

Short communication

Retrospective reproduction analysis in female reindeer (*Rangifer tarandus*)

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Background

Retrospective reproduction analysis has proven a useful study method for many mammal species, but the method has not been used as much in reindeer and caribou studies as it deserves. Analysis of the reproductive organs from non-pregnant caribou (*Rangifer tarandus*) females can potentially give information on previous fertility several years back in time (Dauphiné, 1978). There has been some doubt on the validity for reindeer of some of the histological criteria of ovarian structures described for caribou (Leader-Williams & Rosser, 1983). In both caribou and reindeer it was possible to identify the *corpus rubrum*, which indicate a pregnancy in the preceding season. However, these authors obtained different results concerning the accuracy of identification of *corpora albicantia* (= *corpus rubrum* from earlier years), which indicate pregnancies in earlier seasons. Leader-Williams & Rosser (1983), in contrast to Dauphiné (1978), suspected that some *corpora albicantia accessoria* (remnants of luteinised, non-ovulated, follicles) remained for several years and were counted among the *corpora albicantia*, overestimating the number of previous pregnancies.

Reproductive organs from wild female reindeer in Norway

Reproductive organs from 36 Norwegian wild female

reindeer (*R. t. tarandus*) killed on the Forelhogna reindeer range during the hunting season in 1996 were investigated. Sections of ovaries were made by scalpel, and observations were made with 1.5X - 40X magnification (Heggberget, 1998). Female age was determined from counts of incremental lines in the cementum of an incisor tooth.

Ovulation scars, apparently from many years back in time, were found on the ovarian surfaces. Last year's ovulation scar, that tended to preserve the initially circular shape and relatively clear delimitation from the surrounding surface of the ovary (Fig. 1), could be distinguished from a new scar (Fig. 2) and usually also from older scars that were more or less star shaped (Fig. 3). Old ovulation scars have apparently not been described previously in *Rangifer* (but see Langvatn (1992) for red deer *Cervus elaphus*). The presence or absence of an ovulation scar associated with a regressed luteal structure, together with the appearance of the ovulation scar, helped to separate *corpus rubrum*, *corpora albicantia* and *corpora albicantia accessoria*, the latter being derived from luteinized, non-ovulated follicles (nomenclature and definition following Langvatn 1992). Presence of old ovulation scars also made it easier to find the more obscure, old, *corpora albicantia*. However, ovulations that did not lead to pregnancy would presumably also leave ovulation scars (but no *corpora albicantia*), and must

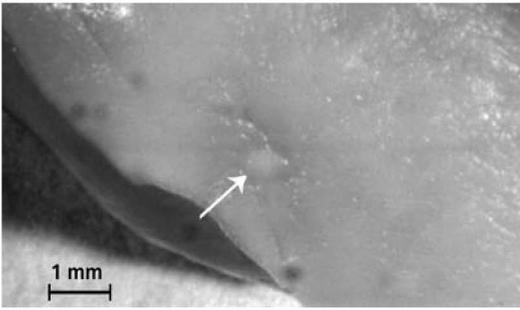


Fig. 1. Ovary from an 11 years old reindeer female from Forelhogna 9 Sep.1996, showing a one year old ovulation scar associated with a *corpus rubrum*. The outline of the scar tissue is more circular and the transition zone between scar and surrounding epithelium more hyaline than in older scars.

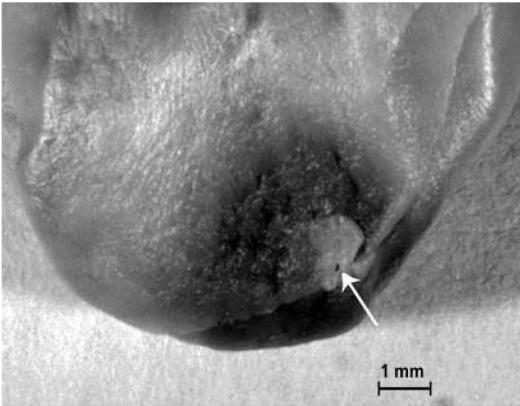


Fig. 2. Ovary from a four year old reindeer female from Forelhogna 13 Sep.1996, showing a new ovulation rupture associated with a primary (=new) *corpus luteum*.

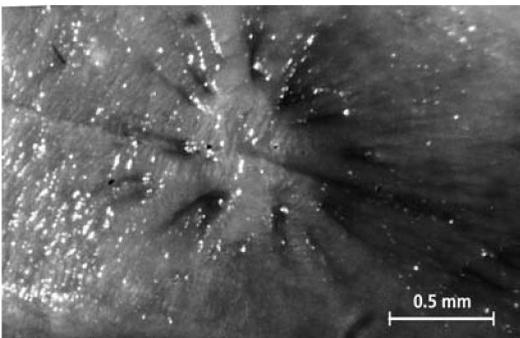


Fig. 3. Ovary from a reindeer female from Forelhogna 30 Aug. 1996, showing a star-shaped, ovulation scar more than one year old and associated with a *corpus albicans*.

be taken into consideration. The results indicated that macroscopic methods sufficed to identify the reproductively significant ovarian structures several years back in time.

The counts of *corpora albicantia* plus *corpus rubrum* did not exceed the possible number of pregnancies according to the age of each female from Forelhogna in 1996. Thus, there was no evidence that *corpora albicantia accessoria* confused the counts of *corpora albicantia* in these females. This accorded with findings by Dauphiné (1978) for caribou, but contrasted with results by Leader-Williams & Rosser (1983) for reindeer on South Georgia.

The regression of the number of *corpora albicantia* plus *corpus rubrum* on female age gave a lower estimate for population pregnancy rate (0.78) than the pregnancy rate (occurrence of *corpus rubrum*) for single years (0.98 in 1984 (Skogland, 1989) and 0.96 in 1996). Thus, some *corpora albicantia* probably disappeared with time, in which case counts of them will tend to underestimate the lifetime reproduction of older females. However, other factors (e.g. differences between years and non-linear relationship between female age and lifetime production of calves) may have added to the differing estimates of reproductive rates.

The frequency of lactation (mammary glands investigation) showed that females with calves were still lactating during the hunting period in August and September.

Individual reproduction analysis of female reindeer killed in autumn revealed:

1. Which females were pregnant during the previous winter (presence of *corpus rubrum*).
2. Which females were still (or recently) suckling a calf when they were killed (lactation).
3. Which of the 1-year old and 2-year old females were pregnant as calves (presence of a *corpus rubrum* in 1-year olds and a *corpus albicans* in 2-year olds).
4. Which females would probably have ovulated during the following rut (follicle size at time of death).
5. Probably also the minimum number of previous pregnancies (counts of *corpora albicantia* plus *corpus rubrum*, assuming 1) *corpora albicantia accessoria* were not included among *corpora albicantia*, and 2) single foetuses, which is usual in Norwegian wild reindeer, but see twin-rates reported by Godkin (1986)).

Practical use

The above points combine with each other and with additional individual information, (e.g. age,

body size and body weight) to give information on a number of ecological aspects of reproduction both at the individual and population level.

Some examples:

- Pt. 1 and 2 combine to reveal individual early calf loss (assuming that all calves still suckle to a certain degree during the hunting season, and adoption after calf loss do not occur).
- Combination with carcass size and weight give information on relationships between body condition and reproduction.
- Reproductive rates of a population can be estimated from the results for individuals.
- Combined with age determination the above information will give population estimates of age at maturation, age specific fertility rates and age specific calf-rearing success.

Studies of a controlled herd should be undertaken to verify the assumptions.

Acknowledgement

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