Relationship between the weight of reindeer calves in autumn and their mother's age and weight in the previous spring.

Reinkalvenes høstvekt relatert til mødrenes vårvekt og alder

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Summary: Age and weight in dams aged less than 5 years old together explain 29% of variation in calves' weight in autumn. Each alone explains 22%. In dams aged 5 to 12 years, weight alone explains 22% while age alone explains only 0.4%. Weight followed by age does not significantly improve the fit in these.

The implication of this regarding selection strategy is that the aim should be to ensure that the female population of a herd should include that smallest possible proportion of 1 to 4 year olds. This age structure can be achieved by slaughtering as many calves (0.5 yr) and young females (1.5 yr) as possible. The lifespan of female recruits and the mean age of the female population of the herd are thus increased. This will also result in an increase in the mean weight of the female population, given that animals aged 5 to 10 years are heavier than 2 to 4 years olds.

Key words: Breeding, breeding methods, selection strategy

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Lenvik, D., Bø, E. & Fjellheim, A. 1988. Reinkalvenes høstvekt relatert til mødrenes vårvekt og alder.

Sammendrag: For mødre yngre enn 5 år forklarer vekten og alderen sammen 29% av variasjonen i kalvenes høstvekt. Alene forklarer hver 22%. Fra 5 til 12 år forklarer vekten alene 19% mens alderen alene bare forklarer 0,4%. Her gir alder etter vekt ikke signifikant tillegg til forklaringen.

For utvalgsstrategien har dette som konsekvns at aldersklassene ett til fire år skal utgjøre en minst mulig andel av hunndyrflokken samlet. Denne aldersstrukturen når man ved å konsentrere hovedslakteuttaket til kalve- og ungsimleårgangene (= 1/2 og 1 1/2 år). Omløpstiden forlenges og gjennomsnittsalderen heves derved innen simleflokken. Ved at aldersklassene mellom fem og ti år er tyngre enn aldersklassene to til fire år, leder dette også til en hevning av gjennomsnittsvekten innen simleflokken.

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Lenvik, D., Bø, E. & Fjellheim, A. 1988, Poronvasojen syksypainon riippuvuus emä n kevätpainosta ja iästä.

Yhteenveto: Alle 5-vuotiaiden vaatimien paino ja ikä yhdessä selittävät 29% vasan syksypainon vaihtelusta. Kumpikin selittää erikseen 22%. 5-12 vuoden ikäisilla vaatimilla paino selittää yksistään 19%, mutta ikä vain 0,4%. Iän riippuvuus painosta ei selittänyt tätä merkisevästi. Valinnan kannalta on tärkeää, että laumassa om pienin mahdollinen määrä 1-4 - vuotiaita naarasporoja tämä ikäjakautuma saavutetaan teurestamalla syksyllä mahdollisimman paljon vasoja (0,5 - vuotiaita) ja nuoria naaraita 1,5 - vuotiaita). Naaraiden elinikä pitenee ja keski-ikä laumassa kasvaa. Tämä lisää myös naaraiden keskipainoa, sillä 5-10 vuotiaat naaraat ovat painavampia kuin 2-4 - vuoitaat.

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Introduction

The Reindeer Husbandry Office (Reindriftskontoret) in Sør-Trøndelag and Hedmark is responsible both for administration of, and as an advisory service to, Lapp reindeer husbandry in the Sør-Trøndelag & Hedmark reindeer grazing district and in Trollheimen and for non-Lapp reindeer husbandry in Jotunheimen. Altogether this includes nine reindeer husbandry groups where in spring, before calving, there are approximately 25 000 animals.

One of the principal concerns of the Office is the fundamental problem in husbandry of selecting the age and weight structure of the female population in a herd. A key question in this respect is the influence of dams' age and weight on the growth of their calves. The most important parameters are calves' weight at birth and their weight in autumn (Dobrotvorsky 1938, Varo 1971).

There is ample evidence showing that there is a positive relationship between a reindeer dam's age or weight and the weight at birth of her calf (Dobrotvorsky 1938, Varo 1972, Lenvik 1980, Rognmo *et al.* 1983, Eloranta and Nieminen 1985, 1986a, 1986b). A similar relationship exists between dams' age and their calves' weight in autumn (Skjenneberg and Slagsvold 1968, Nergård Nyre 1976, Lenvik and Bø 1983). The relationship between dams' weight and calves' autumn weight, however, is unknown. The aim of this study was to investigate to what extent calves' weight in autumn is influenced by first, dams' weight *per se* and second, by dams' age-specific weight.

Materials and methods

Data were collected in the Riast/Hylling reindeer grazing district during 1984 as a result of co-operation between local people involved in reindeer husbandry and staff from the Reindeer Husbandry Office in Sør-Trøndelag add Hedmark. Ear-tagged females were fitted with collars bearing year-class and individual identification codes between 21 - 28 March. The majority of these were weighed at the same time. Special attention was subsequently paid to registering and ear-tagging the calves of collared females during routine calve-marking in summer (14 - 21 July) (Lenvik and Fjellheim 1987). At the autumn slaughtering (13 - 22 November) a large proportion of the calves were weighed and selected for recruitment or slaughter. These calf-weight data were examined in relation to dams' age and weight in spring.

Females were weighed to the nearest kg and calves to the nearest 0.5 kg. Data from male and female calves were combined in the analysis into one «common sex», as follows. The mean weight difference between the sexes (3.43 kg in November) was divided in two and the product was added to, or subtracted from, the recorded November weights of female and male calves respectively.

The resulting material included 1969 paired data sets of females' age and weight, 1564 paired sets of dams' weight and calves' weight in autumn and 1564 triple sets of dams' age, dams' weight and calves' weight in autumn. These data were analysed using linear, multiple and partial regression by the least squares method (MSTAT statistical package: Nissen 1984).

Results and discussion

Relationship between weight and age in females.

The dependence of females' weight on age is shown in Figure 1. Both the age- and the weight-structure of the female population in the herd is currently changing. Figure 1 thus gives a picture of the situation as it was in 1984.

Females' body weight (x_1), as the dependent variable on age (x_2), is maximum at 5 years. Body weight is calculated as two separate functions of age for the intervals 2 - 5 years and 5 - 12 years (Figure 1).

From growth curves for females reported by Skuncke (1973) and Skogland (1984), one might expect to find an increase in mean body weight after 5 years of age. That this does not occur may be due partly to the fact that the animals aged 2 to 5 years old had been selected as calves based on objective weight criteria, while the 6 to 7 year olds had been selected using poorer criteria and the 8 to 10 year olds had not been selected (as calves) in any systematic way at all. The growth curve for females in the Riast/Hylling herd, before introduction of calf-slaughtering and selection

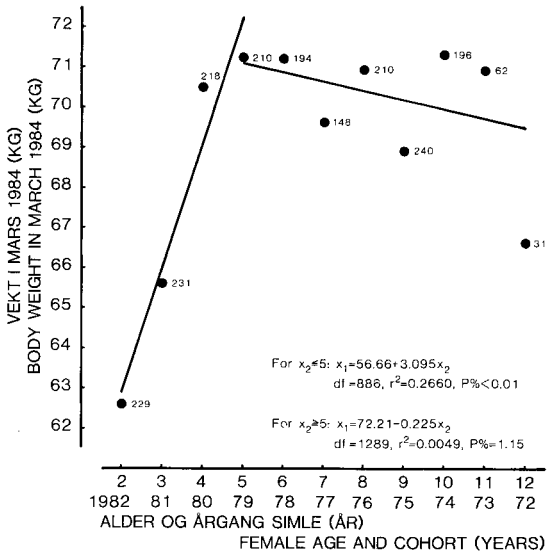

Figure 1. Age-specific growth curve for females in Riast/Hylling in spring (March 1984). The sample size is given for each age class.

Figur 1. Aldersspesifikk vektkurve om våren (mars 1984) for simler i Riast/Hylling. Antall registreringer innen aldersklasse er angitt.

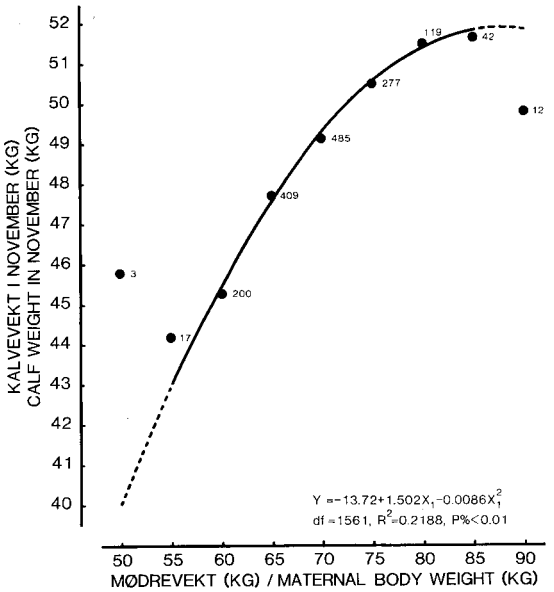

Figure 2. Relationship between reindeer calves' weight in autumn and their dams' weight in the preceding spring. The sample size is given for each weight class.

Figur 2. Sammenhengen mellom reinkalvenes høstvekt og mødrenes vårvekt. Antall registreringer innen vektklasse er angitt.

of calves based on body weight, was more curved and had a peak at 7 - 8 years olds and 70 - 72 kg.

Relationship between calves' weight and dams' weight

Dams' weight (x_1) explains 21.9% of variation in calves' weight in autumn (y) (Figure 2).

There are few data for females in weight classes 50, 55 and 90 kg. Calves with dams in the 90 kg class weighed 1.9 kg less in November than calves from 85 kg dams. The difference was not significant. Calves' weights «plateau»at a dam's weight of 80 kg.

Relationship between calves' weight and dams' age

Calves' weight in autumn (y) increases linearly with dams' age (x_2) up to 5 years old. There is an inverse relationship between calves autumn weight (y) and dams' age (x_2) in females aged older than 5 years. A linear regression provides the best fit for this relationship (Figure 3).

Relationship between calves' weight and dams' weight and age (partial regression)

Calves' weight in autumn is dependent both on their dams' weight ($r^2 = 0.2188$, Figure 2) and age (Figure 3). Dams' age has a stronger

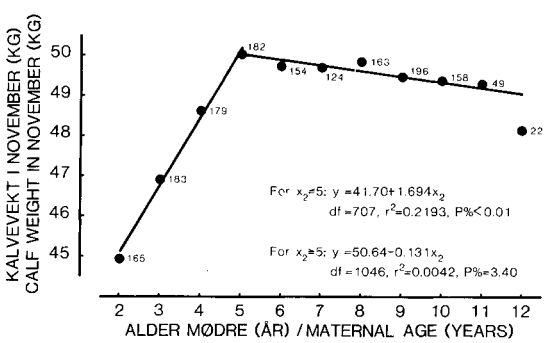

Figure 3. Relationship between reindeer calves' weight in autumn and their dams' age. The sample size is given for each age class.

Figur 3. Sammenhengen mellom reinkalvenes høstvekt og mødrenes alder. Antall registreringer innen aldersklasse er angitt.

influence on the weight of their calves' in autumn in females aged 2 to 5 years (r^2 = 0.2193) than in females aged 5 to 12 (r^2 = 0.0042). These two age intervals were therefore treated separately in the analysis.

Dams' weight and age together explain 28.6% of the variation in calves' autumn weight in the youngest group (females aged 2 to 5 years). Weight alone and age alone each explain 22% of the variation. Age followed by weight, or weight followed by age, explains 7% more of the variation. Calves' autumn weight (y) is shown as a function of females' weight (x_1) and age (x_2) for females aged 2, 3 and 4 years in separate graphs in Figure 4.

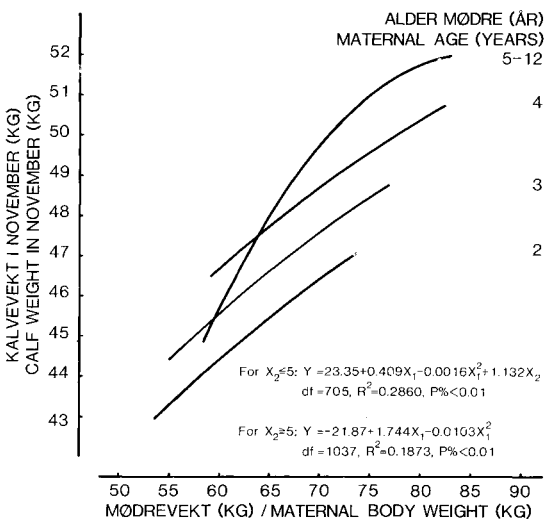

Figure 4. Relationship between reindeer calves' weight in autumn (y) and their dams' weight (x_1)in spring and age (x_2).

Figur 4. Sammenhengen mellom reinkalvenes høstvekt (y) og mødrenes vårvekt (x_1) samt alder (x_2).

Dams' weight and age together explain 18.7% of the variation in calves' autumn weight in the oldest group (females aged 5 to 12 years). Weight alone and age alone explain 18.7 and 0.4% of this variation, respectively. Regression of age after weight does not explain significantly more of the variation but weight after age explains and additional 18.4% of the variation. This indicates that calves' autumn body weight is not significantly influenced by dams' age in females aged 5 years or older. Calves' autumn body weight (y) is shown as a function of females' weight (x_1) and age (x_2) (5 - 12 years) in Figure 4.

Conclusions and practical implications

Females' age and weight evidently have significance regarding the growth of offspring up until autumn. Age, in contrast to weight, however, is important only while dams are young. At a given body weight of dam, calves' average autumn weight will increase 1.1 kg for each increasing year of age up to 5 years. A weight increase of 5 kg in these young females will result in a 1 kg increase in their calves' weight in autumn. Calves of females aged 2 years and weighing 70 kg, aged 3 years and weighing 65 kg or aged 4 years and weighing 60 will therefore be expected, on average, to have approximately the same weight in autumn.

From 5 to 11 - 12 years dams' age has no significance for the weight of calves in autumn. In these age classes weight explaines approximately 20% of the variation in calves' weight in autumn. A weight increase of 5 kg in dams, from 60 to 65 kg, from 70 to 75 kg and from 80 to 85 kg will result in a mean increase of calves' autumn weights of 2.3, 1.3 and 0.2 kg, respectively.

The practical implication of these results for age-structuring the herd is that the mean age of the female population should be kept as high as possible. The mean age can be moved in the right direction by selecting younger rather than older animals for slaughter. The smallest possible number of calves therefore should be recruited. The aim should be develop a herd in which the female population in spring consists of the lowest possible proportion of 1 to 4 year olds. This strategy is sound although it may have to be moderated as a consequence of local variation in losses related to animals' age and condition.

The practical implication of the results regarding weight-structuring is that effort should be made to raise females' weight up to 80 kg but preferably not over this. Furthermore, it would be advantageous to develop high weight in females at the youngest possible age. This is more important than trying to lift adult weights to 80 kg. However, Lenvik and Fjellheim (1988) have showed that pregnan-

cy and raising a calf lead to reduced growth in young females. Selection of calves based on body weight together with husbandry aimed at eliminating reproduction in heavy female calves will result in speeding up growth up to subadulthood (= 1.5 years). At the same time it must be emphasised that the effort of reproduction is unlikely to be the main factor which limits potential growth in subadult females until the mean weight in autumn of recruited calves has reached 50 kg (Lenvik and Fjellheim 1988).

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