CALVING BEHAVIOUR OF FARMED RED DEER

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INTRODUCTION

In wild herds of red deer, hinds due to calve leave the herd and seek out an isolated calving site away from their usual home range (Darling, 1937; Clutton-Brock and Guinness, 1975). With intensive farming of deer the environment is modified by paddock confinement. On farms, hinds seldom have complete isolation for bonding with their calves. To what extent confinement at calving effects calf losses and mismothering, is not known but deserves attention.

Loss of new born calves is a real concern to farmers who have invested heavily in deer. Some tend to think that loss of new born calves is more likely to be caused by disease rather than dystocia or social problems. Human disturbance can lead to unnecessary calving losses through mismothering.

This paper examines calving behaviour of red deer. Many of the observations reported are based on the Invermay herd and are, in some cases, peculiar to the experimental nature of this herd. An understanding of calving behaviour is necessary to determine when assistance is required, and what management should be adopted to avoid unnecessary losses of new born calves.

PRIOR TO CALVING

Resources

The farm and the source of the animals has been described elsewhere (Moore *et al.*, in press). Varying numbers of red deer hinds were mated with red deer stags between 1975 and 1984. The number of these calving hinds averaged about 120 each year. Observations are from monitoring calving hinds aged 3 years and older. Groups of hinds (approximately 20-25 per group) were set stocked 7 to 10 days prior to the first expected calf. The udder status of each hind was recorded at this time and again at weaning in March.

On the Invermay hill deer farm the size of calving paddocks range from 1.3 to 1.7 ha. Natural cover (stands of manuka, boulders) is present in some of these paddocks.

Fence pacing and calving site

Though hinds do pace the paddock fence lines prior to calving, fence pacing is not necessarily an indication that hinds are due to calve within a day or so. Two periods of fence pacing occur. The first can be 7 to 10 days prior to calving. The second is more intense and may

begin up to 2 days before calving. Brantas (1980) reports in laying hens a 400% increase in pacing of hens without access to laying nests compared to hens with access. The fence pacing of hinds may reflect a need for isolation at calving.

Observations indicate the calving site is a small area in the paddock away from the normal resting area of the herd. Hinds have been observed calving on open hill sides, on edges of gullies or in patches of natural cover. The location of these sites was such that a hind would generally avoid immediate disturbance by farm personnel. During calving other hinds rarely approached the site. Occasionally after the birth solicitous hinds did approach; some were tolerated, others vigorously evicted by the new mother.

Determining imminence of calving

The changes in physical appearance cannot be considered in isolation when attempting to determine imminence of calving. Behaviour that differs from the normal pattern shown by the herd should also be considered. While the herd is grazing or resting the preparturient hind is usually restless, distances itself from other herd members and fence paces.

The best indicator of imminent calving is the change in the hinds udder which becomes turgid, with teats prominent.

Twenty four hours prior to calving obvious changes also occur in the shape of the abdomen. The pregnant hind loses the sagging appearance of the abdomen and it is difficult to differentiate, on appearance only, hinds which have calved from those shortly due to calve without reference to the fullness over the flanks.

Hinds carrying twins can usually be discerned by the marked enlargement of the abdomen and their relative lack of udder development 4 weeks prior to calving.

Size of udder is not a good indication of when hinds are likely to calve. Udder development can start about a month before calving in adult hinds. In first calvers udder development does not become obvious until at least about 2 weeks prior to calving and udders are smaller than in mature hinds.

Udders of hinds which lose their calves completely regress within 4 weeks.

CALVING

The Birth Sequence

The appearance of the amniotic sac signals the onset of labour. Hinds often continue to graze until the sac bursts, then lick up the voided

waters and eat the grass over which the waters have splattered. After which they intermittently pace or lie down.

Several researchers, Arman (1974), Arman *et al.* (1978) and Kelly and Whateley (1975) have reported times from the sac bursting until calving with a range of <1 to 240 minutes. Our observations support this highly variable range, the average time being 30 to 45 minutes. The longest time recorded at Invermay from sac bursting until a live birth was 5 hours.

During calving a hind, between contractions, will lick her teats and vulva and the emerging hooves and forelegs of the calf. Some hinds show restlessness and alternately lie down and stand. Contractions are also seen in standing hinds. Those noted for two hinds were 1 per 5 minutes, duration 3 seconds intensifying to 1 per minute, duration 5 seconds over a half hour period immediately prior to the emergence of the nose and head. A characteristic posture of a laterally recumbant hind during a contraction is to hold the neck up with the head looking back over the flank, to flatten the ears, raise the tail and extend the hind legs.

Once the calf's head is out, intense closely spaced contractions normally expell the shoulders. Often the hind will stand, once the calf is out past its ribcage, and the rest of the calf will slide out.

Disturbance of Hinds

When the amniotic sac has burst, calving hinds, alerted or disturbed, may attach themselves to the periphery of the herd or begin pacing the fence line before returning to their calving site. Hinds have been seen to go to a new site for calving following disturbance.

When a calving hind is disturbed at the time when the calf's shoulders are out, the hind may stand up and move off, the calf dropping to the ground some distance from the calving site. A young hind, or one that is nervous or flighty, may not return to the calf but go instead to the calving site.

Cleaning the calf

Hinds are 'active' mothers (Hediger, 1955) and generally will commence cleaning the calf immediately. However, after a prolonged parturition some hinds will rest before commencing this activity. The cleaning of the calf is interspersed with eating the membranes, licking the amniotic fluids from the ground, grazing either standing or sitting, and resting.

After being cleaned the calf will generally suck and stand within 30 to 45 minutes of birth. If a calf is slow to respond to licking and cleaning the hind will nudge it with her nose. A hind with a stillborn calf may at this point rake the unresponsive calf with her forefeet; this has also been seen in fallow deer (Gilbert, 1974).

The periods from birth to the calf standing, sucking and the placenta detaching are given in Table 1. Arman *et al.* (1978) observing tame hinds, mostly calving for the first time, reported 9 of the 23 were lying when first suckling occurred.

Table 1: Observations on calving stages in farmed red deer.

	Time from birth in minutes			
	Average ± s.e.m	Range	N	Reference
Calf first stands	47 ± 7.3	12-80	23	Arman *et al.* (1978)
	32 ± 4.7	17-69	11	Kelly & Whateley (1975)[a]
Calf first sucks	33 ± 4.2	14-177	23	Arman *et al.*(1978)
	45 ± 6.5	23-74	7	Kelly & Whateley (1975)[a]
Placenta detaches	98 ± 14.7	15-245	15	Arman *et al.* (1978)

[a] Calculated from published data.

The Hind and New Born Calf

The new born calf is not an innate 'follower' (Lent, 1974). After the first suckling the hind attempts to lead the calf away from the birth site, but the calf's response is often slow. Repeated vocalisation and nose to nose contact is used for encouragement. At some point in this 'following' activity the calf leaves the hind and seeks cover.

The hind will graze and rest close to the new born calf for periods up to 4 to 5 hours. A second suckling bout, shorter than the first successful attempt, typically occurs within this period. As the calf sucks, the hind licks the ano-genital region and ingests the urine and faeces (Arman, 1974). Again the calf concludes the activity by seeking cover.

Vocalisations

Vocalisations by hinds at Invermay only occur during 4 months of the year. From the beginning of calving until the week after weaning lactating hinds are frequently vocalising. There is the usual calf

directed calling and the less frequently heard undirected calving 'roar'. The calving 'roar', noted pre and post-calving (Corrigall and Hamilton, 1977; pers.obs. G.C., G.M.), is a long soft roar, similar in sound to the stag roar, ending with the neck extended the head up and the mouth open resembling a yawn. The yawning mouth and stretched neck is commonly seen after calving without the vocalisation.

Initiation of Suckling and Sucking

Maternal and young calf behaviour in red deer have been descibed by several authors. Clutton-Brock *et al.* (1982) reports Hall's observations (Hall, M.J. Ph.D. diss, University of Sussex, 1978) that during the first day or two after birth calves sucked every 2 to 3 h while their mothers were with them. Suckling bouts are usually initiated by the hind at the beginning or end of grazing activities. The hind returns and either calls the calf to her from the bedding site or goes directly to the bedded calf, makes nose to nose contact and begins to groom it. The calf then sucks standing up with its tail raised while the hind licks the calf's ano-genital region, ingesting faeces and urine.

After 7 to 10 days the calf spends increasingly more time with its dam and with other calf-dam pairs (Clutton-Brock and Guinness, 1975; pers.obs. G.C., G.M.). At this age suckling frequency is about eight times per 24 hours. (Clutton-Brock, *et al.*, 1982). Calves initiated feeding by 'squeaking' from their bedding site and if this failed to attract the hind they stood up. Hinds were observed to respond more positively to the appearance of a calf from its bedded area than to an audible call. If several similar aged calves are bedding close together, the sudden appearance of a standing calf in that area usually provokes a calling response from more than one hind. Hinds may initiate suckling bouts by grooming an active calf.

Calves are commonly seen to nudge at the hinds' flanks with their muzzles to stimulate suckling bouts. This behaviour is quite different from the enthusiastic bunting that accompanies sucking. Suckling frequency declines to 4 to 5 times over 24 hours at 3 months of age and suckling bouts last approximately 60 seconds (Clutton-Brock, *et al.*, 1982; pers.obs. G.C.).

Calves often attempt to suck or mount their mothers during disturbances. Hall (1983) found calves mount their mothers especially when they are prevented from sucking by her or in moments of heightened excitement. The hind may frustrate attempts to suck during disturbances, but sucking is usually terminated by the young calf. By the time a calf is 8 to 10 weeks old a hind is frequently seen to terminate this activity either by repeatedly lifting her hind leg or by moving away.

Bonding

Red deer calves are 'hider-types' (Lent, 1974), so individual recognition is important to calf and dam as they are separated for long

periods. Calf-dam bonding begins in the first few hours the hind spends close to the calf. On each successive return to the calf the hind approaches it and calls, a soft mewing 'mmm'. The calf either rises and moves to the hind, or remains bedded. Nose to nose contact is made, the hind begins to groom the calf which sucks standing up. The calf-dam bond is consolidated by these contacts. The calf initially is indiscriminate in its approach to hinds and will suck from any hind that answers its call if not repulsed. Calves appear to become more discriminating with age but the bond is initially one sided with relatively slow bonding of a calf to its dam.

The bonding of dam to calf may be completed in the period the hind spends with the calf immediately after birth. Gubernick (1981) suggests it likely that a mother will 'label' her offspring with her saliva when licking them after birth. The onus for recognition in the first few days appears to lie with the hind and is predominantly by smell.

Should a 'hiding' calf squeal, hinds that have recently calved (and sometimes hinds due to calve) will respond by running toward the calf, calling to it. They will then sniff it to confirm identity. A lactating hind will frequently wander through a group of calves that are bedded together sniffing at the head, flank and tail of each calf until she finds her own.

Cross Suckling

Clutton-Brock *et al.* (1982) reports V. Geist (1982 unpubl.) that hinds rarely suckled calves that were not their own. Greater tolerance of other calves by hinds has been observed at Invermay where confinement and experimental manipulation of the natural situation occurs.

A hind whose calf dies or is removed for hand rearing may actively seek out another calf to suckle. In 1984, 5 of 9 hinds which had their 1 to 2 day old calves removed for hand rearing each suckled another calf. Three of these adopted calves continued to feed from their natural dams. A hind, searching for another calf to suckle, may receive threats or attacks from other hinds for attempting to sniff, lick or approach their calves. The searching hind seldom returns an equal threat once the identity of the calf is established. Threats gave way to aggressive displays when the searching hind did not lower her head, move slowly away, run away or use a combination of these. Aggressive displays are either biting or snapping at the back or ears, kicking using forelegs, chasing with neck extended and ears laid back.

In the proceeding report where 5 hinds adopted calves, 2 of these adopted calves ceased sucking from their genetic dams. In both cases the abducting hinds were older than the genetic dams. An unusual case involved hind 332, aged 11 years, whose 1 day old female calf was removed for hand rearing. Hind 332 adopted a female calf, aged 9 days, from a female-male set of twins whose natural mother, a successful mother the previous season, was 3 years old.

The incidence of cross suckling is low in groups where red deer calves were not removed for hand rearing. In 1983 and 1984 cross suckling, involving hinds whose calves died or hinds already with calves of their own, was recorded for 2 of 169 hinds observed.

Hide-Seeking Behaviour

Red deer are a 'hider-type' species and calves are initially unresponsive to disturbance. Hiding behaviour, on close approach by an observer, is noticeably not as strong in a 6 to 24 hour old calf as it is in an older calf. The calf's hiding behaviour begins to diminish 3 to 4 days after birth.

The selection of a calf's bedding site probably helps to conceal its position (Clutton-Brock and Guinness, 1975). In paddocks with short pasture and little natural cover, calves will walk fence lines and attempt to push through netting in search of a hide.

Calf losses, by misadventure and mismothering, can be a consequence of insufficient natural or artificial cover for calf hides. Losses occur when a calf pushes through a fence and is either unable to return, becomes caught in the fence or joins an adjacent calving group. Undue fence pacing by calves can have detrimental effects, bringing the calf into contact with foreign hinds; which may bite it or flay it with their forelegs causing injury and in some cases frightening the calf into pushing through the fence. When calves push through netting some can become hooked up by their hind legs, particularly in 150 mm stay netting.

Herd Structure

Clutton-Brock and Guinness (1975) noted that nursing mothers on the island of Rhum remained together. On Invermay, hinds which have calved and those due to calve shortly are frequently grouped together. Hinds which will have late born calves and barren hinds tend to form a subgroup.

Flight distances in hinds when approached by a person increased from 40 m before calving to 240 m after calving when there was a calf less than 2 weeks old at foot (Clutton-Brock and Guinness, 1975). Hinds which have lost their calves are often seen with the lactating hinds and will react to disturbance, displaying increased flight distance, as will a lactating hind with calf. On Invermay flight distance of hinds with calves at foot varies depending on how accustomed they are to observers and vehicles.

The pattern of association between hinds changes gradually until calving is finished. Barren hinds are not seen to advertise their presence in the calving herd. They do not vocalise and they remain as a subgroup of the calving herd. Hinds that have lost calves sometimes join this peripheral group of barren hinds.

Most calves will join the herd after 7 to 10 days. Until 3 weeks of age a calf spends most of its activity period close to its dam. Calf groups are formed about this age. Early morning and evening games occur. Calves flee from others, run alone or in groups, chasing one another. Lactating hinds are occasionally seen to join these play activities.

POST CALVING

Aging Calves

Age of calf can be estimated from the appearance of the calves hooves and their reaction to being handled.

After birth the protective sole of the calf's hoof is worn off by the calf standing and walking. The time to wear down this pad depends on the terrain the calf is bedding in. Typically little is seen of the pad by the third day after birth with only vestiges of the dried covering hanging from the tips of the dew claws.

The reaction of a calf to handling varies with age. Generally for the first 4 days after birth they passively accept inspection if kept in their curled up position with the head tucked against their side and the outward facing eye covered. Older calves can still be caught while hiding but at this age they vigorously resist handling and squeal loudly.

Kelly and Whateley (1975) report 'For every kilogram less in birthweight, the age at which a calf first moved, when approached by observers, increased by about 1 day'. Our observations support this and also their conclusion that the response could be a reflection of the physical condition of the calf. Calves older than 1 week generally run away when approached. A farmer should investigate large red deer calves still hiding 10 to 14 days after birth. In two cases where calves were diagnosed with multiple arthritis and with spontaneous fractures of the forelegs (C. Mackintosh, pers. comm.) the hiding out phase was prolonged by 2 to 3 weeks.

Aggression toward calves

Calf beating by hinds can cause serious losses as was reported for the first calving period at Invermay in 1973 (Drew and Kelly, 1975). In this case 90 hinds were shifted from an extensive farm situation (West Dohme Station) on to an 8 ha area only 6 weeks prior to calving. Some hinds were observed to severely beat calves with their forefeet and a large proportion of dead calves showed evidence of injury. In established herds this is unlikely to happen.

Overt aggression can readily be observed when calving groups become crowded in paddock corners or when hinds and calves are closely confined in yard pens. Aggression towards calves can occur in chance encounters with foreign hinds. The calf approaches either to suck or when it has been disturbed and cannot find a hide and is physically repulsed.

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On a fallow deer farm several fawns were found dead with injuries. A horse run in the fawning paddock was responsible and was seen to pick fawns up with its teeth and shake them (W. Cain, pers.comm.).

Removing Calves for Hand Rearing

Hind groups appear unaffected by the isolated cases where abandoned calves are removed for hand rearing. However, picking up several calves to be hand reared for experimental purposes appears to have a detrimental effect on the calving group.

The agitated behaviour of hinds that have lost their calves for hand rearing has a contagious effect on their calving group. The general excitement level of the group as a whole is raised. The normal established routine of the calving rounds by an observer resulted in alarm calls (not heard in groups where calves were not removed) and faster mobbing up when disturbed. If disturbed, some hinds went to their bedded calves and took them to the furthest end of the paddock. In other groups, where no calves were removed for hand rearing, only calves already at foot would move off with the hinds.

Ear Tagging Calves

The practice of ear tagging calves in early January when the calf is 6 to 8 weeks old is becoming more popular with farmers than tagging at weaning. This allows them to identify hind-calf pairs for production records while there is still a high frequency of suckling and association between hind and calf.

There is a risk that tagging soon after birth will lead to mismothering or desertion. In 1984, 3 of the 96 red deer calves tagged after birth died of starvation after desertion by hinds. These calves had all been cleaned, were dry and had sucked at least once prior to tagging. The 3 calves were aged 4 to 8 hours old when tagged and were found dead within 2 days of tagging. The average red deer calf mortality until weaning at Invermay has been 7% over the last 5 years (Moore, 1984). Death by starvation and misadventure are still common causes of mortality in red deer calves on commercial farms, accounting for 33% and 13% respectively of total deaths (Asher *et al.*, 1983).

Deaths attributed to poor hind-calf bonding are usually a failure of the farm management system not an indicaton of poor mothering ability of the hind.

Some newly tagged calves (<5%) will attempt to follow the observers or their vehicle after tagging. To dissuade the calf from following, a rough shove with one's hand (simulating the pushing down foreleg motion of a hind) is usually effective. If this fails the calf should be

curled up with its head against its side, the eyes covered with whatever is available, a hand, jersey, long grass and a little pressure maintained on the head until the calf settles. Stroking the calf's head will sometimes elicit the prone response (a flattened frozen attitude). Mimicking the distress squeal of a calf will attract the attention of several hinds. These hinds include those about to calve and those with newborn calves, and it is safe to leave the calf to these fast approaching hinds.

Some hinds will not mob up with the herd when observers approach their calves to tag them. These hinds are highly visible because of their alert, agitated behaviour and their distance from the observer. Behaviour of these hinds varies from fast pacing, to a slow high stepping, stomping gait, and in some instances to a severe threat where the hind darts forward with rump patch flared, neck extended and ears back. A loud noise or the person handling the calf standing up at this point will usually stop the close approach of the hind.

PROBLEMS AND MANAGEMENT SUGGESTIONS

With intensive farming human interference, paddock size, concentrated calvings, high stock densities, changes of environment and group structure immediately prior to calving and at calving time may all contribute to problems in maternal behaviour. These problems become apparent in premature triggering of the maternal response, and mismothering.

In the wild, hinds withdraw from the herd to calve and this may reduce predation and interference from other females and allow the calf time to learn to identify its mother (Clutton-Brock and Guinness, 1975). On farms good mating management is considered to be reflected in a condensed calving period. When several hinds are calving, sometimes within hours of each other, insufficient space to enable a calving hind to avoid overt conflicts with other hinds can present problems.

Most apparent are problems of excessive fence pacing and calf-hind recognition where hinds select calving sites and calves, bedding sites, close together. Fence pacing in hinds is seen as a reflection of the need for isolation at calving. Excessive fence pacing in calves points to an inability to find a hide or to accidental mismothering e.g. dam in adjacent paddock.

Human interference and lack of isolation at calving are the major factors influencing difficulties in hind-calf bonding and recognition. Establishing routines for checking calving groups and frequent use of high power binoculars to check hinds before entering paddocks will minimise mismothering.

It has not been established when the bonding hind to calf is firm enough to withstand human interference. From observations of tagging, weighing and measuring new born calves on Invermay, it is recommended that there should be minimal interference with calves younger than 12 hours old.

The lack of isolation at calving because of high stock numbers can only be partially overcome. Space and time are required for the hierarchy or social tolerance to become established in confined groups (Fraser, 1982). With this in mind, set stocking should take place at least 7 to 10 days prior to the first expected calf.

CONCLUDING REMARKS

The concept of behavioural 'needs' (Hughes and Duncan, 1980) in relation to farming deer require further investigation. Research into behaviour and its relation to management take second place to increasing productivity. Farmers intimately involved with their stock however, are already aware that behaviour cannot be dismissed as unimportant. Where farmers are familiar with the 'normal' patterns of behaviour in their calving herds they experience no difficulty in observing changes. It is difficult to quantify distress in a calving hind. However, distress is tangible enough and a veterinarian must rely on the farmer for early identification of a problem. A veterinarian required to assist the birth process must be aware of the hind's perception of the assistance and avoid unnecessary stress. Yards which a hind knows, subdued lighting, minimum number of people, no abrupt loud noises, no white overalls, reassuring repetitive voice contact and the use of drugs will aid the process. Assisted births with a minimum of stress and interference are the most successful.

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