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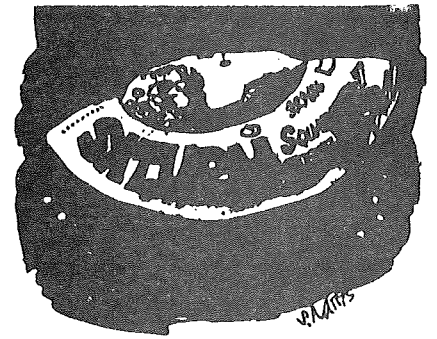
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NOTES

SCIENTIFUR, VOL. 9, NO. 4, 1985.

"They certainly can't call us unidentified."

"It's good to get out again, you hardly ever see anyone during an ice age."

For 36th times these Notes have to be written. Many feelings pass by my mind just now, where SCIENTIFUR is going to enter its 10th year of jubilee. The positive feelings are the dominant ones. It has been extremely fascinating to follow the development of SCIENTIFUR, from its uncertain start in 1976 up to the established and appreciated level it has reached today. In the fur animal production industry SCIENTIFUR is not one of the information sources regarding science, production and communication - SCIENTIFUR IS THE SOURCE! We know it from several kind letters sent to us and from first and second hand oral flowers, which we have been listening to during the years.

Also the increasing number of subscribers - today more than 500 - and original reports tell us that there might be a future for SCIENTIFUR - also after the time where the enthusiastic amateurs will leave the arena.

During the years the readers during the NOTES have been able to follow the problems, the ideas and the progress of SCIENTIFUR almost in all respect. In the start - at least your editor - had the feeling that SCIENTIFUR would be read and appreciated of much more than the 500 subscribers obtained today. During the years we have had a lot more subscribers, but especially practical farmers do not renew their subscriptions. This fact tell us - what also should be expected - that the information level of SCIENTIFUR is sufficient high to covering the requirements for scientists, advisers, teachers, and leading people in the industry.

But this fact is not sufficient for the economical background in the future. Therefore, one of the tasks in the 10th year of jubilee will be search in the area for increasing of the activities of SCIENTIFUR. In the first place in the direction described at the 3rd International Scientific Congress in Fur Animal Production, namely as an International Information Center dealing with translation service, production of educational material and books regarding fur animal production etc. But such things

take time, time is money, and money cannot be obtained without fully moral and practical support from the industry - especially the associations of producers, leading people in the industry, and the leading companies supplying this industry.

Our experiences from production of the English translation of the famous Danish book MINK PRODUCTION have learnt us that it is difficult for a lot of people to realize that service must stop if it should not be used to such an extent that the costs are covered.

MINK PRODUCTION is now on the market - and only 600 of the expected 2000 preorders have been executed. For us - whom are responsible for the production costs of the book - may only hope that a lot of minkfarmers will realize that MINK PRODUCTION is not a book for public libraries, but a handbook which must to at every single farm. During ordering MINK PRODUCTION you will not only help yourself - you will also support a service, which in the future intend to be a valuable partner for you in the farm production of skins.

Those of you whom not yet have done it - DO ORDER MINK PRODUCTION TODAY. You will find an order form in this issue of SCIENTIFUR.

MINK PRODUCTION should be the Christmas gift for your nightbour, your employers, or your cooperating wife or man.

All orders followed by prepayment will be prompt handled, and the book(s) sent by airfreight, so everybody can have them in due time to put under the Christmas tree.

Next year you will be able to obtain the book: "BEAUTIES OF FARM BRED FUR ANIMALS - Mutations and Combinations" containing more than 150 colour pictures, to put under the Christmas tree.

With the hope that everybody will help us to increase the service to the fur animal production we wish to thank all of you and send the best regards to all subscribers, contributors and advertiser(s).

MERRY CHRISTMAS AND HAPPY NEW YEAR.

Your editor



Gunnar Jørgensen

Original Report

The Isoenzymatic Profile of LDH in different Organs and Tissues of Farm-bred Fur-bearing Animals

1. The formation of isoenzymatic LDH spectra in the blood serum of minks and polar foxes in the ontogenesis

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Numerous investigations have shown that lactate dehydrogenase (LDH), which is key enzyme of the glycolysis, changes during individual development (*Milman, Yurovitsky, 1973; Korochkin, 1977*). Alterations are observed both in total activity of the enzyme and its isoenzymatic profile. The analysis of the changes reveals a number of regularities which indicate that at early developmental stages the isoenzymatic LDH spectrum is formed in close relation with the conditions of embryo existence, and the process of embryogenesis and early postnatal ontogenesis are characterized by gradual formation of the LDH isoenzymatic profile which is intrinsic to the metabolic type of adult animal tissues.

LDH plays a definite role in the energy supply of an organism. Hence it was interesting to trace the formation of isoenzymatic LDH profile in fur-bearing animal ontogenesis.

Studies have been made on farm-bred 10-, 20-, 30- and 180-day-old minks and polar foxes and adult animals.

Multiple molecular lactate dehydrogenase forms (LDH, AP 1.1.1.27) in blood serum were revealed by agar gel electrophoresis according to *Wiem's* (1959). The quantitative ratio of LDH isoenzymes was estimated by scanning electrophoregrams (after their histochemical staining) on »Chromoscan-200-201« and calculating the percentage ratio of fractions.

The analysis of experimental results has shown serum LDH to be present in five molecular forms in fur-bearing animals. All the five LDH fractions from rapid anodic (LDH-1) to slow cathodic (LDH-5) were distinctly observed in the enzymograms (fig.1). In 10-day-old kits the molecular enzymatic profile was dominated by the fifth fraction which accounted for the largest part of total activity - 59%, whereas the portion of LDH-1 was small - 8.7%. The domination of the fifth cathodic fraction persisted thereafter. Besides, in the second decade of life the relative LDH-1 content decreased and that of hybrid forms LDH-2,

LDH-3 and LDH-4 increased. In one-month-old animals the ratio of cathodic and anodic fractions was the same: LDH-5 - 43%, LDH-1 - 5.8%.

The early postnatal ontogenesis of polar foxes (like that of minks) was predominated by the fifth fraction in the molecular LDH profile. In 10-day-old kits it comprised one third and in 20- and 30-day-old animals almost one half of total activity. Unlike minks their LDH-1 content was higher. It is more distinct in 10-day-old polar foxes where LDH-1 fraction accounted for 15.4%, whereas in minks it was 8.4%. The difference is also very pronounced in adult animals. Thus in polar foxes relative LDH-1 content comprised 46.2% and in minks it was 2.5 times lower, i.e. 18.5%.

According to the existent hypothesis (*Dawson, 1964*) rapidly migrating towards anode isoenzymes LDH-1 and LDH-2 dominated by H-subunits characterize an aerobic type of metabolism, The function of slowly migrating isoenzymes LDH-5 involves the reduction of pyruvate to lactate, i.e. The catalysis of the last reaction of anaerobic glycolysis.

A shift towards cathodic LDH fractions and lower content of No (No 1 and 2) throughout the whole period of early ontogenesis seems to be connected with a significant role of anaerobic glycolysis in the energy production of growing animals. At this time the cathodic fraction total varied within 13-15% range, i.e. in all cases total lactate dehydrogenase activity of serum is due to the preferential content of the enzyme M-subunits.

At early age total serum lactate dehydrogenase activity was dependent on the preferential content of the enzyme M-subunits with relatively low anodic fraction content, whereas in 6-month-old animals the portion of the latter apparently increased. In minks the total of the 1st and 2nd fractions comprised 21%, in polar foxes it was 30.6% with a sharp decrease in the LDH-5/LDH-1 coefficient to 4.46 and 2.01 in minks and polar foxes, respectively. The tendency towards

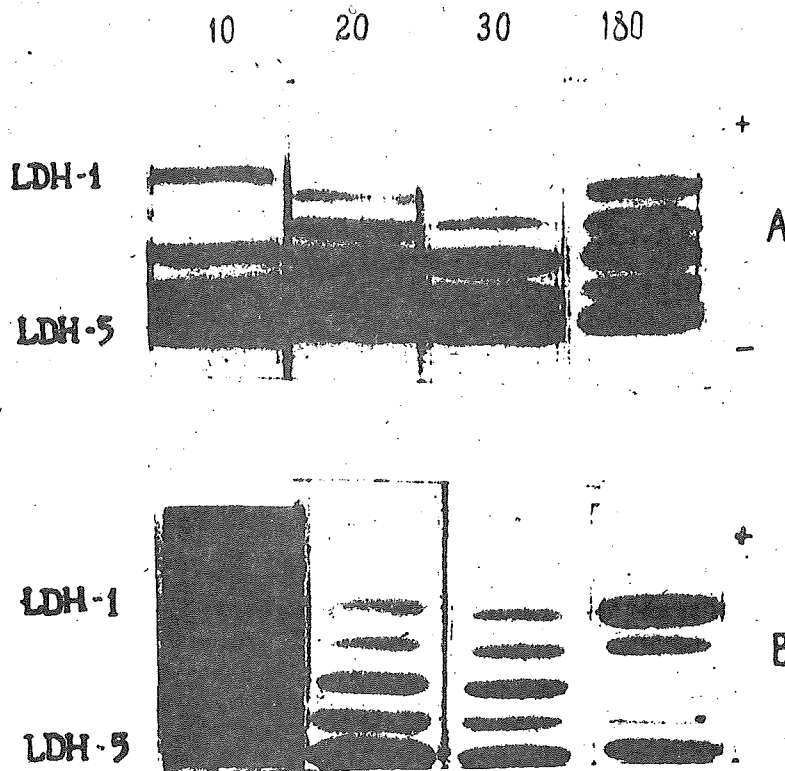


Fig. 1. Zymograms of LDH isoenzymes in the blood serum of minks (A) and polar foxes (B) of different age.

Upper numbers - age, days.

the increased total of rapidly migrating fractions persisted also in adult animals. In minks it augmented to 29.5% and in polar foxes to 56.2% with a further decline in V:I coefficient to 2.02 and 0.50, respectively.

A gradual transition to the dominating portion of anodic enzymatic forms with age is characteristic of the ontogenesis of numerous mammals, including silver fox, a representative of the predator order of the same family to which the polar fox belongs. The formation of the definite LDH spectrum in foxes is gradual and is well observed on erythrocytes (Hlebodarov *et al.*, 1978). During the first month of silver fox postnatal life its erythrocytic LDH consists of five isoenzymatic fractions: from LDH-1 to LDH-5. Foxes older than a month are already characterized by changes in their isoenzymatic LDH spectrum towards prevailing LDH-1 and decreased LDH-3, LDH-4 and LDH-5 isoenzymes. By the end of the third month, i.e. at the age of 90-100 days, the definite LDH spectrum of erythrocytes is completely formed which consists of LDH-1 and LDH-2. It has been experimentally shown (Serov *et al.*, 1975; Bolbierz *et al.*, 1977) that in adult polar foxes the isoenzymatic LDH profile of erythrocytes is similar to that of silver foxes, and it consists of two isoenzymes LDH-1 and LDH-2. The successive formation of the isoenzymatic LDH profile in ontogenesis specified by certain quantitative A/M and B/H subunit ratios reflects subsequent activation of corresponding genes controlling these subunit synthesis during development (Korochkin, 1977).

The predomination of cathodic fractions in the early ontogenesis of fur-bearing animals shows an important role of isoenzymes of group A during development. This group of subunits is phylogenetically older and it is characterized by species specificity.

It is interesting to note that group A does show differences in the molecular profile of serum and erythrocytic LDH in adult minks and polar foxes. Erythrocytes of polar foxes, except for individual cases (Balbierz, 1977), lack both pure LDH-5 isoenzymes formed by the combination of (A)M subunits and hybrid LDH-3 and LDH-4 (Serov *et al.*, 1975), although serum LDH of polar foxes consists of all five fractions their relative LDH-5 content is lower than that in minks. In this case the molecular LDH profile of adult polar fox serum corresponds mainly to the general regularity of the fraction distribution observed in terrestrial mammals (Wilkinson, 1968). In all adult polar foxes the relative total anodic fraction content (LDH-1 + LDH-2) is higher than that of cathodic (LDH-4 + LDH-5), and LDH-1 content is greater than that of LDH-5.

In adult minks the molecular profile of serum LDH is somewhat different. Their cathodic fraction total is higher than that of anodic. LDH-5 has the largest relative activity, and that of LDH-1 is 2.5 fold lower than in polar foxes. Such specificity of the molecular profile of serum LDH in minks is not an exception. Studies conducted by Saison (1971) have demonstrated that the erythrocytic LDH profile for minks

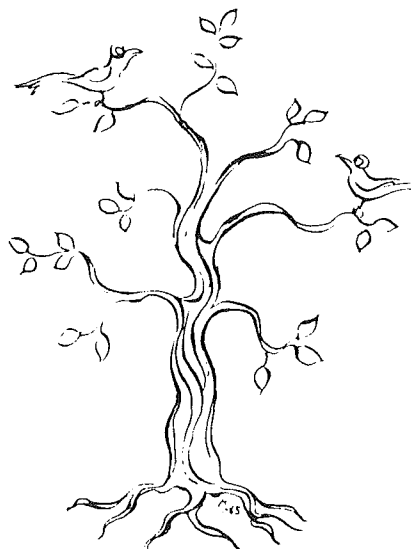
differs from that for polar foxes. Besides LDH-1 and LDH-2 typical of erythrocytes it consists of LDH-3 and LDH-5 in large amounts.

The departure of the molecular LDH profile of mink serum towards the predominance of the 5th cathodic fraction seems to be a specific feature of these animals. Preference for M subunits of the enzyme which are responsible for the anaerobic pathways of glycolysis was formed in the course of prolonged evolution because the animals had to maintain their vital activity when diving under forced hypoxia conditions.

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Seasonal Changes in behavioural Patterns of farmed Polecats (*Mustela Putorius*)

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Summary

Activity of farmed polecats (*Mustela putorius*) consisted of a system of short bursts of activity alternating with rest periods spent inside the nest. The animals were diurnal rather than nocturnal, and they did not exhibit any marked cyclic pattern of behaviours. Locomotor activity and time spent out of the nest increased markedly between April and July, and then declined to become minimal during December-February. The most frequently occurring behavioural patterns under farm conditions were locomotion, self-grooming, eating, drinking, romping, defecation, urination and resting inside and outside the nest. Any marked scent-marking behaviour was not observed. Aspects of aggressive behaviour was not very evident between the sexes. No marked differences in behavioural patterns between sexes were found. Activity of the animals, particularly during winter, was confined to the time of feeding. High rate of passage of feed through the digestive tract of the polecat was found to be a marked behavioural regulator for this species. The results support the conclusion that behavioural patterns of farmed animals differ from that of wild ones in a looser relation with environmental conditions.

Introduction

The polecat (*Mustela putorius*) is a carnivore whose range extends to the northern edge of the subarctic taiga. This small mustelid species has a long sinuous body, relatively short legs, blunt face and small, rounded ears (King 1977). Sexual dimorphism, a characteristic feature of many Mustelidae, is prominent also in polecats, the males being considerably larger than the females. The polecat has been adopted as commercial fur animal for over the few last decades. It has been housed under the same conditions traditionally used for the American mink (*Mustela vison*). However, a farming practice which is good for the mink is not necessarily optimal for the polecat.

Commercial fur animal production aims at optimizing economic profits. This is best achieved when the animals' wellbeing is sufficiently guaranteed. Their wellbeing cannot be measured in absolute

figures, but it can be evaluated by various figures like fur quality, body condition, litter size etc. Also modes of behaviour in animal in question can provide us reliable information of how the animal is adapted to certain conditions, how its feeding and farming arrangements are related to its behaviour, how these arrangements possibly affect its behavioural patterns, to which extent behavioural strategy of the species in captivity possibly differs from that in wild state etc. In most mustelid studies examples of reproductive, maternal, aggressive and play behaviour are documented (Eibl-Eibesfeldt 1955; Lazar & Beckhorn 1974; Poole 1966, 1967, 1972, 1973, 1974), but precise data concerning commercially housed mustelid species is mainly available for the American mink (Klochkov 1966; Gerell 1969, 1970; Kairuldinov & Akhmetov 1981; Kuby 1983). The expressive behaviour of the polecat is to some extent described in the nature (Bäumler 1973; King 1977), and description of aggression and aggressive behaviour are reported in captivity (Poole 1966, 1967; Weiss-Bürger 1981). Under farm conditions, however, any marked data are not available of the behavioural patterns for this species.

This study describes most frequently occurring behavioural patterns and their annual variation in farmed polecats in an attempt to contribute understanding for behavioural figures of this species under farm conditions. Besides activity chart recorder, data were collected by direct visual observations in order to obtain a more complete behavioural profile than that allowed by recording of activity with a mechanical chart recorder. One purpose of this study was to assess possible sex differences as a result of sexual dimorphism among this species. Finally, this study additionally attempted to evaluate the most important factors regulating behaviour of this species under farm conditions.

Materials and methods

Subjects

Adult polecats of both sexes were used. The animals were exposed to conventional farm conditions. All animals were farm-born and farmbred, and they were caged in wire mesh enclosures 100 x 60 x 40 cm (length x width x height). Cylindrical commercially available

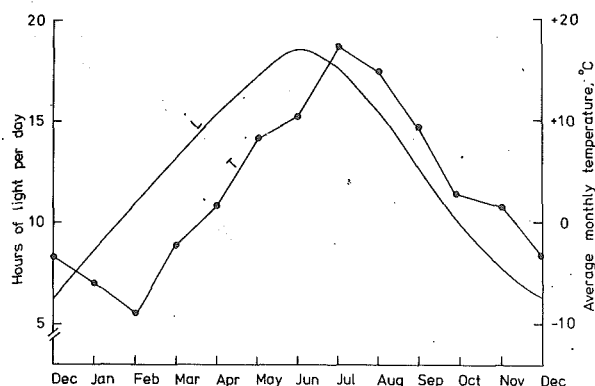


Fig. 1. Annual cycles in photoperiod and temperature. Values represent mean of each month.

styrofoam covered plastic nests (Norcar Ltd.) with an inner diameter of 20 cm and a height of 32 cm were connected to the cages. Dry oat straw and hay was offered to the animals to be used as a bedding material inside the nest boxes. The roof of the nests consisted of wire-mesh net. For further description of the nests see Korhonen & Harri (1984). The animals were inspected daily, and they remained healthy throughout the study.

The animals were fed twice a day: At 0800 h a.m. and 1600 h p.m. Readymixed mink feed and water were available *ad libitum* by conventional procedures. The diet was mainly composed of slaughter-house offals, fish and cerrals, and originated from the local central feed kitchen of Koillis-Savon Rehu Ltd., situated in Juankosko, eastern Finland. For further description of the diet see Korhonen & Harri (1985).

The animals were exposed to out-of-doors conditions of normal subarctic climate. Average light and temperature conditions during a year are illustrated in Fig. 1.

Procedures

Behavioural patterns of the animals were monitored by two main principles: (1) by means of Miniscript Z activity chart recorder. Depression of a treadle by the active animal resulted in a mark on the recording paper run at a speed of 1 cm/h. The treadle was placed into the middle of the cage. (2) by direct visual observations. An observation period started at 0800 h a.m. and lasted for 24 hours through the window of observation room situated about 2 m from the animal cages. The animals were not disturbed and they were not aware of their behavioural observations. The following behaviours were recorded during the testing period:

Locomotion	Activity in which all 4 limbs were moving, and the animal displaced itself in space.
Self-grooming	Animal licks and paws its own coat, face, washing with forepaws. Animal shakes up and scratches its hair coat.

Eating	Chewing of feed.
Drinking	Licking water from available water cup
Romping	Male and female playing together, kissing (>nose to nose contact), hugging, jumping etc.
Defecation	Animal pushes its hindquarters towards latrines and raises its tail up, and defecates. Includes also urination which occurred in connection with defecation. Urination was not recorded as own behaviour because its reliable recognition in many cases was not possible.
Resting outside the nest	Animal was laying outside the nest on the cage floor. No marked movements observable.
Inside the nest	Animal not in sight, staying totally inside the nest box.

These behaviours were selected on the basis of preliminary observations, and were found to be the most frequently occurring behavioural patterns of captive polecats under farm conditions. The other more unimportant modes of behaviour are explained in the text if necessary. Locomotor activity recordings were done during three subsequent years from 1982 to 1984. Direct visual observations were performed during 1983 and 1984. During the first year the animals were observed only 8 hours from 0800 h a.m. to 1600 h p.m., respectively. During 1984 observations at once lasted 24 h-period. Three couples were simultaneously used for the observations throughout this study. Activity of two different couples were recorded by means of activity chart recorder.

Results

Seasonal changes in activity

There was a pronounced seasonal variation in the amount of daily activity. Locomotor activity and

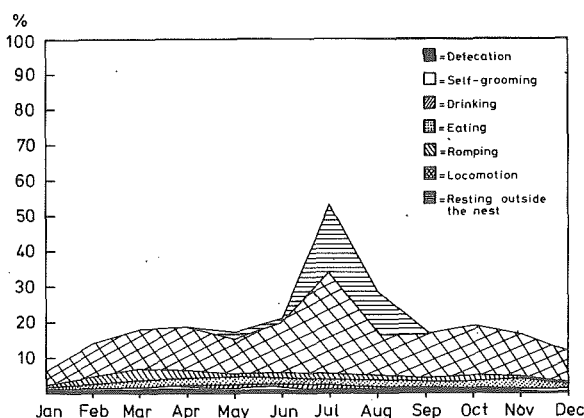


Fig. 2. Cumulative percentage of behavioural patterns of male polecats ($N=3$) during the year 1984.

Table 1. Mean monthly percentages of most frequently occurred behavioural patterns of three polecat males and females during the year 1984.

Month		Inside nest	Resting outside the nest	Defecation	Eating	Drinking	Self-grooming	Locomotion	Romping
Jan	♂	94,5	-	0,4	0,5	-	0,1	4,3	0,2
	♀	94,8	-	0,4	0,5	-	0,1	4,0	0,2
Feb	♂	86,2	-	0,2	1,2	-	0,4	9,7	2,2
	♀	86,8	-	0,2	1,5	-	0,1	9,1	2,2
Mar	♂	82,9	-	0,4	2,0	-	0,3	11,4	3,0
	♀	84,5	-	0,5	0,8	-	0,3	10,9	3,0
Apr	♂	83,9	0,2	0,5	1,9	0,2	0,3	11,5	2,0
	♀	85,4	-	0,3	1,2	0,1	0,2	10,8	2,0
May	♂	83,9	2,1	0,5	2,2	0,4	0,2	9,9	1,0
	♀	87,7	0,2	0,5	2,8	0,8	1,0	7,8	1,0
Jun	♂	79,5	1,1	0,6	2,0	0,6	0,4	14,3	1,5
	♀	75,7	1,5	0,6	3,1	0,5	1,0	16,1	1,5
Jul	♂	46,8	18,6	0,5	1,5	0,5	0,7	29,7	1,7
	♀	46,2	17,2	0,3	2,2	0,6	1,0	21,6	1,7
Aug	♂	73,4	11,3	0,5	2,3	0,2	0,4	10,8	1,1
	♀	76,0	10,4	0,5	1,6	0,2	0,6	9,6	1,1
Sep	♂	85,0	0,2	0,5	1,7	0,2	0,6	10,9	0,9
	♀	88,0	0,1	0,5	1,1	0,1	0,4	8,9	0,9
Oct	♂	81,1	-	0,5	2,1	0,2	0,4	13,7	2,0
	♀	85,7	-	0,5	1,5	0,2	0,4	9,6	2,0
Nov	♂	83,4	-	0,5	2,9	0,1	0,4	11,8	0,9
	♀	88,4	-	0,5	1,6	0,1	0,4	9,1	0,9
Dec	♂	88,8	-	0,4	1,5	-	0,1	8,7	0,4
	♀	92,1	-	0,5	0,9	-	0,1	6,0	0,4

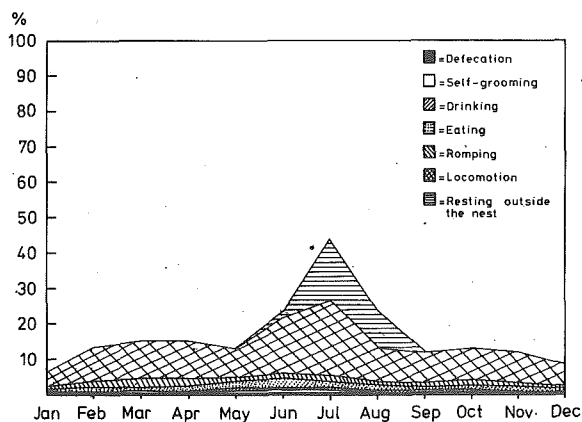


Fig. 3. Cumulative percentage of behavioural patterns of female polecats ($N = 3$) during the year 1984.

time spent out of the nest increased markedly between April and July, and then declined to become minimal during December-February (Figs. 2 and 3, Table 1). During winter the animals spent about 95% of their daily 24 hours inside the nest. During this time they moved occasionally outside the nest to feed or to defecate, and no marked long-term activity records were observed. Locomotor activity and time spent outside the nest increased with decreasing photo-

period and ambient air temperature, and *vice-versa*. During summer the polecats exhibited relatively high activity during the 24 h-period. The intensity of locomotor activity became higher during mating season in March-April. Seasonal changes were evident in the pattern of daily activity. During winter the pattern was rather bimodal activity peaks being confined to the time of feeding at about 0800 h a.m. and 1600 h p.m., respectively. During summer, on the other hand, activity was rather equally distributed throughout the daylight period (Figs. 4 and 5).

Circadian activity rhythm

The activity of polecats consisted of a system of short burst of activity alternating with rest periods spent in the nest. The animals did not exhibit any marked cyclic pattern of behaviours. Mean daily activity patterns for each months (Table 1) demonstrated that the polecat under farm conditions is diurnal rather than nocturnal animal. Individual records indicated that the animal would be active once or several times during some nights, but remained rather inactive during some other nights. Particularly during winter there did not exist any marked night activities. Nocturnal excursions out of the nest were usually 10 min or less in duration, with very little locomotor activity.

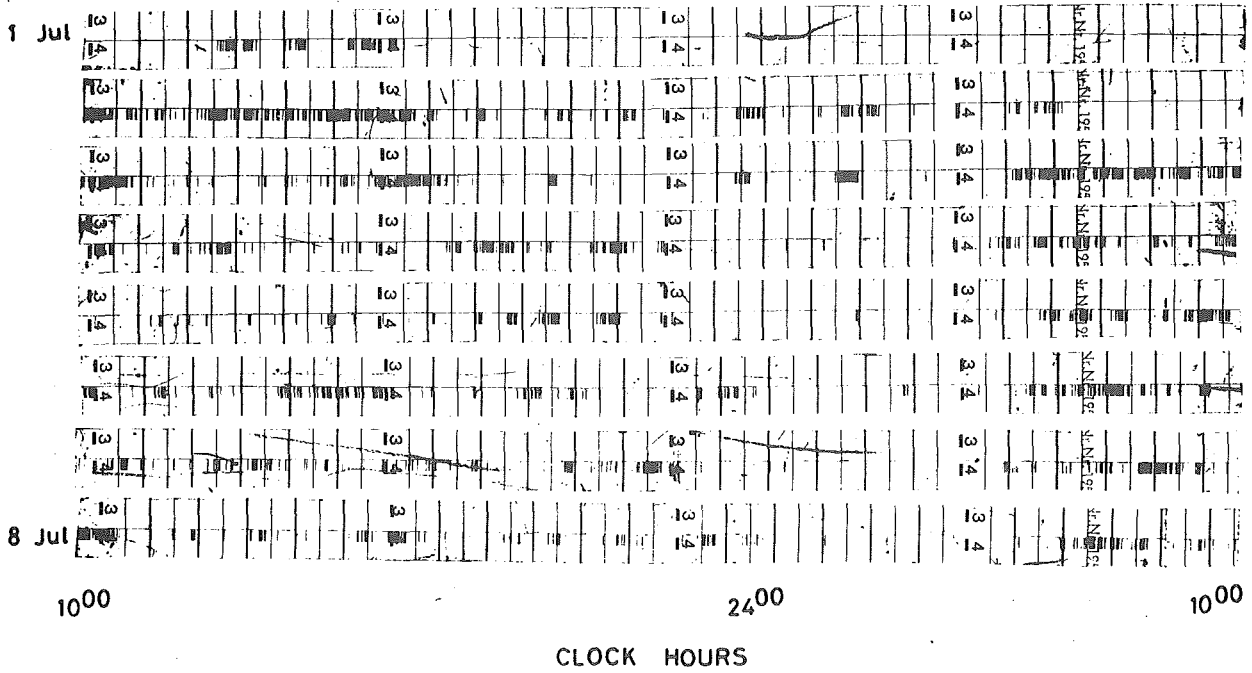


Fig. 4. Original, representative activity chart recordings of polecat couple during summer 1983. Depression of a treadle by the active animal resulted in a mark on the recording paper run at a speed of 1 cm/h.

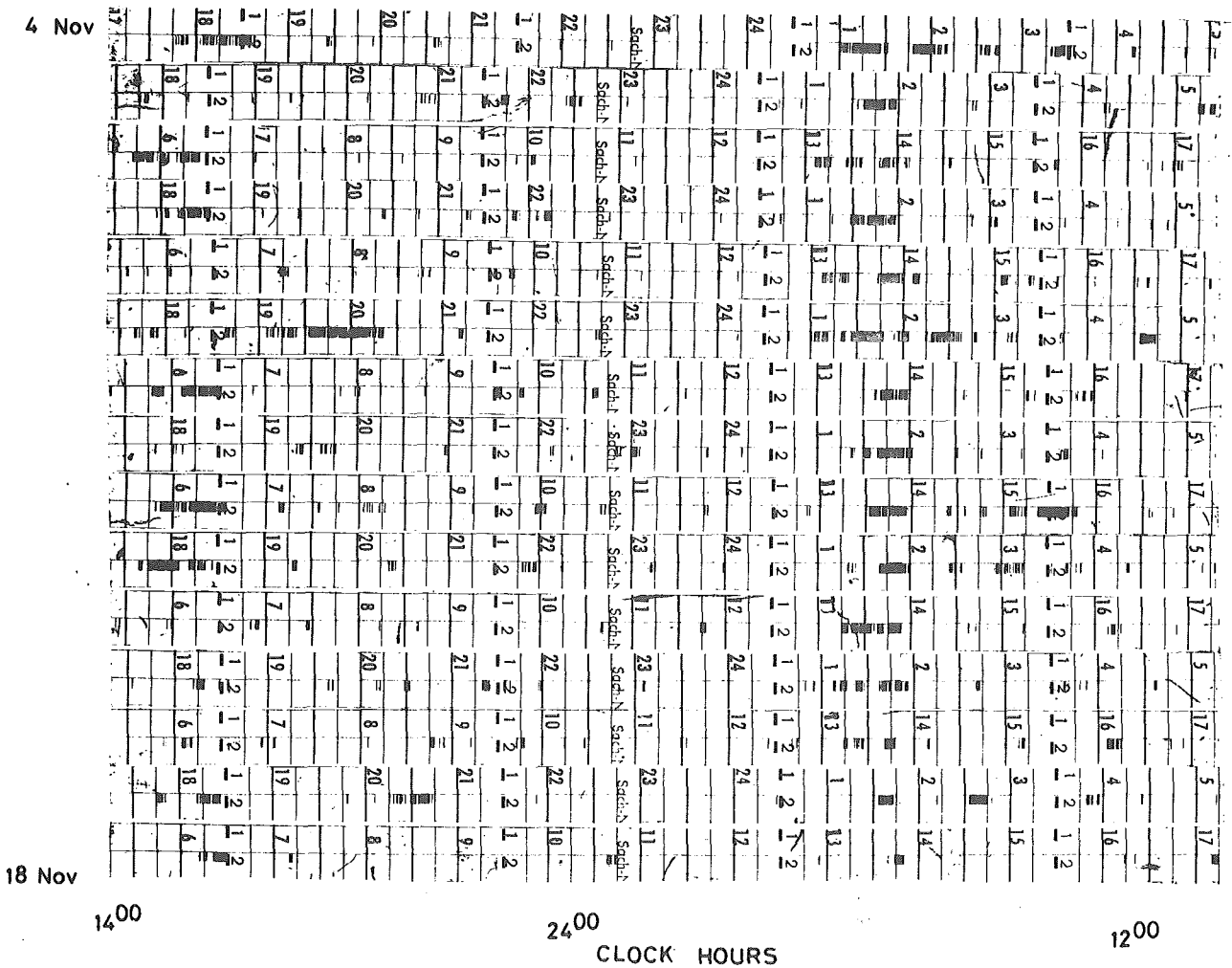


Fig. 5. Original, representative activity chart recordings of polecat couple during winter 1983. Depression of a treadle by the active animal resulted in a mark on the recording paper run at a speed of 1 cm/h.

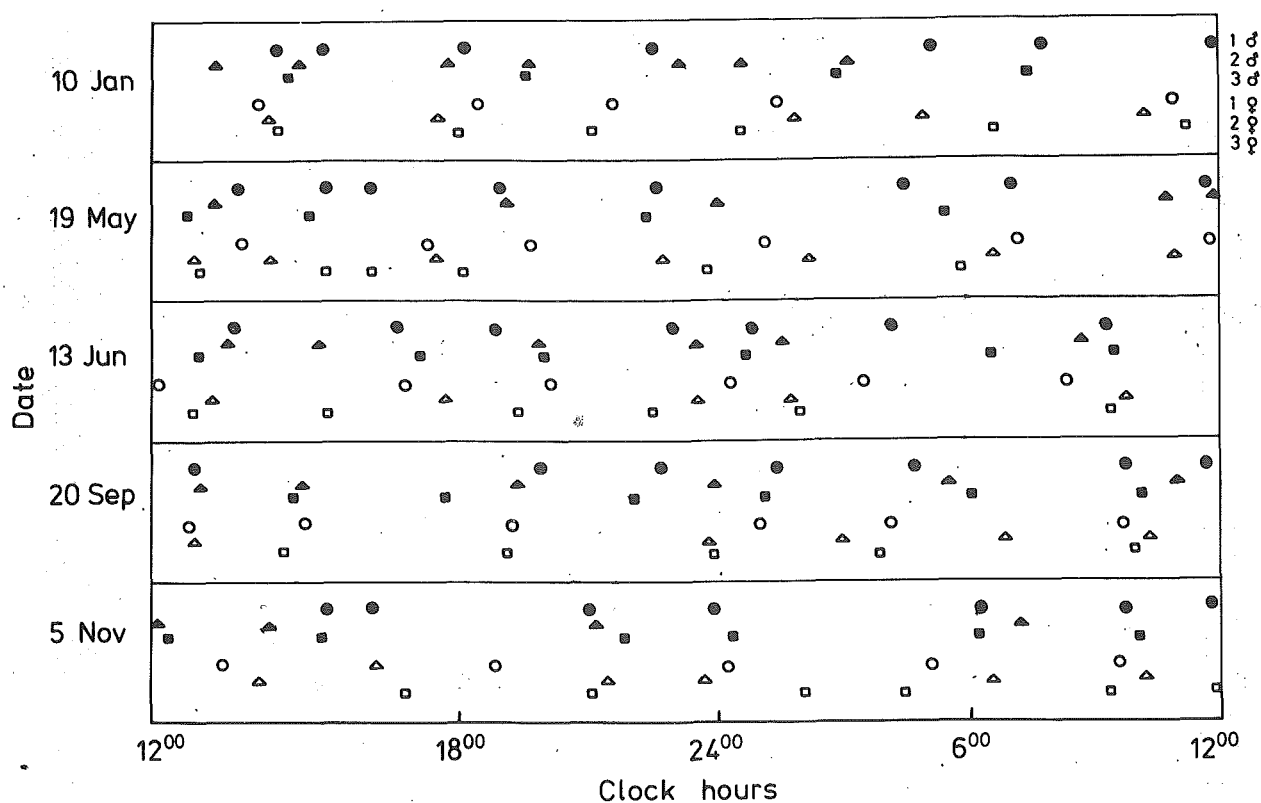


Fig. 6. Defecation times of polecats during a 24-h-period. Five representative days during the year 1984 are presented.

Behavioural patterns

Defecation and urination. No seasonal differences were observable in the defecation (Table 1). Polecats deposited their faeces daily at the same, definite site which was situated in the furthest corner of the cage opposite to the nest. All polecats showed typical defecation behaviour for this species, i.e. the animal pushed its hindquarters towards latrines and raised its tail up. Self defecation was rather fast process lasting for 5-15 seconds. Before defecation the animals regularly sniffed the latrines, and only then turned around and defecated. Distribution of defecation behaviour during a 24 h-period is illustrated in Fig. 6. The animals defecated every 3-5 hours of an average 4-7 times during a 24 h-period. Generally urination occurred in combination with defecation.

Eating. Eating behaviour was concentrated, particularly in winter, on feeding times at about 0800 h a.m. and 1600 h p.m., respectively. Already about half an hour before feeding, the animals generally became »restless« and active. They often peeped around, between carefully listening and walking around the cage. They evidently very eagerly waited for feed. This was most evident during summer. Eating itself lasted generally 5-15 minutes, but the individual variation was rather wide. During summer period the animals spent more of their time while eating than during winter time. However, during winter the feed get frozen very quickly. Thus the animals were forced to eat all feed they wanted just at

the feeding times. It was observed that the animals often sniffed the frozen feed but were not able to eat it.

Drinking. Drinking was concentrated to the warmest summer seasons, although some drinking was observable during late spring (Table 1). Evidently drinking behaviour in spring was involved in high intensity of mating activity because just during this time the animals copulated very actively particularly inside the nest, then quickly slipped out of the nest, layed for a while motionless on the cage floor, then stand up and often licked water. This was most emphasized in males. During winter water was offered to the animals in combination with feeding. However, they did not care about it in general. Any marked snow-eating behaviour, furthermore, was not observed.

Self-grooming. This behaviour did not occur during winter time from November to March (Table 1). When self-grooming, polecats often very eagerly shook up scratched their coat. Generally this behaviour at one time lasted for very short period of time. Self-grooming occurred most commonly just after the animal entered out of the nest. Very often animals slipped out only for self-grooming. Figures like licking and pawing of the coat were rather rare. Face washing often was combined with eating pattern.

Romping and mating process. Romping behaviour was evident throughout the year. However, most

intensively it occurred just during the mating time in March-April. At this time the couples played around together in between hugging and kissing. Then they may run away from each other, soon flirting again and romping together. Great individual variation in behavioural pattern was evident. Romping behaviour did not depend on the time of the day but did occur at daytime as well as at night. During mating season (March-April) activity of the animals markedly increased, and the animals were active also inside the nest. Very often some kind of squeak was firstly heard. Then the whole nest began to shake and swing, after which some bedding material would fly around. For a while male generally slipped out of the nest, and laid motionless limbs stretched on the cage floor. After short period of rest the male jumped back to the nest and the same game started again. Particularly activity intensity of males was at this time high. Copulation process was observed outside the nest. Mating process was rather vigorous, the male grasping the female at the neck and dragging her around. Self the copulation was prolonged lasting at its best for over an hour.

Olfactory communication. As mentioned above, the animals deposited their faeces on particular site called the latrines. Also urination occurred on the same place. Any other scent-marking behaviour in combination with urination or defecation was not observed. Any marking behaviour involving body rubbing and anal dragging were not evident. However, the animals were sometimes found to rub their coat to the cage wall but this seemed to be involved in their self-grooming pattern rather than scent-marking. Animals very often walked around with their head low, sniffing the floor, latrines, feed and also the air. Anal sniffing and neck nuzzling was also particularly evident during the mating time.

Aggression behaviour. Aspects of aggressive behaviour was not very evident between the sexes. Mainly it occurred during mating in March-April, and was involved in copulation process in which the male after short struggle secured a firm hold on the neck of the female and dragging her to and from. Also some kind of »dancing« behaviour was sometimes observed. This already earlier documented (Poole 1967, 1973) pattern is a form of ritual aggression in which the polecat faces its opponent and leaps off the ground, shaking its head while snapping its jaws at the partner.

Sex differences

Males tended to be more active than females, particularly during mating season in spring (Table 1). Also time spent outside the nest for resting was higher in males than in females. However, in such behaviours like defecation, eating, drinking or self-grooming there were no marked sex differences. While eating, females often tended to carry feed inside the nest and eat it there. Stereotypic movement was observed in one male during late autumn. The male moved to and

from the cage side. This lasted at its best 5-10 minutes. However, this stereotypic movement was not a typical pattern but occurred only occasionally.

Discussion

Observations on the daily activity of the polecat in the wild state show that this species is mainly active at night but also reports on hunting behaviour during the daytime are available (Bäumler 1973; King 1977). This nocturnal activity figure is evident also for other wild mustelids species. Bäumler (1973) studied movements of freelifving ermines (*Mustela erminea*) and polecats. His results indicated that polecats were usually active during nights. Ermines were similarly active during winter nights but their activity was shifted from night to daytime at the beginning of March. Nocturnal activity pattern is typical also for freelifving mink (Gerell 1969, 1970; Marshall 1936). Under farm conditions, on the other hand, it has been noticed that, for instance, daily activity of farmraised mink differ from that of wild one (Klochkov 1965, 1966). As in the present study, also activity peaks of ranch minks were confined to the time of feeding. Their activity, furthermore, seemed to be changed more acyclic and diurnal under farm conditions (Klochkov 1966). Gerell (1970) observed activity pattern of freelifving ranch mink, and found that activity pattern was characterized by short bursts of activity periods alternating with rest periods spent inside the nest. The freelifving ranch mink was more dayactive than night-active whereas the wild minks were typically nocturnal. Besides that daily activity was rather evenly distributed throughout the day there were two clear peaks in the activity of freelifving ranch mink. The activity peaks were concentrated at 7-8 h a.m. and 17-18 h p.m., i.e. just with the time of feed supply on the farm. Under farm conditions, Klochkov (1965, 1966) noticed the same phenomenon in farmed minks. This was evident also in the present study for the polecats. Thus it is obvious that in captive animals circadian activity profile differs from that of wild animals in a looser relation to environmental conditions. Nocturnal pattern in the nature is evidently adaptation to availability of prey but also aimed to avoid possible enemies. Under farm conditions, however, times of feed supply serve as the timers for the circadian clocks.

The polecats exhibited rather acyclical behavioural patterns. It has been found a relationship between cyclicity and both basal metabolic rates and feeding patterns, particularly in rodents (Baumgardner *et al.* 1980). Acyclic patterns appear to be related to high energy requirements, feeding throughout the day, and a moderately cold environment. This conclusion mainly holds true also for the polecats. Polecats - like many other mustelid species - pay a high energetic costs of being long and thin because they have to sustain higher rates of basal metabolism than the other mammals of the same body weight (Brown &

Lasiewski 1972). On the other hand, elevated energy requirements have additional ecological consequences in the wild state. It selects for the ability to be active a great number of time which results in a great number and variety of prey items which may be encountered.

High number of defecation, firstly, revealed that high rate of passage of feed through the digestive tract of the polecat is a marked behavioural regulator for this species. Even in winter polecats were forced to come out of the shelter of nest only for defecation and urination 4-7 times a day. The rate of food passage, on an average of 3 hours, for polecat, ferret and mink is considerably shorter than that of most other monogastric species (Sibbald *et al.* 1962; Clemens & Stevens 1980). These mustelids have a relatively short digestive tract of small capacity. Their intestinal tract is only four times the body length (Sibbald *et al.* 1962). This is in agreement with their behavioural characteristics of numerous small meals throughout the day (Charlet-Lery *et al.* 1981). High number of defecation behaviour, secondly, could to some extent be involved in their scent-marking behaviour. This was supported by the fact that the animals generally sniffed the latrines before defecation. Occasionally they also sniffed faeces after defecation. It was also noticed that the male would sniff the anus and faeces of the female when the female was defecating. Both females and males were found to defecate to same, particular place. Also Lockie (1960) noted that wild polecats typically deposited urine and faeces at specific spots in their territories. Faeces and urine, deposited on particular places, have been found to be used in the scent communication in wild stoats and weasels (Erlinge *et al.* 1982). Such marking behaviour seems to be important in the maintenance of territories and convey information among individuals in a rank order. Under farm conditions, however, polecats are often housed so that male and female are put together into the same cage. Erlinge *et al.* (1982) reported that tin the stoat dominant animals had a higher scent-marking frequency, and that males always were dominant to females. In the present study, however, there were no marked differences in defecation between the sexes. Thus it seems obvious that social dominance or rank order in farmed polecats cannot be estimated by their defecation and urination behaviour, or that there are no social dominance between sexes under farm conditions.

When the behavioural profile of our farmed polecats are compared to those observations achieved from wild and captive polecats (Eibl-Eibesfeldt 1955; Bäumler 1973; Lazar & Beckhorn 1974; Poole 1966, 1967, 1972, 1973, 1974; King 1977; Weiss-Bürger 1981), it is evident that many characteristic features are evident also under farm conditions. For instance aggressive behaviour, however, which is perhaps the best documented for this species among mustelids, did not

play any marked if any role in the animals studied. Features of aggressive behaviour were observed mainly during mating time in spring. However, the other forms of aggressivity like ritual aggression and agonistic behaviour described by Poole (1967, 1973) occurred very seldom. In the present study the female and male were housed in the same cage which possibly tends to reduce aggressions between them. In the wild state the situation is different because animals meet each other rather occasionally. No hunting behaviour, furthermore, were observed in the present study. Under farm conditions there is no need for this behavioural pattern because the animals are fed by the farmer.

Acknowledgements

The authors wish to acknowledge Miss Riitta Tirkkonen, Mrs. Leila Venäläinen, Mr. Kari Kälviäinen, Mr. Veijo Putkonen and Mr. Toivo Korhonen for their assistance in carrying out these experiments. Thanks are also due to the staff of Department of Applied zoology for understanding, support and good care. Financial support for this investigation was provided by the Finnish Research Council for Natural Sciences and by Alfred Kordelin Foundation.

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Original Report

Breeding Properties of Mink after Relocation from the Southern to the Northern Hemisphere

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Summary

Two imports of mink from Argentina to Hungary have shown the difficulties in relocation of mink from one hemisphere to another.

Imported 6 weeks old minkkits was delayed 1 year in development whereas imported pregnant females was able to give 2 births the same year.

The results are raising both theoretical and practical perspectives.

Objective

During the last years there was an increasing interest in establishing mink breeding at geographical locations, which are completely different in climatic and other properties from the natural geographical occurrence of minks. In this way minks, which are typical inhabitants of the northern hemisphere were successfully bred by the Garcia Mata Mink Farm at the southern hemisphere in La Plata, Argentina.

Import from the southern to the northern hemisphere possess serious problems to the new breeder due to the difference in the breeding period. In our experiments described below, we tried to answer to basic questions which arise after such a reacclimatization import. First of all does the mink, which is commonly known as a monoestral species require 12 months between subsequent breeding cycle, or the change of environmental conditions can induce a second successful ovulation cycle within a year? Second, which are the most effective technical conditions to achieve the best possible production rate with minimal time delay?

Materials

Our reacclimatization experiments were performed in two steps in our fur farm in Szód (close to Budapest, Hungary), where foxes, fitches, minks and chinchillas have been bred for 5 years.

In the first step we had imported 6 months old minks of wild type color in April 1982 from Argentina (Garcia Mata Farm, La Plata). Due to the opposite seasonal arrangement on the southern hemisphere the breeding period in Argentina in the fall. the peak of births is in October. In April the imported animals

were in the fur developing phase. The hot hungarian summer, with +30° C maximums already in May posed serious threat to the animals.

Although there was no loss but the fur changing process was disturbed. No production was achieved naturally in the first year, because there is no heating after April under our geographical conditions, During this first year, however the acclimatization of the animals was fully achieved as proved by the average production rate for March 1983.

This one year production delay was very disadvantageous economically.

In the second step of our experiment performed in cooperation with the unipropel Co. (Argentina) we tried to overcome this difficulty by importing 70 pregnant females. The animals were transported to Hungary by flight from the Garcia Mata Farm on 18th of October 1984. Birthings were between 22nd of October and 1st of November. 67 females (96 per cent) had produced litter, 3 were empty (4 per cent). Due to insufficient milk production 18 females (26,8 per cent) could not feed the offsprings. The number of born kits were 359 (5,13/female) and the number of weaned kits were 288 (4,11/female).

Conditions of experiments

The animals were fed with slaughter house wastes completed with fish meal. The scandinavian type mink cages were placed in pavilons covered with thick walled plastic foil and protected at both ends with straw bales.

The temperature during the deliveries were between +2° C and +14° C.

From the fifth day after the first birth we had applied 12 hours artificial lightening with 60 W light bulbs/sq m² up to the weaning at the 42nd day.

10-14 days after the deliveries the outer temperature suddenly dropped to ÷14° C.

The inner microclimate was stabilized around ÷2 to +5° C by warm air perfusion.

After the weaning the mothers during a 10 days adaptation period were transferred to normal scandinavian type mink cages located in pavilons. This transfer was performed at 20th of December.

To improve the condition of mothers the feed was supplemented with 4 per cent glucose together with extra vitamine B complex and iron (Fe-fumarát).

During the first production cycle 5 females were lost due to pneumonia and liver degeneration.

Thus the second cycle in January of 1985 was started with 65 females. The artificial lightening for the adult females was stopped at 20th of December. This lightening was, however, continued for the youngsters till the 1st of February in order to improve the feeding. Subsequently the adult females were kept under the same conditions as our own fully acclimatized mink stock.

No difference was observed between the beginning of heating to the imported females compared with our fully acclimatized own mink stock, which was used as a control group.

Mating was performed between 4th and 25th of March. 40 out of 65 females were mated (62 per cent) and among these single mating was for 13 females (32 per cent) double mating was for 23 females (58 per cent) and triple mating was for 4 females (10 per cent).

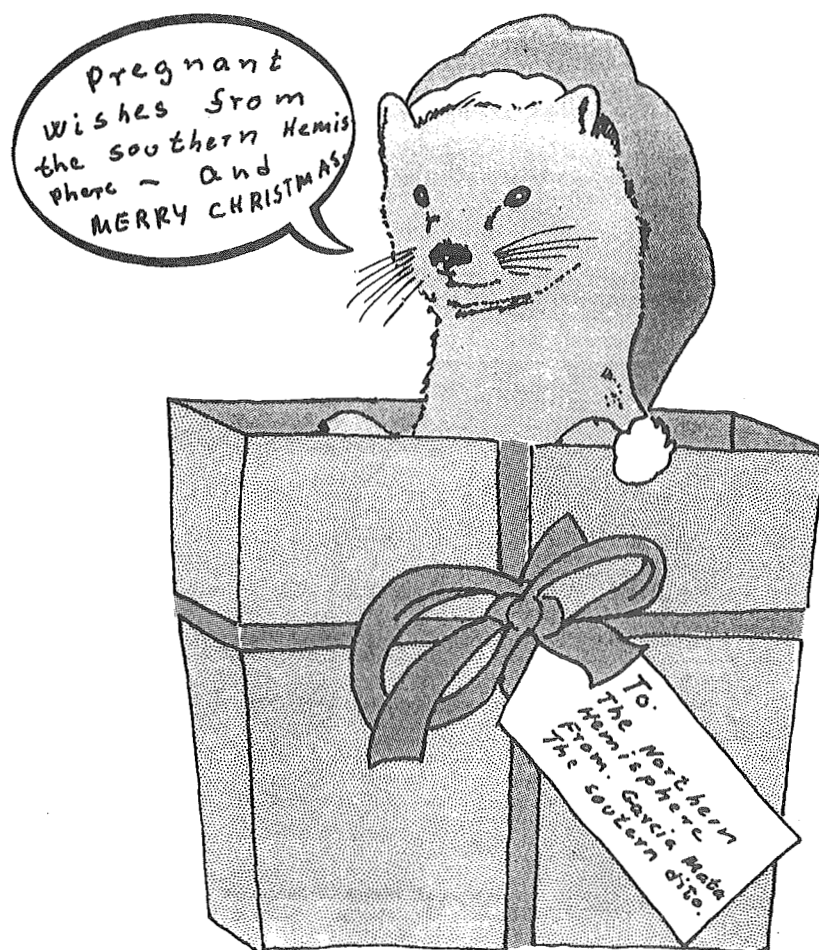
Borning were between 24th of April and 12th of May. 6 of the 40 mated females remained empty. The total number of kits were 113 (1,74/total female); (2,83/mated female) and 102 of this 113 kits are still alive (1,57/total female); (2,55/mated female).

The litters are normally developed and the condition of the females are good.

Conclusions

1. Our assumption about the sharp distinction between the reproduction mechanisms of mono-oestral and dioestral species probably has to be revised.
2. Under special conditions as import, possible new mutations etc., two cycle productions are theoretically possible under one year. Further investigations are needed to follow the gate of the subsequent cycle and the useful lifespan of the breeding stock.

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HOUSING EXPERIMENTS WITH BLUE FOXES IN 1984.

(Lyförsök med blåräv).

Stig Moss, Göran Östberg.

After mating, the cages of 39, 40 and 46 blue fox female at Maxmo were provided with a standard wooden nest box, a wooden nest box with an entrance tunnel, or a wooden nest box similar to that used for silver foxes. In the 3 groups resp., the percentage of female with no cubs 7 days after whelping averaged 39, 25 and 17, the percentage of female with no cubs on 30 June 41, 28 and 22, and the number of cubs on 30 June per female whelping 5.36, 7.25 and 7.26. The differences between group 1 and the other 2 groups were significant.

Finsk Pälstidskrift, 19, 2, 120-121, 1985.

1 table, 3 photos.

In SWED.

CAB-abstract.

EXPERIMENTS WITH STRAW FOR MINK.

(Ströförsök (mink)).

Stig Moss, Göran Östberg.

For 71 mink females whose nest boxes were lined with oat straw (controls), the number of kits born per mated female and the percentage of females with no kits in 1983 averaged 2.8 and 37% resp. vs. 3.6 and 24% for 72 females whose nest boxes were lined with wood shavings (experimental group). In 1984, the percentages of females with no kits 7 days after parturition, on 30 May and on 30 June were 16, 17 and 18 resp. in 94 controls vs. 14, 14 and 16 in 81 experimental females, and the number of kits per female whelping averaged 4.34, 3.81 and 3.78 on the 3 dates vs. 3.74, 3.70 and 3.64.

Finsk Pälstidskrift, 19, 2, 124, 1985.

2 tables.

In SWED.

CAB-abstract.



HOUSING YOUNG SABLES IN SMALL CAGES.

Молодняк соболей в уменьшенных клетках

A.V. Ryslyakov, K.I. Bobryshev, I.I. Bannov.

120 sables, aged 1 year, were each housed in cages with a floor area of 3240 cm² (experimental group) or 5670 cm² (controls). For males housed in the 2 types of cage, body weight in autumn averaged 1268 and 1258 g resp., vs. 951 and 939 for female, the difference between the 2 types of housing being non-significant.

Krolikovodstvo i Zverovodstvo, 6, 7, 1981.

1 Table.

In RUSS.

CAB-abstract.

DARKENED SHEDS FOR MINK.

В затененных шедрах

Yu. D. Koveshnikov.

Data were obtained on Standard, Sapphire and Socklot Pastel males and females allowed natural light from 20 June to 20 Sept. (group 1), natural light from 20 June to 20 July and natural light plus 8 h of artificial light daily from 20 July to 20 Sep. (group 2), and artificial light for 24 h daily from 20 June to 20 July and natural light plus 8 h artificial light daily from 20 July to 20 Sep. (group 3). The animals were cropped at the beginning of Nov. (group 1) or at the beginning of Oct. (groups 2 and 3). For the 3 colour types resp., body weight of males averaged 2051, 1828 and 2158 g in the 1st group, 2150, 2051 and 2143 g in the 2nd, and 2201, 1983 and 2282 g in the 3rd. Corresponding body weights for the females were 1176, 1031 and 1290 g for the 1st group, 1201, 1068 and 1155 g for the 2nd, and 1189, 1013 and 1235 g for the 3rd. The distribution of sizes, and prices obtained, among groups and colour types indicated and increased rate of pelt development in the 3rd group.

Krolikovodstvo i Zverovodstvo, 4, 19, 1984.

3 Tables.

In RUSS.

CAB-abstract.



THE EFFECT OF GENETIC AND ENVIRONMENTAL FACTORS ON THE DENSITY
OF FUR IN VEILED ARCTIC FOXES.

ВЛИЯНИЕ ГЕНЕТИЧЕСКИХ И ПАРАТИПИЧЕСКИХ
ФАКТОРОВ НА ГУСТОТУ ОПУШЕНИЯ ВУАЛЕВЫХ
ПЕСЦОВ

G.M. Diveeva, A.V. Sobol, N.P. Shelina.

For 77, 48 and 33 male cubs weighing 64-85, 86-98 and 100-119 g resp. at birth, primary follicle density (per mm² skin area) averaged 46, 45 and 44; at cropping, for males weighing 5-6 or more than or equal to 7 kg, the number averaged 2.8 and 2.5. For 22 cubs from litters of 5-9 cubs, and 2 cubs from litters of more than or equal to 11, birth weight averaged 90.3 and 87.5 g resp., the number of primary follicles (per mm²) 45.7 and 44.6, body weight at cropping 6.4 and 6.4 kg, the number of primary follicles at cropping 3.0 and 2.9, and the number of secondary follicles 145 and 140. The h² of primary follicle density at birth was 0.74 plus or minus 0.24, 0.69 plus or minus 0.16 and 0.48 plus or minus 0.28 for cubs born in 3 consecutive year, the corresponding h²s at cropping were 0.71 plus or minus 0.20, 0.73 plus or minus 0.20 and 0.27 plus or minus 0.31. For cubs born at the beginning, in the middle and at the end of May, birth weight averaged 82.6, 86.6 and 90.2 g resp., the number of primary follicles per mm² 46.7, 43.7 and 46.7 at birth and 2.9, 2.8 and 2.8 at cropping, body weight at cropping 6.7, 6.4 and 6.9 kg, and the number of secondary follicles per mm² at cropping 135, 126 and 144.

Nauchnye Trudy, Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva i Krolikovodstva, 26, 90-95, 1981.

4 tables, 4 references.

In RUSS.

CAB-abstract.

THE MORPHOLOGY OF THE COLOUR ZONES OF UNDERCOAT FIBRES
IN VEILED ARCTIC FOXES.

МОРФОЛОГИЯ ЗОНАЛЬНОСТИ ОКРАСКИ ПОДПУШИ
ВУАЛЕВЫХ ПЕСЦОВ

G.M. Diveeva, T.G. Novikova, N.P. Shelina.

Data were obtained on 92 fur samples with 5 grades of colour intensity. For the 5 grades (best to poorest) resp., the percentage of pigmented hairs at the base of the sample (the remaining hairs being white) aver-

aged 21.1, 18.2, 12.7, 4.9 and 1.1, and the percentage at the tip 14.2, 11.2, 8.4, 3.1 and 0.6. The length of undercoat hairs in the base layer of the sample averaged 25.6 mm, and the length of the undercoat hairs forming the top layer (approx. 40% of all undercoat hairs) 44.4 mm. The length of pigmented hairs averaged 42.7 mm vs. 44.4 for white hairs. For 170 long-haired, 421 medium-haired and 211 short-haired animals, guard hair length was 66-88, 51-65 and 38-50 mm resp., the top-layer undercoat hair length 42-64, 36-50 and 30-47 mm, and the width of the dark zone at the base 19-38, 27-32 and 15-35 mm. The correlation of the lightness of blue colour with the width of the zone at the tip of the hair was 0.72 for the light blues, 0.24 for the medium blues and 0.28 for the dark blues.

Nauchnye Trudy, Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva Krolikovodstva, 26, 86-89, 1981.

2 tables, 3 references.

In RUSS.

CAB-abstract.

THE DENSITY OF GUARD HAIRS IN ARCTIC FOXES.

ФОРМИРОВАНИЕ ГУСТОТЫ ОСТИ У ПЕСЦОВ

G.M. Diveeva, A.V. Sobol, N.P. Shelina.

Skin samples were obtained at 2 days of age and at slaughter from arctic foxes born over a 3-year period at a fur farm. In 111 cubs, the density of primary follicles averaged 46/mm² skin area for males weighing 64-85 g at birth, 45.5/mm² for males weighing 86-99 g, and 44.0/mm² for males weighing 100-118 g. At slaughter, the density was 2.75/mm² for males weighing 5.0-5.9 kg, 2.50/mm² for males weighing 6.0-6.9 kg, and 2.42/mm² for males weighing more than 6.9 kg. The correlation of the density of guard-hair follicles with body weight was -0.51 at birth, and 0.24 at the end of the growth period. The correlation of the increase in skin area with the decrease in primary follicle density was 0.97. The correlation of the increase in body weight with the increase in skin area was 0.68. The h² of fur density at slaughter was 0.69-0.73, 0.71-0.73 and 0.27-0.42 in the 3 yr, and the h² of the density of primary follicles was 0.48-0.73.

Krolikovodstvo i Zverovodstvo, 6. 14-15, 1982.

In RUSS.

CAB-abstract.

ACCELERATED MATURATION OF THE COAT IN THE ARCTIC FOXES.

Об ускорении созревания

G.A. Kuznetsov, A.V. Yakovenko.

70 arctic foxes (14 per group) were transferred to a windowless shed and allowed 8-h light daily from 1 or 15 July or 1 or 15 August, or were allowed natural daylight (controls). The animals were killed on 3 October, 4 October, 17 October, 1 November, or 17 November when their body weight averaged 6.38, 6.79, 6.46, 6.64 and 7.07 kg resp. The percentage of pelts with the highest undercoat density (5 points of scale) was 54.5, 21.4, 6.15, 63.6 and 72.7 resp., and the percentage of Class 1 pelts was 63.6, 42.8, 84.6, 90.9 and 90.9.

Krolikovodstvo i Zverovodstvo, 2, 16-17, 1980.

2 tables.
In RUSS.

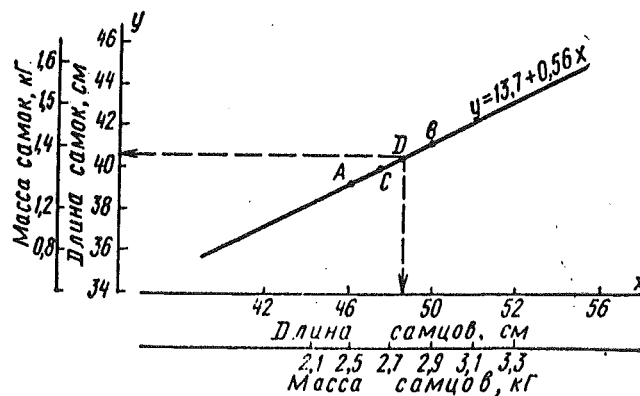
CAB-abstract.

PREDICTING BODY MEASUREMENTS OF MINK.

ПРОГНОЗИРОВАНИЕ РАЗМЕРА НОРОК

G.A. Kuznetsov, S.A. Mashtak.

A graph is given, based on data obtained at a multiplier farm, relating body length of males with that of females, and the relationship was used to predict the body length of offspring.



Соразмерность величины тела у самцов и самок норок

Krolikovodstvo i Zverovodstvo, 2, 16-17, 1982.

1 table, 1 fig.

CAB-abstract.

In RUSS.

BODY WEIGHT OF MALES AND THE QUALITY OF OFFSPRING.

**МАССА САМЦОВ И
КАЧЕСТВО ПОТОМСТВА**

M.K. Makhmudov.

Female nutrias (200 and 80 in 2 groups), aged 14-15 months and weighing 4.5-5.0 kg, were mated with males with an av. body weight of 5.6 kg (1st group of females) or 8.5 kg (2nd group). The age of males was 26-28 months, and mating ratio was 1 male: 8 females. For the 2 types of mating, body weight of offspring at 3 days of age averaged 186 and 231 g resp. in litters of 3 pups, 175 and 217 g in litters of 4, 164 and 191 g in litters of 5, and 160 and 186 g in litters of 6. Corresponding body weights at 60 days were 1015 and 1175 g, 978 and 1100 g, 880 and 1030 g, and 803 and 965 g. For male offspring from litters of 5-6 pups, slaughtered at 11 months of age, body weight averaged 4372 and 4968 g in the 2 progeny groups, dressing percentage 52.2 and 56.5, and pelt area 2080 and 2440 cm².

Krolikovodstvo i Zverovodstvo, 3, 13, 1982.

2 tables.

CAB-abstract.

In RUSS.

FARMED RACCOONS.

ЕНОТ-ПОЛОСКУН

E.I. Ryminskaya.

For 14 females and 15 males captures in 1979, body weight averaged 2.3 kg at transfer to a fur farm in autumn, 4.8 and 5.8 kg resp. for the 2 sexes in the following April, and 7.2 and 9.5 kg in November. For the young (an average of 7 litters), body weight averaged 2.2 kg for females and 1.8 kg for males at weaning in August, 3.3 and 2.7 kg in September, 4.9 and 4.4 kg in October, and 5.9 and 5.3 kg in November. Whelping occurred at the end of April to the beginning of May, and litter size averaged 2.5.

Krolikovodstvo i Zverovodstvo, 5, 21, 1982.

2 tables.

CAB-abstract.

In RUSS.

INCREASING THE QUALITY OF PELTS IN RACCOON DOGS.

Работа над повышением качества шкур

N.I. Synnikov.

For 61 matings between orange-coloured raccoon dogs, 185 matings between orange/silvery animals, and 254 matings between silvery animals, the percentages of offspring of different colours was as follows: orange, 37.8, 4.3 and 1.6 resp.; orange-orange/silvery (an intermediate type between orange and orange/silvery), 26.2, 15.7 and 7.1; orange/silvery, 21.3, 37.8 and 21.3; orange/silvery-silvery, 13.1, 33.0 and 35.4; silvery, 1.6, 9.2 and 34.6. For matings of animals classified as free of the broken fibre defect (5 points), and for matings of classes 5 x 4 and 5 x 3 (both 4 and 3 having a degree of the defect), the percentage of class 4 was 32.8, 52.1 and 45.8, and the percentage of class 3 was 11.6, 13.8 and 22.2.

Krolikovodstvo i Zverovodstvo, 5, 16-17, 1982.

In RUSS.

CAB-abstract.

THE TIME FOR CROPPING FEMALE NUTRIAS FOR PELTS FOLLOWING LACTATION.

О сроках убоя на шкурку самок нутрий после лактации

G.A. Kuznetsov, N.A. Tsepkova, A.V. Shapovalov.

Cropping young females after weaning their 1st litters may result in a lower grade for pelts due to bare patches around teats. For 22 first-parity females, each weaning 2-9 young aged 62 days, bare patches measured 1-12 cm² at weaning; 2 weeks later, 7.7% of the patches were covered with a full growth of coat and 39.8% were covered in some growth of coat, and 1 month after weaning the corresponding percentage were 82.3 and 17.7. Of 71 females destined for culling, 33 were slaughtered 1 month after weaning in winter, and 28 were slaughtered 1 month after weaning in summer. For the 2 batches resp., the percentage of pelts without bare patches was 96.7 and 94.6.

Krolikovodstvo i Zverovodstvo, 5, 16-17, 1982.

1 table. In RUSS.

CAB-abstract.

**EFFECT OF AIRCRAFT NOISE ON LOSSES AMONG FARMED MINK DURING
AND AFTER PARTURITION.**

**(Untersuchungen über den Einfluss von Fluglärm auf die peri- und
postpartalen Verluste beim Farnnerz (*Mustela vison f. dom.*)).**

Wilfried Brach.

In the spring of 1983 a study was conducted in order to determine the imaginable effects of the noise of aircraft on the behavioural sequence and reproductive performance of farm-raised minks.

Ninety-six two year old female standard-minks were individually identified and then allotted randomly into two groups of forty eight animals each. The same commercial breeder applied a similar breeding management to both groups of minks.

The minks to be tested were influenced by thirty-six direct fly-over events by an F 4 F "Phantom" jet during pregnancy. Another sixty direct fly over events of a helicopter (BO 105) took place just before, during and after whelping.

On May 2, when more than sixty per cent of the females had whelped, the minks to be tested were subjected to the simulated landing approach of a helicopter right about the mink-shed.

The other group was kept at the control farm without being influenced by such intensiv aircraft noise.

The following parameters concerning the aircraft noise were recorded:

- noise of pressure level
- range of frequency
- slope of the signal
- duration of the effect.

The effect of the fly-over events on the minks was evaluated by use of video-techniques.

The reaction of most female minks appeared to be brief and of little consequence to on-going behaviour. The effects concerning type and intensity of the reaction did not differ from noise caused by the daily routine of feeding or filling up the water bowls. No general panic within the test-group was noted.

The minks were obviously showing favour to optical stimulus in the way of showing objects orientation. Necropsy and bacterial examinations of whelps that died during the experiments gave no evidence that the ways of their deaths and their causes were induced by exposure to aircraft noise. Reproduction in the test-group and the control group, which was not influenced by aircraft-induced noise could be considered normal.

Inaugural Dissertation, Tierärztliche Hochschule, Hannover, 161 pp, 1983.
18 pp of references.

In GERM.

Author's summary.

EUTHANASIA OF MINK WITH CARBON MONOXIDE.

E. Lambooy, J.A. Roelofs, N. van Voorst.

Mink placed in a box and forced to inhale carbon monoxide developed some convulsions, but only after the onset of unconsciousness, as shown by electronencephalography, and the onset of unconsciousness was sooner than with filtered exhaust gases. Mink forced to inhale filtered exhaust gases developed excitation and considerable convulsions during a phase of decreased consciousness. Pure carbon monoxide is recommended for the euthanasia of mink.

Veterinary Record, 115, 14, 416, 1985.

1 table, 5 references.

CAB-abstract.

BODY WEIGHT GAINS, DIGESTIBILITY OF FEEDS, RATIONS AND CHOSEN HEMATOLOGICAL INDICES OF GROWING POLAR FOXES GIVEN RATIONS WITH ADDITION OF FEEDS PRESERVED WITH FORMALDEHYDE.

(Przyrosty masy ciała strawność składników pokarmowych dawki i wybrane wskaźniki hematologiczne rosnących lisów polarnych, żywionych karmą z dodatkiem pasz konserwowanych formaldehydem).

Henryk Bieguszewski.

The respective experiments were carried out on 48 clinically healthy polar foxes, divided into 3 groups. The 1st group (control) was given standard ration, in which 60% constituted feeds of animal origin. The 2nd group fed the ration, in which 30% of fresh or frozen meat-fish was substituted by the meat-fish feed preserved with formaldehyde. The 3rd group was

fed the ration, in which 60% of meat-fish feed was substituted by the feed preserved with formaldehyde.

Polar foxes took willingly in the rations with addition of preserved feeds. The substitution in the ration for foxes 30 og 60% of feeds of animal origin by the meat-fish feed preserved with formaldehyde did not exert any negative influence on the body weight gains. No worsening of digestibility of constituents of the ration containing the perserved feed has been observed.

Results of the investigations of hematological indices suggest that the feed preserved with formaldehyde does not affect negatively the health of foxes. The commercial values of skins of the foxes of experimental groups approximated the value of skins obtained from control animals.

Roczniki Nauk rolniczych, B, 102, 3, 111-120, 1984.

4 tables, 17 references.

Author's summary,

In POLH. Summany in ENGL, RUSS.

SEASONAL CHANGES IN THE HAEMATOLOGICAL INDICES IN PERIPHERAL BLOOD OF CHINCHILLA (CHINCHILLA LANIGER L.).

K. Jakubow, J. Gromadzka-Ostrowska, B. Zalewska.

1. Changes in nine haematological indices in adult female and male chinchilla were investigated over a period of 18 months.
2. All haematological values were in the same range both for females and males, although seasonal fluctuations were more evident in the females.
3. High levels of the red blood cells count (RBC), haemoglobin concentration (Hb), mean cell haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) during the winter months and low levels of these parameters during the summer months were found.
4. The white blood cells count (WBC) and lymphocyte number (L) also decreased in summer, their values increasing during autumn and spring.



5. The haematocrit values (Ht) and mean celled volumes (MCV) are high during the summer and low during the winter.

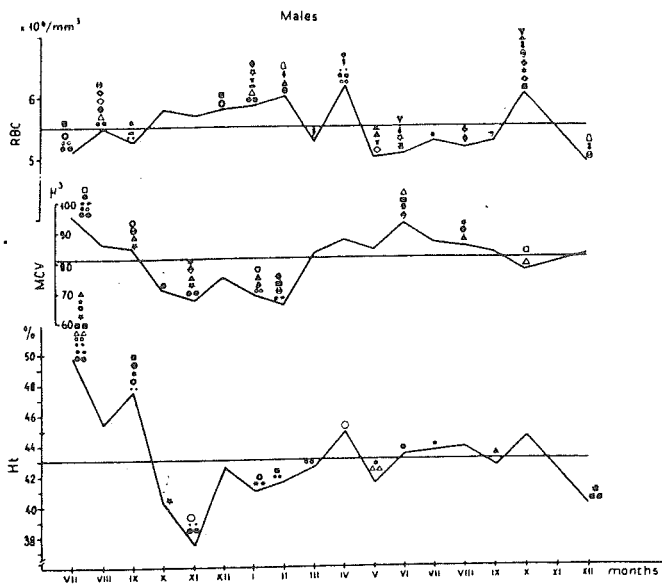


Fig. 2. Fluctuations in RBC count, mean corpuscular volumes and haematocrit values in *Chinchilla laniger* males in relation to the season. Explanation of symbols, see Fig. 1.

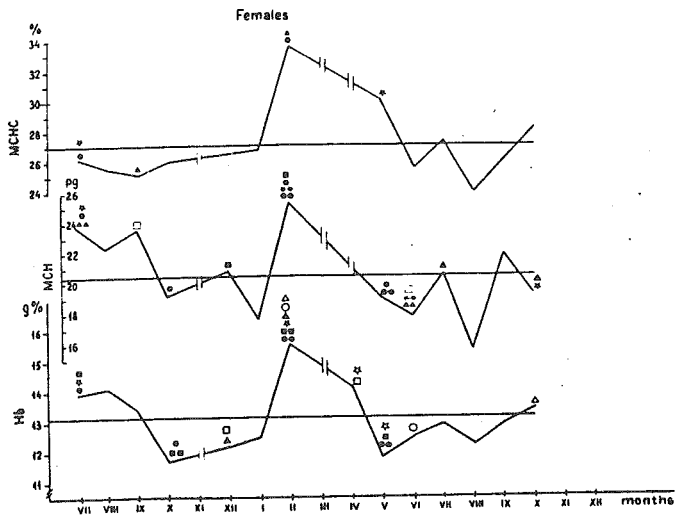


Fig. 3. Fluctuations in haemoglobin concentration, MCH and MCHC in *Chinchilla laniger* females in relation to the season. Explanation of symbols, see Fig. 1.

Comp. Biochem. Physiol. 78A, 4, 845-853, 1984.

1 table, 6 figs., 36 references.

Authors' abstract.

DIFFERENTIAL INVESTMENT BY FEMALE COYPUS (*MYOCASTOR COYPUS*) DURING LACTATION.

L.M. Gosling, S.J. Baker, K.M.H. Wright.

This review of a long-term investigation of feral coypus (*nutria*) includes an account of work on 20 wild-caught, pregnant females kept in captivity until they littered. The surviving male offspring were about 8% heavier than females at birth (males, 224 plus or minus 44 g; females, 208 plus or minus 47 g).

Lactation, which lasted for 7.7 plus or minus 1.0 wk in the wild, lasted for 10-14 wk in captivity. The food consumption of a sample of lactating females was 63% higher than that of non-lactating females. Lactating females did not intervene directly in the access of their offspring to teats. Overall, juveniles preferred those teats which, on average, were supplied by the largest glands, and which presumably had the highest milk yield. Within each litter, male offspring spent relatively more time sucking from the highest yielding teat (the 2nd) and females relatively

more from the lowest yielding teat (the 4th). Thus, males seemed to obtain more milk, and this appeared to be because there was a difference between the sexes rather than because some males were bigger than females. There was no evidence that intrasexual weight rank influenced access to teats. Males grew faster than females throughout lactation and weaning. They appeared to have an intrinsically higher growth potential, which was realised when the food supply was particularly abundant. Males grew most quickly, relative to females, in wk 2-4 of lactation, when the milk supply was high in relation to requirements, and after about week 7, when unlimited solid food formed a high proportion of the diet.

Male growth was negatively influenced by litter size; the slower growth rate of females was not affected in this way. Within each sex, weight at weaning was significantly correlated with birth weight (0.55 in males and 0.75 in females).

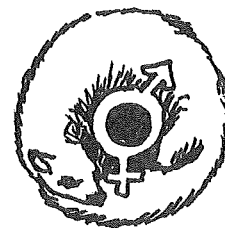
Parental Investment by Female Coypus



Symp. zool. Soc. Lond. 51, 273-300, 1984.

5 figs., 10 tables, 43 references.

CAB-abstract.



GENETICS AND EVOLUTION OF THE LPM SYSTEM IN
THE DOMESTIC MINK.

V. NEW ALLOTYPES Lpm11 and Lpm12 AND TWO CATEGORIES OF
THE GENES IN THE Lpm FAMILY.

ГЕНЕТИКА И ЭВОЛЮЦИЯ Lpm-СИСТЕМЫ
АМЕРИКАНСКОЙ НОРКИ
СООБЩЕНИЕ V. НОВЫЕ АЛЛОТИПЫ Lpm11 И Lpm12
И ДВЕ КАТЕГОРИИ ГЕНОВ В СЕМЕЙСТВЕ Lpm

O.K. Baranov, D.K. Belyaev, T.V. Kut'yavina, M.A. Savina, V.I. Yermolaev.

Two new allotypes Lpm11 and Lpm12 of the Lpm system in the mink serum are described. Lpm11 has not been helpful in discovering more genotypes and phenotypes, in addition to already known, 36 and 22, respectively. As a result of identification of the Lpm12, it became possible to differentiate minimum 25 Lpm phenotypes, instead of 22. The Lpm11 gene is present in seven haplotypes, and the Lpm12 gene - in five of eight haplotypes of the multigene Lpm family. These haplotypes look at present as follows: Lpm^{6,8,10,12}, Lpm^{4,6,8,9,10,11,12}, Lpm^{4,6,7,9,10,11,12}, Lpm^{3,4,6,8,9,10,11,12}, Lpm^{1,6,8,9,10,11}, Lpm^{1,2,6,7,10,11}, Lpm^{4,9,11,12} and Lpm^{2,4,5,7,9,10,11,12}.

The antigenic specificity of Lpm11 was found in all individual blood serum samples taken from eleven species closely related to domestic mink and from the interspecific hybrids of Mustelidae, the Lpm12 antigen being not observed in the same serum samples. The data obtained suggest that the genes of new allotypes belong to different categories of genes of the Lpm family. Lpm¹¹ gene as well as the Lpm⁶, Lpm⁹ and Lpm¹⁰ genes, represents the category comprising relatively conservative genes with monomorphic or almost monomorphic population penetrance in all Mustelidae species studied. Lpm¹² gene seems to be related to another category, including Lpm¹, Lpm², Lpm³, Lpm⁴, Lpm⁵, Lpm⁷ and Lpm⁸, whose members are phenotypically only expressed in domestic mink and cause almost all types of genotypic variability for the Lpm system.

Genetika, USSR, 20, 7, 1190-1204, 1984.

3 figs., 4 tables, 2 references.

Authors' summary.

In RUSS. Summary in ENGL.

INTERSPECIFIC ANTIGENIC VARIATION OF SERUM PROTEINS IN
THE FAMILY MUSTELIDAE (CARNIVORA).

МЕЖВИДОВАЯ АНТИГЕННАЯ ИЗМЕНЧИВОСТЬ
СЫВОРОТОЧНЫХ БЕЛКОВ В СЕМЕЙСТВЕ
MUSTELIDAE (CARNIVORA)

D.K. Belyaev, O.K. Baranov, I.I. Fomicheva, S.I. Smirnych, D.V. Ternovsky,
Ju G. Ternovskaya.

Interspecific antigenic differences by five-six proteins characterized by the highest rate of evolution in particular immunoglobulin, G, α_2 -macroglobulin, Lpm-lipoprotein, were found using the rabbit intersera against the blood sera of the sable, European mink and polecat. The fact of step-like change of the IgC structure in the domestic mink and, partially, in the sable which can be interpreted as a result of activation of the immunoglobulin genes in phylogenesis. The serological closeness was confirmed for the sable and domestic mink, the European mink and Siberian mink, as well as the remoteness of the European mink from the domestic one, and a weak differentiation of the stoat from the solongoy has been shown.

Zoologicheskii zhurnal, Moskva "Nauka", 63,6, 912-922, 1984.

6 figs., 24 references.

Authors' summary.

In RUSS. Summary in ENGL.

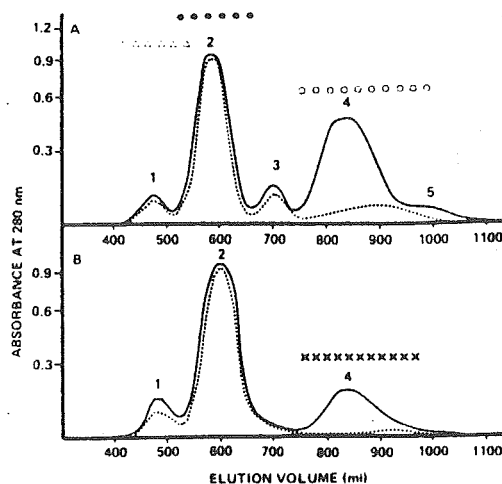
A COMPARATIVE STUDY OF SERUM AMYLOID A PROTEIN (SAA)
FROM MINK AND MAN.

G. Marhaug, A.L. Børresen, G. Husby, N. Nordstoga.

1. Serum amyloid A protein (SAA) was isolated from mink and human serum by ultracentrifugation and gel filtration and characterized by two-dimensional gel electrophoresis and Western blotting followed by autoradiography.

2. SAA was found in similar quantities in the high density lipoprotein (HDL) fraction of serum from a patient suffering from systemic juvenile rheumatoid arthritis (JRA) and mink stimulated with lipopolysaccharide (LPS). Only very small quantities were present in normal human controls and not detectable in normal mink.

Fig. 1. Gel filtration of delipidated HDL on a 5×100 cm Sephadex G-100 in 5 M guanidine/0.1 M acetic acid. Samples: 300 mg apoproteins in 30 ml eluent. (A) ApoHDL from human serum. Patient with JRA. —; normal controls. ---. (B) ApoHDL from mink serum. Endotoxin-treated mink, —; normal controls, ---. Reactivity with antisera to: human albumin ($\Delta\Delta\Delta$), human apoA-I (.....), human apoSAA ($\circ\circ\circ\circ$), and mink AA ($\times\times\times\times$). The material in peak 3, corresponding to human apoA-II, is lacking in mink HDL, and the relative amount of apoC proteins is reduced in normal mink HDL, when compared with human HDL (peaks 4 and 5 in normal mink and normal human HDL). The increased protein amount in peak 4 from both the JRA patient and the endotoxin-treated mink reflects the increased amounts of apoSAA in these sera.



3. Striking similarities were found in molecular weight, isoelectric point and degree of heterogeneity for human and mink SAA, while immunologic cross-reactivity between the two species was not found.

4. In contrast to human HDL, mink HDL was found not to contain apo-A-H and only minute amounts of ApoC proteins.

Comp. Biochem. Physiol, 78B, 1, 401-406, 1984.

4 figs., 33 references.

Authors' abstract.

MECHANISMS INVOLVED IN SPONTANEOUS OCCURRENCE OF DIPLOID-TRIPLOID CHIMERISM IN MINK (*MUSTELA VISON*) AND CHICKEN (*GALLUS DOMESTICUS*).

МЕХАНИЗМЫ СПОНТАННОГО ВОЗНИКНОВЕНИЯ ДИПЛОИД-ТРИПЛОИДНОГО ХИМЕРИЗМА У ПОРОК (*MUSTELA VISON*) И КУР (*GALLUS DOMESTICUS*)

N.S. Fechheimer, G.K. Isakova, D.K. Belyaev.

Diploid-triploid chimerism has been reported in man and a number of laboratory and livestock animals. The mechanisms of their origin remains enigmatic. One approach is to calculate for each proposed mechanism the expected frequencies of zygotes bearing different gonosomic complements in the two cell lines. The samples observed are then compared with the expectations. The mechanisms that have been considered are: 1) fertilization of a blastomere; 2) the second polar body absorbed into a blastomere; 3) fertilization of the first polar body; 4) independent fertilization of both nuclei in binucleated oocytes; 5) fertilization of the second polar body as well as the egg; 6) fusion of two eggs. A sample of minks comprised three preimplantation embryos, nine postimplantation embryos and

three neonatal pups with gonosome complements of 7XX/XXX, 3XX/XXY, 4XY/XYY; the chicks comprised 13 embryos at one day of incubation, one at four days, and one adult bird with gonosome complements of 5 ZZ/ZZZ, 1 ZZ/ZZW, 1 ZW/ZZW and 5 ZW/ZWW. If it is assumed that within each species all or most of the 2n/3n chimeras arise due to the same mechanism, then the occurrence of a type that has an expectation of zero for a given proposed mechanism effectively eliminates that mechanism as a source. All of the chicks could have resulted from only one mechanism, i.e. independent fertilization of both nuclei and binucleated oocytes. The sample of minks could have resulted from the same mechanism or from fertilization of a blastomere of a two-cell, 2n embryo.

Genetika, USSR, 20, 2, 2048-2054, 1984.

2 tables, 31 references.

Authors' summary.

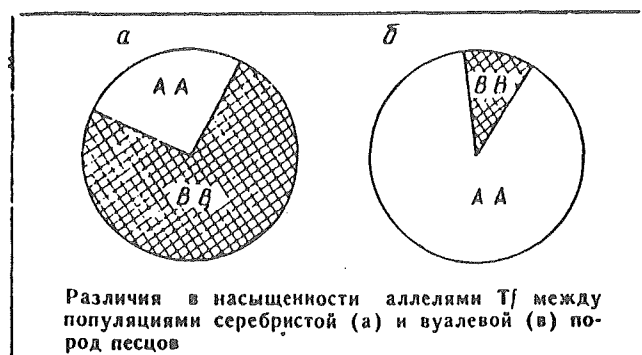
In RUSS. Summary in ENGL.

GENETIC MARKERS.

Генетические маркеры

A.M. Mashurov, S.N. Kashtanov, O.M. Balandina.

Blood samples obtained from 1300 silver and veiled arctic foxes were typed using electrophoresis on acrylamide and starch gels, and cellulose acetate. 20 protein and enzyme systems were identified, and 8 were found to be polymorphic. The frequencies of genotypes Tf AA and Tf BB were 0.338 and 0.662 resp. in silver animals, and 0.838 and 0.162 in veiled animals.



Krolikovodstvo i Zverovodstvo, 4, 15-16, 1981.

1 table, 1 fig.

CAB-abstract.

In RUSS.

COMPARATIVE CYTOGENETICS OF THREE SPECIES OF CANID
(CARNIVORA, CANIDAE).

4. DISTRIBUTION OF REPETITIVE DNA SEQUENCES IN THE CHROMOSOMES.
СРАВНИТЕЛЬНАЯ ЦИТОГЕНЕТИКА ТРЕХ ВИДОВ СОБАЧЬИХ
(CARNIVORA, CANIDAE)

СООБЩЕНИЕ IV. РАСПРЕДЕЛЕНИЕ НА ХРОМОСОМАХ ПОВТОРЯЮЩИХСЯ
ПОСЛЕДОВАТЕЛЬНОСТЕЙ ДНК

A.S. Graphodatsky, V.A. Potapov, T.P. Lushnikova.

Repetitive DNA fractions, Cot 0-001, of the fox, *Vulpes fulvus*, and the arctic fox *Alopex lagopus*, were used for homo- and heterologous in situ hybridization. Repetitive DNA sequences of *A. lagopus* demonstrate extensive hybridization to the additional heterochromatic short arms. Repetitive DNA sequences of *V. fulvus* have no predominated hybridization sites, those of the arctic fox having no such sites in the chromosomes of fox and distributing along the whole chromosomes. Repetitive DNA sequences of fox show no extensive hybridization to the additional heterochromatic arms of arctic fox chromosomes.

Genetika, USSR, 21, 3, 420-423, 1985.

1 fig., 11 references.

Authors' summary.

In RUSS. Summary in ENGL.

THE EFFECTIVENESS OF SELECTING ARCTIC FOXES ON THEIR RESPONSE
TO CHANGES IN LIGHT REGIME.

ЭФФЕКТИВНОСТЬ ОТБОРА ЛЕСЦОВ С ЛУЧШЕЙ
РЕАКЦИЕЙ НА ИСКУССТВЕННОЕ ИЗМЕНЕНИЕ
ДЛИТЕЛЬНОСТИ СВЕТОВОГО ДНЯ

G.A. Kuznetsov, G.P. Kazakova.

Data were obtained on 41 females and 14 males allowed 5-h light daily from 1 June to 31 August, and 13 h daily from 1 Sep. to the end of the mating season. There were 3 types of female; females that had mated early in the previous spring, females that had mated late in the previous spring, and females that had mated early in the breeding season over several years. For the males the date on which semen of standard quality was first collected was 16-22 Oct. The onset of mating was observed on 9 Oct. for females that had always mated early, and on 13 Oct for those that had mated early in the previous spring; of those that had mated late in the previous spring, none mated in the experiment.

Nauchnye Trudy, Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva i Krolikovodstva, 25, 10-17, 1981.

2 tables, 2 references.

CAB-abstract.

In RUSS.

SELECTING YOUNG ARCTIC FOXES ON BEHAVIOUR.

Отбор молодняка по поведению

V.V. Koshitskii, B.D. Babak.

Data were obtained on 90 pairs of full-sisters, displaying either dominant or timid behaviour. For the 2 types of female resp., the av. litter size per housed female was 7.5 and 5.9, and preweaning mortality of the young was 13.6 and 21.4%. The difference in litter size was due to the timid females having a poorer mating ability.

Krolikovodstvo i Zverovodstvo, 4, 16-17, 1981.

In RUSS.

CAB-abstract.

ESTIMATION OF BREEDING VALUE FOR LITTER SIZE IN MINK BY THE
DIRECT UPDATING METHOD.

K. Christensen, H. Hauch, N. Glem-Hansen.

The principles of estimating breeding value for litter size in mink by the "direct updating" method was described. Some comments are given on approximations made for making the data systems for breeding value estimations as stream lined as possible. The direct updating method of estimating breeding values is now applied in more than 100 Danish mink farms.

Z. Tierzüchtg.Züchtgsbiol. 101, 205-209, 1984.

2 figs., 2 tables, 5 references.

Authors' summary.

In ENGL. Summary in FREN, SPAN, GERM.

THE PERFORMANCE OF "SABLE" MINK OF THE STANDARD COLOUR.

ХАРАКТЕРИСТИКА ПРОДУКТИВНЫХ КАЧЕСТВ СОБОЛИНЫХ
НОРОК СТАНДАРТНОЙ ОКРАСКИ

A.K. Krizhik, K.V. Kuznetsov.

For 52 male and 47 female Sable (long-haired) mink, and for 25 male and 25 female Standards, heterotype hair length averaged 34, 31, 27 and 25 mm resp., kemp length 32, 28, 23 and 21 mm, and undercoat length 21, 19, 15 and 15 mm. For 456 Sable and 4977 Standard females at one farm, and 570 Sable and 7106 Standard females at another farm, whelping rate

was 81.0, 81.3, 82.6 and 94.1% resp., and litter size averaged 6.02, 6.49, 6.00 and 6.70 at birth and 3.78, 4.70, 4.21 and 5.72 at weaning. The characters of Sable pelts are described.

Nauchnye Trudy, Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva i Krolikovodstva, 25, 3-9, 1981.

6 tables, 1 references.

CAB-abstract.

In RUSS.

CROSSES BETWEEN SPECIES IN FOX PRODUCTION.

(Artskrydsninger i ræveproduktionen).

Outi Lohi, Norodd Nes.

An illustrated description is given of the following fox crosses: silver X blue, silver X Lapponia, silver X Shadow, silver X Blue Star, red X Shadow, Platinum X blue, silver X Arctic Pearl, silver X arctic, Arctic Marble X blue, Arctic Marble X Shadow, Arctic Marble X Arctic Pearl, and crosses involving Sun Glow and Sun glow White foxes with other species.

Dansk Pelsdyravl, 47, 2, 65-72, 1984.

23 colour photos.

CAB-abstract.

In DANH.

THE ARCTIC DAWN FOX - A NEW COLOUR MUTATION.

(Arctic Dawn Räv - en ny färgmutation).

Lars Elofson, Jack Sevenius.

An illustrated account is given of the Arctic Dawn fox mutation. The pelts of foxes of this mutation are similar to those of Blue Shadow foxes but with red instead of blue guard hair tips. Matings of an Arctic Dawn male with blue fox females resulted in 90 Arctic Dawn and 30 white cubs. Chromosome studies indicated that Arctic Dawn may be a blue fox mutation.

Våra Pälsdjur, 56, 1, 18, 1985.

1 photo.

CAB-abstract.

In SWED.

SILVER FOX COLOUR VARIETIES.**(Silverrävens fargtyper).**

Ulla Katajamäki.

The Platinum, White Face, Gold Platimun, Arctic Marble, Arctic Marble White, Sun Glow, Sun Glow White, Pearl, Burgundy, Amber, Fawn Glow, Dakota Gold, Cinnamon Gold and Autumn Gold fox mutations are described and illustrated, and an account is given of their genotypes.

Finsk Pålstidskrift, 19, 1, 28-32, 1985.

10 colour photos.

CAB-abstract.

In SWED.

COLOUR TYPES OF ARCTIC FOXES AND FOXES.**ЦВЕТОВЫЕ ТИПЫ ПЕСЦОВ И ЛИСИЦ**

L.V. Milovanov.

Colour types of arctic foxes and foxes produced in Norway are listed, and a comparison is made with types produced in the USSR. Blue arctic foxes in Norway are known as veiled arctic foxes in the USSR.

Krolikovodstvo i Zverovodstvo, 2, 33-34, 1982.

In RUSS.

CAB-abstract.

LONG-HAIRED MINK.**Длинноволосая норка**

N.I. Synchronov.

For 204 dark-brown, Pastel, Lavender and Silverblu pelts from long-haired mink, length of the guard hairs averaged 28.9, 29.0, 28.3 and 26.0 mm resp. for females, and 30.3, 30.9, 31.1 and 34.0 mm for males. Corresponding figures for undercoat hairs were 18.1, 19.0, 17.6 and 19.0 mm for females, and 18.7, 18.9, 18.7 and 21.0 mm for males.

Krolikovodstvo i Zverovodstvo, 4, 16, 1981.

2 tables.

CAB-abstract.

In RUSS.

THE RELATIONSHIP OF PRODUCTIVITY OF AMBER SAPPHIRE MINK
WITH AGE.

СВЯЗЬ ПРОДУКТИВНОСТИ НОРКИ
ЯНТАРЬ-САПФИРОВАЯ С ВОЗРАСТОМ

V. Yu Yurchenko, M.K. Sokolova.

Reproductive performance was better from Amber Sapphire x Silverblue matings than from matings of amber Sapphires. Oestrus started in Amber Sapphire on 10 March, which was later than in mink of other colour types. Litter size of Amber Sapphires was highest at 2 year of age.

Povysh. produktivn. zverovod. i okhot-promysl. fauni, Moscow, USSR, 10-14 1982.

3 tables, 4 references.

CAB-abstract.

In RUSS.

BREEDING NUTRIAS. 1.

Племенная работа
с нутриями

G.A. Kuznetsov, N.A. Tsepkova.

Colour types are described, and their genotypes and classification criteria are tabulated.

Krolikovodstvo i Zverovodstvo, 2, 37-38, 1982.

2 tables.

CAB-abstract.

In RUSS.

BREEDING NUTRIAS. 2.

Племенная работа
с нутриями*

G.A. Kuznetsov, N.A. Tsepkova.

Colour types and genotypes are discussed.

Krolikovodstvo i Zverovodstvo, 3, 36-38, 1982.

3 tables.

CAB-abstract.

In RUSS.

GENETIC PRINCIPLES OF THE PRODUCTION OF WHITE NUTRIAS.

Генетические основы
производства
белых шкурок нутрий

G.A. Kuznetsov.

At a farm maintaining Azerbaijan White nutrias, the percentage of pure

white offspring was 76 for matings of white animals, and 25 for matings of spotted animals. Matings of white animals result in an increased mortality and low fertility due to a lethal effect in WW homozygotes, and therefore crossing with Standard animals is used, resulting in 68.2% of white offspring if one pure white parent is used, or 47.7% if one spotted parent is used. For Italian White nutrias, white colour is controlled by the recessive genes *ta*. For "Snowwhite" animals obtained by crossing mutant animals, both guard hair and undercoat are pure white, and the genotypes of these animals are *tataVv*, *tstsVv* or *tstaVv*, obtained by mating white, beige or mother-of-pearl animals with "golden" types, "lemon" (*TtaVv* or *TtsVv*) with silvery, or brown heterozygotes (*tsta*) with beige or mother-of-pearl animals. Fertility of "Snowwhite" animals mated was 25% lower than for the parental types, so mating between Snowwhite animals and one of the parental types is recommended; such matings result in 50% of white animals. Mother-of-pearl animals appear to be heterozygous for beige (*ts*) or Italian White (*ta*).

In RUSS.

CAB-abstract.

STUDIES ON SOME BLOOD CONSTANTS OF COYPU (MYOCASTOR COYPUS MOLLINA)

(Cercetari privind unele constante sanguine la nutrie (*Myocastor coypus Mollina*)).

Nicolae Stancioiu, Georgeta Petcu, Aurel Cáprárin.

Some blood constants were studied on 20 clinically healthy, male, standard nutrias, fed and kept under identical conditions. They included erythrocyte and leucocyte counts, the haematocrit value, the amount of haemoglobin, leucocytic formula, total proteins, total lipids, phospholipids, cholesterol value, free amino acids and some mineral elements.

The results have shown that: 1) the blood of nutrias is higher in erythrocytes and haemoglobin than the blood of other animal species; 2) lipemia and cholesterolanemia are lower than in other domestic animals, except the horse, the goat and the rabbit.

St. Cerc. Biol., Seria Biol. Anim. 35, 2, 107-110, 1983.

4 tables, 10 references.

Authors summary.

Is there a Correlation between Testicle Size and reproductive Performance ?

Lisa M. Heron and A. A. Rietveld, Northwood Fur Farms, Inc., Cary, Ill. U.S.A

Objective

This study was to examine the correlation between the testicle size of the male and reproductive performance.

Materials

All males were young and selected from the same strain. Seven males were classified as »small« testicles, and seven as »large«. Fifteen mink were used as a control group with these mink having moderately sized testicles. 121 females were used, all of similar strains and were in their third year. Other materials used were a caliper and Ketamine brand anesthetic.

Method

To obtain the testicle measurements the males were given 0.2 ml of Ketamine anesthetic. This immobilizes the male but does not put him completely under. A caliper is used to measure the width of both the testicles combined. From these, the seven mink with the smallest testicles were chosen for the »small« group, and the seven with the largest were chosen for the »large« group. Fifteen males with average sized testicles were chosen for the controls.

The »small« group was mated to 31 females, the »large« group to 30 females, and the control group to 60 females.

As is customary on the farm, 1/3 of the females were injected with HCG. They were then mated on the eighth and ninth day following injection. The rest of the mink were mated four times, twice in the first cycle and twice in the second cycle. Those mink that did not follow this pattern were mated as close to this scheme as possible.

Results

Those females bred by the »large« males had 1 barren (3.3%), 4 litters of 3 or less (13.3%), 13 litters of 7 or more (43%), and a total of 163 kits born alive and 9 dead. This gives the group a litter average of 5.43 (alive at birth). the average testicle size of these males was 32.4 mm.

In the females bred by the »small« males, there were 4 barren (12.9%), 5 litters of 3 or less (16.12%), 10 litters of 7 or more (32%), and a total of 147 kits alive and 10

dead. The litter average for this group was 4.74 (kits alive at birth). The average testicle size was 24.4 mm.

In the females bred by the control males 4 were barren (6.6%), 8 had litter of 3 or less (13.3%), 29 had litters of 7 or more (48.3%), and a total of 346 kits alive and 10 dead. This gives an average of 5.76 (kits alive at birth). The average testicle size of these males was 28.30 mm.

Conclusion

It can be seen that overall the control males did better than the other two groups. They had a higher litter average, a larger number of litters above seven, and the same percentage of litters of three or less as those with »large« testicles. Those in the »large« group came in second and has the lowest percentage of barrens. This data suggest that neither extreme maximizes reproduction.

However further research must be done to test this theory.

	Large	Small	Control
No. of males	7	7	15
No. of females	30	31	60
No. barren	1	4	4
% barren	3.3	12.9	6.6
Litters 3 or less	4	5	8
% 3 or less	13.3	16.1	13.3
Litters 7 or more	13	10	29
% 7 or more	43	32	48.3
Kits alive	163	147	346
Kits dead	9	10	10
Ave (at birth)	5.43	4.74	5.76
Ave testicle size (mm)	32.4	24.4	28.3

Acknowledgement

The authors acknowledge the kind cooperation of Edwin C. Hahn, Ph.D., of the University of Illinois, Urbana, Illinois.

A Digest of Dr. Cyril Adams's Research on Mink Reproduction

Lisa M. Heron and A. A. Rietveld, Northwood Fur Farms, Inc.,
Cary, Illinois, USA

»All men naturally desire to know - -«
Aristotle

In March of 1984, the mink industry lost a great researcher and a good friend in the passing of Dr. Cyril Adams. In his early years, he was exposed to the work of A. Hansson, I. Johansson, R. Shackelford and O. Venge, and this eventually led to his research in mink reproduction. The following is a summary of his work, with an outlook towards the future.

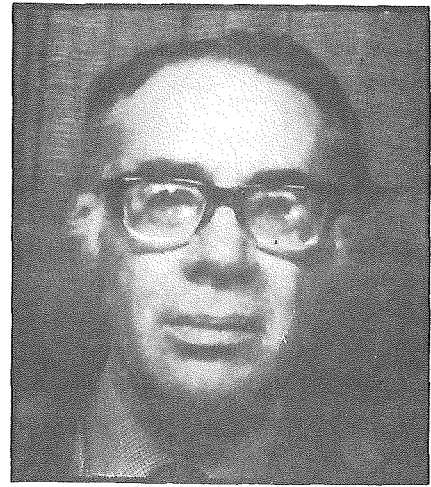
Dr. Adams started working with mink in the season of 1970-71. His original observation was that the prevalent management practices, specifically regarding reproduction, led to tremendous waste. According to his figures, only about 50% of the eggs would survive¹. This is much lower than in other comparable mammals. It was with this in mind that he started his research. The complications of induced ovulation and delayed implantation, along with the lack of knowledge of the aforementioned, were considered the reasons for poor results. Through his work over twelve years, a whelping rate of 95%, with a litter average of 5.2 can now be obtained².

Increased efficiency of reproduction

The concept of delayed implantation has been a challenging one. The delay itself is variable, and is subject to many outside influences. The importance of the delay can be directly linked to productivity. As the time before implantation increases, so does egg mortality³. The actual delay is due to the corpus luteum, which is at first inactive in secreting progesterone. This is the hormone which signals the beginning of implantation⁴.

In searching for the answer, Dr. Adams explored many possibilities. These included progesterone supplements, anti-estrogen products, and the use of artificial light.

Injection of progesterone products such as primolut were found to be highly effective in reducing gestation length and thus increasing litter size⁵. Also because estrogen and progesterone work as antagonists, the anti-estrogen products were found to be effective⁶. However, because these products require extensive work and handling of the mink, they are considered



Dr. Cyril Adams

only applicable on an academic level. Further research in this area has been done by Martinet, Travis, Papke, Concannon, and currently by Murphy, each in their respective countries.

The last approach has been the most successful. By using artificial light to lengthen the day, the gestation period has been shortened⁷. This is easily applied to the farm situation, as exemplified by its use in Argentina and the United States.

When the process of induced ovulation was examined, Dr. Adams came to several conclusions. An initial ovulation is easily induced. Even simple contact with a male may cause it. However, the second ovulation requires actual copulation for at least 12 minutes⁸. To add to the difficulty, there also must be a delay of at least six days after the first ovulation or a second one will not occur⁹.

Through his work with hormones, Dr. Adams discovered the value of Human Chorionic Gonadotropin (HCG). In 1973 he started his experiments and found it to be a priceless management tool. HCG causes ovulation to occur and may be used instead of a male for the mating in the first heat.

Research with HCG has been carried out at Northwood Fur Farms since 1975. A trial comparing different mating schemes was done at Northwood in 1983. Each started with an injection of HCG, then an eight day wait. The combinations were: 1. vas. male - fertile male, 2. HCG - fertile male, 3. single mating, 4. fertile male - fertile male. The fourth combination was found to be the most effective¹⁰.

Thus the treatment should be HCG followed with a pair of matings, one on the eighth day, and one on the ninth day. With this procedure, the workload can be normalized, and the number of males reduced. It has been found that most females will follow this pattern. It is important to note that with a little extra attention, very few females remain unmated. 1.08% of the HCG mink did not mate in 1985 at Northwood, and 2.5% only mated once. It is important to integrate the program in the farm routine to reap the most benefits¹¹.

7. *Prostaglandin* - Hormone used to initiate estrus.
8. *Oxytocin* - That hormone which causes uterine contractions and milk let-down.

Foot notes

1. F.B.A. International Mink Breeders Conference Report, 1971. »Farm Experiment«, *C. E. Adams*, pg. 1.
2. Fur Farmers' Gazette of the United Kingdom, Sept. 1983. »Kit Production 1983«, *C. E. Adams*, pg. 22.
3. F.B.A. International Mink Breeders' Conference Report, 1974. »F.B.A. Fur Farm Experiment«, *C. E. Adams*, pg. 4.
4. *Ibid.*, pg. 1.
5. F.B.A. International Mink Breeders' Conference Report, 1982. »The Application of Hormones to Mink Breeding«, *C. E. Adams*, pg. 85.
6. F.B.A. International Mink Breeders' Conference Report, 1974. »Reproduction/F.B.A. Fur Farm Experiment«, *C. E. Adams*, pg. 31.
7. F.B.A. International Mink Breeders' Conference Report, 1982. »The Application of Hormones to Mink Breeding«, *C. E. Adams*, pg. 83.
8. Fur Farmers Gazette of the United Kingdom, Dec. 1982. »Observation of the Induction of Ovulation and Expulsion of Uterine Eggs in the Mink«, *C. E. Adams*, pg. 22.
9. *Ibid.*, pg. 22.
10. 1983 Unpublished data, Northwood Fur Farms, Inc. Cary, Ill. U.S.A.
11. F.B.A. International Mink Breeders' Conference Report, 1979. »F.B.A. Fur Farm Experiment 1978/79, Report and Commentary«, *C. E. Adams*, pg. 131.
12. Fur Farmers' Gazette of the United Kingdom, Dec. 1983. »Kits in July«, *C. E. Adams*, pg. 10.
13. F.B.A. International Mink Breeders' Conference Report, 1976. »The Farm Experiment: Progress Report and Commentary«, *C. E. Adams*, pg. 65.
14. F.B.A. International Mink Breeders' Conference Report, 1973. »The Farm Experiment, Retrospect and Prospect«, *C. E. Adams*, pg. 1-2.
15. Unpublished data. Northwood Fur Farms, Inc. Cary, Ill. U.S.A.
16. Fur Farmers' Gazette of the United Kingdom, June 1983. »Duration of Copulation and Fertility in the Mink. *Mustela Vison*«, *C. E. Adams*, *A. A. Rietveld*, pg. 25.
17. Fur Farmers' Gazette of the United Kingdom, Dec. 1983. »1983 Breeding Season«, *C. E. Adams*, pg. 12.
18. F.B.A. International Mink Breeders' Conference Report, 1977. »The F.B.A. Experiment Unit and Field Trials 1976/77, Progress Report and Commentary«, *C. E. Adams*, pg. 70.
19. F.B.A. International Mink Breeders' Conference Report, 1976. »The Farm Experiment: Progress Report and Commentary«, *C. E. Adams*, pg. 65.
20. F.B.A. International Mink Breeders' Conference Report, 1977. »The F.B.A. Experimental Unit and Field Trials 1976/77, Progress Report and Commentary«, *C. E. Adams*, pg. 70.
21. Fur Farmers' Gazette of the United Kingdom, Dec. 1982. »Observations on the Induction of Ovulation and Expulsion of Uterine Eggs in the Mink«, *C. E. Adams*, pg. 22.
22. »Effect of Subsequent Mating on the Fate of Fertilized Ova in Mink«, *V. G. Bernatskii*, *Animal Breeding Abst.* (1972) 40, 339.
23. F.B.A. International Mink Breeders' Conference Report, 1980. »How Many Matings - Is One Enough?« *C. E. Adams*, pg. 114.
24. Fur Farmers' Gazette of the United Kingdom, 1983. »Mating Systems For Mink«, *C. E. Adams*.
25. F.B.A. International Mink Breeders' Conference Report, 1979. »F.B.A. Fur Farm Experiment 1978/79, Report and Commentary«, *C. E. Adams*, pg. 125.
26. *Ibid.*, pg. 129.
27. F.B.A. International Mink Breeders' Conference Report, 1973. »The Farm Experiment, Retrospect and Prospect«, *C. E. Adams*, pg. 3-4.
28. F.B.A. International Mink Breeders' Conference Report, 1974. »Reproduction/F.B.A. Fur Farm Experiment«, *C. E. Adams*, pg. 31.
29. F.B.A. International Mink Breeders' Conference Report, 1981. »Mink Reproduction: Experiments and Observations«, *C. E. Adams*, pg. 27.

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INDUCED OVULATION IN MAMMALS.

S.R. Milligan.

A review of "reflex" ovulation, i.e. that arising as a direct result of the acute initiation of a surge of LH secretion by sexual stimuli. These species include members of the Insectivora (shrews), Rodentia (including voles and lemmings), Lagomorpha (rabbits and hares), Carnivora (cat, ferret, mink and raccoon) and Artiodactyla (lama and alpaca).

1 table, 10 pp of references.

CAB-abstract.

STIMULATION OF REPRODUCTIVE FUNCTION IN ARCTIC FOXES.

**СТИМУЛЯЦИЯ
РЕПРОДУКТИВНОЙ
ФУНКЦИИ ПЕСЦОВ**

V.I. Krotov, P.A. Kononov.

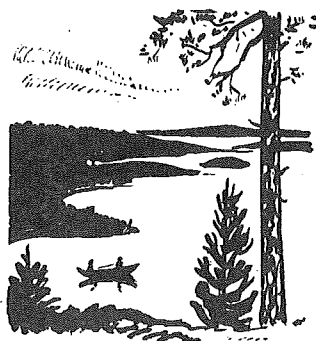
20 females were each given 100 IU HCG on the 2nd, 4th, 5th and 6th April, plus 500 IU HCG 12 h after the treatment on the 6th. Ten females were each given 10 IU PMSG on the 2nd April, plus 100 IU HCG on the 4th, 5th and 6th April, and 500 IU HCG 12 h after the treatment on the 6th. Ten females were each given 100 microg Oestrophan PGF₂alpha analogue on the 2nd April. Also, 20 controls were each given 1.0 saline on the 2nd, 4th, 5th, 6th and 7th April. For the 3 experimental groups and the controls resp., the percentage of females mating to 17th April was 100, 90, 0 and 45. In the 1st experimental group and the controls resp., the number of females whelping was 13 and 9, litter size averaged 9.8 and 13.0, the number of liveborn cubs per housed female averaged 5.5 and 9.8, the number of cubs weaned per whelping female averaged 8.0 and 9.2, and the number weaned per housed female 5.2 and 4.1.

Krolikovodstvo i Zverovodstvo, 1, 15, 1984.

1 table.

CAB-abstract.

In RUSS.



OESTRUS CONTROL IN THE FERRET.

M. Oxenham, J.M. Evans.

As most readers will appreciate, the female ferret (*Mustela putorius furo*) (jill) is a seasonally polyoestrous animal with its breeding season starting in March and continuing until the end of August. The signs of oestrus in the absence of the male can be very prolonged since ovulation is induced by the very rough precoital behaviour of the male ferret (hob).

What is perhaps not so well known is that the persistently high oestrogen levels associated with prolonged oestrus can cause a fatal pancytopenia in this species (Kociba and Caputo 1981). There would seem to be a special need therefore to control oestrus in this species where the animals are not kept for breeding. This can be achieved either by spaying or by hormonal means.

The second generation progestogen, proligestone (Delvosteron: Mycofarm), has been shown to be active in a number of different species (Os 1982) and reports of its successful use in ferrets have been recorded by some veterinary surgeons in practice. Thus a small "trial" to investigate the effect of giving a single dose of proligestone at the beginning of the breeding season was set up in conjunction with the Wessex Ferret Club.

On March 21, 1984, nine jills (average weight 1 kg) were injected with 0.5 ml of proligestone subcutaneously over the shoulder/base of the neck. Another animal was dosed in a similar way on May 10. Follow up enquiries in November revealed that there were no signs of oestrus in any of the ferrets for the whole of that breeding season and that there were no apparant adverse sideeffect.

We thought it appropriate to bring the results of this preliminary small study to the attention of your readers as the new breeding season approaches.

Veterinary Record, 116, 11, 300, 1985 (Letters).

2 references.



OVARIAN FOLLICLES IN MINK DURING OESTRUS.

ФОЛЛИКУЛЫ НОРКИ
В ПЕРИОД ЭСТРУСА

V.M. Kolpovskii.

Ovaries were obtained from 12 young females from 12 to 29 March. Microphotographs of follicles at various stages of oestrus are given.

Krolikovodstvo i Zverovodstvo, 5, 18-19, 1982.

5 photos.
In RUSS.

CAB-abstract.

SOLUBLE Mn^{2+} -DEPENDENT ADENYLATE CYCLASE ACTIVITY IN THE TESTIS
OF THE BLUE FOX (ALOPEX LAGOPUS).

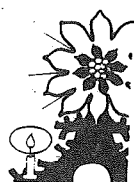
A.J. Smith, T. Jahnsen, H. Attramadal, V. Hansson.

Soluble Mn^{2+} -dependent adenylate cyclase (MnAC) activity was found in testicular cytosol from blue foxes castrated during the breeding season. The rate of MnAC activity was approximately constant for 30 min at 35°C and for 2 hr after storage at 25°C. Activity was directly proportional to cytosol protein concentration and was optimal in the physiological pH range. Enzyme activity declined in the presence of an alkylating agent (N-ethyl maleimide, NEM) and was eliminated at a concentration of 1 mM NEM. Low concentrations (0.1-10 mM) of a reducing agent (β -mercapto ethanol, β ME) did not increase MnAC activity, whereas a high concentration (100 mM) led to a significant reduction ($p < 0.01$) in activity. Substitution of Mn^{2+} in the assay medium with Mg^{2+} led to a total loss of enzyme activity, which could not be regained by adding hormones or by preincubation of cytosol for 60 min. The K_m for Mn^{2+} was estimated to be 3.5 mM. The affinity of the enzyme for Mn^{2+} was not altered by varying the concentration of ATP. In contrast, increasing concentrations of Mn^{2+} appeared to increase the affinity of the enzyme for $MnATP^{2-}$. The K_m for $MnATP^{2-}$ thus varied from 6 to 18 mM.

Archives of Andrology, 12, 225-230, 1984.

2 figs., 18 references.

Authors' summary.



**ENDOCRINOLOGIE - A STUDY OF THE BINDING CAPACITY OF THE PLASMA
PROTEIN CONNECTING THE TESTOSTERONE OF TWO WILD MAMMALS WITH
THE CYCLIC TESTICULAR ACTIVITY, THE FOX AND THE BADGER.**

(Endocrinologie - Etude de la capacité de liaison de la protéine plasmatique liant la testostérone chez deux Mammifères sauvages á activité testiculaire cyclique, le Renard et le Blaireau.)

Daniel Maurel, Anne-Marie Laurent, Jean-Yves Daniel, Jean Boissin.

The binding capacity of the plasma testosterone binding globulin (TeBG) as determined by the equilibrium dialysis method, in fox and badger, was shown to vary in relation to the seasonal endocrine activity of the testis. During the winter breeding period, the TeBG binding capacity was low in the fox and high in the badger, whereas an opposite situation prevailed during the sexual quiescence phase. Independent of those seasonal variations, the binding capacity of TeBG was already lower in fox than in badger.

C.R. Acad. Sc. Paris, 291, Serie D-693-696.

1 fig., 22 references.

Authors' summary.

In FREN. Summary in ENGL.

HORMONAL STIMULATION OF OVULATION IN SABLES.

ГОРМОНАЛЬНАЯ СТИМУЛЯЦИЯ ОВУЛЯЦИИ
У СОБОЛЕЙ

V.G. Bernatskii, L.G. Utkin, A.B. Kulichkov.

50 females aged 1 year were each given 10 IU HCG within 12 h of mating, and 82 control females were not treated. For the 2 groups resp., the percentage whelping was 28.0 and 23.1, the number of young obtained 34 and 47, and the number of kits per housed female averaged 0.68 and 0.57. For 2-years-old females that had mated after 18 July, each given 10 IU HC (21 females) or untreated (40 females), the percentage whelping was 38.0 and 15.0 resp., the number of young obtained 17 and 12, and the number of kits per housed female averaged 0.81 and 0.30. For 15 and 13 females aged 15 months, each given 50 or 100 IU HCG resp. after mating, the percentage whelping was 40.0 and 43.2 vs. 27.1 for 59 un-

treated controls. Litter size per female whelping averaged 2.33, 3.60 and 2.37 for the 3 groups resp., and the number of kits per mated female 0.87, 1.31 and 0.49.

Nauchnye Trudy, Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva i Krolikovodstva, 26, 100-104, 1981.

4 tables, 1 fig., 5 references.

CAB-abstract.

In RUSS.

POLYGAMY OF MALE SABLES AND ITS RELATIONSHIP WITH THE REPRODUCTIVE PERFORMANCE OF FEMALES.

ПОЛИГАМНАЯ СПОСОБНОСТЬ САМЦОВ СОБОЛЕЙ
И ЕЕ СВЯЗЬ С ПОКАЗАТЕЛЯМИ ВОСПРОИЗВОД-
СТВА САМОК

A.B. Kulichkov.

For 43, 56 and 27 males each mating with 3, 4 and 5 females resp., the percentage of females returning to oestrus was 17.1, 18.1 and 17.0, litter size averaged 3.6, 3.5 and 3.5, and the number of kits per housed female averaged 2.7, 2.6 and 2.6. The lowest percentage of females returning to oestrus (8.3) and the highest number of kits per housed female (2.75) were obtained for males aged more than or equal to 10 years, each mated with 3 females, and the smallest number of kits per housed female (1.67) for 4-years-old males each mated with 5 females.

Nauchnye Trudy, Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva i Krolikovodstva, 25, 111-116, 1981.

5 tables, 5 references.

CAB-abstract.

In RUSS.

GROWTH OF SABLES DURING THE POSTEMBRYONIC DEVELOPMENT.

РОСТ ЩЕНКОВ СОБОЛЕЙ В ПОСТЭМБРИОНАЛЬНЫЙ
ПЕРИОД

E.G. Sergeev, N.M. Tsepkov, L.G. Utkin.

Body weights and body measurements were recorded for 90 males and 89 females from 10 to 180 days of age, and are given in tables and graphs. For the 2 groups resp., body weight averaged 273 and 257 g at 1 month of age, and 1321 and 986 g at 6 months, and body length 24.9 and 24.4

cm at 1 month, and 45.9 and 42.1 cm at 6 months.

Nauchnye Trudy, Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva i Krolikovodstva, 25, 26-39, 1981.

6 figs., 4 tables, 3 references.

CAB-abstract.

In RUSS.

THE NATURE OF SEXUAL CYCLICITY OF FEMALE MINK.

К ПРИРОДЕ ПОЛОВОЙ ЦИКЛИЧНОСТИ САМОК НОРОК

V.G. Bernatskii, G.M. Diveeva.

For 790 females, each of which was studied over 3 year period, the percentage exhibiting only 1 oestrus during the mating season was 27 in the 1st year, 21 in the 2nd, and 17 in the 3rd; the number of matings per female averaged 1.62, 1.81 and 1.84 in the 3 year. For 252, 483 and 45 females that had exhibited 1, 2 or 3 oestrous periods in their 1st mating season, the percentage having only 1 oestrus in the 2nd year was 23.4, 17.0 and 8.9 resp., the percentage with 2 oestrous periods 72.6, 75.0 and 68.9, and the percentage with 3 oestrous periods 4.0, 8.0 and 22.2. For 141, 388 and 42 dams exhibiting 1, 2 or 3 oestrous periods, percentage of daughters (256, 701 and 84 females resp.) exhibition only 1 oestrous was 36.7, 30.8 and 21.4 vs. 56.3, 63.3 and 66.7% exhibiting 2 oestrous periods, and 7.0, 5.9 and 11.7% exhibiting 3 oestrous periods. The number of oestrous periods in the 1st year was significantly correlated with that in the 2nd year (0.26), and the number in the 2nd year with that in the 3rd year (0.24). The h^2 of the number of oestrous periods per mating season was 0.26.

Nauchnye Trudy. Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva i Krolikovodstva, 26, 96-99, 1981.

2 tables, 3 references.

CAB-abstract.

In RUSS.



**THE FERTILITY OF STANDARD MINK FEMALES IN RELATION
TO THE NUMBER OF MATINGS.**

(Plodnost samic standardnich norku pri ruznem poctu pareni.)

L. Stolc, M. Fantova, M. Skrivan.

The following characteristics were studied in 2,224 standard mink females: size of the litter at birth and weaning, cub survival percentage, and sterility of females in relation to number of matings and female age.

It was found that the number of matings has not any effect on the size of the litter at birth but that it affects significantly the number of weaned cubs and their death rate; in this respect, two or three times mated females seem to represent an optimum situation, and with increasing number of matings the percentage of sterile females declines greatly.

Sbornik Vysoke Skoly Zemedelske v Praze, Fakt. Agron., R.B. Zivocisna Vyroba (Czechoslovakia), 41, 123-133, 1984.

6 tables, 11 references.

Authors' abstract.

In CZCC. Summary in RUSS and ENGL.

BREEDING NUTRIAS AT THE "VOSTOCHNYI" STATE FARM.

**Опыт разведения нутрий
в совхозе «Восточный»**

Yu. M. Efremov, I.S. Martynov, N.V. Kamalov.

For 300 females and 50 males housed indoors in cages with wire floors, body weight averaged 300 and 310 g resp. at 1 day of age, 800 and 800 g at 30 days, 1100 and 1500 g at 60 days, 2200 and 2400 g at 4 months, and 3600 and 4100 g at 7 months. Housing indoors without access to water had no adverse effect on the quality of pelts compared with results obtaining at the same farm for nutrias housed with pools (75% of pelts complying with requirements of the State Standard).

Krolikovodstvo i Zverodvodstvo, 4, 14-17, 1982.

2 tables, 3 figs.,

CAB-abstract.

In RUSS.

DETERMINING OESTRUS IN NUTRIA.

ОПРЕДЕЛЕНИЕ ПОЛОВОЙ ОХОТЫ У НУТРИЙ

O.P. Mikhailova.

Data were obtained on 18 mature and 12 six-month-old female housed in groups of 3-4 animals. Oestrus was determined using cytological examination of vaginal smears, and mating was confirmed by microscopic evidence of spermatozoa present in smears. Oestrous cycles of examined females appeared regular, with a short pro-oestrus (24 h), oestrus lasting 2-8 days, and metoestrus 2 days. The duration of dioestrus was difficult to establish, since the luteal phase in the experimental animals was concurrent with pregnancy. The highest CR was obtained for females that had mated during early oestrus (100%), 6.7% of females that had mated during late oestrus returned to service.

Krolikovodstvo i Zverovodstvo, 2, 17-18, 1982.

In RUSS.

CAB-abstract.

**EFFECT OF PROGESTERONE AND MEDROXYPROGESTERONE ACETATE
ON PREGNANCY LENGTH AND LITTER SIZE IN MINK.**

Stanislaw J. Jarosz, W. Richard Dukelow*. (*reprints).

The objective of these studies was to determine the effect of progesterone and medroxyprogesterone injected at varying times post coitum on gestation length and litter size. During a 3-year period mink females of "Standard" strain were given progesterone at a dose 5 mg at 15 and 20 days in the first year and at 17-20 days in the second year, after the last mating. The respective control groups were given the vehicle. Medroxyprogesterone acetate was given in the second year at a dose of 4 mg at 14-19 days following the last mating and in the third year at a dose of 2 mg at 8 days after the last mating. The results on pregnancy length and litter size after progesterone injections in the experimental and respective control groups were as follows: 52.7 days and 4.3 kits, 51.3 days and 4.3 kits, 52.2 days and 5.8 kits, 50.2 days and 4.8 kits, 44.7 days and 5.6 kits, 46.0 days and 6.1 kits. A dose of 4 mg MPA resulted in the blockage of parturition in pregnant females. After administration of MPA at doses of 2 mg at 8 days following the last mating,

the pregnancy length and litter size in the experimental group were: 48.0 days and 6.1 kits and in the control: 52.2 days and 4.8 kits.

Lab. Animal Science, 35,2,156-158, 1985.

2 tables, 8 references.

Authors' abstract.

HORMONAL CORRELATES OF PHOTOPERIOD-INDUCED PUBERTY IN A REFLEX OVULATOR, THE FEMALE FERRET (*MUSTELA FURO*).

Kathleen D. Ryan.

An attempt to develop an animal model wherein the pubertal process could be initiated or accelerated by a readily controlled, noninvasive, external signal, this study examined sexual development of the female ferret, a photoperiodic, reflex ovulator. These animals exhibit signs of precocious sexual maturation within 6 wk of exposure to a stimulatory, long-day photoperiod at 15 wk of age. In the first study, females matured under a long-day stimulus were allowed to mate with a fertile male ferret. All six females ovulated after mating, and three of six became pregnant and successfully delivered and reared litters, demonstrating that vulvar edema induced by long days reflected the onset of true precocious sexual maturation. The second study attempted to determine the endocrine basis of this photoperiod-induced puberty. Immature ferrets were either left intact or were ovariectomized at 13 wk of age. These females either remained untreated or immediately received an estradiol implant.

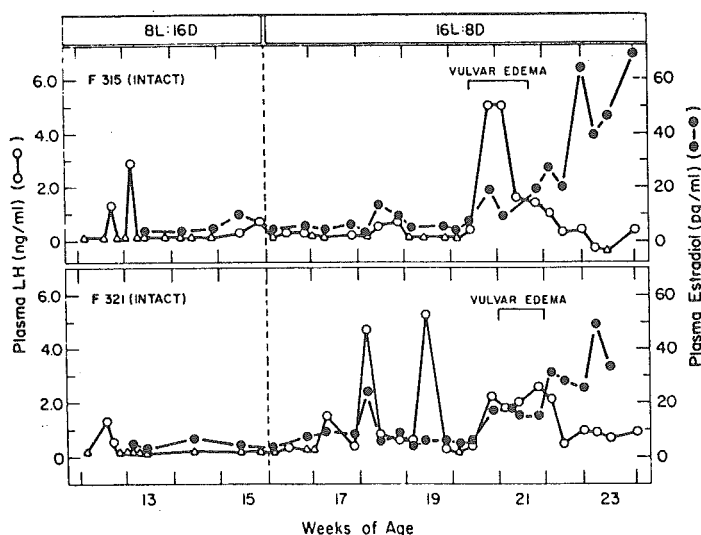


FIG. 1. Patterns of LH and estradiol in plasma of two individual female ferrets in response to housing in long-day photoperiod (16L:8D, dashed vertical line) from 16 wk of age. Vulvar edema onset for each female is shown by the horizontal brackets.

Controls in each group remained in short days, and others were transferred to stimulatory long days at 16 wk of age. Results indicated that immature ferrets exhibited a rise in plasma luteinizing hormone (LH) upon ovariectomy, and that the estradiol implant was an effective negative feedback signal for the duration of the study in animals in short days. In contrast, females in long days exhibited an "escape" from LH inhibition by the steroid implant at the same age at which the intact females in long days were beginning to mature. These data suggest the young ferret exhibits a high sensitivity to estradiol negative feedback which is decreased in response to a stimulatory photoperiod, and which decrease is coincident with sexual maturation in intact animals under the same conditions.

Biology of Reproduction, 31, 5, 925-935, 1984.

5 figs., 1 table, 33 references.

Author's abstract.

HETEROLOGOUS RADIOIMMUNOASSAY OF FOX LH: LEVELS DURING THE REPRODUCTIVE SEASON AND THE ANOESTRUS OF THE RED FOX (*VULPES VULPES* L.)

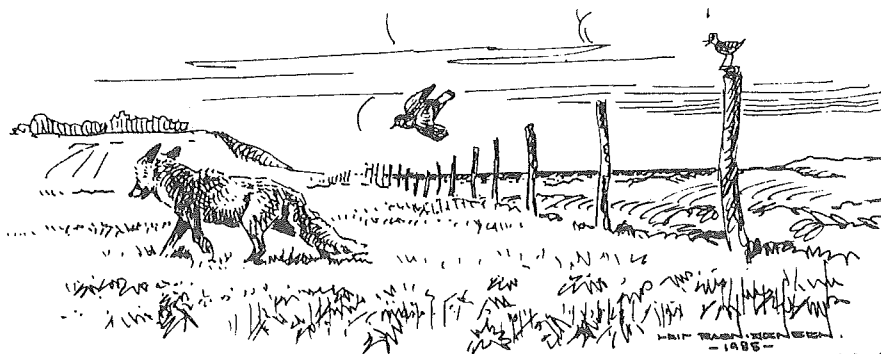
M. Mondain-Monval, M. Bonnin, R. Canivenc, R. Scholler.

A heterologous radioimmunoassay using ovine LH as the labeled hormone, canine LH as the standard, and an anti-ovine LH rabbit serum was validated for the measurement of fox LH. Physiological validation of the assay was evidenced by the high concentrations of LH at oestrus and following ovariectomy or the administration of LH-RH. Throughout the year, plasma LH levels demonstrate important variations, being low during and after the luteal phase (1.4 ± 0.3 ng/ml) (mean \pm SE) and increasing during the second part of anoestrus (5.2 ± 1.4 ng/ml). This latter increase might be correlated with that of androgens observed at the same period. Several LH rises preceded the preovulatory LH surge.

General and Comparative Endocrinology, 55, 125-132, 1984.

18 references, 7 figs.

Authors' abstract.



THE WORLD'S FIRST FOX AI STATION.

(Imponerende premiere på verdens første station for rævesæd.)

Peter Hjorth.

The AI station, which is run in cooperation with the Danish Fur Breeders' Association, houses 130 foxes. It is expected that 5000 insemination doses will be produced per year.

Dansk Pelsdyravl, 47, 12, 707, 1984.

2 pictures. In DANH.

CAB-abstract.

AI RESULTS IN 1984.

(Insemineringsresultater i 1984).

Outi Lohi.

Of 1216 fox females inseminated once, 1288 females inseminated 2 or 3 times, and 1335 females that were both mated and inseminated, 57, 73 and 74% resp. concieved. The number of cubs produced per inseminated female averaged 3.5, 5.4 and 6.3 resp., and that produced per female whelping averaged 7.0, 7.4 and 8.5. For blue x blue, silver x silver, silver x blue, and blue x silver matings, the number of cubs produced per inseminated female was 6.1-8.3, 2.5-3.1, 4.4-5.9 and 0.7-1.5 resp., and that per female whelping was 8.9-9.4, 4.4-4.8, 7.7-8.0 and 2.3-5.0.

Dansk Pelsdyravl, 47, 12, 726-727, 1984.

2 tables. In DANH.

CAB-abstract.

INSEMINATION OF FOXES. BREEDING COMBINATIONS AND REPRODUCTIVE PERFORMANCE IN 1984.

(Seminering av rävar: Använda avelskombinationer och dräktighet 1984).

Maija Valtonen, Ulla Katajamäki.

For 13 120 blue, 6394 Shadow, 313 arctic and 457 halfbred arctic fox females inseminated in Finland in 1984, the overall CR was 58.62, 58.77, 62.30 and 62.36 resp., and the number of cubs born per litter averaged 7.07, 7.12, 6.99 and 7.29; the overall number of cubs per inseminated female averaged 4.17. For 664 blue fox females inseminated with semen from males of the same species, the CR was 62.0% and the number of cubs per inseminated female averaged 4.85 vs. 58.43% and 4.11 for 12 456 blue fox females inseminated with semen from silver, Arctic Marble, Platinum,

red, Sun Glow or crossbred males. For 3005 Silver, Arctic Marble, Platinum, red and crossbred fox females, the overall CR was 45.96%, and the number of cubs born per inseminated and whelping female averaged 1.65 and 3.60 resp. The CR of 2141 silver fox females inseminated with semen from males of the same type was 47.25%, with an average of 1.68 cubs born per inseminated female vs. 29.61 and 0.83 for 233 females inseminated with semen from males of a different type.

Finsk Pälstidskrift, 19, 1, 10-11, 1985.

6 tables.

CAB-abstract.

In SWED.

INVESTIGATIONS OF FOX SEMEN.

(Ræveavl - sædundersøgelse).

Ib J. Christiansen, Tove Cleemann, Mette Schmidt.

111 ejaculates from 48 foxes of various types were examined. Ejaculate volume ranged from 0.3 to 1.5 ml, being 0.5-0.8 ml for 72 ejaculates. Of the 111 ejaculates, 89 had normal sperm concentration, and 81 ejaculates had satisfactory sperm motility. Semen collection from 32 males was easy, and that from 6 males was very difficult. In ejaculates from 39 males, 23.3% of spermatozoa were abnormal (4.9% head and 18.4% tail abnormalities).

Dansk Pelsdyravl, 47, 11, 591-592, 1984.

3 tables.

CAB-abstract.

In DANH.

LIGHTING EXPERIMENTS WITH BLUE FOXES IN 1983 AND 1984.

(Lysforsøg med blåræve 1983 og 1984).

H. Konnerup-Madsen, Outi Lohi.

152 fox females were given extra light for up to 3 1/2 h per day from 1 March to 20 April in 1983, and 62 females were given up to 4 1/2 h extra light daily from 15 February to 20 April in 1984. In the 2 groups, 89.5 and 96.8% resp. of females mated vs. 96.0 and 96.8% resp. of 121 and 60 controls not given extra light; 36.8 and 71.4% resp. of young and adult treated females mated before 1 April in 1983, and 34.6 and 94.1% in 1984 vs. 29.2, 65.8, 8.0 and 71.4% of controls, the difference between treated and control young females being significant in both years, and that between treated and control adult females being significant in 1984. The percentage of young + adult infertile females in 1983 was 8.8 for treated females and 16.5 for controls vs. 20.0 and 6.7 in 1984, and the number of kits born per mated female averaged 10.16, 8.16, 8.30 and 9.78

resp. It was concluded that although extra light during the mating season produces early matings, it does not seem to affect reproductive performance significantly.

Dansk Pelsdyravl, 48, 1, 37-39, 1985.

5 tables, 1 fig.

CAB-abstract.

In DANH.

MATING EXPERIMENTS WITH BLUE AND SILVER FOXES.

(Avlsforsøg med blå- og sølvræve).

H. Konnerup-Madsen.

Of 40, 40 and 39 blue fox females fed diets containing 58.6, 52.1 and 45.3% of protein resp. during the breeding season, 87.5, 97.5 and 69.2% mated, and 11.4, 10.3 and 10.7% were infertile. In the 3 groups resp., litter size at birth averaged 7.89, 8.15 and 6.00, and litter size at weaning 5.93, 6.68 and 5.08. The percentage of females mating before 1 April was 47.5, 10.0 and 12.8 in the 3 groups. Of 23 silver fox females fed rations with 58.6% protein and 22 females fed 52.1% protein, 22 and 21 resp. mated, and 13.0 and 13.6% were infertile. Litter size averaged 3.09 and 3.50 at birth, and 2.30 and 3.09 at weaning.

Dansk Pelsdyravl, 47,4, 237-238, 1984.

2 tables.

CAB-abstract.

In DANH.

DYNAMICS OF SOME ZOOTECHNICAL TRAITS IN THE BREEDING OF MINK.

(Dinamica di alcuni parametri zootecnici nell'allevamento del visone).

F. Pizzi, C. Crimella.

Data were collected on a farm with an average population size of 4000 females and 1500 males. During 1981-83, litter size (at 10 days of age) averaged 5.50, 5.40 and 5.0 resp. for mink housed in the higher of 2 cage tiers, and 6.13, 5.20 and 5.0 for those in the lower cage tier. Differences between years were significant only within cage location; differences between cage locations were not significant. The effects of colour variety and parity on litter size were not significant.

Atti della Societa Italiana delle Scienze Veterinarie, 37, 483-487, 1983.

3 tables, 5 references.

CAB-abstract.

In ITAL.



EFFICIENCY OF UTILISATIONS OF FOOD ENERGY BY FEMALE GROWING MINKS.

G. Burlacu, V. Rus, C. Aldea, M. Nicolae, L. Cosmescu.

The efficiency of utilisation of food energy by female growing minks, from weaning to adult age, was studied. The food given, pelleted according to an original technology, has the following chemical composition on a DM basis: 87.0% organic matter, 37.1% crude protein, 11.7% crude fat, 2.6% crude fiber, 35.6% nitrogen-free extractives and 13.0 per cent ash.

Young minks had a feed intake, in relation to body weight, varying from 11.6 g to 58.6 g DM/d. Maximum feed intake related to $\text{kg}^{0.75}$ was recorded at 700 g body weight (approximately 98 g DM/kg^{0.65}). Digestibility of the given food expressed in DE, averaged 87.7[±]1.2%, while metabolizability, 82.3[±]1.1%.

Total heat production related to the intaked gross energy, was 48.0[±]3.0%, and the retained energy, 34.3[±]4.0%.

The net efficiency of the metabolizable energy used for maintenance and production could not be accurately determined. However, taking to account the calculated values required for maintenance, of 649 kJ/kg^{0.75} in 300 to 600 g young minks, and of 607 kJ/kg^{0.75} in 600 to 1100 young minks and also the maintenance efficiency, $K_m=0.75$, the coefficient for ME utilisation in protein and fat synthesis, of 0.50 and 0.75, respectively, it was able to determine the average ME efficiency used as net energy for maintenance and production: 70%.

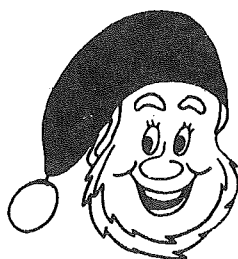
The highest values of nictemeral metabolism were recorded in the evening, and the lowest ones, at noon; the difference between the maximal and the minimal value did not exceed 6 per cent.

Arch. Tierernähr., Berlin, 34, 10, 739-747, 1984.

3 tables, 4 figs., 9 references.

In ENGL. Summary in GERM and RUSS.

Authors' summary.



PROCESSED FISH AND DRY FEED PELLETS FOR BLUE FOXES
DURING THE BREEDING SEASON.

(Industrifisk og tørfoderpiller til blåårve i avlsperioden).

H. Konnerup-Madsen, Agerledet, DK 9300 Sæby, Denmark.

During the breeding season, blue fox female (24-26 per group) were fed (1) a standard diet (controls), (2) the standard diet + 50 percent extra vitamins, (3) 30 percent processed fish in the diet, (4) EWOS dry pellets or (5) DMF dry pellets. Overall, 74 percent of female mated, following electric resistance measurements of vaginal mucus to assess the correct time for mating. In the 5 groups, 34.6, 11.5, 11.5, 13.4 and 37.5 percent resp. of female were infertile, litter size at birth averaged 5.62, 8.15, 8.50, 6.96 and 4.91 kits, litter size at weaning 5.00, 6.27, 6.27, 5.88 and 3.78 and kit weight at 8 weeks of age 2235, 2204, 2191, 2213 and 2092 g.

Dansk Pelsdyravl, 45, 2, 67-68, 1982.

3 tables.

CAB-abstract.

In DANH.

BREEDING EXPERIMENTS WITH BLUE FOXES.

(Avlsforsøg med blåårve).

H. Konnerup-Madsen, Agerledet, DK 9300 Sæby, Denmark.

For 144 blue fox female fed during the mating season on standard rations (controls) or (1) standard rations plus 16 percent pig's head, (2) additional barley, (3) additional barley + extra vitamins, or (4) extra fat, the percentage of infertile female averaged 10.3, 14.3, 16.0, 20.0 and 15.4 resp., litter size at birth 7.79, 6.18, 6.60, 7.04 and 6.04, litter size at weaning 5.38, 5.21, 5.44, 5.48 and 4.73, and cub weight at 8 weeks of age 2.30, 2.19, 2.09, 2.20 and 2.13 kg.

Dansk Pelsdyravl, 46, 5, 273, 1983.

In DANH.

CAB-abstract.

THE USE OF "SPENT" CHICKENS FOR MINK FEEDING.

Richard J. Aulerich, Philip J. Schaible.

A study was conducted to investigate a method of processing, for mink feed, chickens that have finished efficient egg production. This poultry product was used as a substitute for the more costly ingredients of rations during late growth and furring of mink.

The "spent" chickens were treated with the antibiotic, neomycin, in their drinking water then killed, scalded, defeathered and frozen; they were not bled or eviscerated. The frozen birds were ground and fed to mink at 0, 12.5, 25 and 50 percent levels.

Rate of growth of mink increased as the level of poultry product became greater. Fur quality of the mink was not adversely affected by the feeding of the "spent" chicken but the incidence of "wet belly" was greater with diets high in poultry, probably due to the high level of fat. No other hormonal disorders or diseases attributable to the feeding of chickens were encountered.

Quarterly Bulletin of the Michigan Agric. Expt. St., Vol. 47, 3, 451-458, 1965.

4 tables, 1 fig., 13 references.

Authors' abstract.

A PRELIMINARY REPORT ON "SPENT" CHICKENS FOR MINK FEEDING DURING REPRODUCTION AND EARLY KIT GROWTH.

Richard J. Aulerich, Philip J. Schaible.

A group of 20 female mink was fed a diet consisting of 50 percent "spent" chicken and a similar group of mink was fed a typical mink breeding ration containing no chicken during reproduction and early kit growth. Slightly more females whelped and larger litters were obtained on the diet containing poultry, but kit survival and growth was better on the control ration. However, these differences were not statistically significant. Weight of the adult females was maintained better on the diet containing "spent" chicken than on the control ration, probably due to its greater fat and energy content.

Quarterly Bulletin of the Michigan Agric. Expt. St., Vol. 48, 1, 13-16, 1965.

4 tables.

Authors' abstract.

**SIMPLE METHOD OF PROCESSING "SPENT" CHICKENS FOR MINK FEEDING
AND THEIR USE DURING LATE GROWTH AND FURRING.**

Richard J. Aulerich, Philip J. Schaible.

A method previously developed by the authors for converting "spent" chickens into mink food has now been simplified. In the present method, birds are not defeathered but otherwise treated as in the author's previous method. This simplification makes it unnecessary to transport live birds to commercial processing plants for bleeding, defeathering, evisceration and washing. It permits mink ranchers to deal directly with egg producers. It also makes more mink food available from the same quantity of chicken and substantially lowers its cost per pound.

The presence of ground feathers in the new poultry product did not adversely affect its consumption by mink of this age and size. The mink ate around the coarser feather particles. Growth rate of mink fed the poultry product was superior to that of the control group; fur quality was about equal. No detrimental effects that could be attributed to the feeding of a high level of the chicken product were encountered.

Quarterly Bulletin for the Michigan Agric. Expt. St., Vol.49, 3, 24-27, 1966.

2 tables.

Authors' abstract.

**THE INFLUENCE OF PRESERVED FOOD IN NUTRITION OF POLECAT-FERRETS
AND FOXES ON CERTAIN PARAMETERS OF THE ORGANISM.**

**(Wplyw konserwowanej paszy w zywieniu tchórzofretek i lisow na
niektóre cechy organizmu).**

Henryk Bieguszewski.

In the first series of the experiments the influence of preserved food on digestibility of the components of a feed ratio and on chosen haematological parameters of polecat-ferrets was examined. There were not found statistically significant differences in digestibility of a feed ratio containing preserved food. The number of red blood cells, haematocrit, erythrocyte sedimentation rate and fragility of erythrocytes of the experimental animals was on almost the same level as in the controls. Preserved food caused a statistically significant increase of the number of leukocytes and the content of haemoglobin in 5 months old animals.

In the second series of the experiments it was noted, but statistically un-evidenced, increase of the level of albumins, alpha amino nitrogen, kreatinine, cholesterol, activity of transaminases, and statistically significant increase of the level of urea in plasma of the experimental foxes. Feeding of foxes with preserved food may cause defined gross and microscopic lesions in liver, intestines and kidneys, of a little higher intensity than these in foxes on a standard fodder. A trade value of hides of polecat-ferrets and foxes from the experimental group was almost the same as the control animals.

Medycyna Weterynaryjna, Poland, 40, 5, 280-284, 1984.

3 tables, 19 references.

Author's summary

In POLH. Summary in RUSS and ENGL.

MIXED FEEDS FOR MINK.

Комбикорма для норок

G.S. Taranov.

The diets given to group 1 mink, of either sex, was of raw meat and fish products and extruded wheat, that of group 2, 3 and 4 contained feed mixtures which provided 60% of the digestive protein. For group 2 the feed mixture was a powdered concentrate, and for groups 3 and 4 it contained feed fat and barley. The diet for group 4 was pelleted, whereas those for groups 2 and 3 were loose. The feed mixtures for groups 2, 3 and 4 had, in common, fish meal, yeasts and a multiple vitamin supplement. Taken in group order, average daily feed energy intake was 385, 363, 350 and 332 kcal. In August the males gained on average 13.5, 10.3, 10.0 and 11.1 g body weight gain of females not given. Yield of pelt was 664, 670, 666 and 685 cm², of which 55.0, 70.7, 75.0 and 72.5% were of normal quality.

Krolikovodstvo i Zverovodstvo, 2, 12, 1984.

2 tables.

CAB-abstract.

In RUSS.



**EFFECT OF 10% ELEUTHEROCOCCUS, GIDROLIZIN L-103, FLOWER POLLEN
AND SAPROPEL ON POLAR FOXES.**

(Eleiterokoka 10% tinkuras, hidrolizina L-103, ziedputeksnu un
sapropeļa izbarošanas nozīme polarlapsam).

E. Liepīns, A. Zaharova, R. Pavlovska.

Polar foxes were fed on diets to which was added a 10% tincture of Eleutherococcus, Hidrolizīns L-103, flower pollen or sapropel (organic mud). All the preparations increased the resistance of the foxes to infection, quickened the growth rate, and improved pelt quality. Flower pollen was the most effective, but sapropel was most profitable.

Trudy Latviiskoi Sel'skokhozyaistvennoi Akademii, 204, 10-16, 1983.

4 figs., 1 table, 2 references.

CAB-abstract.

In LV. Summary in RUSS.

REPRODUCTIVE FAILURE AND MORTALITY IN MINK FED ON GREAT LAKES FISH.

R.J. Aulerich, R.K. Ringer, Susumu Iwamoto.

Experiments were conducted from 1968 to 1971 inclusive to investigate reproductive complications and mortality in mink attributed to the use of Lake Michigan coho salmon in the ration (Aulerich, Ringer, Seagran and Youatt, 1971). The results indicated that coho salmon as such was not responsible for the loss in fertility. Mink rations that contained other species of Great Lakes fish caused similar reproductive complications, but to a lesser degree. The toxic factor(s) appeared to be concentrated in coho salmon canning by-products, which when fed to adult mink as 30% of the diet were lethal within 3 months. The coho salmon fed to mink during the later feeding trials appeared to be more toxic than that fed in the earlier experiments.

Rancidity or mercury contamination of the fish was ruled out as being responsible for the problem. A direct relationship between the extent of reproductive failure in the mink and the chlorinated hydrocarbon pesticide content of the fish was demonstrated, but no clinical signs of chlorinated hydrocarbon pesticide poisoning were detected in the mink. The clinical signs and lesions noted in mink that died while receiving diets that contained Lake Michigan coho salmon were very similar to those observed in mink fed on rations that contained 30 parts/10⁶ supplemental PCBs.

These included anorexia, bloody stools, fatty liver and kidney degeneration, and haemorrhagic gastric ulcers. Analyses of the tissues from mink that died while fed on diets containing Lake Michigan coho salmon or 30 parts/10⁶ supplemental PCBs showed similar PCB residues, which averaged about 11 parts/10⁶ in the brain. Feeding mink on diets that contained 10 parts/10⁶ PCB, alone or in combination with chlorinated hydrocarbon pesticides, depressed growth. A PCB-toxicity experiment revealed that mink are very sensitive to these compounds and that the toxicity varies inversely with the chlorine content of the PCBs.

J. Reprod. Fert., Suppl.19, 365-376, 1973.

10 tables, 1 fig., 18 references.

Authors' summary.

THE VALUE OF CORN DISTILLERS DRIED SOLUBLES IN THE MINK RATION.

Philip J. Schaible, Hugh Travis.* (*reprint address).

Seven experiments were conducted during all phases of the life cycle of mink to determine the value of corn distillers Dried Solubles in the ration. A total of 852 mink (382 adults and 470 kits) was used over a 4-yr period.

Corn Distillers Dried Solubles gave good results during growth and furring when used as a replacement for 5% horse meat in a typically practical ranch-type ration. Corn Distillers Dried Solubles also performed well when it replaced up to 20% of a commercial supplemented cereal for mink.

Corn Distillers Dried Solubles satisfactorily replaced dried liver product and dried skimmed milk in dry diets specifically designed for mink during the winter, summer and fall maintenance periods.

When corn Distillers Dried Solubles was added to a commercial ranch ration at 6% level (dry basis), good results were obtained during the periods of breeding, gestation, parturition and lactation. However, corn Distillers Dried Solubles was unable to replace the entire contents of fresh liver during these periods.

Proc.of Sixteenth Distillers Feed Conf., 3-12, March 8, 1961.

9 tables, 3 references.

Authors' summary.

LYSOZYME ADDITION IN THE MINK FEEDING AND FUR QUALITY.**(Aggiunta di lisozima nella razione dei visoni e qualita della pelliccia).**

D. Casciotti, C. Renieri, M. Silvestrelli, F. Pacelli.

In this paper we considered two different lysozyme contributions (5 and 25 mg/animal/die) in mink standard feeding. The fur quality of the two treated groups has been compared with that of a control. A better quality has been observed in the treated animals.

Rev. di Coniglicoltura, 21, 7, 37-39, 1984.

7 tables, 8 references.

Authors' summary.

In ITAL. Summary in ENGL.

EFFECT OF NATRIUM SELENITE ON NUTRIA GROWTH AND DEVELOPMENT.**БИОЛОГИЧЕСКОЕ ДЕЙСТВИЕ СЕЛЕНА НА РОСТ
И РЕПРОДУКТИВНЫЕ СПОСОБНОСТИ НУТРИЙ**

G.K. Kuliev.

The biological effect of selenium on nutria development and fecundity was studied. It is shown, that the five-fold injection of 0.1% Na selenite solution affects positively the growth of animals, the development of ovaries and the maturity of reproductive cells.

Sel'skokhozyaistvennaya Biologiya, 10, 121-122, 1984.

1 table, 8 references.

Authors summary.

In RUSS. Summary in ENGL.

VITAMIN K IN THE NUTRITION OF MINK.

Hugh F. Travis, Robert K. Ringer, Philip J. Schaible.

Experiments were conducted to ascertain: (1) whether normal adult mink require vitamin K; (2) whether dark mink differ in this respect from sapphire mink which contain the Aleutian gene; and (3) whether sulfaquin-oxaline or certain antibiotics affect blood clotting time.

The dietary requirement of normal adult mink was established as being less than 13 mg of menadione sodium bisulfite (USP) per ton, or 6,5 µg per pound of feed. Practical ranch rations would contain much higher levels of vitamin K activity.

The mean whole blood prothrombin time of sapphire mink (16.8 ± 0.4 seconds) was similar to that of dark mink (17.8 ± 0.4 seconds).

Sulfaquinoxaline fed for 6 to 8 days at the 0.05% level or higher significantly increased the whole blood prothrombin times.

Menadione sodium bisulfite (USP) at a level of 10 gm per ton of food (fed as Klotogen F) reduced the blood clotting time of mink fed sulfaquinoxaline at a level of 0.06%.

Addition of aureomycin and terramycin at a level of 400 gm per ton of food when fed for 6 or 8 days did not significantly increase whole blood prothrombin times.

Mink fed a semipurified ration had comparable blood clotting times to those fed a typical ranch ration.

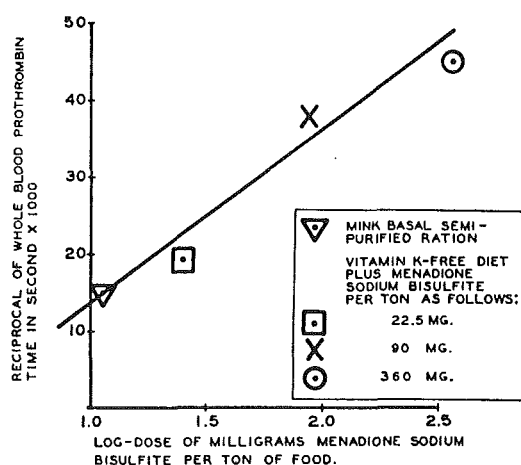


Fig. 1 Determination of vitamin K (menadione sodium bisulfite) level of mink basal semipurified ration using chick assay.

J. Nutrition, 74, 2, 181-184, 1961.

5 tables, 1 fig., 9 references.

Authors' summary and conclusion.

THE INFLUENCE OF THYROPROTEIN ON GROWTH AND FURRING IN MINK.

Richard J. Aulerich, Philip J. Schaible.

This study was conducted to ascertain the effects of feeding thyroprotein to dark, pastel and sapphire mink. Mink in the experimental groups were compared with littermates in control groups with respect to body growth, fur quality and the rate of furring priming. The dark mink that received thyroprotein showed a significant increase in weight gain over their controls; the other color phases were not affected. Maturation of the skin and hair (fur priming) was not retarded or accelerated and fur quality was not significantly enhanced by the thyroprotein supplementation during late growth and furring.

Quarterly Bulletin of Michigan Agric. Expt.St., vol. 49, 2, 211-215, 1966.
2 tables, 13 references. Authors' abstract.

EFFECTS OF FEEDING COHO SALMON AND OTHER GREAT LAKES FISH ON THE MINK REPRODUCTION.

R.J. Aulerich, R.K. Ringer, H.L. Seagran, W.G. Youatt.

Feeding experiments were conducted to investigate reproductive problems attributed to the feeding of Great Lakes coho salmon to mink. Several other species of fish were fed for comparison. Whole, raw sexually mature coho salmon taken from tributaries of Lake Michigan were ground, mixed into a diet at a 30% level, and fed to mink before breeding and during gestation. This diet caused reproductive failure and (or) very early kit mortality. Feeding canning by-products of coho salmon from the same source and at the same level to adult mink for 3 months resulted in mortality. Reduced reproductive performance and (or) excessive kit mortality were observed in mink which were fed diets that contained Lake Michigan bloater chub, Lake Michigan yellow perch, and mature coho from the Lake Erie system. Mink rations which contained West Coast coho salmon and Lake Erie yellow perch did not impair reproduction nor results in excessive mortality.

No correlation was found between the degree of oxidative rancidity or mercury contamination of the fish and the reproductive performance of the mink. The levels of pesticide residues in the fish (and the complete diets) and the degree of reproductive decline and (or) kit mortality observed in the mink appeared related.

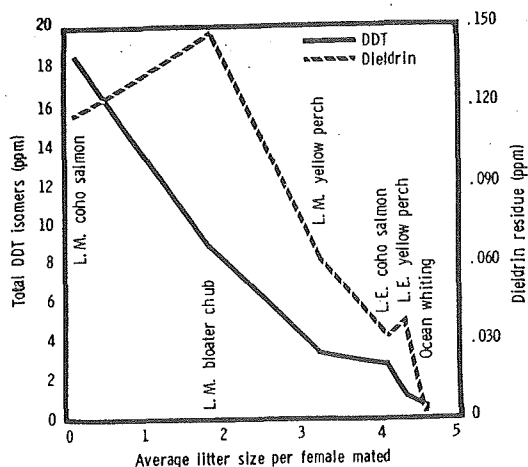


FIG. 1. Relationship between litter size and pesticide residues in fish fed to mink in experiment III.

MINK
MATTERS



The study demonstrated that coho salmon per se does not cause the reproduction and mortality problems. Further, the disorder is also associated with other species of Great Lakes fish and appears to be dependent upon the species of fish and its environment.

Can. J. Zool. 49, 611-616, 1971.

9 tables, 1 fig., 5 references.

Authors' abstract.

RATE OF ACCUMULATION OF CHLORINATED HYDROCARBON PESTICIDE RESIDUES IN ADIPOSE TISSUE OF MINK.

R.J. Aulerich, R.K. Ringer, D. Polin.

Dieldrin, DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane), and DDD (1,1-dichloro-2,2-bis-p-chlorophenyl)ethane) were fed to mink to ascertain the rate of accumulation and isomeric distribution of the residues in adipose tissue. Activated carbon was incorporated into the rations in an attempt to reduce the rate of pesticide residue accumulation. Adipose tissue samples, produced biweekly by biopsy, were analyzed by gas chromatography for pesticide residues.

Mink fed 100 ppm DDT plus 50 ppm DDD had tissue pesticide levels averaging 373 ppm by the 2nd week of feeding and 510 ppm by the 4th week. Control tissues averaged from 5 to 23 ppm DDT and its isomers. In control tissues, the three isomers DDT, DDD, and DDE (1,1-dichloro-2,2-bis(p-chlorophenyl)ethane) accounted for 59, 15, and 26%, respectively, of the total concentration. In samples from treated mink, the relative concentration of DDT, DDD, and DDE was 74, 23, and 3%, respectively, of the

total level. The dieldrin content of tissues from mink fed 2.5 ppm dieldrin plateaued at about 21 ppm in 4 weeks.

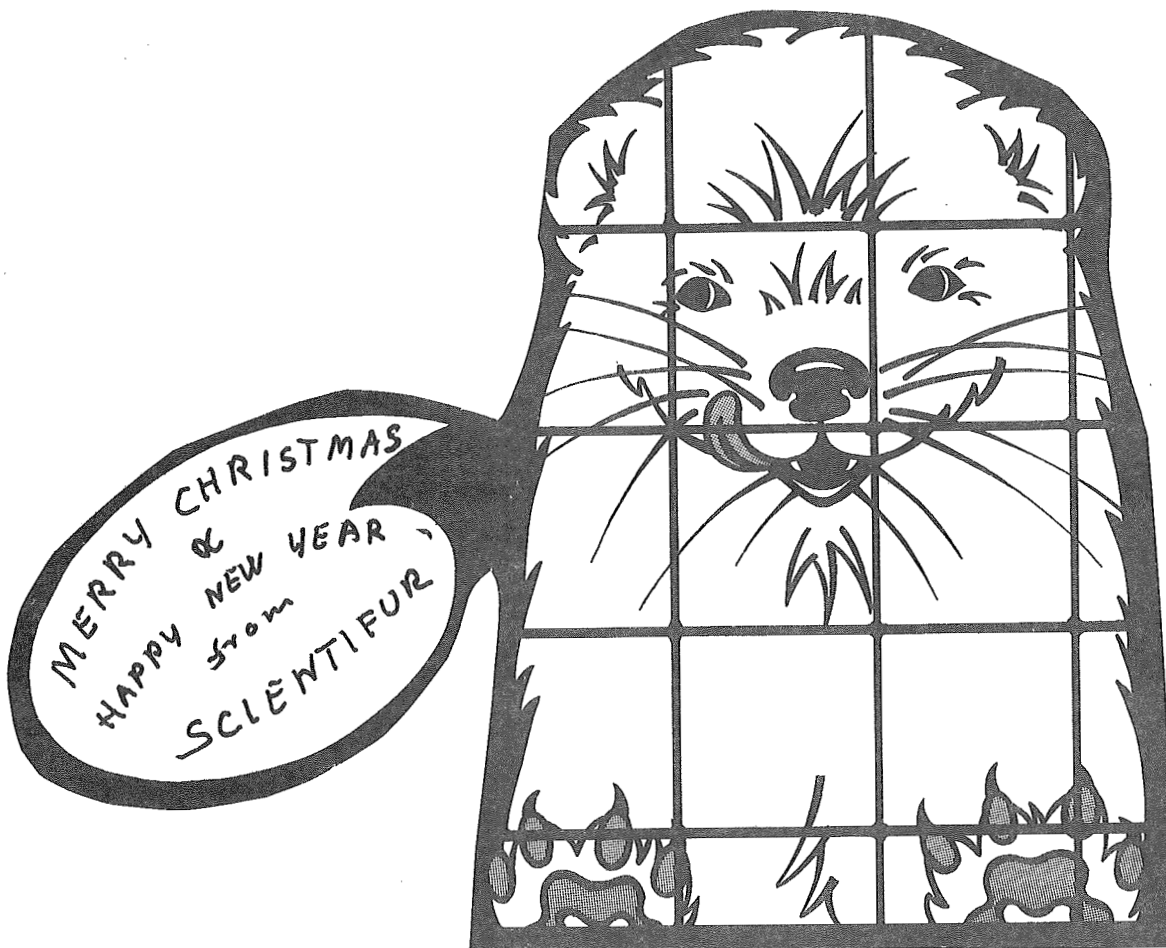
Activated carbon in the diet at 4410 ppm did not influence the rate of pesticide accumulation in the fat, the level at which the pesticide residues tended to plateau, or the distribution of DDT and its isomers.

Can. J. Zool. 50, 1167-1173, 1972.

1 fig., 4 tables, 7 references.

Authors' summary.

In ENGL. Summary in FREN.





**IMMUNOENZYME WESTERN BLOTTING ANALYSIS OF ANTIBODY SPECIFICITY
IN ALEUTIAN DISEASE OF MINK, A PARVOVIRUS INFECTION.**

David D. Porter, Helen G. Porter, Austin E. Larsen, William J. Hadlow. Aleutian disease virus (ADV), an autonomous parvovirus, persistently infects mink and induces very high levels of virus-specific antibody. All strains of ADV infect all mink, but only highly virulent strains cause progressive disease in non-Aleutian mink. The development of antibody to individual ADV proteins was evaluated by Western blotting by using the sera of 22 uninfected mink and 163 naturally or experimentally infected mink. ADV has virion proteins of 86,000 and 78,000 daltons that are closely related. A new, possibly nonvirion protein of 143,000 daltons was observed, as well as a known nonvirion protein of 71,000 daltons. Sera from mink experimentally or naturally infected with ADV of high or low virulence generally reacted about equally with all four proteins. The only exceptions noted were that 8 of 15 sera of mink infected transplacentally preferentially reacted with the two virion proteins and sera from mink with the monoclonal gammopathy of Aleutian disease reacted preferentially with either virion (10 of 12) or nonvirion (2 of 12) proteins. *Journ. of Virology*, 52, 3, 745-749, 1984.

1 fig., 4 tables, 28 references.

Authors' summary.

**ROCKET LINE IMMUNOELECTROPHORESIS: AN IMPROVED ASSAY FOR
SIMULTANEOUS QUANTIFICATION OF A MINK PARVOVIRUS (ALEUTIAN DISEASE
VIRUS) ANTIGEN AND ANTIBODY.**

S. Alexandersen, J. Hau.

A rocket line immunoelectrophoretic assay (RLIE) was developed for the simultaneous quantification of viral antigens and antiviral antibodies of the important mink parvovirus, aleutian disease virus (ADV). The sensitivity of the RLIE assay was found to be $5 \log_2$ higher than that of the counter current immunoelectrophoresis which is the assay routinely used for diagnostic purposes.

Journ. of Virological Methods, 10, 145-151, 1985.

3 figs., 1 table, 14 references.

Authors' abstract.



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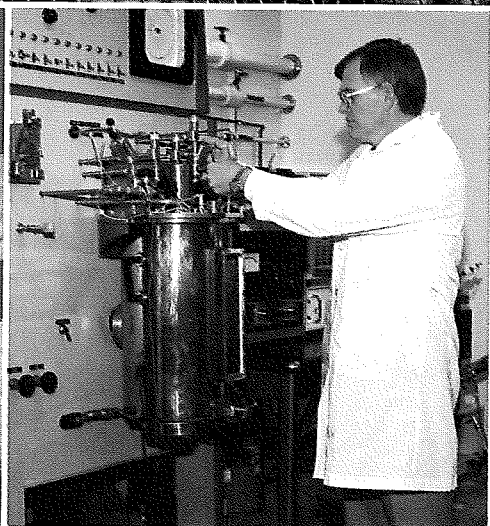
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ON THE LYMPHOTROPISM OF ALEUTIAN DISEASE VIRUS (ADV).

Susanne Roth, O.R. Kaaden.

In persistently infected mink ADV and its specific antigens were detected in different lymphoid organs. In about 4% of the peripheral blood mononuclear cells (MNC), spleen, thymus and lymphnode MNC, and up to 40% of the bone marrow cells ADV-specific antigens could be demonstrated by nuclear fluorescence using polyclonal and monoclonal antibodies. Furthermore, infectious ADV was isolated from these cells over a period of 15 month by co-cultivation with CCC Clone 81-cells. Some of these isolates were adapted to grow in culture with titres up to 10^8 focus forming units/ml. The blood MNC were further fractionated by different methods. ADV-specific antigens and infectious virus could be detected in the B and T cell-enriched fractions. The corresponding cells from lymphoid organs of mink that were demonstrated to be serologically negative for ADV were found to be fully permissive for ADV "in vitro". Fibroblasts did not support the growth of ADV. - These findings indicate that ADV exhibits a lymphotropism "in vivo" and can persist in different lymphoid cells from persistently ADV-infected mink for a long period of time.

Zbl.f. Bakteriologie, Mikrobiologie und Hygiene, A. 258, 4, 528, 1984.
(Abstract of papers of the Virology Section of the DGHM).

Only abstract received.

**EXPERIMENTAL TRANSMISSIBLE MINK ENCEPHALOPATHY:
BRAIN LESIONS AND THEIR SEQUENTIAL DEVELOPMENT IN MINK.**

Robert J. Eckroade, Gabriele M. ZuRhein, Hanson, Robert P.

The microscopic pathology and the sequential development of lesions in transmissible mink encephalopathy (TME) infected mink were determined by the examination of 28 mink inoculated intraperitoneally with TME mink brain and 10 mink inoculated with normal mink brain. These mink were killed at intervals post-inoculation (4-33 weeks). Histopathological alterations were limited to the central nervous system, and were characterized by vacuolation of gray matter, neuronal degeneration and nerve cell loss, and hyperplasia and hypertrophy of astrocytes in gray matter. The significance of each of these lesions was discussed. There was a notable absence of inflammatory cell infiltrates, acute neuronal changes, neurophagia, or microgliosis. These lesions were not observed in the control

mink. Lesions were first detected at 24 weeks and subsequently followed a pattern of development. The progression of lesions was most rapid in the cerebral cortex. The spread of lesions in the cerebral cortex appeared to occur by direct extension along nerve cell layers III, IV and V from affected to adjacent unaffected cortex. The topographical distribution of lesions was determined by the examination of 5 terminally affected TME inoculated mink. The lesions were bilaterally symmetrical, widespread in the brain, and uniform among mink.

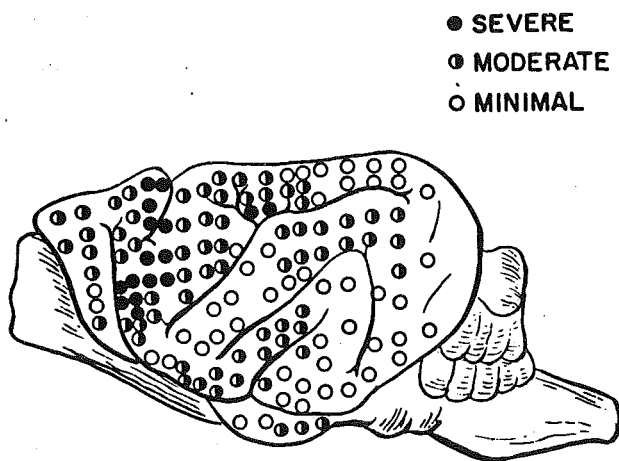


FIGURE 12. Lateral view of mink brain showing topographical distribution of TME lesions in the cerebral cortex.

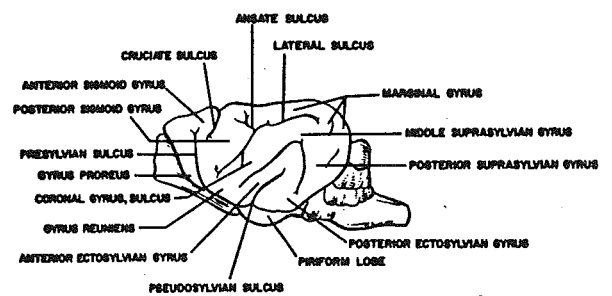


FIGURE 13. Cross anatomy of mink brain from a lateral view.

The location and severity of lesions were shown on drawings of the lateral aspect of the cerebral cortex, and of 13 standardized coronal sections. Spongiform degeneration involved the cerebral cortex, the non-cortical telecephalon, diencephalon and mesencephalon and diminished caudally in the neuraxis. The sites of initial lesions at 24 weeks were the most severely affected areas terminally. Clinical disease was recognized at 30 weeks post-inoculation, although disruption of gray matter by vacuoles occurred 4-6 weeks earlier. The brain from some experimental mink were assayed in mink to determine the presence of TME agent. TME agent was first detected at 16 weeks post-inoculation and was present in all mink brain assayed thereafter, but was not detected in the brain of mink killed at 4 and 8 weeks post-inoculation.

Slow Transmissible Diseases of the Nervous System, Vol. 1.
Academic Press Inc., New York, 409-449, 1979. ISBN 0-12-566301-3.

27 figs., 5 tables, 37 references.

Authors' abstract.

Part of Ph.D. Thesis.

ON THE ORIGIN OF TRANSMISSIBLE MINK ENCEPHALOPATHY.

R.F. March, R.P. Hanson.

Studies on mink susceptibility to sources of scrapie from the United States, but not from the United Kingdom, indicate that transmissible mink encephalopathy (TME) most likely originates from mink being fed scrapie-infected sheep or goat tissues. Experiments further suggest that the shortest natural route for infection is via bite wounds inflicted by littermates rather than by the oral route per se. Other studies, on the biologic characterization of the TME agent from Sawyer County, Wisconsin, indicate that this particular source of TME is composed of a mixture of subpopulations which include a hamster pathogen and a mink-monkey pathogen.

Slow Transmissible Diseases of the Nervous System, Vol. 1.
Academic Press Inc., New York, 451-460, 1979. ISBN 0-12-566301-3.

Authors' abstract.

OCCURRENCE AND COMPOSITION OF UROLITHS IN FARM MINK.

(Auftreten und Zusammensetzung von Harnsteinen beim Farmnerz).

H. Zimmermann, P. Schweder.

Growing loss has been recorded due to urolithiasis from mink farms in recent years. Primarily affected were young males, between June and August, however, with no disposition by colour types being discernible. Urolith analysis by means of radiological diffractometry showed that struvite calculi, which accounted for 96 per cent of 100 examined nephroliths and cystoliths, were the only types of calculi which were of relevance to the urolithiasis-based diseases among the minks.

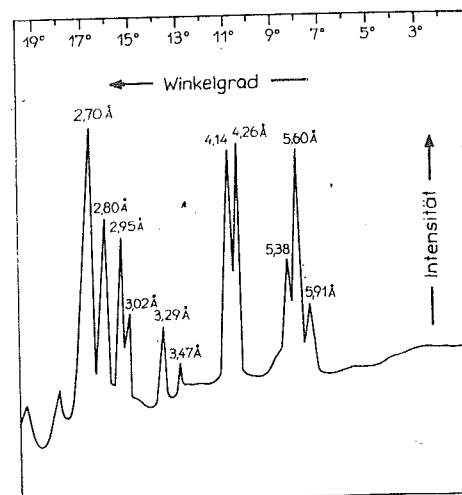


Abb. 1 Interferenzbild der häufigsten Harnstein-Substanz Struvit der Nerze (Interferenzangaben in Å; Å = 0,1 nm)

Mh. Vet.-Med. 40, 374-376, 1985.

4 tables, 1 figs., 13 references.

In GERM. Summary in RUSS and ENGL.

Authors' summary.

BLASTOMYCOSIS IN A FERRET.

Andrea Lenhard.

A case is reported in an 18-month old female ferret (*Mustela putorius furo*), which presented with an ulcerated lesion of the left metacarpal pad. A tissue imprint of the forepad lesion demonstrated mononuclear phagocytes and broad-based budding yeasts consistent with *Blastomyces dermatitidis*. Thoracic radiography revealed reticulonodular interstitial pneumonia, with focal consolidation of the middle portion of the left lung and areas of trapped pleural fluid. An agarose gel immunodiffusion test was positive for serum antibody to *B. dermatitidis*. Therapy with intravenous amphotericin B (0.8 mg/kg every other day) and oral ketoconazole (5 mg/day) was instituted, but amphotericin B had to be reduced, then stopped, because of side effects. The animal relapsed and was euthanized. Necropsy revealed *B. dermatitidis* infection of the lungs.

JAVMA, 186, 1, 70-72.

2 figs., 12 references.

CAB-abstract.

DERMATOMYCOSIS IN RANCH FOXES.

E.B. Janovitz, G.G. Long.

Cases of dermatomycosis are reported in 50 of 220 foxes (colour variants of *Vulpes fulva*) kept in a barn, which developed multiple crusty areas of alopecia, initially diagnosed as sarcoptic mange and treated unsuccessfully by dipping with a commercial organophosphate insecticide. Within 24 h, 5 of the treated foxes died and 20 other were listless and had a serious ocular discharge. Necropsies performed on 2 foxes revealed hyphae and fungal spores in hair follicles and surface keratin and *Trichophyton mentagrophytes* was cultured from skin scrapings and hair. Oral therapy with griseofulvin was initiated, but slow response to therapy and economic loss forced the owner to liquidate the operation.

JAVMA, 185, 11, 1393-1394, 1984.

3 figs., 11 references.

MANGE DUE TO CHEYLETIELLA BLAKEI, SMILEY 1970 IN POLAR FOXES IN POLAND.

A. Malczewski, A. Kopczewski, Malgorzata Malczewska, J. Zieliński.

In September 1982 itching, loss of naiv and the formation of dandruff particularly on the back and the base of the tail were noticed in 2 farms

with 96 and 68 polar foxes in the district of Gdansk. As symptoms typical of *Sarcoptes scabiei* like vesicles, crusty and pustules were missing and the symptoms noticed occurred in an unusual localisation, new investigations were prompted at the Institute of Parasitology of the Polish Academy of Science and at the Institute of Veterinary Hygiene at Gdansk. Mites of the species *Cheyletiella blakei* were detected in all skin scrapings taken from foxes in these 2 farms. This is the first finding of these mites in polar foxes and in Poland. The foxes were treated subcutaneously with 1 ml Ivermectin/animal twice with an interval of 6 weeks. Skin scrapings of 30% of the treated foxes were examined at 2 weeks intervals from the day of the first treatment on. Within 6 months of examination all animals became free of the mites and the symptoms of disease disappeared completely. The drug did not influence negatively mating behaviour and gestation of the bitches nor the puppies. From these investigations it is concluded that Ivermectin at a dosage of 1 ml/fox subcutaneously is active against *Cheyletiella blakei*, even if it is not as active as against *Sarcoptes* for the control of which one treatment is sufficient. In these 2 farms 2 cases of symptoms like itching and skin alterations in animal attendants were recorded but they were diagnosed as mange due to *Sarcoptes*.

Zbl. Bakt. Hyg. A 258, 2/3, 412-413.

Abstract from 11th Meeting of the Deutsche Gesellschaft für Parasitologie e. V. (Only abstract). Authors' abstract.

A POSTMORTEM DIAGNOSIS OF DIROFILARIASIS MAY HAVE FAR-REACHING IMPLICATIONS.

T.D. Anderson, Gale Salmon.

A necropsy revealed severe heartworm disease in a fox at a commercial breeding operation. These pathologists suggest such a situation could signal danger to the domestic canine population.

Vet. Med., 1283-1285, October 1984.

5 figs., 4 references.

Authors' summary.



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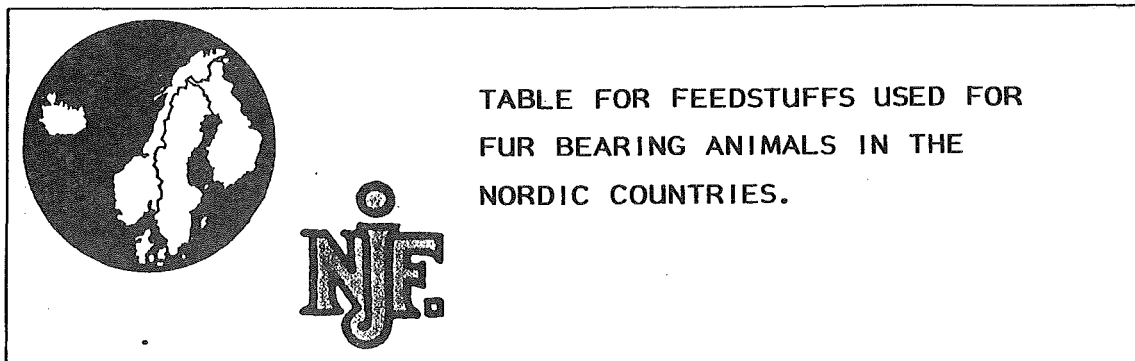


TABLE FOR FEEDSTUFFS USED FOR
FUR BEARING ANIMALS IN THE
NORDIC COUNTRIES.

Nordisk fodermedelstabell

för pälsdjur

1985.

Tables for chemical composition and apparent digestibility of crude protein, crude fat, carbohydrate and metabolizable energy in feedstuffs used for fur bearing animals were worked out on the basis of experimental data, practical experience and common sense for most feedstuffs used in the Nordic countries.

Where data from several experiments were available the authors choosed the data they assumed to be most representative.

Based on Norwegian and Danish experiments a table for content and digestibility of Amino Acids in commonly used feedstuffs for fur bearing animals were worked out.

The basis for digestibility coefficients was experiments with mink.

Furthermore a list of names of feedstuffs is given in Swedish, Danish, Norwegian, Finnish and English.

(N.Glem-Hansen, Hans Berg, Anders Skrede og Maria Neil).

Nordiska Jordbruksforskares Förening

Subsektion för pälsdjur

26 pp. In SWED.

Obtainable: N. Glem-Hansen, Danish Fur Breeders Association,
60, Langagervej, DK 2600 Glostrup, Denmark.

NEW BOOK

Mink Production

Now on the market.

Editor: *Gunnar Joergensen*

MINK PRODUKTION, 1st edition 1984 (Danish edition)
 MINK PRODUCTION, 1st edition 1985 (English edition)

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This book is a direct translation of MINK PRODUKTION, which was published by the Danish Fur Breeders Association in 1984.

In the preface to the Danish edition, Helge Olsen, manager of the Danish Fur Breeders Association, wrote, "In Denmark, we have managed in a good way to exploit the natural production factors through cooperation on pretty well everything worth cooperating on - sales, advisory activities, procurement of feed, feed production and control, combating disease, and research and development.

Preface

300 pages.

Rich in illustrations, tables, figures, and both black/white and colour photos.

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The results of this cooperation are available to new fur breeders, but since 'it is the present that creates the future', it is the fur breeders in operation now who determine the future of the industry, and the future belongs to those who have prepared for it. Being prepared really means making sure you possess the available, relevant knowledge and having a flair for using it."

When it comes to the production and selling of skins, the cooperation in Scandinavia is just as natural as the cooperation in Denmark. In granting permission for translation of this book into English, the Danish Fur Breeders Association is extending the hand of friendship to strengthen the international cooperation on the farmed production of fur animals.

MINK PRODUCTION naturally describes mink breeding principally on the basis of Danish experience, but the fact that Denmark is one of the leading nations in this field should guarantee that the book contains much valuable information for mink breeders all over the world.

A glance at the relevant literature shows that manuals of this nature are few and far between – perhaps because of the extensive cooperation required for their preparation and publication.

The International Scientific Congresses on Fur Animal Production and the birth of SCIENTIFUR in 1976 are a clear message from Scandinavian scientists – firmly supported by the fur breeders' organizations – that they desire increased international cooperation on the production side.

While thanking the Danish Fur Breeders Association for the confidence it has shown in granting us permission to translate and distribute MINK PRODUCTION, SCIENTIFUR wishes to urge all working in this field to support international cooperation by using the products that result from it and by making suggestions for new "products" – which can best be procured through that same international cooperation.

In the hope that this book will provide many hours of good reading, I wish a successful future to all.



Hilleroed, October 1985

Gunnar Joergensen
Editor & Publisher

Scientifur

48 H Roskildevej
DK-3400 Hilleroed
Denmark

The book is extremely attractive and readable. It is naturally primarily addressed to fur breeders, and new breeders, in particular, will find that it gives them a great deal of useful information. However, it also provides a valuable textbook and manual for teaching purposes.

Issued August 8, 1908.

U. S. DEPARTMENT OF AGRICULTURE:

FARMERS' BULLETIN 328.
SILVER FOX FARMING.

WILFRED H. OSGOOD,
Assistant, Biological Survey.



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1908.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., May 28, 1908.

SIR: I have the honor to transmit herewith a report on the rearing of silver foxes. As civilization encroaches on the breeding grounds of wild animals the supply of fur steadily diminishes and the price correspondingly advances. If furs as articles of use and adornment are not soon to disappear from general use, methods must be devised for raising fur-bearing animals in confinement. This subject is now being investigated by the Biological Survey. The present bulletin furnishes information as to the possibilities of the propagation of silver, or silver-black, foxes and the best methods of conducting the business. The silver-black fox is one of the highest priced of fur bearers, and hence offers a tempting field for experiment. The business of raising this animal is believed to promise fair if not large returns for skill, experience, and the investment of moderate capital.

I recommend that this report be published in the Farmers' Bulletin series.

Respectfully,

C. HART MERRIAM,
Chief, Biological Survey.

HON. JAMES WILSON,
Secretary of Agriculture.

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