelder, 1989), fitting group, sample period and interaction of the environment and the linear contrast for period. We assumed residuals were uncorrelated across periods for each group. No attempt was made to assess the environment main effect.

To assess any association between behaviour and weather, behaviour scores were accumulated over hours within sample periods, and transformed (log(1 + x)) to stabilize the variance. Scores were then analysed by least squares, fitting the weather variable that explained the greatest variation as a covariate and assuming conditional independence of scores between hours given the explanatory weather variable.

Initial liveweight and weight gain were analysed by least squares, fitting environment, week, sex and all interactions involving these terms. However, terms involving sex were not significant, and were dropped from the model. We assumed that there was no within-group dependence in weight change due to competition, since feed was not limiting.

4. Results

In Experiment 1, running, pacing and vocalising declined after weaning for both treatments ($P < 0.001$, Fig. 1). For vocalising and running, the decline was more rapid for F than N ($P < 0.01$, Fig. 1(a) and (c)). Regression slopes for vocalising were $-0.41$ for F and $-0.22$ for N (SED, standard error of the difference between means, $= 0.070$), and for running were $-1.14$ for F and $-0.67$ for N calves (SED = 0.168). Regression slopes for pacing did not differ significantly between treatments ($-0.30$ for F and $-0.37$ for N, SED = 0.131; $P > 0.05$), and while looking at the observer declined significantly over time ($P < 0.001$), no difference between treatments in this decline was observed ($P > 0.05$). The percentage of observations in which the deer were recorded as
disturbed was 1.7% for N and 2.1% for F \( (P > 0.05) \). Overall means for pacing and vocalising tended to be greater for N calves, but this difference did not reach significance \( (P > 0.05) \), Table 1.

Calves in the earlier groups in Experiment 1 were lighter \( (P < 0.001) \) and gained more weight over the 14 days post-weaning than calves in the later groups \( (P < 0.001) \), Table 2. Overall, F calves gained less weight (mean = 2.4 kg) than N calves (mean = 3.0, SED = 0.48 kg; \( P < 0.05 \)).

In Experiment 2, behaviour was more variable than on the research farms, which could be attributed to a greater frequency of environmental disturbance (10.2% of N samples and 10.3% of F samples). Similar trends to Experiment 1 were observed (Table 1), with overall mean frequencies for pacing and vocalising tending to be greater for N than F calves. Walking showed an opposite trend with a greater value for F than N, but overall movement (running, pacing or walking) still reached a lower value for F (8.4%) than N (13.9% of calves per sample).
Table 1
Mean percentages of observations in which different activities were observed, and mean numbers of vocalisations counted, for treatments F and N in Experiments 1 and 2. SEDs and the significance of differences between means for F and N in Experiment 1 are also given (ns = not significant).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Experiment 1</th>
<th></th>
<th></th>
<th></th>
<th>Experiment 2</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>N</td>
<td>SED</td>
<td>Significance</td>
<td>F</td>
<td>N</td>
<td>SED</td>
<td>Significance</td>
</tr>
<tr>
<td>Running (%)</td>
<td>2.1</td>
<td>1.7</td>
<td>0.9</td>
<td>ns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacing (%)</td>
<td>10.7</td>
<td>27.4</td>
<td>5.0</td>
<td>ns</td>
<td>2.5</td>
<td>10.3</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Vocalising (no./2 min)</td>
<td>20.8</td>
<td>29.3</td>
<td>3.1</td>
<td>ns</td>
<td>3.3</td>
<td>5.5</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Effects of weather variables on activities were found across both treatments in Experiment 1. The frequency of running increased as the score of wind strength increased, pacing was more frequent as cloud score increased, and vocalisation increased as temperature decreased ($P < 0.05$). In Experiment 2, vocalisation was again observed to increase as temperature decreased ($P < 0.01$). Pacing also increased as temperature decreased, and running increased with cloud cover ($P < 0.05$).

5. Discussion

Reasons for weaning deer calves at a young age include improved flexibility of management of the calves and their dams, and the widespread belief that hinds which have had their calves removed before mating conceive earlier (Moore et al., 1985; Pollard and Pearse, 1998; Haigh, 1999). It is acknowledged that this process is stressful to the calves and a wide range of techniques are employed to reduce stress, for example, adding hinds to the group of young deer, keeping the calves in a familiar paddock, and shifting only a few hinds per day away from the group of calves to be weaned (Moore et al., 1985; Pollard and Pearse, 1998; Haigh, 1999).
al., 1985; Friedel and Church, 1994; Pollard and Pearse, 1998; Haigh, 1999). The current experiment investigated a further technique for reducing post-weaning stress.

Transporting weaned calves a large distance away from their mothers, rather than keeping them within auditory range, was associated with more rapid declines in vocalising and running during the days immediately following weaning, and there was a suggestion in both studies that overall frequencies of pacing and vocalising were lower in the transported calves. From a management perspective, this suggests that separation stress, and pasture damage from pacing, may be reduced by keeping calves and their mothers well apart. However, against this benefit was the greater weight gain in calves left near their mothers. Possibly, there was a difference in pasture quality between the two sites, a negative effect of transportation or an unfamiliar environment, or a beneficial effect of remaining near the hinds. The latter possibility was not supported in the study by Haigh et al. (1997), in which wapiti calves kept beside their mothers did not gain weight faster than calves kept a short distance away. Further work across a range of environments is required to determine optimal separation distances from both animal welfare and farm productivity aspects.

Behavioural disturbance increased as weather conditions deteriorated (cloud and wind increasing, and temperature decreasing), supporting farmers’ beliefs that weaning should be carried out in fine weather (Pollard and Pearse, 1998). Griffin et al. (1988) observed a decrease in leukocyte numbers in weaned calves during a period of cold weather, indicating that cold may be an additional stress to that of weaning.

Finally, calves were still calling and pacing along fencelines 6 days after weaning, indicating that the stress of separation lasted at least this long. Previous research indicated that calves weaned at 3–4 months may take 3 or more weeks to settle after weaning (Pollard et al., 1998). There may be productive advantages in leaving deer calves with their mothers for longer (Loudon et al., 1984; Mulley et al., 1994) and it is likely that this would be in the interests of the welfare of the animals. A study of the effects of weaning age on behaviour and productivity would be worthwhile.

5.1. Welfare implications

Wide separation of newly weaned deer calves from their mothers reduced the duration of running and calling by calves following weaning, compared with keeping them in nearby paddocks. However, the groups kept near each other gained more weight. Further work is required to determine the best distance to keep the groups apart. As weaning at 3–4 months of age appears to cause distress, the consequences of weaning at a later age deserve investigation.

References


