

REPRODUCTION DATA IN SWEDISH DOMESTIC FOREST REINDEER (*RANGIFER TARANDUS L.*)

Data om reproduktion hos svensk skogsren.

by

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Summary: Reproductive organs from female domestic reindeer of the forest type were collected during the period 1978-1982 (N=499). Following data are derived from samples from the season 1981-1982 (N=315). The rate of pregnancy was high, 93% and 60% among adults and yearlings respectively, also a few calves were pregnant. In the middle of September only a few of the collected ovaries had active luteal structures. Ovulations can in the absence of pregnancy proceed up to December-January. Different methods for describing the conceptional period is used. The first conceptions were calculated to 23/9, before 1/10 14% of the females had conceived and before 18/10 80% of the females had successfully mated. Only a few females had conceived after the 1/11.

Rangifer 2 (2) : 22-27

MOSSING, T. & RYDBERG, A. 1982. Data om reproduktion hos svensk skogsren.

Sammanfattning: Reproduktionsorgan från svensk skogsren har samlats in under perioden 1978-1982 (N=499). Följande data härrör dock från en säsongens material (1981-1982) (N=315). Dräktighetsprocenten var hos vuxna vajor 93% och hos vuxna jor 60%. Ett fåtal kvalvar var också dräktiga. Aktiva gulkroppar fanns i ett fåtal ovarier insamlade i mitten av september. Ovulationer kan fortgå fram till december-januari om befruktning inte sker. Olika metoder för att beskriva parningsperiodens längd har använts. De första befruktningarna under säsongen beräknades till 23/9. Innan 1/10 hade 14% av vajorna parats och 80% av dessa hade befruktats innan 18/10. Endast ett fåtal befruktningar beräknades till efter 1/11. Huvuddelen av parningarna skedde under de två första veckorna i oktober.

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MOSSING, T. & RYDBERG, A. 1982: Ruotsin metsäalueen poron lisääntymisestä.

Yhteenveto: Ruotsalaisen metsäporon lisääntymiselimiä on koottu vuosina 1978-82 (N=499). Seuraava aineisto käsittää kuitenkin vain kauden 1981 - 1982 (N=315) materiaalin. Täysikasvuisten vaadinten tiheysprosentti oli 93 ja vuongelienvastaavasti 60%. Muutamia tiineitä vajoja myös todettiin. Syyskuun puolivälissä todettiin joissakin ovarioissa aktiiveja keltarauhasia. Mikäli hedelmöitymistä ei tapahdu, voi ovulaatioita esiintyä vielä joului-tammikuussa. Pariutumiskauden pituuden kuvaamiseksi on käytetty erilaisia menetelmiä. Ensimmäisten hedelmöitymisten tutkimuskaudella arvioitiin tapahtuneen 23.9. mennessä. 1.10. mennessä oli 14% vaatimista pariutunut ja 80% niistä oli hedelmöitynyt 18.10. mennessä. Vain muutamia harvoja hedelmöitymistapauksia arvioitiin tapahtuneen marraskuun alun jälkeen. Pääosa pariutumisista tapahtui lokakuun kahden ensimmäisen viikon kuluessa.

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INTRODUCTION

An analysis of the lambing periods in different populations of mountain sheep (*Ovis canadensis*) show that these generally are shorter in northern populations compared to those in the southern regions (Bunell 1982). He also demonstrated a strong correlation to phenology of the vegetation and furthermore a relationship between the length of the lambing period and the predictability of the vegetation. The environment of the reindeer fulfil

all requirements for having a concentrated calving period. Since the gestation period is more or less constant and delayed implantation not seems to occur (Ringberg 1982), this discussion should also be valid for the rutting period.

The extension of conceptional period has been described with different methods in many cervidae. In this context one must notice the difference between an observed conception and an actual fertilization since both sterile ovulations and

matings seems to occur (Simkin 1965, Thomas and Cowan 1975, Harder and Moorhead 1980).

The general pattern is that most females conceive during a short period of rut when they come into estrus and the males perform specific rutting activities (Mossing 1980). After this, those females are mated which for one reason or another were not successfully mated during the actual rut. A concentration of the rutting activities to a short period is obviously beneficial to the population, and clarification of the different factors involved in the regulation of the reproductive activities would be of great interest.

Studies of reproduction and fetal growth in reindeer and caribou show that they have the same general growth pattern as other northern ungulates. (Dauphiné and McClure 1974, Roine 1974, Roine et al 1982, Krog et al 1980). The reindeer female is polyestrous and in the absence of pregnancy can experience several (up to 6) luteal cycles. This enables the female if fertilization fails

to mate again after another estrus cycle of 10-12 days (McEwan and Whitehead 1972).

MATERIAL AND METHODS

Reproductive organs from slaughtered Swedish domestic forest reindeer females were collected at slaughtering 1978-1982 (N=499) around Arvidsjaur in Northern Sweden (Fig. 1).

Samples from the period 28th October to 16th December 1981 were fixed in 10% formalin, all other samples were frozen. Length and weight of all embryos were taken. Samples from the season 1981-1982 were more carefully checked for different luteal structures, follicles and to very small embryos. In doubtful cases, ovarian structures were prepared for histological examination, stained in Mallory's original and checked for identity. Classification of different kinds of corpora lutea follows descriptions from Roine (1974), Dauphiné and McClure (1974), and Dauphiné (1978).

RESULTS

Rate of pregnancy

The rate of pregnancy in different age classes is seen in Tab. 1. There was no significant difference between year classes of adult animals and these have therefore been treated as one group. The rate in adult animals is high, 93%, and 60% of the slaughtered yearlings were pregnant. The low number of calves may explain the high rate among them, but evidently pregnancy among young females is not rare. Among the 10 adult non-pregnant females the infertility could be connected to morphological malformations in two cases, while all others appeared to be normal.

Tab. 1. Rate of pregnancy in females slaughtered on the 2/12 1981 — 19/2 1982.

Tab. 1. Dräktighetsprocent hos vajor slaktade 2/12 1981 — 19/12 1982.

Age	N	% pregnant
Calves	11	27
1 - 2	51	60
2 →	148	93

Ovarian structures

Of 15 adult females taken 15th-16th September two (13%) had corpus luteum of estrus (CLE), one of them containing two luteal bodies, one functional and one regressive. All the other ovaries

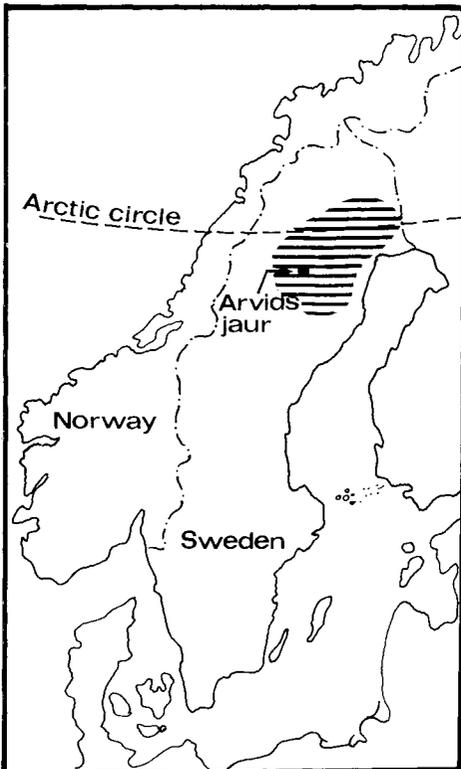


Fig. 1. The distribution of Swedish domestic forest reindeer.

Fig. 1. Utbredning av svensk skogstamren.

had large (< 8 mm) follicles, in some cases newly ruptured, indicating an approaching luteal phase. The termination of the ovulatory period is more difficult to set. In samples taken 2—17/12 23 (13%) females were not pregnant (calves excluded). Of those five had luteal structures in different stages of development. Further, in two adult females, slaughtered on the 7/1 and 18/1, early stages of CL together with large follicles were seen. To summarize these observations it seems as if estrus cycles in the absence of pregnancy can proceed into December and in rare cases, even longer. Most of the sterile females have ceased their ovulatory period by this time.

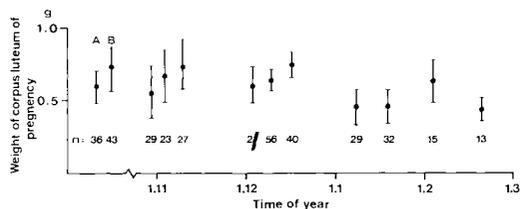


Fig. 2. Weight ($x \pm SD$) of corpora lutea of pregnancy (CLP) in reindeer. A and B are weights of CL taken from females slaughtered 28/10 — 10/11 without (A) and with (B) measurable embryos respectively.

Fig. 2. Vikt ($x \pm SD$) av gulkroppar (CLP) hos ren. A och B är vikt av gulkroppar från vajor slaktade 28/10 - 10/11 utan (A) och med (B) synliga embryo.

Many ovaries exhibit scars of different shapes, but in non of these could the origin be determined with any great accuracy. In ovaries taken in October-December several scars were also seen. Many of these were pigmented but there was no correlation with an assumed number of ovulations or the age of the female, and this indicates that the number of scars is an unreliable measurement of the number of pregnancies or ovulatory cycles within a season.

The weight of the CL of pregnancy (CLP) in females with a macroscopic embryo (as defined in Fig. 3) is significantly greater as compared with females without such but with other signs of pregnancy ($p > 0.001$, Mann-Wittney U-test) (Fig. 2). Secondary or accessory CL (SCL) occur together with CLP with a frequency of 46% ($N=323$), but no significant correlation with age, season or size of CLP was found. Furthermore, there was no difference in frequency when comparing late and early conceptions (as defined in Fig. 3) to the overall frequency ($p > 0.05$). The

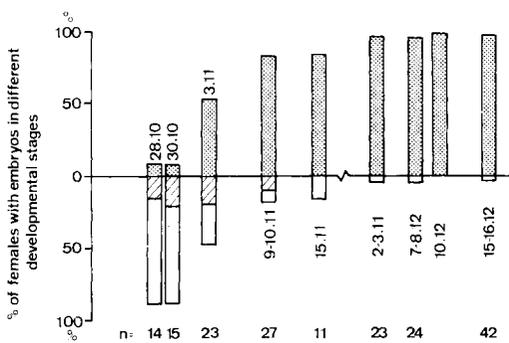


Fig. 3. Percentage of adult female reindeer with: shaded - visible embryos and fully developed membranes; stippled - allantochorion not fully developed; white - no or very small signs of blastocysts, but with developed CLP.

Fig. 3. Procent vajor med: grått - synliga embryo och fullt utvecklade membran; strekat - ej fullt utvecklade allantochorion; vitt - inga eller mycket små tecken av blastocyster, men med utvecklade gulkropp.

SCL are usually smaller but can sometimes attain almost the same size as the functional CL. 57% of the SCL was found in the same ovary as the CLP, though the difference was not significant ($p > 0.05$).

Reproductive period

Information on dates of conceptions can be obtained from ovarian structures and measurements of embryos. Fig. 3 shows the development in terms of morphological changes of the embryo and embryonic membranes in adult females. At the end of October placentation, in most cases, has not yet started and it is not possible to detect macroscopic embryos (> 3 mm). In the beginning of November (3/11) about 50% of the pregnant females have macroscopic embryos with developed membranes and placentation has commenced. One week later (9—10/11) most embryos have reached this stage and only a small proportion are in an earlier stage of development. Using the approximate time schedule based upon growth, embryonic membranes and placentation given by Roine (1974) most of the conceptions should have occurred during late September, which seems to be rather early in the season. On the other hand, Dauphiné and McClure (1974) give the approximate age of a 4 mm embryo as 23 days, leading to the conclusion that the mean time for conceptions was around 11/10.

Reliable dates of conceptions can be obtained from

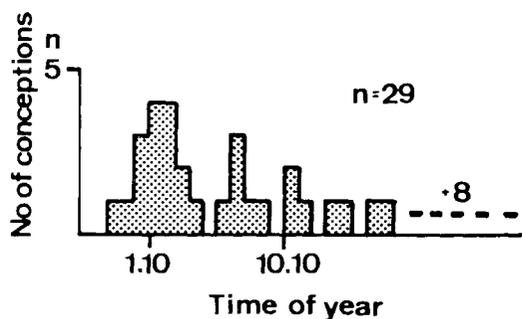


Fig. 4. Calculated dates for conceptions in adult reindeer slaughtered 9–10/11 and 15/11 1981. 8 females had no measurable embryos.

Fig. 4. Beräknad tid för parning hos vuxna vajor, slaktade 9–10/11 och 15/11 1981. 8 vajor saknade synliga embryo.

embryo size (Crown-rump length < 40 mm) (Dauphiné and McClure 1974). A good calculation of how the population as a whole behaves in this respect can only be made from samples where most of the females have conceived and, in addition have small but measurable embryos (Fig. 4). If we use that method we find that a small proportion (14%) have conceived before the 1st of October, and most of them (78%) before 17th of October. The eight pregnant females (22%) with no measurable embryos must have conceived after the 17th of October and, if we include the whole material, only about 3% of the adult females mated successfully after the 1st of November.

Fetal growth

Samples from the years 1978–1982 are combined in Fig. 5, in which it can be seen that the variation within each sample is considerable. If we make the simple assumption that embryos of equal weight are of equal age, we may deduce that most conceptions occur within a span of three weeks and that very few can be considered as very late ones. Fetal growth is strongly accelerated after about three months, and we can assume that the variation in fetal weight, at least before this period is mainly due to different ages.

Any polynome describing fetal growth based upon mean values contains some error since the calculated mean values are not based upon fetii of equal age. The median mean is considered as less sensitive to the contagious distribution of the frequency of conceptions than arithmetic mean and is therefore used in our calculations. The median

day for conceptions is earlier set to the 6th of October (Fig. 4). The curve for least square solutions based on median mean values gives the polynome $y = 12633.2 - 942.90X + 25.7138X^2 - 0.31833X^3 + 0.00165X^4$ for fetal growth during the period 28/10 - 81 to 18/1 - 82 (Fig. 5). We can then calculate the approximate days for conceptions in samples for which the curve is valid (2/12 - 16/12 1981) (Fig. 6). The distribution of conceptions is significantly different from a normal distribution ($p < 0.05$). The mating period starts at the end of September and 80% of the females are conceived before the 19th of October. No main peak or biphasic pattern can be seen, possibly because the samples are taken from different herds within the sampling area.

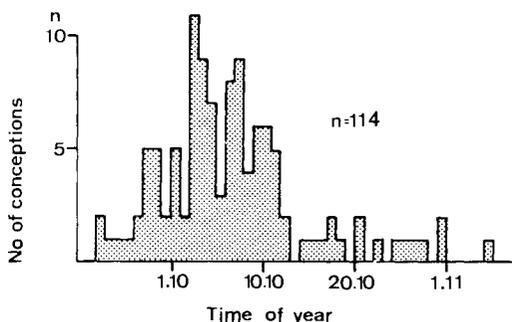


Fig. 6. Calculated dates for conception in adult reindeer slaughtered on the 2/12 — 16/12 1981.

Fig. 6. Beräknad tid för parning hos vajor slaktade 2/12 — 16/12 1981. Beräkningarna baseras på ekvationen i Fig. 5.

DISCUSSION

Collection of reproductive data is important in a long perspective because these are parameters subjected to annual changes and which provide considerable information about the status of the population. The main goal with this study was to describe the extension of the reproductive period. Reliable data on the fetal development in reindeer is currently lacking and the results presented here are virtually based upon work on other deer, or approximations. However, even if a critical attitude is adopted, the similarities in the fetal development in various deer species are great and generalizations can be made.

Most of the females conceive within a three-week period and only a small proportion of the successful matings can be considered as very late ones. Reliable comparisons with other reindeer or

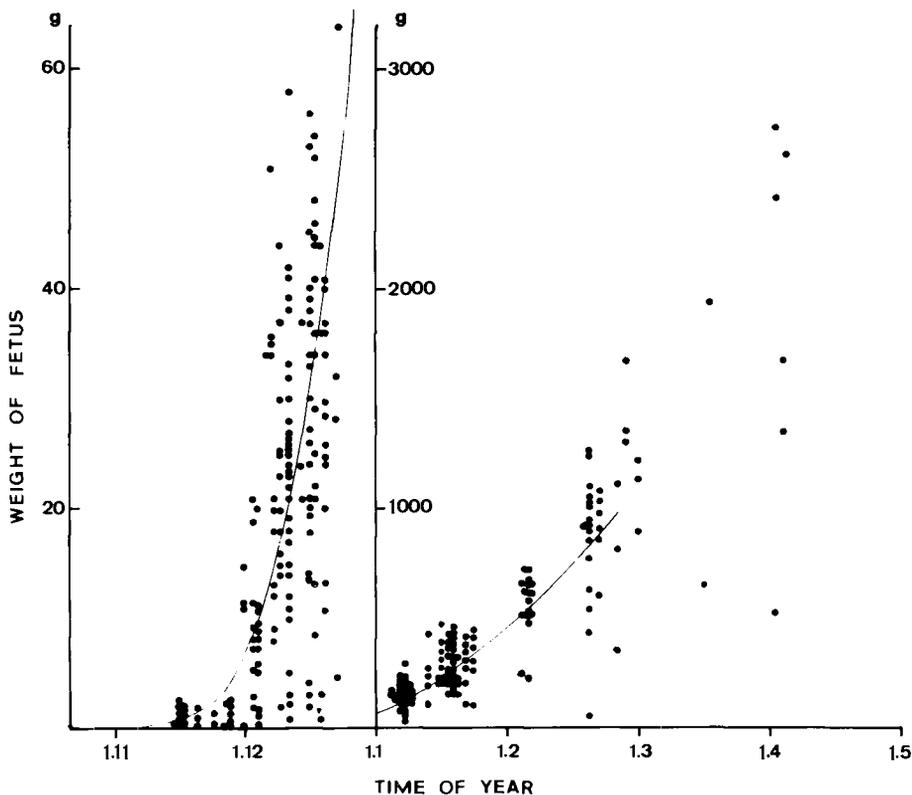


Fig. 5. Fetal growth in reindeer slaughtered during 1978-1981. Note the different weight scales. Curve is least square solution of median mean values of the given group.

Fig. 5. Storlek av foster hos renar slaktade 1978-1981. Notera de skilda viktskalorna. Kurvan anger minsta kvadratmetodens exkvation baserad på medianvärden vid enskilda slakttillfällen.

caribou populations are difficult to make. Nevertheless, a general conclusion is that the data presented here indicate a somewhat longer reproductive period than those cited in Dauphiné and McClure (1974). Further studies might explain the effect of the slaughtering on population parameters and behaviour of the reindeer. Along with the long reproductive period there follows a concomitantly long calving period, and in this area, the peak is around the middle of May. Further, the observed late conceptions can be confirmed in observations on free-ranging herd. Newborn calves can be observed throughout the summer and even as late as in September and females are observed to show estrus behaviour up to February (pers obs).

Both males and females can potentially mate during a fairly long period which is influenced by the photoperiod (Lincoln 1977). It is also likely that the social structure influence the reproductive activities. Although little evidence is presented, the presence of large males might synchronize estrus activities of the females and thereby affect the length of the reproductive period.

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