REPRODUCTIVE CYCLES AND PERFORMANCE OF RUSA DEER IN THE TROPICS AND SUBTROPICS

Keith Woodford

1. INTRODUCTION

Rusa deer *(Cervus timorensis)* come from Indonesia (Whitehead, 1972). The two sub-species brought to Australia are known as Javan rusa and Moluccan rusa. The Javan rusa are 25-40% larger than the Moluccans.

Rusa deer belong to the same genus as sambar *(Cervus unicolor)* and red deer *(Cervus elaphus)*.

Rusa deer can breed successfully with sambar which evolved on the Asian mainland. The geographical separation between sambar and rusa probably occurred in the last 15,000 - 30,000 years (Harrington, 1985). The genetic distance between rusa and sambar is probably analogous to the genetic distance between red deer and sika deer, or perhaps red deer and Canadian elk.

Unpublished farm experience with the crossing of red and rusa deer indicates that first cross animals can occur from natural matings, although there are some behavioural and also possibly genetic constraints. There is also at least one confirmed progeny from a red/rusa cross hind mated to a rusa stag. However the first cross males appear to be non fertile and the fertility of the second generation females (.75 rusa, .25 red) has not been documented.

The apparent genetic closeness between red and rusa deer (for example they are much closer than red and fallow, or rusa and chital) is of considerable interest, given that red deer developed in temperate regions and have reproductive cycles that are entrained by seasonal changes in hours of daylight, whereas rusa evolved as a distinct species in equatorial regions.

2. REPRODUCTIVE CYCLES

The full story on rusa reproduction has yet to be told, but there is strong circumstantial evidence for pheromonal or other social signals within the herd that can result in concentration of calving and antler casting (Woodford and Dunning, 1990).

The reproductive cycles of rusa deer are complex. The following observations have been obtained mainly from the Gatton College herd which is

predominantly of Javan rusa, with additional observations from other Queensland herds.

2.1 Females

1. Puberty in hinds is weight related. Javan hinds become fertile at between 40 and 50 kg. This can be at less than eight months of age.

2. The gestation period for Javan rusa is approximately 253 days. Moluccan rusa may be shorter. It is notable that rusa have a longer gestation than red deer, despite being a smaller species.

3. The oestrus cycle appears to range from about 10 to 18 days. These figures require confirmation, and the shorter observations may be atypical.

4. The calving is often very concentrated even when there is a management policy of non seasonal mating. Up to 70% can be born within a three week period. It is possible that the concentration of calving may be greater in Javan herds than Moluccan herds.

5. Births can occur in all months. However this situation does not normally apply for individual herds.

6. The main calving period is usually in the autumn. However several farmers with Moluccan herds have succeeded through seasonal mating policies in concentrating the calving into the spring period from late August to October. It appears that once in this pattern the concentrated spring calving is maintained even if the stags remain with the hinds. At Gatton College the Javan herd has been split as from 1990 into spring and autumn herds. Autumn born hinds become spring calvers (18 months later) and vice versa.

7. Hinds that calve at the main calving period have a subsequent anoestrus period of several months, but hinds that calve after the main calving period can conceive within three weeks of parturition. The shortest observed intercalving interval in Javan rusa has been 281 days where the first calf was reared and 271 days where it was not reared.

8. Non lactating hinds (either maidens or unsuccessful breeders in the current year) tend to conceive about one cycle earlier than lactating hinds.

2.2 Stags

1. Pedicle growth in stags is initiated when liveweight reaches 30-35 kg. This can be as young as four months.

2. Spiker stags can become sexually active at less than one year.

3. Spiker antlers are cast at any time between 14 and 24 months of age. In any herd they all tend to cast within a few weeks.

4. Subsequent antler cycles are generally circannual. However antler cycles at Gatton College for individual animals have ranged from 259 to 393 days. Some farmers have reported antler cycles of up to two years.

5. Variability in duration occurs in all stages of the antler cycle (antler growth, antler hardening and hard antler).

6. Stags growing antler are generally asexual in their behaviour and they are not regarded as competitors by other stags that are in hard antler.

2.3 Hind/Stag Interactions

1. Lactating hinds will commence to cycle either in the presence of a rutting stag or in the presence of other cycling hinds. However a stag that is in hard antler but is either pre rut or post rut will not induce a lactating hind to commence cycling.

2. Stags tend to cast their antler early if there are no hinds in estrus. Casting can be delayed by at least several months if there is a continuing supply of estrus females.

3. Antler hardening occurs much more rapidly when estrus females are present. It may also be influenced by other stags coming into the rut.

2.4 Regulating Factors

There is no proof available as to how the reproductive cycles are regulated. However it appears that four types of pheremonal or other social interactions occur.

1. Hind/hind interactions where the presence of estrus hinds induces other hinds to cycle.

2. Hind/stag interactions where the presence of estrus females increases the rate of antler hardening and delays the subsequent casting of antlers.

3. Stag/hind interactions where the presence of a rutting stag induces hinds to cycle.

4. Stag/stag interactions where the presence of a rutting stag induces other stags to rut. However it is not clear whether this is a direct effect or the combined effect of stag/hind and hind/stag interactions.

At Gatton we have sufficient confidence in these hypotheses that they are a basis for some of our management policies. For example, if we want stags to cast their antler so as to prepare for the next breeding season we try to keep them at maximum distance from estrus females; if stags are growing velvet antler then we keep them away from females; and if we want stags to harden their antlers more rapidly then we try to keep them close to cycling females. It does not always work perfectly, but most of the time it seems to have some effect. This year, for example, we have succeeded in advancing our autumn calving season by several weeks. We suspect that we would have greater success if we could increase the distance (currently only 100m) between stags and hinds.

We also suspect that the rusa stags can be influenced by red hinds. For example in April 1990 we had a herd of 30 red hinds that was left without a stag awaiting the arrival of semen and embryos from New Zealand. This appeared to bring two-year old rusa stags nearby into an early rut.

3. REPRODUCTIVE PERFORMANCE

3.1 The Gatton Herd

Between 1985 and 1989 the Gatton rusa herd was managed on a continuous mating basis with stags and hinds running together in the same paddock at all times. During this period the calving rate for hinds aged two years and greater (n=123) was 97%. This calving rate was measured as calves born divided by hinds potentially mated. The weaning rate from these hinds, measured as calves weaned divided by hinds potentially mated, was 84% (Woodford and Dunning, 1990).

There were also 18 births from 24 yearling hinds, of which 12 calves were successfully raised. These hinds were all less than 19 months at time of parturition. Typically these hinds gave birth to their second calf at 26-28 months of age and their third calf at 36 months of age.

Perinatal losses and deaths up to weaning totalled 15.7% of total births. Most losses were still births but others resulted from mismothering and hypothermia within 24 hours of birth. There was no obvious common factor, such as low birthweight, dystocia, or low maternal liveweight as a cause of death. However, the death rate in calves was highest where the dam was a first calver. Many of these births were occurring in winter. Accordingly, stags were withdrawn

from the hinds for the period between 8 October and 22 December 1989 with the aim of ensuring no births between 20 June and late August 1990.

We have yet to analyse fully our reproductive data for autumn 1990, spring 1990 and autumn 1991. However it is apparent that our overall death rates in calves have been dropping. Nevertheless we still have significant death rates in calves from primiparous hinds.

Despite the considerable number of still births and perinatal losses, the overall reproductive performance is high. This is due to the high pregnancy rates and the early puberty of hinds. If herd weaning rates were to be measured, as with the temperate species, as calves weaned divided by hinds two years and older then the hind weaning rate for the five years ending December 1990 would be about 98% per annum.

3.2 Commercial Farms

At Gatton College we surveyed all Queensland deer farmers for the three years ending June 1987, 1988, and 1989. In the case of rusa farmers it proved difficult to accurately determine reproductive performance. This was in part because most farmers did not muster their autumn born fawns until July or August, which was after the survey period. Also, there was considerable interfarm and interstate movement of deer in these years.

Despite the problems in quantifying precisely the reproductive performance, it is apparent that rusa are naturally fertile and that they will breed unless under very severe nutritional stress. It would seem that reproductive performance of mature hinds on commercial farms is similar to that at Gatton. However calf growth rates tend to be lower, and this means that calves from yearling hinds are less common than at Gatton.

The farm surveys showed perinatal deaths, including still births, of 10.6%. This may be an underestimate as the hinds typically calve in long grass and the dead calves decompose quickly. Farmers reported predators (mainly wedge tailed eagles) as a significant problem but it is difficult to know how many deaths attributed to this cause were of healthy calves.

3.3 Reproductive Technology

Although there is research interest in developing artificial insemination and embryo transplant techniques for rusa deer, there is very little commercial activity or interest in this area. In part this is because, unlike red and fallow deer, overseas sources of superior genetic material have not been identified.

4. CONCLUSIONS

Rusa deer are naturally fertile early maturing animals. Pregnancy rates are typically greater than 95%. Perinatal deaths and still births are significant on most farms and reduce the weaning rate to 80-85%.

The reproductive cycles of rusa deer are complex. Stags appear to have a circannual cycle and this cycle is important in determining the calving cycle. The antler cycles tend to be highly correlated within any one herd in a particular year but less correlated between herds and between years.

Research that aims to further identify the factors that influence these cycles is inherently difficult. This is because of the need to isolate geographically the various animal groups within any trial. However it is important that these cycles be further investigated and understood so that farmers can control the time of calving which is fundamental to management strategies that balance feed supply and demand. Also, because annual growth cycles in stags are closely correlated to the reproductive cycles, this time of calving has a major impact on the months of slaughter.

5. REFERENCES

Harrington, R. (1985). Evolution of distribution of the cervidae. Biology of Deer Production. The Royal Society of New Zealand, Bulletin 22:3-11.

Whitehead, GK. (1972). Deer of the world. Constable, London.

Woodford, KB, Dunning, A. (1990). Production cycles and characteristics of rusa deer in Queensland, Australia. Proc. Int. Conf. Biol. Deer Prod. Mississippi (In Press).