

Annual Report

1999

Danish Fur Breeders Research Centre

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Activity level in mink selected for high or low feed efficiency

Overgaard, L., Sørensen, K. & L.L. Jeppesen

The aim of this study was to investigate whether feed efficiency was a heritable property in mink. Included in this study it was tested if the selection would affect the activity level of the mink. The study was made with two lines of mink selected for high or low feed efficiency. The activity level of the mink was examined in October 1997 and 1999 at 75 pair of mink. The study showed that mink selected for high feed efficiency were less active than mink selected for low feed efficiency. It was concluded that selection on feed efficiency in mink would influence on the activity level.

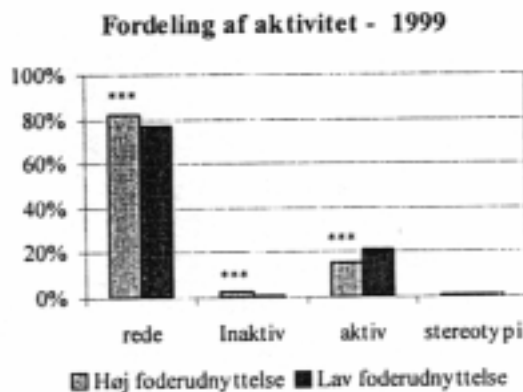


Fig. 2. Distribution of activity in mink selected for high (N=123) and low (N=126) feed efficiency. Observations were made in 1999. ***: $p < 0.001$.

Annual Report 1999, 7-9. 2 figs., 4 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark.

A temperament test used for selection of explorative mink under commercial farm conditions

Møller, S.H. & S.W. Hansen

The welfare of production animals may be improved by adapting the production system to the needs of the animals and by selecting those animals best adapted to the production system. As no documented improvements of welfare are readily available in mink housing, a temperament test (the stick test) is now being applied for use under commercial farm conditions. The test, that categorises the mink as fearful, explorative or aggressive when a stick is

inserted into the cage, has been developed and used for selection under experimental conditions. It has been demonstrated that the temperament categorised in the stick test is related to the reaction in novel object and intruder tests as well as to cortisol response to handling. In order to facilitate the use of the stick test in practice it has been simplified and implemented on six Danish mink farms. On average, 60% of adult mink females were characterised as explorative in August but the percentage differed between farms. After 30 minutes of introduction the farmers were able to perform the stick-test with 74%-100% agreement with an experienced test person. In order to improve the welfare at farm level, a selection line of 200 explorative females is established on each farm for the mating season in March 2000. During the first three years of selection the effects of the behavioural selection on other welfare indicators, such as health, behaviour and production will be monitored.

Annual Report 1999, 11-16. 1 table, 7 figs., 10 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark

Group- or family-housing in mink – Recent results in Danish research

Pedersen, V

This contribution deals with recent results from Danish research concerning consequences of group or family housing in farmed mink. Experimental designs, results and conclusions are shortly presented from three publications, one published as a M.Sc. report (N.K.Jeppesen, 1999) and two submitted to international journals (Jeppesen et al., Pedersen and Jeppesen).

Considering mink dams, welfare was improved by being housed in 3-room cages during the nursing period since a significant reduction of stereotypies was found in that period compared to traditional housing. However, continued co-housing of the mink dam with her litter in 3-room cages caused a reduction of the mink dam's welfare. This was demonstrated by increased stress levels, damages to teats, pelt damages and bites on the leather side, when the kits were 16 weeks old and at pelting time.

Jeppesen (1999) found that housing mink kits in the litter (3-room horizontal) or in groups of five animals (2-room vertical) from weaning to pelting

caused reduced body weights and an increase of aggressive interactions. Concurrently an increase in pelt damages and bites on the leather side was found before and at pelting time compared to traditionally housing (pair in 1-room). No significant effects of housing systems were found on stereotypies, social grooming and social play in this study.

The last study (Jeppesen et al.) found that the traditional housing system showed a higher level of stereotypies no matter the social context (alone, in pairs, group). Early weaning only affected 7 month old traditional housed mink kits in a negative direction.

Overall it was concluded that group housing reduced the level of stereotyping, but increased the level of aggression and concurrently increased the number of casualties, wounds and pelt damages in mink dams and kits. Further research is needed of how negative effects of group housing can be avoided before group housing can be implemented in mink farming as a reasonable alternative to the traditional way of keeping mink.

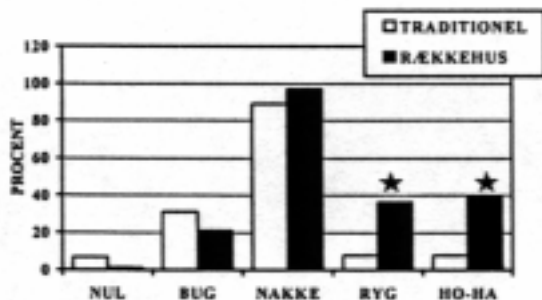


Fig. 1. Per cent fur without (NUL) or with bite marks on the leather side of the stomach (BUG), the neck (NAKKE), the back (RYG) and hip/tail (HO/HA) in females housed individually in traditional cages or litter wise in 3-room sheds. One asterisk indicates a significant difference between the two cage systems.

Annual Report 1999, 17-23.2 photos, 2 tables, 1 fig., 3 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark.

Do mink have occupational needs?

Hansen, S.W

Focus on the welfare of farmed animals has increased the interest in ensuring that their biological needs are satisfied, but some needs may be more important to the animals than others. It is therefore important not only to investigate which behaviour patterns represent needs, but also to quantify these and to assess their relative importance for the welfare of the animals. No one doubts that mink have a need for food because the consequence of the lack of food is fatal. There are also examples in support of the conclusion that mink have a strong motivation, and thus need, for a nest box. The need for the softer values such as shelf and occupation can be more difficult to document. It is a fact, however, that these soft values gain more and more weight in the national and international welfare debate. At the Danish Institute of Agricultural Sciences in Foulum, a project has been initiated with the aim of quantifying mink's priorities with regard to the resources that may potentially improve the welfare of the mink. The method for measuring mink's priorities is called "operant conditioning". The method aims at measuring how much the mink will pay/work to be able to perform a given behaviour or gain access to a resource. The animal is trained to work (e.g. pressing a pedal) to be able to perform a given behaviour or to gain access to a resource as a reward. Gradually the work needed to get the same reward is increased. Changes in the number of rewards as a function of the amount of work needed by the animal is described by a demand curve. If the animal is willing to continuously increase the work to obtain the same reward, the need for the reward in question is inelastic. If the work needed decreases when the price increases, the need for the reward in question is elastic. By comparing the demand curves of different resources, it is possible to decide which resources the mink values the most. It is important for the future development of the fur trade to be able to evaluate the possible demands for the fulfilment of the mink's behavioural needs and to suggest relevant changes for the fulfilment of documented needs in mink.

Annual Report 1999, 25-29. 14 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark.

Effect of an empty cage between female ranch mink in reproduction period

Overgaard, L.

The aim of this study was to investigate whether an empty cage between female ranch mink would affect the reproduction results. The study was made at three farms with Standard mink. One week before expected parturition (mid April) half of the Standard mink females were placed with an empty cage between each other. The other half was placed beside each other, and the additional cages were filled with other mink. In that way, one of the mink sheds held twice as many mink as the other.

The females were weighed at birth and 42 days after birth. The number of kits born and weaned was registered and the kits were weighed at 42 days. The females' level of stress was evaluated according to how often they varied between being in the nest box and in the cage during a 10 minutes observation period. To assess the females nesting ability a 'kit-in-distress-test' was done.

The females placed in every second cage weaned more and larger kits, and they had a lower kit loss. When the female were placed beside an empty cage, they had fewer changes between cage and nest, and were less willing to leave their nest boxes. It was concluded that fewer mink in a shed had a positive effect on the females' condition and their reproduction results.

Annual Report 1999, 37-42. 3 tables, 2 figs., 9 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark.

Preference for various nest box designs in silver foxes (*Vulpes vulpes*) and blue foxes (*Alopex lagopus*)

Jeppesen, L.L., Pedersen, V. & K. E. Heller

Outside the breeding season adult silver and blue fox vixens with no previous permanent nest box experience were given free choice between nest boxes that differed in height of placement, nest boxes with different number of rooms, boxes with or without platforms, or boxes with different light conditions. Only a single parameter was simultaneously varied. Both fox species clearly preferred an elevated multi-room nest box, but while silver foxes showed pref-

erence for boxes supplied with a platform, blue foxes preferred secluded boxes with an entrance room. There was no box preference with respect to light conditions. The possible welfare implications of the preferences are discussed.

Annual Report 1999, 43-46. 2 tables, 1 fig., 11 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark.

Status concerning the project tame/domesticated blue foxes

Hansen, S.W.

The project "tame/domesticated?" blue foxes was initiated in 1996 on four private farms. The aim of the project is through selection to make the blue foxes more confident towards human contact.

The selection was based on the reaction of the foxes to the titbit test. The titbit test was performed by offering the foxes a titbit. The foxes approaching the test person and taking the titbit are considered confident. The foxes that don't approach the test person are considered fearful. The test is performed repeatedly and the foxes approaching the test person the most times and taking the titbit are selected as potential breeding animals in a selection line. The final selection is done by the farmer who besides temperament also considers production-related traits. Using the titbit test and the practical selection procedure, it has not been possible to establish a sufficiently large number of confident breeding females in the selection lines.

Contributory factors have been that:

- The animal material of the project has been considerably reduced since two farms have dropped out and one farm has reduced the breeding population by 40%
- The titbit test is not sufficiently specific with regard to temperament because the hunger motivation possible affects the animals' reaction.
- The stability of confident temperament measured by the titbit test is insufficient for establishing a line of confident breeding animals.

A continuation of the project on the private farms should await a discussion between the involved parties of the results obtained so far.

Annual Report 1999, 47-50. Danish Fur breeders Research Centre, Holstebro, Denmark.

Selection for kit growth - considering welfare of the dam. Results of the third year of selection

Hansen, B.K., P. Berg, J. Malmkvist, S.W. Hansen and U. L. Rasmussen

The present report is the third provisional report of a selection project started in 1996. The aim of the project is to evaluate the genetic variation in early kit growth and its relation to body weight later in the growth period and the demands on the dam, furthermore to develop methods to describe behaviour parameters and their genetic relation to maternal traits. These relations make it possible to describe the consequences of different breeding schemes, where litter size, growth of kits and maternal traits are included. Based on data from selection lines the accuracy of the genetic correlation is higher than when estimated on unselected material.

The three selection lines were established in 1996. In line 51 the selection criteria is litter size. The selection for growth of kits is in line 52 based on kit's own capacity and in line 53 on the maternal ability to induce growth in kits. The breeding goals in the three lines are chosen to make the data collected as informative as possible. In all lines the breeding values are estimated by an Animal Model, which makes use of information from all relatives and parents to relatives. Furthermore the estimation method allows the estimation of breeding values for the kits own capacity for growth and for the maternal ability to improve growth of the kits separately.

Based on the average of estimated breeding values in the lines a positive response has been shown in the selected trait in all lines. The response in kit growth is about 15 grams of body weight at 4 weeks in line 52 and about 18 grams of body weight at 4 weeks in line 53. Even though the selection in lines 52 and 53 is based on either the kits own capacity for growth or the dam's ability to induce growth in her kits the achieved phenotypic weight in these lines is a result of both traits. Further research will clarify the consequences of these selection methods on the dam, the future reproduction ability of the selected female kits and on the pelt characteristics. Preliminary results thus confirm that there are two ways to affect the early growth of kits by selection: to select for the kits own growth capacity or to select for maternal ability to induce growth of kits.

Preliminary results from the studies on dam behaviour suggest that the frequency of the dam movements 'from the nest box to the cage' or 'from the cage to the nest box' may be related to the number of lost kits.

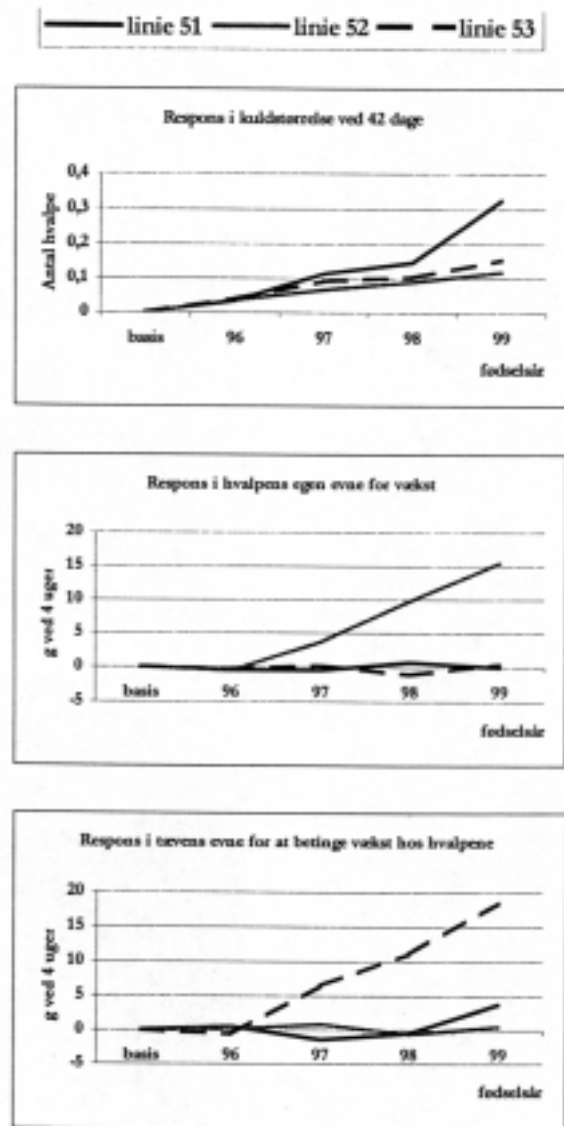


Fig. 1. Response based on breeding values estimated from all animals including information from all years.

Annual Report 1999, 51-54.1 table, 1 fig., 6 refs.
Danish Fur Breeders Research Centre, DK-7500
Holstebro, Denmark.

Algal meal (*Haematococcus pluvialis*) with a high astaxanthin content as food supplement to mink (*Mustela vison*). Effect on reproduction, kit pre-weaning growth performance and daily milk intake

Hansen, K.B., Tauson, A.H. & J. Inborr

The experiment was performed in order to evaluate possible effects on reproduction in the mink of dietary supplementation of an algae meal (Novasta) with a high astaxanthin content. The study comprised two parts: First, the apparent and ileal digestibilities of astaxanthin and accumulation of astaxanthin in liver, concentration of astaxanthin in plasma and effects of dietary supplementation on ovulation rate (no. of corpora lutea (CL)), implantation rate, number, weight and length of foetuses were evaluated (Part A). Second, reproductive outcome (number of live and stillborn kits) kit growth performance and milk intake were studied (Part B). Both Part A and B comprised 20 female mink (10 control (C) and 10 Novasta (N)), housed under conventional farm conditions. N animals were supplied with 5.35 mg astaxanthin/animal and day (0.25 g algae meal). Apparent ileal and faecal digestibility of astaxanthin was about 70% and astaxanthin in plasma and liver was significantly higher in N animals ($P < 0.001$). Both the number of CL, the number of implantation sites, the number of foetuses and litter size were highest in the N-group, but not significantly so. The differences were 1.4 (CL), 0.9 (implantation sites), 0.7 (number of foetuses) and 1.2 (litter size). The percent of stillborn kits was significant reduced ($P = 0.004$) but the milk intake was not affected by treatment group. A significant effect of week of lactation and litter size ($P < 0.001$) on the milk intake was found. Kit weight gain was not affected by the experimental treatment.

Annual Report 1999, 55-58. 4 tables, 1 fig., 4 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark

A long period of restricted feeding during the winter is not a precondition for large litters

Møller, S.H.

How to feed female mink during the winter in order to get the largest number of kits, has been debated for many years. Based on experience, many farmers

in Denmark has fed more restricted in practice than experimental results would indicate. In order to compare the effect of flushing according to experimental results with the feeding regime often practised in Denmark, an experiment with 500 to 600 brown primiparous females on each of four private farms was conducted. Half the females were fed a Restricted amount of feed, aiming at a 25% reduction in body weight from November to February. The other half of the females were fed almost Ad libitum aiming at a 10% reduction in body weight. At one farm the Ad libitum fed group lost more than 20% in body weight while flushing did not succeed in the Ad libitum fed group at two other farms, whereby the litter size were reduced by approx. 0,8 kits. The pre planned weight reduction and flushing did only succeed in both feeding groups at one farm, showing no difference in litter size between feeding groups. Large differences were found in the percentage of mated as well as barren females between farms, but not between feeding strategies. Less than half the females with low weight were found when body condition was graded. The mortality was low and unaffected by the feeding strategy, while the incidence of sticky kits in the Restricted fed group was twice as high as in the Ad libitum fed group. The farm experiments showed that a long period of restricted feeding is not needed in order to achieve the full effect of flushing on litter size. The flushing effect could be achieved by a weight reduction in a period up till one week before the mating season allowing the females to gain weight in the period of flush-feeding shortly before and during the mating period. However, this feeding practice was only successful in one out of four farms indicating that feeding management during the winter is not an easy task and that better feeding management tools are needed.

Annual Report 1999, 59-65. 5 tables, 2 figs., 10 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark.

Financial calculations on selection lines

Rasmussen, U.L.

Until now we have only reported the selection results as production results, but the most important result in many aspects is actually the economic result (gross margin). These results have now been calculated as gross margins for the 1996 and 1997,

both per pelt, per breeding female and per cage for each of the lines at the Research Farm "SYD".

In 1996 line 64 (selected for minimum pelt biting) was the one with the highest gross margin. In 1997 line 72 (selected for high weight in selection for males and high litter size index in selection for females) had the highest gross margin.

Annual Report 1999, 67-70. 1 table, 2 figs. Danish Fur Breeders Research Centre, Holstebro, Denmark.

Different energy distribution in the feed for mink females in the winter and reproduction periods 1999

Clausen, T.N. & C. Hejlesen

Table 7. Greasy kits frequency and number of females with nosing sickness.

| Hold | Antal kuld | Fedtede kuld, % | Tæver med DS, antal |
|------|------------|-----------------|---------------------|
| 1 | 119 | 26,9 | 10 |
| 2 | 112 | 26,8 | 7 |
| 3 | 113 | 27,4 | 6 |
| 4 | 118 | 27,1 | 11 |
| 5 | 120 | 30,0 | 6 |
| 6 | 115 | 36,5 | 8 |
| 7 | 113 | 37,2 | 9 |
| 8 | 118 | 33,1 | 18 |

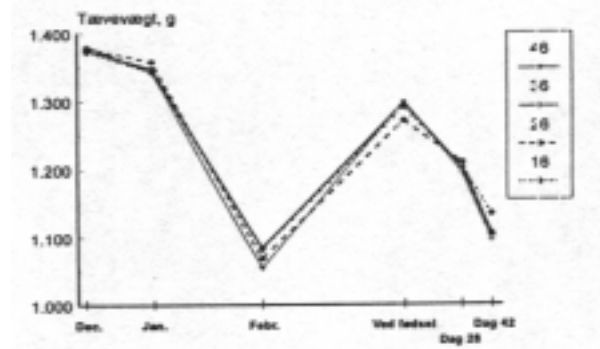
For the investigation 8 groups, each consisting of 125 wild type female mink, were used. The protein content in the feed in the winter- and reproduction periods was lowered from 55 % of the metabolisable energy from protein to 45 vs. 30 %, and the carbohydrate content was varied from 10 to 20 % of the metabolisable energy. The results showed that we can lower the protein content in the feed in the winter and reproduction periods to 45 % of the metabolisable energy and use 15 % of the metabolisable energy from carbohydrates in the feed without negative consequences for litter size, kits and female weights at weaning. Females fed 30 % of metabolisable energy from protein in the winter

period until February 19 had a higher number of greasy kits than the other females.

Annual Report 1999, 71-75. 7 tables, 2 figs., 1 ref. Danish Fur Breeders Research Centre, Holstebro, Denmark.

Reduced quantity of fish in feed for mink in the winter- and nursing period

Hejlesen, C. & T.N. Clausen



Figur 1. Tæverægs vægtudvikling. Female weight change

The effect of replacing fish offal and industrial fish with dried protein sources (haemoglobin meal, meat meal, fish meal, potato protein, corn gluten, and soy bean meal) in feed for mink females in the winter- and nursing period was investigated. Four groups each consisting of 125 mink of the colour type standard, was given respectively 46, 36, 26 and 16 % fish offal. ME was 45%, 40% and 15% from protein, fat and carbohydrate respectively. Litter size at birth, kid weight at weaning, and female loss of weight from parturition to weaning was not effected by substitution of fish protein with dried protein feed stuffs. Kid mortality was extremely high, but not effected by the treatment. Kid mortality was also high among the rest of the standard females at the research farm. The investigation showed that replacing fish offal and industrial fish with dried protein sources is possible without altering litter size and the result of the nursing period. Because of the high kid mortality it is recommended to replicate the experiment before implementing the result.

Annual Report 1999, 77-80. 4 tables, 2 figs., 3 refs. Danish Fur Breeders Research Centre, Holstebro, Denmark.