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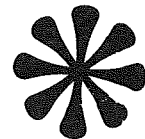
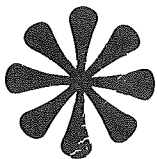
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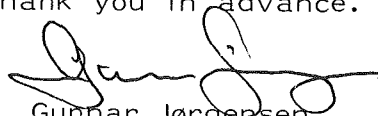
At the beginning of January 1987 the invoice for the 1987-subscriptions will be sent out.

Please note, that the subscription price has raised to Dkr. 420.- pr. volume.

We ask you, please, to pay the invoice prompt.

Thank you in advance.




Gunnar Jørgensen
Editor





THANK YOU FOR THE
FIRST **10** YEARS



MERRY CHRISTMAS

HAPPY NEW YEAR

NOTES

SCIENTIFUR, Vol. 10, No. 4, 1986.

Dear Readers, Subscribers, Advertisers and Contributors.

DEAR ALL SUPPORTERS OF THE INTERNATIONAL COMMUNICATION AND CO-OPERATION REGARDING FUR ANIMAL PRODUCTION.

Thanks to you SCIENTIFUR has grown in all respects during the first ten years of its existence. Thanks to you it has been both a great pleasure and very inspiring for us in the editorial end of our common "child", SCIENTIFUR, born as a result of fruitfull brain storming at the First International Scientific Congress in Fur Animal Production, Helsinki 1976.

Reading the Notes during the ten years you today can realize that your editor has not got every of his ambitions regarding SCIENTIFUR and related activities fullfilled. Therefore, we hope for positive development also in the next decade of SCIENTIFUR's existence.

In the Notes of the latest issue of SCIENTIFUR we wrote about our intentions of printing the journal in professional way from No. 1, 1987. In spite of the fact that the subscription rate is raised by 20% we have to realize that our economic state do not allow us to take the step in 1987, but somewhat progress will happen in the direction of better appearance of the journal, which we hope you will appreciate.

As mentioned above THE SUBSCRIPTION PRICE WILL INCREASE BY 20%, FROM DKr. 350.- to DKr. 420.- FROM JANUARY 1987.

The reason for it is increasing expenses everywhere - but, at the same time we draw your attention to the fact that the rate has been unchanged for 3 years. SCIENTIFUR IS STILL A CHEAP AND A VERY EFFECTIVE WAY TO GET INFORMATION REGARDING SCIENCE AND PRODUCTION IN THE LEADING FUR ANIMAL PRODUCING COUNTRIES AS WELL AS IT IS THE ONLY INTERNATIONAL COMMUNICATION CHANNEL IN THIS RESPECT.

The invoice for this service - the 1987 subscription of SCIENTIFUR - will

be sent to you at the very beginning of the new year. Hopefully, you will execute it promptly, so that our sparetime can be used for other hobbies than to send out reminders. THANK YOU.

The year 1987 will be the year before The 4th International Scientific Congress in Fur Animal Production going on in Canada/USA on August 20th to 28th 1988 (as mentioned in SCIENTIFUR, Vol. 9, No.3, pp 240-241).

The advertising of this 4th Congress was written by Mrs. Arlen V. Kerr, executive secretary of the Canadian Mink Breeders Association. It hurt us very much to learn that Mrs. Arlen V. Kerr has died. But Mr. Tony Rietveld has assumed us that the arrangement committee - although its losses - will continue the programming of the congress.

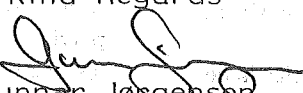
1987 will be the year when the 2nd book published by SCIENTIFUR will come out, namely the former mentioned one "Beauties of Farmed Fur Animals - mutations and combinations" or "The Colour Genetics of Farmed Fur Animals", which will be the Scandinavian title.

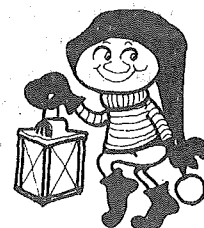
This extremely attractive book will appear in 2 Scandinavian languages and in English. The English edition ultimo 1987 - so individuals as well as companies do not need to use their imagination very much for the absolute excellent present for Christmas 1987 and every exhibitions regarding live animals or skin during the 1987/88 season. We intend to send a folder presenting the book, suggesting the price and containing a preorder slip at the next issue of SCIENTIFUR.

Well, dear readers, things are still going on. We are looking forward to be of service for you also during 1987.

At the same time we thank you for your supports in different ways, many kind words, orally or written, during 1986. We wish all of you a MERRY CHRISTMAS AND A HAPPY AND PHOSPEROUS NEW YEAR.

Kind Regards


Gunnar Jørgensen
Your Editor



Original Report

The Cybernetic Concept as a Manner of Approach to the Technology of Fur Animal Breeding

(Conceptual cibernetice ca mod de abordare a tehnologiei de crestere a animalelor de blana)

Romulus Gruia, Dept. Agric. of State, I.A.S. Prejmer, judetul Brasov, Romania

Summary

It is presented one of the integrative concepts of the fur animal breeding field, which, starting from the premises of its structuration in dynamics and complex zooproductive ecosystems, puts into evidence its functional aspect linked to description of the leading, regulation and selfregulation cybernetic mechanisms.

The complexity of the mechanisms was described through a model of possible correlations between the recent theories and interdisciplinary sciences, as well as through the analyses of the systemic structure and of the cybernetic dynamics of the fur animal ecosystem.

By the approach to the cybernetic concept, which constitutes a stage in the consolidation of the animal breeding manner of thinking in an informational meaning, the work tries to direct the fur animal breeding conceptually towards the operational aspect of the problem, i.e. the one of optimisations on computer.

In the present stage of development of the fur animal breeding, divided on specialties, it is often felt the need of an integral comprehension of the exploitation of these animal species. This integration may be done at the level of the individual biological system, at the populational one, or at the zooproductive ecosystem level (7). Not to take into account the integrity of the fur animal organism, but also of the ecosystem to which these species belong, constitutes a big mistake, which can be corrected by appropriating the integrative concepts, as for example the cybernetic concept.

Starting from the premises that cybernetics is not only the science of computers, but also the science of dynamic and complex systems, and considering that

the animal exploitation confounds itself with the existence of the dynamic and complex zooproductive ecosystems, we try to consider the field of the fur animal breeding from integrative and systemic positions, putting into evidence the functional aspect through the description of the cybernetic and leading mechanisms, the regulation and selfregulation ones (6). Also the present concept tries to direct the specialists towards the growth of the efficiency of their activity, under the conditions of replacing the natural thermodynamic equilibrium maintaining at the same time the ecological equilibrium (5, 7).

The complexity of the approached phenomena being extremely large, we are going only to initiate a certain point of view in order to clarify things and in search of the essences of the functioning. Thus the elaboration of the concept drew its characteristic elements out of a group of new sciences and theories and especially out of the complex interrelation of these systems, which suggest the functionality and the maintenance of the desired dynamic equilibrium.

We consider that a particular meaning for the exploitation of the fur animals have the theory of systems, the theory of information and the more recent interdisciplinary sciences. They provide the functioning frame of the analysed system, but also the direction and the sphere of activity on hierarchical systemic levels. A particular contribution to the establishment of the conceptual frame have ecology, bioenergetics, zoometeorology which assure the applicability or the concretization of the action. All these, as well as the technics of processing of the furs under particular commercial conditions, provide the response of the analyzed system, its behaviour, as a reply given in an organized way to the disturbant factors.

The fur animals framed in a zooproductive ecosystem offer an integrative and unitary manner of studying the respective biosystem, making possible the analysis of its functionality with the help of the cybernetic principles. The regulation and selfregylation mechanisms of the ecosystem aim to achieve the desired order under the conditions of the dynamic equilibrium or of the climax at the ecosystem level, respectively to maintain the homeostasis at all the systemic levels (2, 3, 11).

The feed-back circular or conceptual mechanism (positive or negative), which general by enriched the knowledge of the biological phenomena (1, 4, 8 etc.) offer the fur animal ecosystem the necessary support in order to achieve the respective control. Actually, the human factor achieves the control, this one being the regulating element necessary to optimize the fur production. The antropoc factor, with its informational, calculating and command elements, is placed on the inverse connection loop (fig. 1).

The circuits suggested in the figure are characteristic to the feed-back circuits, because in the case of the zooproductive system of the fur animals, the issue sizes of the regulated system (S) will act upon the regulating system (R), so that the element R, control-

ling the issue of the element S, may control its activity. The issue size y equals the transformation the regulated system (S) may have upon its entrance sizes $x + \Delta x$, i.e. $y = S(x + \Delta x)$. But as Δx equals the transformation the regulator R may transmit to the y size, i.e. $\Delta x = Ry$, then $y = S(x + Ry)$, from which

$$y(1 - SR) = Sx \text{ and } y = \frac{S}{1 - SR} x, \text{ which constitutes in}$$

fact the fundamental formula of the regulation through feed-back (8, 10).

The regulation represents the process through which the fur animal ecosystem, as a cybernetic system, can oppose itself (temporarily at last) to the second principle of the thermodynamics. It is the process through which the state of this biosystem acquires a certain independence confronted by the variations the entrance sizes and can assure the order of the system by reducing the disorder processes which take place in its frame (4, 9, 10).

The regulator system R of the ecosystem in which are framed the fur animals disposes, besides of the connecting mechanisms, or the error compensation, of mechanisms used to prevent the errors. The moment the commanding centre (R), of the feed-back mechanism receives not only informations generated

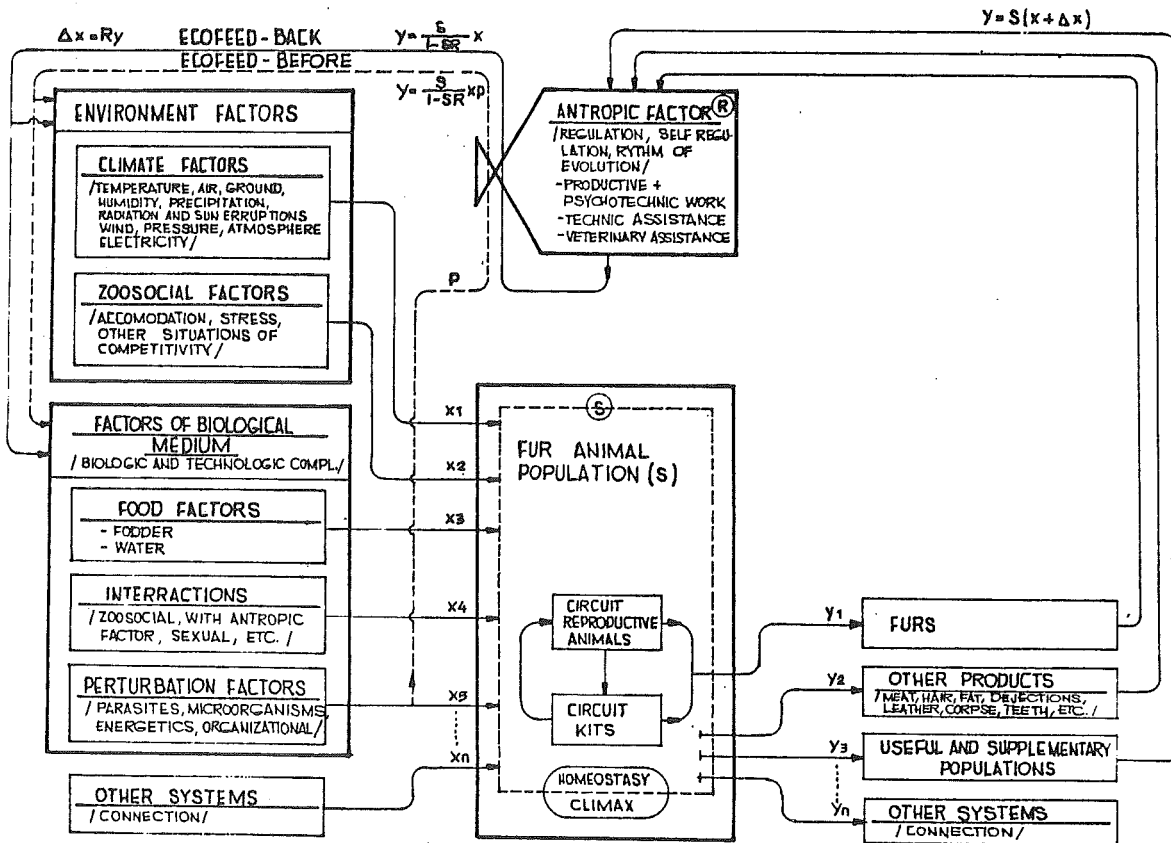


Fig. 1. The systemic structure and the cybernetic dynamics of the fur animal zooproductive ecosystem.

x - the multitude of entrances in the system.

y - the multitude of outings from the system.

R - regulating system. S - regulated system (the fur animal farm, as an element of the given ecosystem).

p - disturbant factors.

by the variations of the regulated element (S), but also informations generated by the disturbance elements (p), or the medium ones, which could act upon the regulated element (S), the feedback mechanism becomes in fact a feed-before mechanism, able not only to correct, but also to prevent the modifications of the regulated element (S). In the case of the feed-before mechanism the classical formula by O. Lange becomes:

$$y = \frac{S}{1 - SR} xp, \text{ where } p \text{ re}$$

presents the informations generated by the disturbance factors (7, 8, 10).

For the organ level of the fur animals the feed-back mechanism has relatively been more studied at present, but for the overindividual levels it is less known.

In the case of the feed-before mechanism the processing becomes very complicated because this mechanism has to anticipate the evolution of the phenomena, to elaborate variants, to simulate strategies and to choose the best one of them. We consider that in the fur animal ecosystem the antropic factor constitutes the element which achieves just these things. More precisely, man, receiving information not only from the regulated element (the farm with fur animal population), but also from all the disturbant- and medium factors, practically transforms the feed-back mechanism of the ecosystem in a feed-before mechanism.

At an ecosystem level the respective mechanisms may be called, due to the implications they generate, ecofeed-back and, respectively, ecofeed-before mechanisms (6). The regulation of the ecosystem through these mechanisms may lead to an informational hygiene (10) which addresses itself to the components of the fur animal ecosystem and, generally, to the medium. Because a medium which generates a too large quantity of information may uselessly require many of a times the regulating mechanisms and especially those ment to protect the fur animals' organism. Therefore the corresponding regulation of the information leads to superior fur productions.

Conclusions

1. By the appropriation, at a first stage, of the concept of cybernetics, first of all for the biological and technical aspects, but also for the economical ones, with the help of which the technology of the fur animal breeding can be approached, can be reached a superior stage which finally leads to the technics of modelation, finding new optimized solutions, highly efficient, ment to improve the technologies of fur animal breeding without deteriorating the medium, by processing the data with help of the computer.

2. In order to understand the manner in which the regulating processes work and the manner in which the information is processed at all systemic levels of hierarchies of the ecosystem it is necessary a cybernetic conception and even an informational metholo-

gy, with the help of which can be discovered the principles of organizing and work of the regulating and selfregulating mechanisms of the fur animal ecosystem. The cybernetic conception, as a manner of approach to the fur animal breeding technology seems to be very suitable to the complexity of the phenomena we have to face and may lead to the improvement of the efficacy of our actions.

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SCIENTIFUR, VOL. 10, NO. 4, 1986.

THE EFFECTS OF PHOTOPERIOD AND MELATONIN ON SERUM PROLACTIN LEVELS OF MINK DURING THE AUTUMN MOLT.

Jack Rose, Frederick Stormshak, James Oldfield, John Adair.

An experiment was conducted to determine the effects of a reduced daily photoperiod and exogenous melatonin on serum prolactin levels of mink during the autumn molt and growth of the winter pelage. During the last week of June, adult standard dark female mink (*Mustela vison*) were exposed to natural changes in daylength (controls), a reduced photoperiod of 6 h light: 18 h dark (6L:18D) or exposure to natural changes in daylength and treated with melatonin (10 mg) in a Silastic implant inserted subcutaneously over the scapular area. Beginning July 2, and continuing through October 22, blood samples were collected at nine biweekly intervals, and serum prolactin concentrations were quantified by a heterologous double antibody radioimmunoassay. Both reduced photoperiod and exogenous melatonin caused serum prolactin levels to decline rapidly after mid-July, resulting in concentrations that were significantly lower than those of controls 6 to 8 wk earlier. These data suggest that growth of the winter pelage of mink is strongly associated with declining prolactin levels. It appears that part of the photoperiodic-induced effects on fur growth of the mink are mediated through melatonin and its effects on prolactin synthesis and/or secretion.

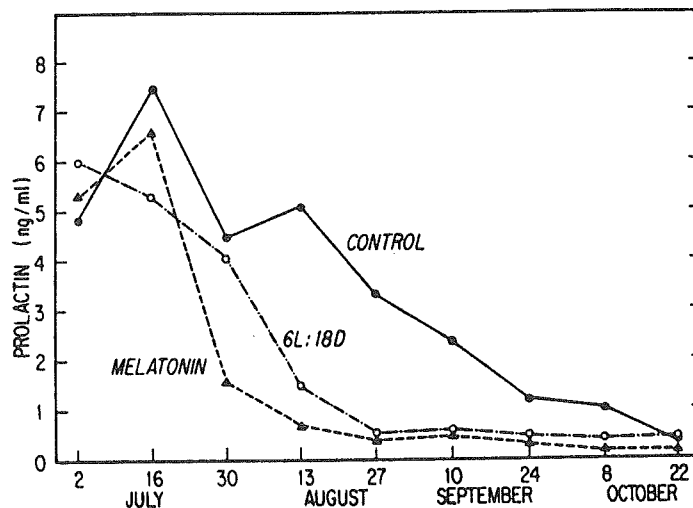


Fig. 2. Serum prolactin concentrations of adult standard dark female mink exposed to natural changes in daylength (controls), reduced photoperiod of 6 h light:18 h dark (6L:18D), or natural changes in daylength and treated with 10 mg melatonin, from June 26 to October 22, 1980. Means were derived from triplicate determinations. Common estimates of the standard errors expressed as logarithmic transformed values were as follows: controls, 0.1234 (N = 5); 6L:18D, 0.088 (N = 7); and natural light plus melatonin treatment, 0.088 (N = 7).

**SEASONAL CHANGES IN ENERGY ECONOMY OF FARMED POLECATS
AS EVALUATED BY BODY WEIGHT, FOOD INTAKE AND BEHAVIOURAL STRATEGY.**

Hannu Korhonen, Mikko Harri.

An analysis of seasonal changes in energy budget of the farmed polecat (*Mustela putorius*) was performed in subarctic climate. Cyclical variations were found in the body weight of male polecats from maximum values in February (2.1 kg) to minimum values in June–July (1.5 kg). There were only minor seasonal changes in the body weight of females. There was a direct relationship between body weight and voluntary energy intake on one hand ($r=0.89$) and an inverse relationship between body weight and locomotor activity ($r=-0.88$) on the other hand. Energy intake was significantly ($p \leq 0.05$) higher during winter (224 kcal/animal/day) than during summer (142 kcal/animal/day). Total time spent outside the nest was at its maximum during the winter months (60 min./day). The results suggest that in male polecats, changes in absolute food intake induce seasonal changes in body weight. Seasonal changes in locomotor activity seem to be less important in energy balance regulation. The fact that the body weight of females showed only minor seasonal variation supports the role of sexual hormones in the control of the body weight.

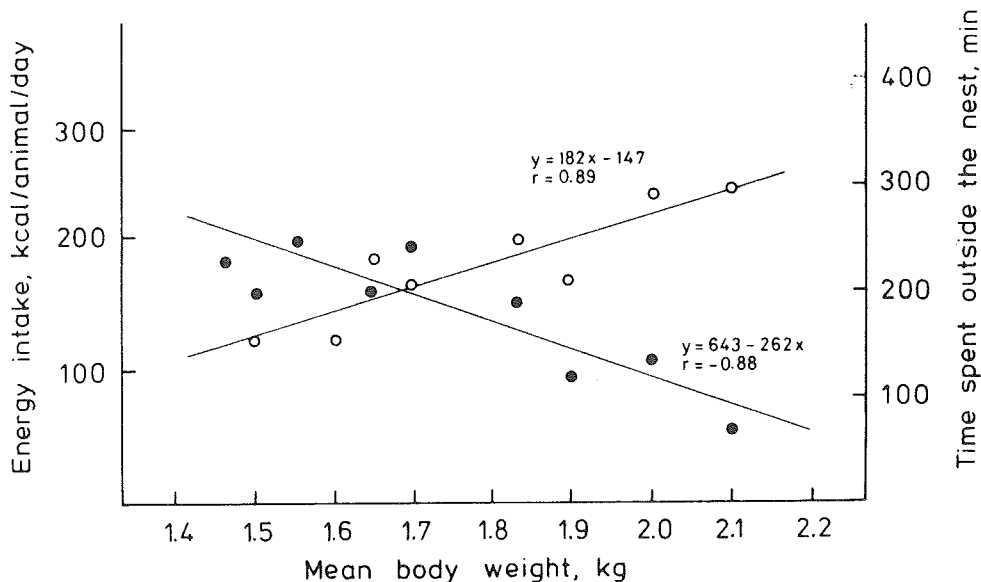


FIG. 5. Correlation between daily activity (●) and energy intake (○), respectively, and body weight in male polecats (N=6). Body weight represents changes from minimum values in June–July to maximum one in February.

TEMPERATURE AS A REGULATOR OF ENERGY BUDGET IN THE POLECAT.

Hannu Korhonen, Mikko Harri.

The polecat is a small mustelid species which pays high energetic costs for being long and thin. Because of its small body mass and elongated body shape, its surface area is much greater than that of a larger or normally shaped mammal of the same size. The insulative capacity of its short-haired fur coat is low. Thus it has to sustain a metabolic rate which is twice as high as that estimated by its body size. The lower critical temperature of the polecat is also high, i.e. around + 24°C. That this species, in spite of these drawbacks, copes well in such subarctic conditions as exist in Finland, is surprising and demonstrates its adaptivity.

The polecat is, however, extraordinarily well adapted to cold climates and seasonal temperature and food abundance fluctuations. This is a result of seasonal changes in its energy budget which includes alterations of voluntary feed intake, body weight and behavioural patterns. The nest provides especially an important microhabitat for the polecat. During winter it spends around 23 hours of the day inside the nest. Even in summer it prefers to stay almost 12 hours of the day inside the nest. While the nest is so well insulated the polecat copes by its basal metabolic rate as long as it stays inside the nest. Thus one can understand why the polecat prefers the nest so eagerly.

Body weight of the male polecat is at its highest during mid-winter (about 2.1 kg), and during spring it drastically declines reaching its lowest during mid-summer (about 1.5 kg). This marked seasonal change in its body mass mainly consists of changes in the amount of subcutaneous fat reserves. Besides feed consumption, locomotor activity of the polecat is seasonally regulated. By these two means the polecat is able to effectively manipulate its body mass seasonally.

Sopeytuminen ja suojauminen kylmässä ympäristössä
Kylmätutkimusssymposium, 15.-16.4 1986, Kuopio
(Toim. M. Harri, H. Korhonen, O. Hänninen) s. 14.
1 table.

In FINN.

Authors summary.

THE CHINCHILLA.

(Chinchilla)

E. Isenbugel.

A comprehensive and well illustrated compendium of diseases in Chinchilla.

Heimtierkrankheiten by E. Isenbugel & W. Frank. Stuttgart, German Federal Republic, Verlag Eugen Ulmer, 99-117, 1985.

18 figs., 41 references (on pp 158-159).

In GERM.

Abstract: G. Jørgensen.

CALCANEAE OF MEMBERS OF THE MUSTELIDAE. PART I, MUSTELINAE.

Howard J. Stains.

The calcaneae of 20 spp. (7 genera) (*Eira barbara*, *Galictis vittata*, *G. cuja*, *Gulo gulo*, *Martes americana*, *M. flavigala*, *M. foina*, *M. martes*, *M.*

pennati, *M. zibellina*, *M. altaica*, *M. erminea*, *M. frenata*, *M. nivalis*, *M. nigripes*, *M. putorius*, *M. sibirica*, *M. vison*, *Poecilictis lybica* and *Poecilogale albinucha*) of members of the Mustelinae are described and compared. All species have a well-developed trochlear process and sustentaculum. The anterior articular surface is absent in 14 of the 20 spp. (all *Mustela* and most *Martes*). The genera *Martes* and *Mustela* are much alike except for size. *Galictis* is the most aberrant, approached most closely by *Poecilictis*. *Poecilogale* is close to *Mustela*; *Eira* and *Gulo* close to *Martes*.

1976

CALCANEA OF MUSTELIDS

239

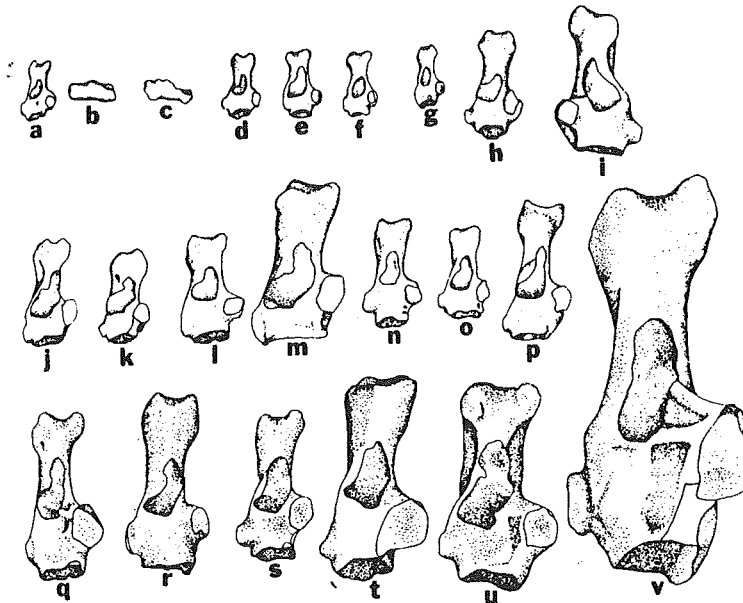


Figure 1. Right calcanea of members of the Mustelinae. a, *Mustela nivalis*; b, and c, lateral views; d, *M. erminea*; e, *M. altaica*; f, *M. frenata*; g, *Poecilictis lybica*; h, *M. nigripes*; i, *M. sibirica*; j, *M. vison*; k, *Poecilogale albinucha*; l, *Galictis cuja*; m, *G. vittata*; n, *Martes americana*; o, *M. martes*; p, *Mustela putorius*; q, *Martes flavigula*; r, *M. foina*; s, *M. zibellina*; t, *Eira barbara*; u, *M. pennanti*; v, *Gulo gulo*.

Bull. South Calif. Acad. Sci., 75, 3, 1976 (Recd. 1977) 237-248, 1976.
1 fig., 2 tables.

DIMIDI-abstract.

ECOLOGY OF THE STONE MARTEN IN ALSACE FRANCE. (Ecologie de la Fouine en Alsace)

Antonie Waechter.

The genus *Martes* in Western Europe is represented by two species: *Martes martes* L. and *Martes foina* Erxl., which cannot be easily differentiated externally.

A better description of the ecological niche of the Stone marten is therefore attempted based upon field observations in Alsace, as well as upon some laboratory observations of behavior.

Whilst martens are restricted to wooded areas, stone martens are found only in and around villages and quarries: 95.2% of the trapped animals were taken at less than 500 meters from the last house of the village. The Stone marten is found in almost all urbanized Alsatian areas, including some cities. The Stone marten inhabits village barns, stone-heaps or even abandoned burrows made by other species. The availability of possible habitats apparently fixes the ceiling of population size in the study area. The Stone marten preference for stony habitats in du Caroux (Southern France) the Stone marten does not depend upon the presence of human dwellings.

The average size of the Stone marten's home range in Alsace is 80 hectares. Within this range, the principal and secondary lairs, as well as "hunting grounds" and defecation places are to be found.

The study of scats collected in the field, as well as "cafeteria experiments" in the laboratory, indicate that the Stone marten is opportunistic, exploiting those foods which are most abundant at any given period of time. In Alsace, chicken's eggs can locally account for up to 90% at the caloric intake in June and July; berries and fruits form the staplefood in summer, whereas small mammals are mostly eaten in winter.

Terre Vie, 29, 3, 1975 (Recd. 1976) 399-457, 1975.

18 tables, 24 figs., 30 references.

In FREN. Summary in ENGL.

Author's summary.

**ON THE RELATION OF THE DISTRIBUTION OF MARTENS (SUBGENUS
MARTES PINEL) IN THE USSR TO BIOCLIMATIC FACTORS.**

**О НАЛЕГАНИИ АРЕАЛОВ РАЗНЫХ ВИДОВ ПОДРОДА КУНИЦ
(*MARTES PINEL*) В СССР**

N.N. Bakeev.

In the European part of the USSR the northward and eastward distribution of the thermophilic stone marten, *M. foina* Erxl., is limited by winter cold; the boundary of its range coincides with the January isotherm of -10° C and the isolines of several other meteorological indices. The pine marten, *M. martes* L., and in particular the sable, *M. zibellina* L., are cold loving species. The southern limits of their ranges are determined by the effective summer air temperatures. Therefore in southern latitudes the sable and the pine marten live in alpine, predominantly dark coniferous taiga forests with a relatively colder climate.

Byull. Mosk. O-VA Ispyt Prir. Otd. Biol. 77, 2, 5-15, 1972.

2 figs., 1 table, 33 references.

In RUSS. Summary in ENGL.

Author's summary.

**ON THE OVERLAPPING OF THE RANGES OF DIFFERENT SPECIES
OF MARTES PINEL IN THE USSR.**

**О НАЛЕГАНИИ АРЕАЛОВ РАЗНЫХ ВИДОВ ПОДРОДА КУНИЦ
(*MARTES PINEL*) В СССР**

N.N. Bakeev, Yu N. Bakeev.

In the USSR the subgenus *Martes Pinel* is represented by three species with wide zones of coinciding habitats: *Martes zibellina*, *M. martes* and *M. foina*. A coexistence of *M. zibellina* and *M. martes* is observed both in the pessimum zone at the northern boundaries of their ranges, where both species are represented by small populations. In the optimum zone the populations of these species have separate habitats.

M. martes and *M. foina* are species relatively distant phylogenetically and occupy different niches; they are encountered on the same localities in the Caucasus and the European part of the USSR, in the zone optimum for both species.

Byull. Mosk. Obshchest Ispyt. Prir. Otd. Biol., 75, 2, 27-37, 1970

5 tables, 24 references.

In RUSS. Summary in ENGL.

Authors' summary.

**THE STONE MARTEN (MARTES FOINA) AND THE PINE MARTEN
(MARTES MARTES) IN THE VORONEZH OBLAST.**

**КАМЕННАЯ И ЛЕСНАЯ КУНИЦЫ
В ВОРОНЕЖСКОЙ ОБЛАСТИ**

L.S. Ryabov.

Only one finding of the stone marten has been reported in the Voronezh oblast between 1919 and 1957. Today martens of both species are successfully extending their range on this territory. The eastern boundary of the stone marten has shifted eastward and seems to lie now beyond the limits of the oblast. Due to the protection and underexploitation of pine martens, they have increased in number and are widely populating small woods and strips of forests. Stone martens penetrate in villages and towns: in Voronezh they occur in garrets of high buildings, where they prey on doves.

Byull. Mosk. O-Va Ispyt. Prir. Otd. Biol. 81,4, 24-37, 1976.

3 figs., 11 references.

Author's summary

In RUSS. Summary in ENGL.

ON THE BYGONE DISTRIBUTION OF SABLES IN EUROPEAN RUSSIA.

**О БЫЛОМ РАСПРОСТРАНЕНИИ СОБОЛЯ
В ЕВРОПЕЙСКОЙ РОССИИ**

N.G. Grakov.

A critical analysis is given of the bygone distribution of sables in the European part of the USSR, including the distribution of individuals with traits of sable - pine marten hybrids, in marten populations. The information on the occurrence of sables in Lithuania and central Russia is recognised as unconvincing.

The range of sables in Europe was confined in the past to the territories of the present Arkhangelsk oblast. Komi ASSR and northern half of the Permsk oblast, presumably also the north of the Karelian ASSR and southwestern part of the Kola peninsula. Stray sables may have penetrated considerably farther westwards and southwards, giving rise to temporary isolated micropopulations. During the VIII-III cc. B. C. the sable may have inhabited the region of the r. Kama, extending southwestwards to the mouth of the r. Vyatka.

Byull. Mosk. O-Va Ispyt. Prir. Otd. Biol., 79, 1, 31-41, 1974.

40 references.

Author's summary.

In RUSS. Summary In ENGL.

**RELATIONSHIP BETWEEN FOOD HABITS AND ACTIVITY PATTERNS
OF PINE MARTENS.**

William J. Zielinski, Wayne D. Spencer, Reginald R. Barrett.

Pine martens (*Martes Americana*) consume a variety of food types annually but seasonal foraging is restricted to a subset of available prey. Winter foods include chickarees (*Tamiasciurus douglastii*), voles (*Microtus* spp.) snowshoe hares (*Lepus americanus*), and flying squirrels (*Glaucomys sabrinus*), whereas ground-dwelling sciurids (*Spermophilus* spp. and *Eutamias* spp.) comprise the bulk of the diet during the remainder of the year. Activity also is variable by season, with martens foraging at night

during winter and by day during summer. Seasonal marten activity does not appear associated with optimal ambient temperature but instead appears synchronized with the activity of prey.

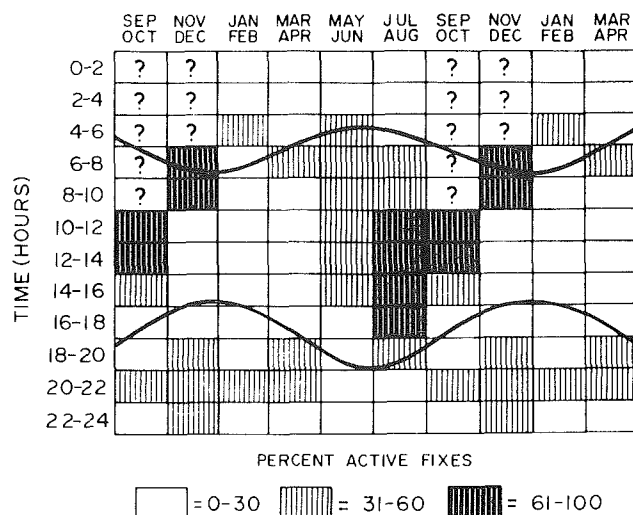


FIG. 2. Diel activity of martens at Sagehen Creek from July 1979–September 1980 (Pacific Standard Time). The four columns on the right duplicate the four on the left and are included for continuity. Undulating lines indicate approximate time of sunrise and sunset and question marks denote cells with insufficient data.

J. Mamm. 64, 3, 387–396, 1983.
3 figs. 2 tables, 46 references.

Authors' summary.

**SEX-RELATED DIFFERENCES IN THE DEVELOPMENT, SIZE AND PROPORTIONS
OF THE SKULL IN THE PINE MARTEN *MARTES MARTES* L.
(MAMMALIA, MUSTELIDAE).**

**ПОЛОВЫЕ РАЗЛИЧИЯ В РАЗВИТИИ, РАЗМЕРАХ И
ПРОПОРЦИЯХ ЧЕРЕПА ЛЕСНОЙ КУНИЦЫ
MARTES MARTES L. (MAMMALIA, MUSTELIDAE)**

O.L. Rossolimo, I.J. Pavlinov.

Noticeable sex-related differences in growth rate were discovered within the age interval 0–1; the values of nearly all characters changes more intensively in females than in males. The sex-related differences in absolute measurements are reliable for all characters at a level of significance of 0.01, during the whole period under consideration. A decrease of sex-related differences was observed for a number of characters from the 0 to the 1 age group with a subsequent increase towards the 2, 3 groups. The sex-related changes in skull indices are most pronounced in the 0 groups: the skull of the females is more infantile than the skull of males in all the indices. In older age groups the configuration of the female skull is near to that of the male skull.

Byull. Mosk. O-Va Ispyt. Priir. Otd. Biol., 79, 6, 23–35, 1974.

3 tables. 3 figs., 15 references.

Authors' summary,

In RUSS. Summary in ENGL.

**AGE-RELATED CHANGES IN THE SKULL CHARACTERS OF MARTES MARTES L.
(MAMMALIA: MUSTELIDAE) IN THE POSTNATAL PERIOD:**

**ВОЗРАСТНЫЕ ИЗМЕНЕНИЯ ЧЕРЕПА ЛЕСНОЙ КУНИЦЫ
MARTES MARTES L.
(MAMMALIA: MUSTELIDAE) В ПОЗДНЕМ ПОСТНАТАЛЬНОМ
ПЕРИОДЕ РАЗВИТИЯ**

I. Ya. Pavlinov.

Age-related changes are most pronounced in the characters associated with the masticatory apparatus. The development of these characters has a three-four phase periodicity: an acceleration of their age-related changes is observed at the age of 6-8 years. The development of all other characters is two-phasic, with a complete cessation of growth at the age of 3-4 years. The height and breadth of the dome as well as of the capacity of the brain case absolutely decrease with age. The peculiarities of development observed in the characters of the temporal complex seem to be associated with the dynamics of temporal muscles activity.

Byull. Mosk. O-Va Ispyt. Prir. Otd. Biol., 82, 5, 33-50, 1977.
1 fig., 2 tables, 22 references. Author's summary.
In RUSS. Summary in ENGL.

ANOMALIES OF SKULL STRUCTURE IN THE PINE MARTEN (*MARTES MARTES L.*).

**АНОМАЛИИ В СТРОЕНИИ ЧЕРЕПА ЛЕСНОЙ КУНИЦЫ
(*MARTES MARTES L.*)**

I. Ya. Pavlinov.

Twelve different anomalies were discovered in the skull of the pine marten; they occurred in 11.7% of all the skulls examined and 14% of the anomalous skulls had two or more defects. Teratogenic anomalies are more frequent in males, anomalies of pathogenic origin are equally frequent in both sexes. The frequency of anomalies increases with age, particularly in males. The causes of the appearance of conjugate anomalies, the importance of anomalies as a factor in mortality rate, are discussed.

Byull. Mosk. O-Va Ispyt. Prir. Otd. Biol., 85, 1, 30-36, 1980.
1 table, 7 references. Authors' summary.
In RUSS. Summary in ENGL.

**VARIABILITY OF THE SAGITTAL CREST (*CRISTA SAGITTALIS EXTERNA*)
ON THE SKULL OF THE PINE MARTEN (*MARTES MARTES L.*).**

**ИЗМЕНЧИВОСТЬ СТРЕЛОВИДНОГО ГРЕБНЯ
(*CRISTA SAGITTALIS EXTERNA*) НА ЧЕРЕПЕ
ЛЕСНОЙ КУНИЦЫ**

I. Ya. Pavlinov.

The sagittal crest of pine martens varies very widely both in degree and mode of development. The individual variability of the crest is highest during the period of its intensive formation. Three types of crest development are recognised in males and two types in females. The recognised types are not random variations within each separate age group, but follow the general pattern of development of the initial juvenile type of temporal ridges structure in the age group 0.

Byull. Mosk. O-va Ispyt. Prir. Otd. Biol., 81, 1, 28-33, 1976.
2 figs., 4 references. Author's summary.
In RUSS. Summary in ENGL.

**SOME FEATURES OF THE LOCOMOTOR ORGANS OF *MARTES MARTES* L.
ASSOCIATED WITH THE MODE OF LIFE.**

**НЕКОТОРЫЕ ОСОБЕННОСТИ ОРГАНОВ ДВИЖЕНИЯ
ЛЕСНОЙ КУНИЦЫ (*MARTES MARTES* L.)
В СВЯЗИ С ОБРАЗОМ ЖИЗНИ**

I.I. Sokolov, A.S. Sokolov.

Among the representatives of the family Mustelidae the pine marten is the best adapted to an arboreal mode of life. As compared with the European polecat (*Mutela putorius* L.), a typical ground species of the same family, the pine marten has a number of features of constitution, postcranial skeleton and muscle associated with the ability of this animal to climb, jump and move in the crowns of the trees. Having the same number of vertebrae as the polecat, the marten is characterised by a short thorax, and elongated loins which increase the flexibility of its body. When jumping its long tail plays the part of parachute and rudder. The extremities, in particular the hind limbs, longer than in other ground species, are favorable to fast running and leaping. The high degree of differentiation of limb muscles and especially of the chest muscles assures a great variety of movements.

Byull. Mosk O-va Ispyt. Priir. Otd. Biol., 76, 6, 40-51, 1971.

6 tables, 18 references.

Authors' summary.

In RUSS. Summary in ENGL.

**DENTAL ABNORMALITIES IN THE PINE MARTEN, *MARTES MARTES* (L.)
(CARNIVORA, MUSTELIDAE) FROM POLAND.**

Mieczyslaw Wolsan.

Dental abnormalities found in 8 out of 220 skulls of pine martens from Poland are described and attempts are made to explain their occurrence.

Zool. Anz., Jena, 213, 1/2, 119-127, 1984.

1 table, 6 figs., 28 references.

Author's abstract.

In ENGL. Summary in GERM.

**ON THE PINE MARTEN (*MARTES MARTES*) OF SARDINIA.
(Über den Baumarder (*Martes martes*) Sardinien).**

R. Hutterer, Adelheid Geraets.

Recent records of the pine marten from Sardinia confirm that the species is distributed in the highlands of the island. The marten lives in dense macchia impenetrable to man and areas of cork oaks. Some measurements and comments on the coloration of the pelage are given, as well as a summary of the known records. Contrary to the diagnosis given by Miller (1912), the subspecies *Martes m. latinorum* Barrett-Hamilton, 1904 is characterized by very dark fur and a big orange throat patch.

Z. Säugtierkunde, 43, 374-380, 1978.

2 figs., 15 references.

Authors' abstract.

In GERM. Summary in ENGL, ITAL.

**THE COMPARATIVE ECOLOGY OF COASTAL, RIVERINE AND LACUSTRINE
MINK *MUSTELA VISON* IN BRITAIN.**

Nigel Dunstone, J.D.S. Birks.

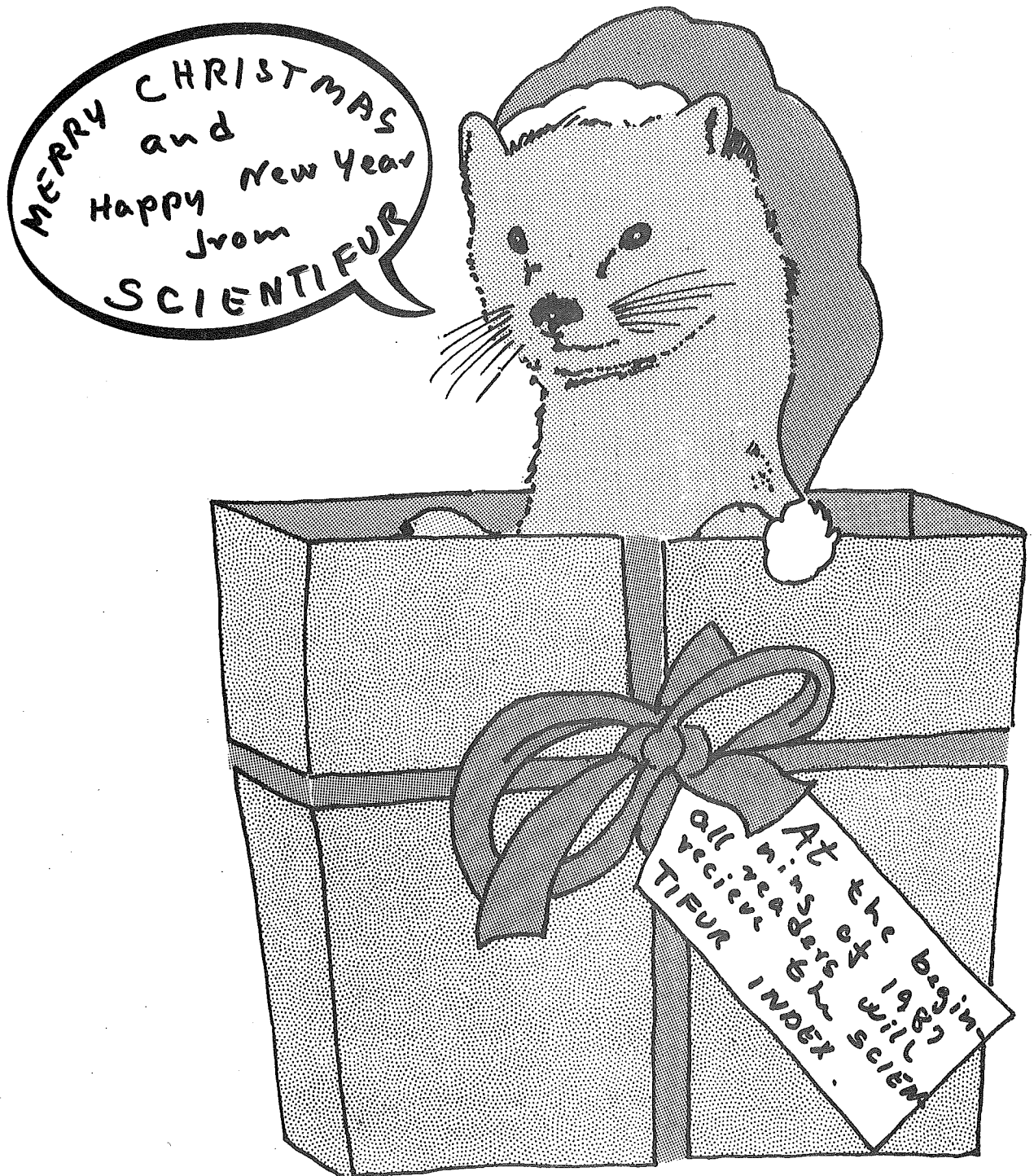
Aspects of the ecology of feral American mink are compared for three waterside habitats: a rocky sea-coast, an oligotrophic river, and an eutrophic lake. The population density of mink was greatest on the rocky coast, and least on the oligotrophic river. The observed differences may be explained by variations in the diet, home range size and den-use of mink between each habitat.

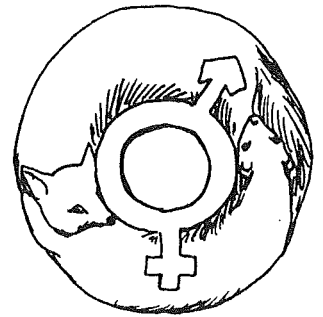
Zeitschrift für angewandte Zoologie, Berlin, 72, 1/2, 59-70, 1985.

4 figs., 4 tables, 24 references.

In ENGL. Summary in GERM.

Authors' summary.





NEW FORMS OF HEREDITARY TYROSINEMIA TYPE II IN MINK: HEPATIC TYROSINE AMINOTRANSFERASE DEFECT.

Knud Christensen, Per Henriksen, Hilmer Sørensen.

Three different forms of hereditary tyrosinemia type II, with some of the features described for the Richner-Hanhart's syndrome, occur in mink (*Mustela vison* Schreb.). These disorders are inherited as simple autosomal recessive characters. The main symptoms of the diseases are watery dull eyes, frequent urination, alteration of the hair/skin on the toes and a highly elevated level of tyrosine in blood and urine. An enzyme defect in hepatic tyrosine aminotransferase (EC 2.6.1.5) is considered as the reason of these three forms of the mink disease. Differences between these forms of hereditary tyrosinemia in mink now described lie among other things in the time of onset, duration and severity of the disease.

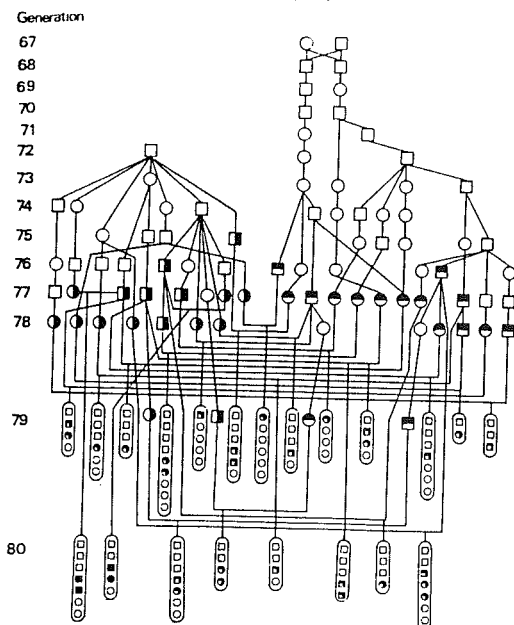


Fig. 1. Genealogical diagram of diseased mink in the years 1979 and 1980. A square represents a male and a circle represents a female. The male 72.1 was bought from a farm where the "early type" of the disease had occurred, so the carriers in the left side of the diagram are supposed to have the gene of the "early type" of the disease. They are marked with black in the right side of their symbol.

The animals in the right side of the diagram are supposed to be carriers of another gene which has existed in the farm for a long period. These animals are marked with black in the upper half of the symbol.

Animals having the "intermediate type" of the disease are supposed to have both genes, which are symbolized with black both in the top and in the right side of the symbol.

Symbols for animals having the "early type" of the disease are completely black (CRISTENSEN et al. 1979).

Hereditas, 104, 215-222, 1986.
1 fig., 4 tables, 30 references.

Authors' summary.

HYBRIDIZATION OF SABLE AND PINE MARTEN.

ГИБРИДИЗАЦИЯ СОБОЛЯ И ЛЕСНОЙ КУНИЦЫ

N.N. Grakov.

Hybrids were obtained from crossing of female marten and male sable but not from reciprocal crosses. The hybrids are capable of normal pairing between themselves and with the initial forms, but offspring is known only from crossings of female kidus with male marten. Male hybrids are assumed to be sterile. Heterosis is inherent but in the shape of bones the

hybrids differed but little from pine martens and sables. Hybridization is not infrequent in nature, it is the cause of the polymorphism of sables and martens in the Urals and adjacent regions.

Byull. Mosk. O-Va Ispyt. Prir. Otd. Biol., 81, 6, 5-15, 1976.
1 table, 30 references. Author's summary.
In RUSS. Summary in ENGL.

**SOME ASPECTS OF SPATIAL DIFFERENTIATION OF MAMMAL POPULATION
WITH SPECIAL REFERENCE TO MARTES MARTES.**

**НЕКОТОРЫЕ АСПЕКТЫ ПРОСТРАНСТВЕННОЙ
ДИФФЕРЕНЦИРОВКИ НАСЕЛЕНИЯ МЛЕКОПИТАЮЩИХ
НА ПРИМЕРЕ ЛЕСНОЙ КУНИЦЫ (MARTES MARTES)**

S.P. Naumov, N.N. Rukovsky.

On the Onega Peninsula, martens in regions with predominance of spruce or pine forests belong to two different populations. They differ in the density of population, size of home ranges, character of utilization of territory and peculiarities of feeding. In regions with intensive hunting, the age composition of martens changes by winter at the expense of regular immigration of young individuals from regions without hunting. There are 7 yearlings per 1 adult female what exceeds twice the potential fecundity.

Zool. Zh. 51, 12, 1879-1874, 1972.
20 references. Authors' summary.
In RUSS. Summary in ENGL.

PELT QUALITY IN ARCTIC FOX X RED FOX HYBRIDS.

**КАЧЕСТВО ШКУРОК ПЕСЦОВО-ЛИСЬИХ
ГИБРИДОВ**

N.I. Syrnikov.

The hybrids were obtained from insemination of arctic fox females with red fox semen. Most traits in the hybrids were intermediate to those of the parent species, but there was possibly some heterosis for body weight.

Moscow, USSR, 16-21, 1984. (ISSN-0130-8731)
3 tables. CAB-abstract.
In RUSS.



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Original Report

Recent Male Mink Reproduction Studies and some Prospects for the Future

Christer Sundqvist, Department of Biology, Åbo Akademi, Turku, Finland

Introduction

This paper presents a summary of male mink reproduction studies. Instead of being a critical and comprehensive review, the paper is intended to be a brief description of recent mink investigations. Interested readers, needing more information, should consult the appropriate references. The references were taken from a database, and run on an IBM PC (1, 2).

Male mink infertility problems

One problem of essential economic importance in the breeding work of mink is the presence of infertile males. This condition has been described by many investigators since the 1960's. During the 1980's male mink infertility has been further characterized. For example, breeding for mink with an extremely dark fur, with polygenes for darker pigmentation, has generated a colony of mink wherein 20-30% of the males are infertile (3-7). In this mink color variety high incidences of orchitis and/or aspermatogenesis with testicular sperm antigen-antibody complexes could be found (3, 8). The extremely dark mink is an interesting model of naturally occurring orchitis (9). Recently it has been found that the blood-testis barrier, normally separating seminiferous tubules into an adluminal (containing spermatocytes and spermatids) and a basal compartment (containing spermatogonia), is totally broken down during testicular regression (10). This could be the anatomical explanation for frequent occurrence of testicular autoimmune disease in mink. Increased testicular levels of the blood-testis barrier altering substance, histamine, has been reported (11).

Finding the causal relationship between the breakdown of the blood-testis barrier and the occurrence of immunopathologic problems should be more thoroughly investigated in the

future. In authors laboratory some neuropeptides have been detected with immunocytochemical studies in mink testicular tissue (*Fagerhed, Gustafsson & Sundqvist*, unpublished). We have used the PAP-method to demonstrate GH, oxytocin, ACTH, vasopressin and prolactin. The functional role of these substances in severe testicular disturbances will soon be evaluated.

Methods have been developed for assaying mink male infertility. The old methods, sperm test and testicular palpation, have been the subjects of various investigations (12-19). These methods are widely used on farms in Scandinavia. The newer test methods, testosterone test and aspiration biopsy of the testis (19-21), are finding applications in basic mink reproduction studies. Aspiration biopsy of the mink testis seems to be the most valuable test method. It gives the investigator a good opportunity to observe defects in the spermatogenesis.

Although the testicular palpation allows the detection of infertile males, the method is largely restricted to the recognition of major testicular disturbances. The sperm test offers a powerful tool in breeding mink. Males producing semen of unsatisfactory quality are effectively eliminated. Prescreening of infertile males can also be performed by electro-ejaculation or samples have been collected directly from the epididymis using a lance (22, 23). Restricting the copulation to 6 min results in reduced fertility (24) due to too few spermatozoa being ejaculated or defects in uterine sperm transport.

The testosterone test gives conflicting results and must await further study before its real value can be assessed. Although there exists a correlation between serum testosterone and sperm quality, it seems as if only males with delayed puberty (25, 26) or greatly distur-

bed testicular development can be detected by this test (27).

Future studies should be stressed on the possible negative effects of aspiration biopsy on testis development and better systems for quantification of testicular cells (promising results have been obtained with a DNA flow cytometer (28). Experiments using epididymal puncture should continue. More data will be delivered after the method has had full scale (*Anthony A. Rietveld, personal communication*). *Today's mink producers must be open to alternative methods. This could include more efficient selection for the reproductive traits (23) as well as the usage of in vitro fertilization or gene manipulation.*

Spermatogenesis and testicular development in the mink

Various degrees of testicular disturbances in mink have been studied (29). Interestingly harmful effects in testicular development could be found in mink transported over long distances (25, 26, 30, 31). The negative effect on reproductive capacity and testicular development was transitory and after long distance transportation mink got accustomed to the new conditions gradually generation after generation. The mink might be a useful model for investigations into the effects on progeny after maternal stress.

There is a considerable lack of accurate quantitative data on spermatogenesis in mink. A few investigations have dealt with morphometric studies on mink testicular tissue (16, 27, 32, 33). Correlations between testicular development and spermatogenesis have been found, as well as correlation between the frequency of polyploidy in bone marrow and spermatogenesis (34). In normal mink testes a considerable cell loss was found during spermatogenesis (27). This phenomenon is, however, observed in other seasonal breeders as well. The appearance of the blood-testis barrier in mink shows annual variations (10) and is completely absent in the regressive testis.

There is an attempt to classify the spermiogenesis in the mink into 19 steps and 12 corresponding stages of the cycle of the seminiferous epithelium (10). Although results from authors laboratory (27) allowed the definition of 14 separate stages, 12 spermatogenic stages can be used as well. Spermatozoa having a cytoplasmic droplet have been studied in detail (35). In mink the following spermatozoal abnormalities

were described: coiled and bent tails, tailless spermatozoa, spermatozoa with head defects and also an abnormal tendency to clumping of spermatozoa (19).

In order to better understand the process of spermatogenesis in mink accurate investigations should be carried on. Practically no data exist on mink testis biochemistry and steroidogenesis. Ultrastructural studies on Leydig and Sertoli cells during different stages of spermatogenesis are also recommended.

Hormonal therapy for mink males

Hormones have been used in mink breeding in order to manipulate male reproduction or to regulate seasonal coat changes. Sexual behaviour could be initiated by testosterone treatment in castrated male mink independent of the period of year (36). Chorionic gonadotropin was successfully used to increase male mink reproductive capacity (37) and Clomiphene citrate increased the sperm count in sterile individuals (38-40). Testicular development was much faster in melatonin treated mink (41-43). Also feeding intensity affects male reproductive performance (44).

It is not yet practical to use hormonal therapy to increase reproductive capacity in an ordinary farm situation. Due to the complexity in the regulation of reproductive hormones and the difficulties in determining each animal's basal hormonal status, progress in this area is very slow.

Influence of photoperiod on mink male reproduction

The mink is a seasonal breeder (45). The pineal gland mediates the onset of reproductive activity (46) and the photoregulation of the annual testis cycle in the mink, a short-day mammal, is dependent on phase relationships existing between the daily cycle of alternating periods of light and darkness (47-50). In the mink very short days stimulate testis activity (51).

Plasma prolactin varies annually, with a minimum in the spring and a maximum in June (52). Plasma thyroxine concentrations are highest during the spring and autumn months and lowest during the winter (53). The plasma testosterone cycle showed an annual maximum in January-February. (52, 20). The existence of genotypic differences in male mink was found during puberty with respect to the production of testosterone (54). Artificial light has been found to increase (55) or decrease (56) reproduc-

tive performance in mink. Constant illumination decreases the mass of gonads (57).

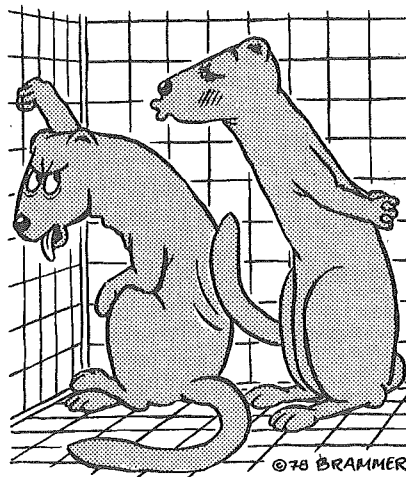
Since the first observations showing that the mink is a short-day mammal, this animal has been widely used in many studies on photoperiodism. The strength of photoperiod as a basic agent in reproduction should, however, be more thoroughly studied.

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SCIENTIFUR, VOL. 10, NO. 4 1986.



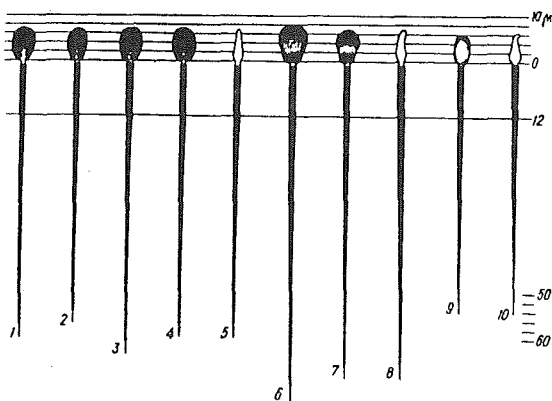
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SPECIES PECULIARITIES OF SPERMIMUM MORPHOLOGY IN CERTAIN REPRESENTATIVES OF CARNIVORA IN CONNECTION WITH THEIR HYBRIDIZATION.

ВИДОВЫЕ ОСОБЕННОСТИ МОРФОЛОГИИ СПЕРМИЕВ ОТДЕЛЬНЫХ ПРЕДСТАВИТЕЛЕЙ ОТРЯДА ХИЩНЫХ (CARNIVORA) В СВЯЗИ С ИХ ГИБРИДИЗАЦИЕЙ

E.P. Steklenev.

Spermium morphology was studied in 7 species of Carnivora representatives. Their clear distinctions reflecting genetic relations between certain species of animals in the zoological series are established. Genetical determination of the spermium morphology is confirmed by the data of the hybridization analysis.



Схематическое изображение форм и размеров спермиев представителей отряда хищных (Carnivora):

1 — домашняя собака (*Canis familiaris*); 2 — волк обыкновенный (*Canis lupus lupus*); 3 — лисица обыкновенная (*Vulpes vulpes*); 4 — енотовидная собака (*Nyctereutes procyonoides*); 5 — вид сбоку; 6 — степной хорек (*Mustela (putorius) eversmani*); 7 — каменная куница (*Martes (martes) foina*); 8 — вид сбоку; 9 — домашняя кошка (*Felis catus*); 10 — вид сбоку.

Tsitologiya i Genetika, 9, 2, 142-146, 187, 1975.

1 fig., 1 table, 22 references.

Author's summary.

In RUSS. Summary in ENGL.

MORPHOMETRIC STUDIES ON MINK TESTICULAR TISSUE.

Christer Sundqvist.

The mink, a seasonal breeder of great economic importance, shows a high incidence of male infertility. This problem has forced investigators to find methods of assaying male mink infertility. In this study, morphometric studies have been performed on testicular tissue of a total of 31 males eliminated from breeding after testicular palpation, sperm test, and estimation of serum testosterone concentrations. Males having low sperm quality or disturbed testicular development ($n=24$) had significantly ($p < 0.01$) lower numbers of spermatocytes, spermatids, and free-floating luminal spermatozoa compared with males with good sperm quality ($n=7$). No differences were found in the numbers of spermatogonia, Sertoli, and Leydig cells. Other morphometric parameters such as mean diameter, mean area, mean volume, percentage of area, and surface area per volume of nuclei are also presented for each cell type in the testis. It may be concluded that the sperm test is best suited for assessing fertility in mink. Severe disturbances in testicular development can be detected by testicular palpation and serum testosterone measurements.

Theriogenology, 24, 6, 1985.

3 tables, 6 figs., 26 references.

Author's abstract.

TESTICULAR ASPIRATION BIOPSY IN EVALUATION OF FERTILITY OF MINK (MUSTELA VISON).

Christer Sundqvist, A. Lukola, M. Parvinen.

A 19-gauge needle biopsy was taken of the testis of mink in late January. When scores from 1 to 10 were given according to the developmental stage and number of spermatogenic cells, males scoring 8-10 returned significantly better breeding results than did males having scores 7. The biopsy did not affect libido or induce other disturbances of fertility. Fine-needle aspiration biopsy of the testis is possibly the most convenient

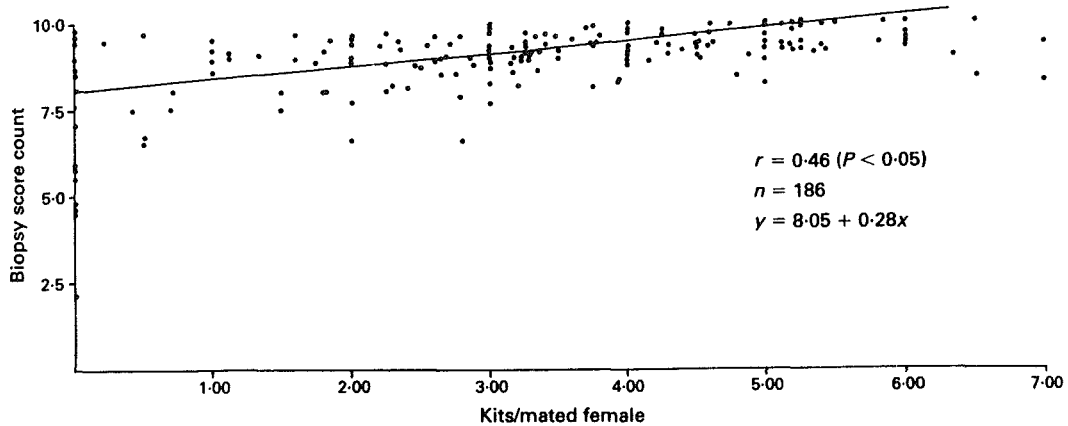


Fig. 1. Relationship between individual testicular biopsy score counts and reproductive results in mink.

and accurate infertility assay in mink breeding.

J. Reprod. Fert., 77, 531-535, 1986.

2 figs., 2 tables, 17 references.

Authors' summary.

INABILITY TO PERCEIVE PHOTOPERIOD AFFECTS TESTES SIZE AND TESTOSTERONE SECRETION IN MINK.

K.A. Koudele, A.C. Napolitano, R.J. Aulerich.

Photoperiod changes around the winter solstice (21 December) stimulate testes enlargement, descent and endocrine function in mink in preparation for the 3 to 4 week breeding season (21 February to 21 March). After the breeding season, testosterone (T) concentrations in serum quickly decline and testes become small, fibrous and abdominal. The length of the photoperiod is relayed via the eyes and the superior cervical ganglia (SCG) to the pineal gland which is responsible for controlling the onset of reproductive activity. If the eye/SCG/pineal axis is interrupted, disturbances in reproductive function result. To separate the roles of the eyes and SCG on photoperiod-controlled reproduction, prepubertal pastel male mink received one of the following treatments (6 animals/treatment) before the 1984 winter solstice: 1) bilateral blinding, 2) bilateral superior cervical ganglionectomy (SCGx), 3) blinding and SCGx, 4) blinding and sham SCGx (sSCGx) or 6) remained intact (i). The animals remained under the naturally-occurring photoperiod. Blood via jugular venipuncture and testes dimension were taken at 2 week intervals beginning 1 month after the surgeries were completed (December, 1984). A testicular volume was calculated and serum was assayed for T concentration. Onset of pubertal increase in testes size or T concentration did not differ among

treatment groups. However, all three blinded mink groups maintained enlarged testes significantly longer after the breeding season than sighted mink. Blinded animals also showed a slower rate of testes involution with the testes not becoming abdominal until July while the sighted animals testes were abdominal in May. The T profile paralleled and slightly preceded that of the testes volume in all groups. Testes recrudescence of SCGx males began in November, 1 month before that of sSCGx or I males. Blinded animals showed no recrudescence by the 1986 breeding season. Therefore, we conclude that the eyes are necessary for the proper timing of testes regression, regrowth and concomitant endocrine function with the photoperiod. The SCG has a negative influence on testes recrudescence since growth began sooner in SDGx animals.

Society for the Study of Reproduction, Suppl. 1, 34, 1986.

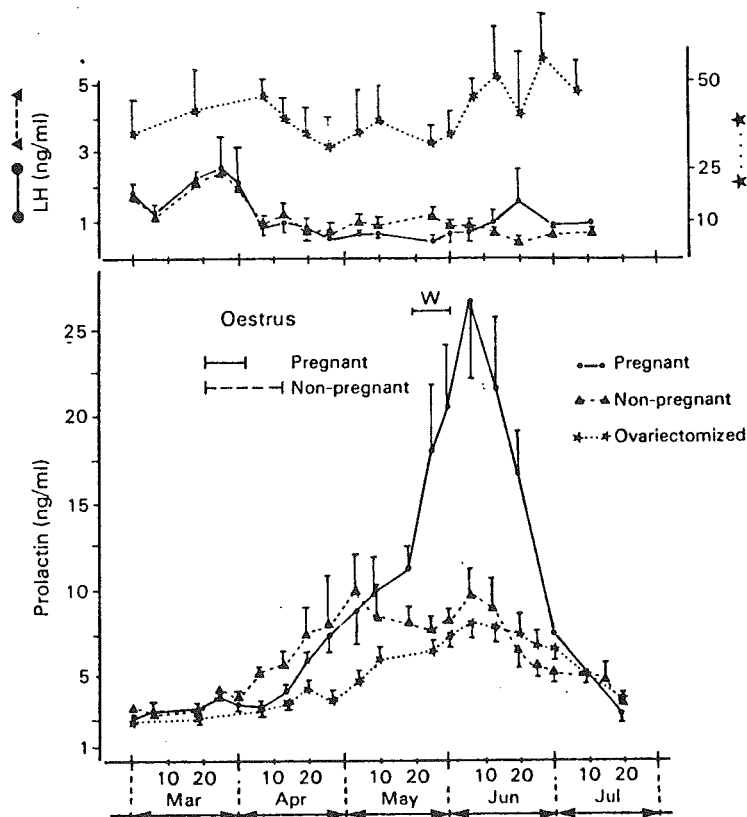
Only abstract received.

Authors' abstract.

SEASONAL VARIATIONS OF PLASMA PROLACTIN AND LH CONCENTRATION IN THE FEMALE BLUE FOX (*ALOPEX LAGOPUS*).

M. Mondain-Monval, O.M. Møller, A.J. Smith, A.S. McNeilly, R. Scholler.

A heterologous radioimmunoassay system developed for the rabbit and suitable for a wide range of mammalian species has been shown to measure prolactin in the plasma of the blue fox. Evaluation of prolactin levels throughout the year showed that concentrations displayed a circannual rhythm with the highest values occurring in May and June. Prolactin concentrations remained low (~ 2.5 ng/ml plasma) from July until April with no consistent changes found around oestrus (March–April). In 8



Text-fig. 6. Weekly variations of plasma prolactin and LH concentrations in intact (8 pregnant, 10 non-pregnant) and ovariectomized (4) female blue foxes. W, whelping. Values are mean \pm s.e.m.

pregnant females, the prolactin increase in late April and May coincided with the last part of gestation and lactation: concentrations (mean \pm s.e.m.) increased to 6.3 ± 0.6 ng/ml at mid-gestation, 9.7 ± 2.1 ng/ml at the end of gestation and 26.7 ± 5.0 ng/ml during lactation. In 10 non-pregnant animals, the mean \pm values were 7.1 ± 1.2 ng/ml in April, 8.8 ± 2.2 ng/ml in May and 9.8 ± 1.3 ng/ml in June. The prolactin profile in 4 ovariectomized females was similar to that observed in non-pregnant animals, but the plasma values tended to be lower during the reproductive season (April-June). In intact females, the only large LH peak (average 28 ng/ml) was observed around oestrus. During pro-oestrus, baseline LH levels were interrupted by elevations of 3.1-10.4 ng/ml. During the rest of the year, basal levels were 3 ng/ml. In ovariectomized females, LH concentrations increased within 2 days of ovariectomy and remained high (35-55 ng/ml) at all times of year.

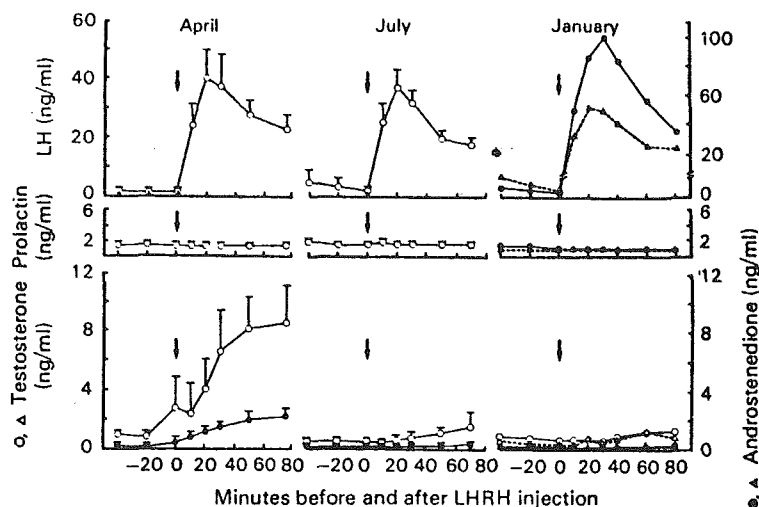
J. Reprod. Fert., 74, 439-448, 1985.
7 figs., 31 references.

Authors' summary.

SEASONAL VARIATIONS OF LH, PROLACTIN, ANDROSTENEDIONE, TESTOSTERONE AND TESTICULAR FSH BINDING IN THE MALE BLUE FOX (ALOPEX LAGOPUS).

A.J. Smith, M. Mondain-Monval, O.M. Møller, R. Scholler, V. Hansson.

The seasonal changes in testicular weight in the blue fox were associated with considerable variations in plasma concentrations of LH, prolactin, androstenedione and testosterone and in FSH-binding capacity of the testis. An increase in LH secretion and a 5-fold increase in FSH-binding capacity were observed during December and January, as testis weight increased rapidly. LH levels fell during March when testicular weight was maximal. Plasma androgen concentrations reached their peak values in the second half of March (androstenedione: 0.9 ± 0.1 ng/ml; testosterone: 3.6 ± 0.6 ng/ml). A small temporary increase in LH was seen in May and June after the breeding season as testicular weight declined rapidly before levels returned to the basal state (0.5-0.7 ng/ml) that lasted until



Text-fig. 5. Plasma concentrations of LH, prolactin, testosterone and androstenedione after LHRH challenge in 4 anaesthetized male blue foxes at three times of the year. The arrows depict the time of injection of LHRH. The values in April and July are means \pm s.e.m. of 4 animals, while those in January are single samples from 2 individuals.

December. There were clear seasonal variations in the androgenic response of the testis to LH challenge. Plasma prolactin concentrations (2–3 ng/ml) were basal from August until the end of March when levels rose steadily to reach peak values (up to 13 ng/ml) in May and June just before maximum daylength and temperature. The circannual variations in plasma prolactin after castration were indistinguishable from those in intact animals, but LH concentrations were higher than normal for at least 1 year after castration.

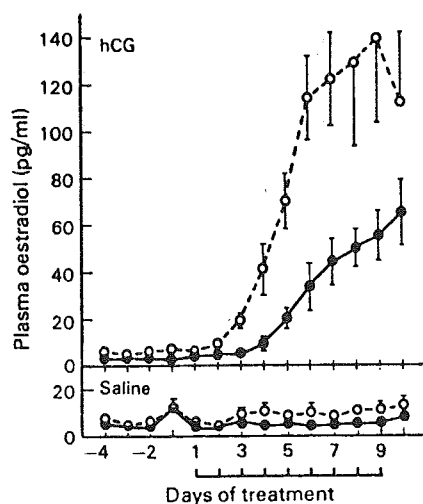
J. *Reprod. Fert.*, 74, 449–458, 1985.
6 figs., 26 references.

Authors Summary.

MATURATION OF OVARIAN FUNCTION IN FEMALE FERRETS IS INFLUENCED BY PHOTOPERIOD.

K.D. Ryan.

Sexual maturation of immature ferrets in response to a stimulatory photoperiod generally occurs within 6–7 weeks after imposition of long days at 16 weeks of age. In this study, females were examined for evidence of ovarian maturation after 22 days of exposure to the stimulatory photo-



Text-fig. 1. Oestradiol secretory response of immature female ferrets at 19 weeks of age to daily injections of 5 i.u. hCG (N = 6 for each group) or 0.25 ml saline (N = 4 for each group). Injections were begun on Day 1. Open circles represent data from females housed in long days (16L:8D) for 22 days; closed circles represent data from females housed continuously in short days (8L:16D). Where no standard error bars are shown, the error is covered by the symbol for the mean.

period, before any sign of sexual maturation. The photoperiod-stimulated and control females were the same age (19 weeks), had similar body weights, and showed no evidence of vulvar oedema. Comparison of oestradiol secretory response to hCG stimulation and of follicular development in the ovary revealed marked ovarian stimulation in females kept in long days compared to control females kept in short days. A prolonged period of ovarian stimulation therefore occurs during exposure to long days before there is external evidence of sexual maturation in ferrets.

J. *Reprod. Fert.*, 74, 503–507, 1985.
3 figs., 15 references.

Author's summary.

**INFLUENCE OF DAY LENGTH AND ENDOCRINE STATUS ON LUTEINIZING
HORMONE SECRETION IN INTACT AND OVARIECTOMIZED ADULT FERRETS.**

D.K. Ryan, S.F. Siegel, S.L. Robinson.

The purpose of this study was to examine the pituitary-ovarian relationship of both estrous and anestrus female ferrets. The endocrine status of the animals was induced by manipulating photoperiod: females in estrus were housed in long days (16L:8D); females in anestrus were housed in short days (8L:16D). For studies of intact animals in both photoperiods, plasma luteinizing hormone (LH) levels were quantified in blood samples collected from adult ferrets at 5-min. intervals over a 24-h period. Similar groups of females (estrous and anestrus) were ovariectomized (while remaining in their assigned photoperiods) and blood samples were collected at 5-min. intervals for 4-h periods on Days 1, 2, 4, 10, 17, and 35 after ovariectomy. Intact, estrous females exhibited continuously low or undetectable levels of LH with no evidence of episodic secretion. Ovariectomy of these estrous animals resulted in rapid onset (within 24 h) of episodic LH secretion, with pulses occurring in excess of 1 pulse/h. No substantial further change in frequency or amplitude of pulses occurred in these females from 1 to 35 days postovariectomy. In contrast, intact anestrus ferrets exhibited clear episodic LH secretion at a frequency of about 0.4 pulses/h. Removal of ovaries from these females caused no change in LH secretion for 24-48 h, after which LH pulses gradually increased in frequency. By 18 days after ovariectomy, LH patterns were indistinguishable among ovariectomized females in long and short days. These studies suggest a major site of ovarian negative feedback on LH secretion during anestrus is the hypothalamus, whereas the site of the negative feedback on LH secretion during estrus is the hypothalamus, whereas the site of the ovarian feedback in estrous females is not yet evident.

Biology of Reproduction, 33, 690-697, 1985.

4 figs., 2 tables, 26 references.

Authors' abstract.

**HETEROLOGOUS RADIOIMMUNOASSAY OF LH IN TWO SEASONALLY
BREEDING ANIMALS: HARE (LEPUS EUROPAEUS) AND MINK (MUSTELA VISON).**

Michelle Mondain-Monval, Monique Caillol, Monique Meunier.

A heterologous radioimmunoassay using ovine LH as the labelled hormone, canine LH as the standard, and a rabbit anti-ovine LH serum (GDN 15) was developed and validated for LH measurement in the plasma of two seasonally breeding animals (induced ovulators). Physiological validation of the assay was evidenced by the increase of LH levels after LHRH injections and castration. In the hare, the longer the time after castration, the higher the cumulative response of LH after LHRH stimulation.

Can. J. Zool., 63, 1339-1344.

1 table, 7 figs., 38 references.

Authors' abstract.

EMBRYONIC DEVELOPMENT IN THE BLUE FOX.

Maija Valtonen, W. Allan King, Ingemar Gustavsson, Auli Mäkinen.

To describe the growth and development of blue fox embryos, 227 embryos

were collected from 19 vixens at different stages of gestation. The vixens were mostly mated twice and slaughtered 2-4, 4-6, 6-8, 9-10, 12, 13-15, 14 (three vixens), 16-18 (two vixens), 19, 18-20, 20-22, 22-24, 25-27, 29-30 (two vixens) and 48 days later. The number of corpora lutea was estimated and the embryos measured and photographed. The fertilized eggs recovered 2-4 days after mating were still at the 1-cell stage while those recovered at 4-6 days were at 2-4 cell stage. Cumulus cells were still present at the 4-8 cell stage. Morulae were found in the uterus 6-8 days after mating. At 13-15 days of gestation the blastocysts were expanded, being 1 mm in diameter at 16-18 days. Implantation was observed 16-18 days after breeding when approximately one-third of the gestation period (52 days) was over. The embryo progressed between days 18 and 24 from less than 5 to 10 mm in length. Embryos at 25-27 days measured 11 to 13 mm and at 29-31 days 19 to 22 mm. Within and between-litter embryonic size varied greatly at a given time after mating. Differentiation and characteristic features of the fox embryos were better related to length than to postcoital age. Embryonic loss was studied in relation to the number of corpora lutea. At the preimplantation stage, embryonic loss was 25%. After implantation, the difference between the number of corpora lutea and recovered embryos was 26%.

Nord. Vet.-Med, 37, 243-248, 1985.

3 tables, 1 fig., 15 references.

Authors' summary.

In ENGL. Summary in SWED.

THE REPRODUCTIVE CYCLES OF SOME MUSTELIDAE SPECIES.

РЕПРОДУКТИВНЫЕ ЦИКЛЫ САМОК НЕКОТОРЫХ КУНЬИХ (MUSTELIDAE) I

P.I. Danilov, I.L. Tumanov.

The sexual sphere of 295 females of 9 species of Mustelidae was investigated. These data are supplemented by direct observation on captive and wild animals. In the northern part of European USSR polecats and European and American minks reach sexual maturity in the first year of life, weasels and ermines in the second year, and the majority of females of other representatives of the family, only in the third year of life. The calendars time of run and mating is March-June in the weasel, May-June in the ermine, late February-April in the polecat, late March-April in the European mink, late February-March in the American mink, July in the pine marten, May-June in the wolverine, May-July in badger and February-June in the otter.

Byull. Mosk. O-Va Ispyt. Priir. Otd. Biol., 80, 5, 35-47, 1975.

3 tables, 11 figs., 23 references.

Authors' summary.

In RUSS. Summary in ENGL.

THE REPRODUCTIVE CYCLE OF SOME FEMALES OF THE MUSTELIDAE FAMILY.

РЕПРОДУКТИВНЫЕ ЦИКЛЫ САМОК НЕКОТОРЫХ КУНЬИХ (MUSTELIDAE)

P.I. Danilov, I.L. Tumanov.

A study was made of the sexual cycles of weasel, ermine, polecat, European and American mink and pine marten females. The gonads of 244 females were histologically analyzed. Data are given on age at sexual maturity, mating periods, duration of pregnancy, fertility etc.

Byull. Mosk. O-Va Ispyt. Priir. Otd. Biol., 80, 1, 137-146, 1975.

2 tables, 3 figs., 49 references.

Authors' summary.

In RUSS. Summary in ENGL.

REPRODUCTIVE CYCLES OF MALES IN SOME MUSTELIDAE.

РЕПРОДУКТИВНЫЕ ЦИКЛЫ САМЦОВ НЕКОТОРЫХ
КУНЬИХ (MUSTELIDAE)

P.I. Danilov, I.L. Tumanov.

Spermatogenesis in all species under study is characterized by almost the same pattern of sexual cycle which lasts, on the average, 4 months. Changes in reproductive organs occur uniformly and differ only in time. A comparative analysis of spermatogenesis in the species under study has allowed to distinguish among them animals with early spring, early summer and summer periods of rut.

Zool. Zhurn., 51,6, 871-880, 1972.

5 figs., 23 references.

Authors' summary.

In RUSS. Summary in ENGL.

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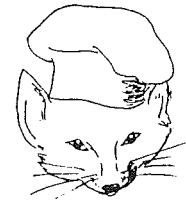
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NUTRITION

**EFFECTS OF AMMONIUM PERCHLORATE ON SOME BIOCHEMICAL VALUES
OF BLOOD IN MINK.**

**ВЛИЯНИЕ СКАРМЛИВАНИЯ ХЛОРОКИСЛОГО
АММОНИЯ НА НЕКОТОРЫЕ БИОХИМИЧЕСКИЕ**

F.E. Santuryan. **ПОКАЗАТЕЛИ КРОВИ У НОРОК**

Young mink were fed for 30 days on a diet containing on average protein 9.38, fat 4.8 and carbohydrate 3.09 g/100 kcal, without or with ammonium perchlorate 5 mg/kg bodyweight. Ammonium perchlorate had no effect on blood chloride, phosphorus, total protein nitrogen, urea N or uric acid. but increased blood glucose and the activities of serum enzymes, including alpha-hydroxybutyrate dehydrogenase, lactate dehydrogenase, creatine phosphatase alkaline phosphatase and alanine aminotransferase.

Sbornik Nauchnykh Trudov Moskovskoi Veterinarnoi Akademii, 76-77, 1984.
2 tables. CAB-abstract.

In RUSS. Summary In ENGL.

USE OF AMMONIUM PERCHLORATE FOR REARING YOUNG MINK.

**ПРИМЕНЕНИЕ ХЛОРОКИСЛОГО АММОНИЯ (ХКА)
ПРИ ВЫРАЩИВАНИИ МОЛОДНЯКА НОРОК**

F.E. Santuryan.

Ammonium perchlorate (APC) at 5 mg C104-/kg bodyweight added to the diet given to young mink from 2 to 3 months of age, increased their rate of growth and the size of pelt produced. The effect of APC was greatest during the first 30 to 40 days of feeding and was greater in males than in females. APC given from 2 months old to slaughter, with 2 intervals of 19 days each, gave the greatest economic return. APC had no adverse effect on quality of pelts.

Sbornik Nauchnykh Trudov Moskovskoi Veterinarnoi Akademii, 100-104, 1984.
4 tables. CAB-abstract.

In RUSS.

**TOXICITY OF SODIUM MONOFLUOROACETATE (COMPOUND 1080)
TO MINK AND EUROPEAN FERRETS.**

T.C. Hornshaw, R.K. Ringer, R.J. Aulerich, H.H. Casper.

The toxicity of sodium monofluoroacetate (Compound 1080) to mink (*Mustela vison*) and European ferrets (*Mustela putorius furo*) was evaluated through LC50 and reproduction tests. Subacute dietary exposure to Compound 1080 resulted in dose-dependent decreases in body weights and feed consumption in both species. The mink were more sensitive to Compound 1080 than were the ferrets. The 28-d dietary LC50 for mink and for ferrets was calculated to be 3.2 and 9.4 ppm, respectively. Dietary exposure to 0.80 ppm Compound 1080 for 2 months prior to breeding severely impaired reproduction in the mink, which was presumed to be due to oligo- or aspermia. In young, rapidly growing ferrets, red and white blood cell

RAISING RACCOONS FOR RELEASE. PART III. NUTRITIONAL PROBLEMS.

Adele T. Evans, Richard H. Evans.

This is the third in a four-part series of articles describing various aspects of a simplified method of raising raccoons for release, based on the authors' experience as well as that of other animal rehabilitators. Parts I and II, which appeared in May (Vol. 6, No. 5) and June (Vol. 6, No. 6) issues, respectively, discussed the history and physical development of raccoons and the initial phases of rehabilitation. Part III describes common nutritional problems that occur in young raccoons and methods of treating the resultant conditions.

Veterinary Technician, 6, 8, 404-414, 1985.

1 fig., 6 references.

Authors heading.

BASAL METABOLIC RATE OF WOLVERINES DURING GROWTH.

J.A. Iversen.

The basal O_2 consumption and CO_2 release were measured in three growing wolverines using an open-circuit system. The data indicate that in wolverines weighing up to 3 kg, the oxygen uptake is related to the 1.411 power of body weight, while in those weighing more, the exponent is reduced to 0.638. The significance of the "break" in the metabolic rate/body weight curve at the 3 kg weight level is discussed. When the weight specific metabolic rate was plotted against age on semilogarithmic paper, the termination of growth was associated with a change in the slope of the metabolic rate/age regression line. In growing animals, the age regression line is defined by the equation

$$\frac{M}{W} \text{ (kcal/kg/day)} = 102.6 e^{-0.0276t \text{ (days)}}$$

whereas the equation

$$\frac{M}{W} = 77.6 e^{-0.001477t}$$

describes the relationship in wolverines where growth has ceased.

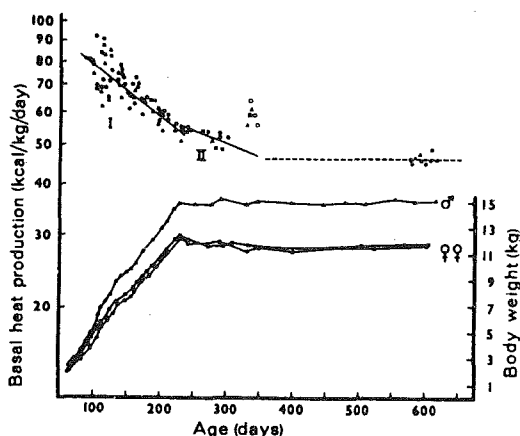


Fig. 4. Weight curves and semilogarithmic plot of basal heat production (kcal/kg/day) of wolverines with increasing age. Line I is given by the equation $\log M/W = 2.0113 - 0.0012 t$ (where M = heat production (kcal/kg/day), W = body weight (kg) and t = age (days) and line II by the equation $\log M/W = 1.89 - 0.000639 t$. Open symbols indicate winter metabolism. The dotted line represents the basal metabolic level of 'adult' wolverines.

Norw. J. Zool. ,
20, 4, 317-322, 1972.
4 figs., 2 tables, 13 refs.
In ENGL

Author's summary.

STUDIES ON THE DIET OF THE CARNIVORES IN POLAND.
(Badania nad pokarmem ssaków drapieżnych w Polsce).

Barbara Rzebik-Kowalska.

The paper presents the results of an analysis carried out on 1240 stomachs of carnivore mammals from the territory of Poland, including the fox (*Vulpes vulpes*) (623 stomachs), polecat (*Mustela putorius*) (501), pine marten (*Martes martes*) (89), beech marten (*Martes foina*) (9), badger (*Meles meles*) (4), raccoon-like dog (*Nyctereutes procyonoides*) (3), stoat (*Mustela erminea*) (1) and weasel (*Mustela nivalis*) (1).

Acta Zool. Cracov. 17, 1-19, 215-306, 1972.

29 tables, 2 figs., 94 references.

In POLH. Summary in ENGL and
 subtitles in ENGL.

Part of Authors summary.



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Scientifur.

12 references.

Author's summary.

In NORG. Summary in ENGL.

**INTESTINAL ADENOMATOSIS IN THE BLUE FOX.
MORPHOLOGICAL AND ENZYME HISTOCHEMICAL ASPECTS.**

Karin Eriksen, Thor Landsverk.

Histological changes in the intestines of 5 fox cubs from a farm, on which 300 of 400 weanlings developed diarrhoea and 40 died, consisted of thickening of the intestinal wall, and a long tortuous crypts (outlined by a high pseudostratified epithelium which lacked differentiation of goblet cells).

Intracellular bacteria resembling *Campylobacter* spp. were found in the apical cytoplasm of the altered epithelial cells. The adenomatosis was considered to be the result of interaction between the bacteria and the host cells, resulting in disturbed epithelial differentiation.

Nord. Vet.-Med., 37, 4, 254-255, 1985.

CAB-abstract.

**β HEMOLYTIC STREPTOCOCCAL INFECTION IN RED FOXES (*VULPES VULPES* L.)
IN FRANCE: THE NATURAL DISEASE AND EXPERIMENTAL STUDIES.**

J. Barrat, J. Blancou, C. Demantke, Y. Gerard.

β Hemolytic streptococcal infections, usually of group G and C, were identified in red foxes in France. In a study of 31 animals, septicemia and jaundice were found to be the main signs of the disease. Gross and microscopic lesions consisted of generalized inflammation of viscera and joints, jaundice, cellulitis and abscesses of spleen, liver, lung and kidneys. The disease was reproduced in foxes by intramuscular inoculation of less than the minimal quantity of bacteria lethal to mice. When challenged, recovered animals were resistant to infection that proved to be lethal to control animals.

J. of Wildlife Diseases, 21, 2, 141-143, 1985.

2 tables, 6 references.

Authors' summary.

**OCCURRENCE OF PLASMIDS AND ANTIBIOTIC RESISTANCE
AMONG *CAMPYLOBACTER JEJUNI* AND *CAMPYLOBACTER COLI*
ISOLATED FROM HEALTHY AND DIARRHEIC ANIMALS.**

Wayne C. Bradbury, Donna L.G. Munroe.

Serologically defined strains of *Campylobacter jejuni* and *Campylobacter coli* from healthy and diarrheic animals were examined for the occurrence of plasmid DNA in association with the antibiotic susceptibility of the bacterial host and the health status of the animal host. Of all campylobacter organisms surveyed, 53% (116 of 200) contained plasmid DNA. A plasmid occurrence rate of 73.8% was obtained for *C. coli* from healthy pigs, contrasted by lower plasmid occurrence rates for *C. coli* from diarrheic pigs (30%) and from all diarrheic animals (21.4%). For *C. jejuni*, in contrast, only 13.6% of healthy cattle contained plasmid DNA, contrasted by a higher plasmid occurrence rate of 31.2% from diarrheic cattle. A high plasmid occurrence rate of 75.8% was observed for *C. jejuni* from healthy chickens. *Campylobacter* plasmids ranged in size from 1 to 86 megadaltons. Antibiotic susceptibility for 52 animals isolated

(excluding chickens) indicated that most isolates were susceptible to kanamycin, erythromycin, gentamicin, tetracycline, and compound sulfonamide, whereas few were susceptible to bacitracin (19.2%); approximately half were susceptible to ampicillin (55.8%) and streptomycin (51.9%), and no isolates were susceptible to penicillin G. More isolates containing plasmids were resistant to ampicillin, tetracycline, and gentamicin than were isolates not carrying plasmids, there being a statistically significant difference for tetracycline and gentamicin, which suggested that these two antibiotics were probably plasmid mediated. The antibiotic susceptibility patterns of 21 chicken isolates of *C. jejuni*, by contrast, were different in that most were susceptible to ampicillin in addition to kanamycin, erythromycin, and gentamicin, whereas few were susceptible to compound sulfonamide, streptomycin, and tetracycline in addition to penicillin G and bacitracin. A 30- or 39-megadalton plasmid, or both, common to many of the chicken isolates was usually associated with tetracycline resistance.

J. of Clin. Microbiology, 22, 3, 339-346, 1985.

7 tables, 2 figs., 45 references.

Authors' summary.

THE SLOW VIRUS IN HUMAN AND ANIMAL MEDICINES.

(Les virus lents en médecine animale et humaine).

C. Bosgiraud, J.A. Nicolas, M. Simeon de Buochberg.

The central nervous system diseases group, due to slow virus, is composed by subacute spongiform encephalopathies. The group is different from viral slow diseases and persistent infections due to conventional virus. The ovine scrapie and mink encephalopathy on the one hand, Kuru CREUTZ-JACOB's and ALZHEIMER's diseases on the other hand, have in common some epidemiologic, histopathologic and neuropathologic characteristics, here enlarged.

Rev. Méd. Vet. 136, 8-9, 609-616, 1985.

60 references.

Authors' summary.

In FREN. Summary in ENGL, GERM, SPAN.

SUSCEPTIBILITY OF EUROPEAN WILD MAMMALS TO ROTAVIRUS INFECTION.

(Recherche d'anticorps anti-rotavirus dans des sérums d'animaux sauvages en France).

A. Schwers, J. Barrat, J. Blancou, M. Maenhoudt, P.-P. Pastoret.

A serological survey was performed in order to determine the susceptibility of different European mammalian species to rotavirus infection.

Anti-rotavirus antibodies were detected in about 25% of roe-deer sera, 35% of fox sera, 55% of wild boar sera and 80% of red deer sera; wildcat, marten and white-breasted marten are also susceptible.

Ann.Méd. Vét., 127, 651-654, 1983.

1 table, 11 references.

Author's summary.

In FREN. Summary in ENGL.



**PARASITIC NEMATODES OF RACCON DOGS, NYCTEREUS PROCYONOIDES
VIVERINUS FROM KANAGAWA PREFECTURE, JAPAN.**

神奈川県丹沢山に生息するタヌキ *Nyctereutes procyonoides viverinus*
にみられた寄生蠕虫

Akihiko Uchida, Kikue Uchida, Yoshihiko Murata, Tatsuo Udagawa.

Six nematode species, namely *Ancylostoma kushimaense*, *Arthrostoma miyazakiense*, *Capillaria* sp., *Trichostrongylinae* sp., *Toxocara tanuki* and *Trichuris* sp., were found in the intestine, oesophagus and stomach of five raccoon dogs, *Nyctereus procyonoides viverinus* captured at Mt. Tanzawa, Kanagawa prefecture, Japan, 1984. Morphological characteristics of these nematodes were described and figured. All of these nematodes were recorded for the first time from Kanagawa prefecture.

Bull. Azabu. Vet. Med., 5, 2, 133-144, 1984.

43 figs., 22 references.

Authors' summary.

In JAPN. Summary in ENGL.

**THE PREVALENCE OF ANTIBODIES AGAINST TOXOPLASMA GONDII
IN SOME ONTARIO MAMMALS.**

I.R. Tizard, J.B. Billett, R.O. Ramsden.

A survey of serum samples from mammals trapped in Central Ontario showed that many contained antibodies to *Toxoplasma gondii*. The prevalence of infection as reflected by positive reactions in the Sabin-Feldman Dye Test appeared to be related to the type of diet of each species examined, and specifically, to the proportion of rodents in the diet. Of the fox blood samples tested, 84% were positive. The percentage of positive samples diminished through, coyote, mink, bear, fisher skunk, raccoon, marten and rabbit. Blood samples from squirrel, deer, hare and groundhog were negative.

Journ. of Wildlife Diseases, 12, 322-325, 1976.

1 table, 11 references.

Authors' summary.

**INVESTIGATIONS ON THE EFFICACY OF IVERMECTIN
PREPARATION FOR SCABIES COMBATING IN REARED FOXES AND RABBITS.**

(*Badania skuteczności preparatu ivermectin w zwalczaniu świerzbu u lisow hodowlanych i krolikow.*)

Andrzej Lineburg, Qojciech Krukowski.

Results of the treatment of penetrating scabies of foxes due to *Sarcoptes scabiei* and that of rabbit's ears due to *Psoroptes cuniculi* were presented. Ivermectin preparation of MSD-agvet in form of injection which is a mixture containing 80% of dihydroaverration showed a strong parasiticide effect in relation to parasitic Nematodes and arthropods.

Nowosci Weterynarii, Poland, 14, 2, 164-169, 1984.

1 table.

Authors' summary.

In POLH. Summary in ENGL, RUSS.

CHEMICAL RESTRAINT IN THE PINE MARTEN.

P. Wilson.

Ketamine hydrochloride injected i/m is reported to be very satisfactory for

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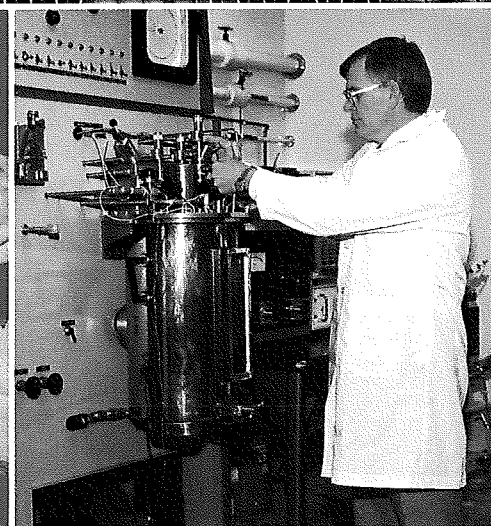
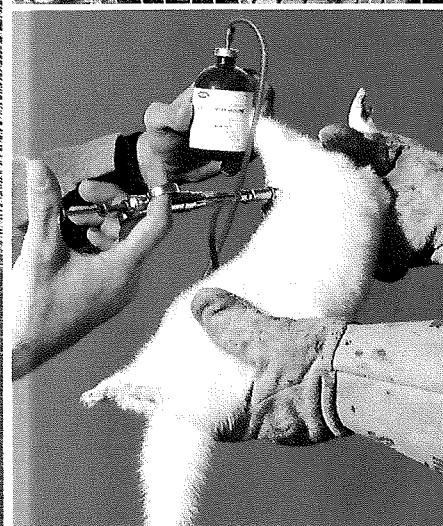
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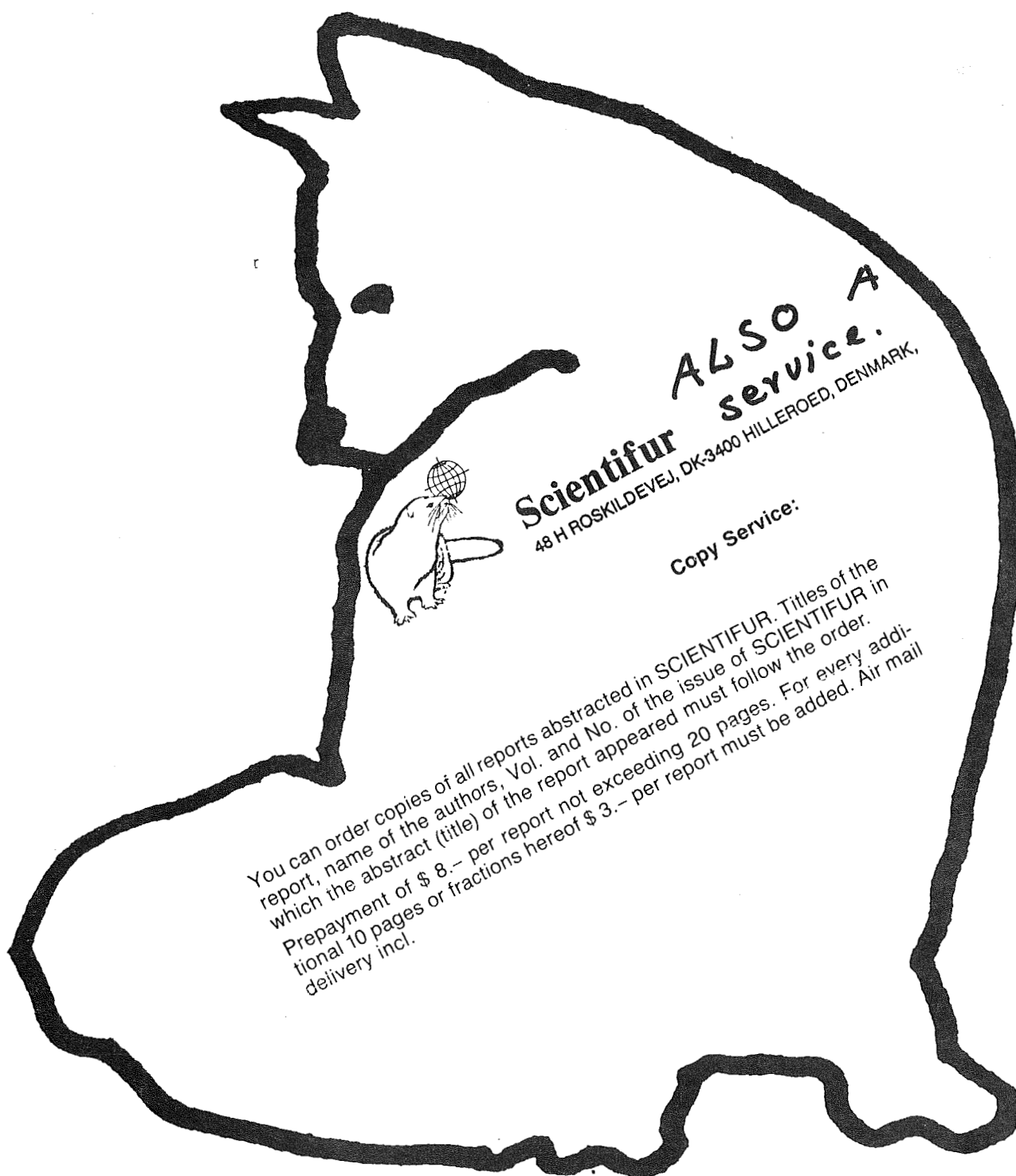
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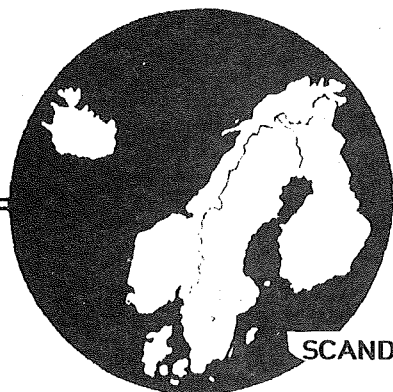
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restraint and handling of the pine marten (*Martes martes*) and, in higher doses, for short duration anaesthesia. At 7 mg/kg the righting reflex was lost for nine minutes, during which time the animals were heavily sedated and could be easily handled.

Vet. Rec., 98, 302-303, 1976.
2 references.

DIMDI abstract.





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JORDBRUGSFORSKERES
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SCANDINAVIAN ASSOCIATION OF AGRICULTURAL SCIENTISTS

**ABSTRACTS FROM
MEETING IN SCANDINAVIAN ASSOCIATION OF AGRICULTURAL SCIENTISTS
DIV. OF FUR ANIMALS
Kuopio, Finland, September 1986.**

Regarding FUR ANIMAL PRODUCTION - NJF SEMINARIUM NO. 110.

NJF-UTREDNING/RAPPORT NR. 27

PELSDYRSEMINAR 1986

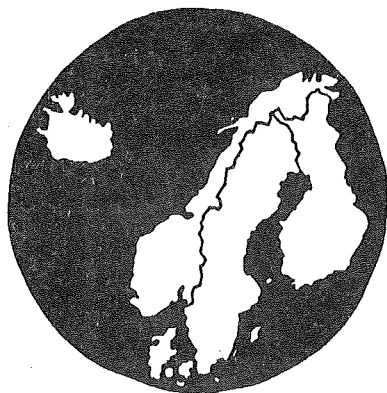
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ABSTRACTS FROM
MEETING IN SCANDINAVIAN ASSOCIATION OF AGRICULTURAL SCIENTISTS
DIV. OF FUR ANIMALS
Kuopio, Finland, September 1986.

Regarding FUR ANIMAL PRODUCTION - NJF SEMINARIUM NO. 110.

FUR ANIMAL RESEARCH AT THE UNIVERSITY OF KUOPIO.

Mikko Harri.

Teaching.

University of Kuopio opened its doors for the students in 1972 with the following branches of study: medicine, odontology, medical physics, pharmacy, biochemistry and environmental hygiene. Later other branches of study were created, and environmental hygiene was differentiated into three specialization lines in 1979. One of these lines was animal production. Department of zoology, which had been a helpstation for medical teaching only, was now responsible for teaching of animal production, and the name of the department was changed into department of applied zoology. The specialization line of animal production includes: aquaculture, laboratory animal science, and fur animal production. All students have the same common and theme studies but in their specialization studies they can choose fur animal production for their area of specialization.

Research.

Research started together with teaching activity. The beginning was not always free from difficulties and mistakes. Our idea of king was that we could judge the background of the animals from the size of their internal organs. We collected material for three years, broke two balances, and produced a 50 high heap of coputer paper, and got a conclusion that one cannot draw any conclusions from the size of internal organs (NJF Symposium 85, 1985). Later our research activity has been directed into the following subjects:

- Energy metabolism of fur bearing animals withs special reference to adaptation to low environmental temperatures.
- Significance of the wintering nest or lying plate for energy economy of the animals, and how much the animals use the nests in different situations and seasons.
- Regulation of energy balance from physiological point of view. i.e. how and why body weight of the animals varies in different situations, whether the animals are able to compensate for a day of fast by eating more on the following day, or lack of energy density of the diet by eating bigger portions.
- Problems on environmental hygiene on farms, dirtytness of the nests and how one could reduce it, microclimate inside the nest boxes.

- Thickness of skin in the mink (together with Finnish Fur Breeders Association).
- Adaptation to farm life from ethological point of view, circadian and seasonal rhythms of motor activity, social competition for feed, eating behaviour.
- Studies on chromosomes of fox and raccoon dog (Dr. Auli Mäkinen with her group).

15 pp, 85 references.
In SWED.

Author's summary.

LIVE ANIMAL GRADING AS BASIS FOR SELECTION BY INDEX METHOD.

Ejner Børsting, Jesper Clausen.

The preliminary examination of the valuation of mink kits for breeding correlations between repeated valuations have been examined. These variations have been made by different judges or the same judge in August or November.

Significant correlations have been found between valuations made by 2 judges for quality, colour and size, but only for colour and weight when the same person evaluates the kits in August and November. Therefore, selection for quality cannot be carried through in August whereas a partial sorting for colour and weight can be made on the basis of a valuation in August.

Heritabilities for valuations and weight are medium to high and the use of the results for calculating the family index and the selection according to the breeding figure of value can give a clear result of the breeding work.

The pressure of work in connection with the valuation of all kits can be reduced by evaluating the male kits and by using their results for the selection of male as well as female kits.

6 pp, 6 tables, 4 references.
In DANH.

Authors' summary.

HERITABILITIES OF PELT TRAITS IN SILVER FOXES.

Hilkka Kenttämies.

Heritability of pelt traits in silver foxes were studied at the department of Animal Breeding, University of Helsinki in collaboration with the Association of Fur Animal Breeders and a private farm Turkis-Sampo at North Carelia. The results of this work would be used in development of selection methods for foxes.

This study was restricted to include only the silver foxes from colour types of the red fox. The sires of the kits were also the silver foxes. The material in the years 1983-85 consisted a total of 1445 kits. In analysis for genetic paramters there were 1239 kits, 120 sires and 270 dams. Subjectively scored traits were darkness and cleanness of colour, size, underfur density, guard hair density, and silkiness of hair. The personnel of the farm graded the animals.

There existed 21 to 41% variation in the traits. Year and sex had significant effect on each trait. In addition, the kits of one-year-old dams were smaller than were the kits of the older dams. The kits born in small litters (1-3 kits) were larger than those born in greater litters. The correlations among the traits were usually positive, the closest relationships existed between the quality traits. The large animals tended

to be good also in quality.

Heritabilities (and standard errors) of the traits were as follows: darkness 0.59 (0.12), cleanness 0.13 (0.08), size 0.59 (0.12), underfur density 0.25 (0.09), guard hair density 0.14 (0.08), and silkiness 0.23 (0.09). The magnitude of heritabilities imply that it is possible to improve pelt traits of the silver foxes through selection.

4 pp, 3 tables, 4 references.
In SWED.

Author's summary.

ELECTROPHORETIC VARIATION IN FARM BRED SILVERFOXES (VULPES VULPES).

Kari Saarenmaa.

Samples were taken from farmed animals in the eastern and western parts of Finland, being concerned as isolated populations. The both groups include imported American animals and so called "carriers", but this work does not include those from the farm of the eastern part of Finland. A piece of liver was taken and stored frozen at a temperature of -18° C. Little pieces - weight app. 0.5 grams - were homogenized in two millilitres distilled water and applicated into the gel without centrifugation. The samples were run in horizontal 12% starch electrophoresis. Two gel buffers were used:

a) 1:1 0.043 M Tris/0.0043 M citrate : Poulik (1957), pH 7.4.

b) 0.005 M Tris/0.005 M NaHPO_4 pH 8.3.

Elektrodebridges same, ten times more concentrated. This rather preliminary research included 310 samples and eight enzymes were stained:

a-buffer: IDH, MDH, LDH, ACO,

b-buffer: PGI, PGM, 6-PGD, G-6-PDH.

Only IDH and PGI showed heterozygosity. No inbreeding was observed and genotype frequencies equalled with expected Hardy-Weinberg equilibrium. Genetic distances (Nei 1972) showed the western animals and "carriers" to be the same or very closely related populations. The American population is more like the western than the eastern population distances not being great between any populations.

This work has been supported by Finnish Fur Breeders Association which I wish to thank.

7 pp, 5 references.
In SWED.

Author's summary.

THE AUCTION CLASSIFICATION OF PELTS AS BASIS FOR SELECTION INDEX.

Outi Lohi

Introduction.

The information about the pelt characteristics of the progeny can be based on grading of live animals or grading of pelts. The aim of this study was to investigate whether the grading information from the auction company represents a genetic variation in regard to the pelt characteristics.

Material and methods.

Material is collected from 12 ranches and includes the colour types scanblack and pastel. On these ranches all animals of scanblack and pastel colour types were marked individually at pelting in 1982, 1983 and

1984. In heritability counts all pelts in normal quality groups (SS - quality II) are included. The total material includes 23812 scanblack and 8775 pastel pelts.

The analysis of variance is carried out with SAS procedure NESTED.

Results.

A clear difference between the ranches can be seen in all characteristics. This is partly due to environmental effects but illustrates also differences in genetical material. After the differences between the two sexes were eliminated by SAS procedures STANDARD the following heritability estimates were counted out from the total material:

	scanblack h ²	pastel h ²
Quality	15	20
size	32	18
colour	38	57
shade of the colour	11	13

The results in regard to scanblack type are more constant from year to year and between the two sexes than the results on pastel type.

11 pp, 7 tables, 5 references.
In DANH.

Author's summary.

STUDIES ON REPRODUCTION AND FOLLICULAR DEVELOPMENT IN MINK.

Gabrielle Lagerkvist, Lars Elofson, Hans Gustafsson.

Investigations on mating patterns in mink, and the effects of the female age and mating pattern on reproduction, were carried out at the Swedish Fur Animal Research Farm at Uppsala during 1981-1983. In 1984 the project was extended to also include physiological studies:

- eggs and embryos were collected by flushing the female genital tract
- follicular development during the breeding season was studied in females that had been left unmated
- females were slaughtered one month after last mating. Embryos and corpora lutea were counted.

For the different mating groups, matings started on fixed dates in the periods 8/3-15/3 for 1+9 mating and 10/3-25/3 for 1+1 mating. A total of 193 1-year old females and 236 older females were distributed over the groups.

83% of the females accepted mating on the first or the second day tested. In the latest mating group almost every female accepted mating immediately.

In agreement with earlier investigations, for 1 year old females a good breeding results was obtained when mated according to the 1+9 system early in the season. For older females, fertility was superior in the group where mating started on the 25th of March: 7.9 kits per litter (including stillborn) and 6.1 mated female at 3 weeks.

In 1-year old females, mated according to the 1+9 system, more normal embryos were found in the oviducts and uterus (5.8) than in those mated according to the 1+1 system. Older females, mated late in the mating season according to the 1+1 system, carried 8.5 normal embryos at an average. In 3 out of 19 females, mated 1+9, embryos from the first mating were found in the uterus.

The number of follicles at least 0.5 mm were determined in 1-year old unmated females slaughtered in the period 12/3-2/4. No signs of cyclicity could be observed. In 3 out of 16 females one atretic follicle was found. A few compact luteinized follicles were noted, which imply that the mink

might also ovulate spontaneously. In these females raised progesterone titres were observed.

9 pp, 6 tables, 3 references.
In SWED.

Authors' summary.

NEW EXPERIENCES OF MINK TESTICULAR ASPIRATION BIOPSY.

Christer Sundqvist, Altti Lukola.

Male mink fertility problems have been studied and efforts have been made to find effective means for eliminating infertile individuals from breeding. From the farmer's economic point of view it is important that infertile males are effectively eliminated as early as possible. Aspiration biopsies of the mink testis were performed in January and February. In these tests, the unanaesthetized mink was held firmly while the testis was punctured carefully avoiding any injury to the cauda epididymidis. As the needle passed through the testicular tissue, a syringe was used for aspiration. This sampling seemed painless for the mink, and produced no harmful effects on libido, appetite or general behaviour. Samples were immediately investigated in a phase-contrast microscope, or samples were spread onto object glasses, air-dried and analyzed after staining with a May-Grünwald-Giemsa solution. Each view was scored on a scale from 1 to 10 which was a slightly modified Johnsen's score count. Additionally samples have been analyzed in a DNA flow cytometer. Results showed that high scoring males returned better breeding results ($r=0.46$; $p < 0.05$). Males scoring 7 could be considered as infertile. The sample could be stored inside the needle for at least 5 days, still allowing elongated spermatids to be counted with great accuracy. However, spermatogonia and spermatocytes were not easy to find even after one single day inside the needle. In the analyses the main emphasis is focussed on the presence of condensing acrosome- and maturation-phase spermatids. Therefore it is possible to check the fertility of males in samples stored inside the needle. Measurement of the seasonal changes in testicular development by biopsy and DNA flow cytometry showed that a rapid expansion of the haploid cell compartment could be seen in early January. This means that mink males with delayed spermatogenesis, or a complete absence of it, can be detected even at this early date. Because specimen collection, staining, and analysis are easy to do, the aspiration biopsy technique is very suitable for assaying mink infertility in a normal farm situation.

3 pp, 8 references.
In SWED.

Authors' summary.

FRESH SEMEN IN ARTIFICIAL INSEMINATION OF FOXES.

J.A. Fougner, M. Forsberg.

Breeding of foxes for fur production is of considerable economic importance in the Nordic countries, Canada and the Soviet Union. Since the introduction of artificial insemination of fox breeding in Norway (1973 and 1979), this technique has expanded to several other countries. In 1986 approximately 130,000 vixens were subjected to artificial insemination with fresh semen in the Nordic countries alone.

The article reviews recent experience in semen collection, sperm preservation, heat control and time of insemination in estrus. Effects on fertility by inseminating highly diluted semen are reported.

Earlier studies indicated that 100–150 million sperms were the minimum numbers of spermatozoa per insemination dose necessary to achieve maximal numbers of fertilized ova when utilizing fresh semen. A pilot study in Norway in 1985, where blue fox vixens were inseminated with fresh silver fox semen, showed that good fertility could be achieved by inseminating twice with 30 million spermatozoa per dose.

In 1986 a trial was performed where 325 blue fox vixens from 7 farms in Norway were inseminated with liquid semen from 50 silver fox males. Each ejaculate was split for dilution to contain 100, 60, 40 and 20 million sperms per milliliter. The number of spermatozoa in a semen sample was determined using a modified hemocytometer (AB Leo Diagnostics, Helsingborg, Sweden). All inseminations took place within 3 hours of sperm collection. Total volume of extended semen for intrauterine deposition was 1 milliliter.

The fertility results of vixens inseminated with different sperm numbers are summarized in Table 1. Vixens in groups 1, 2, 3 and 4 were randomly assigned to the groups at the time of insemination. Vixens in group 5 and 6 were chosen by the technician at the time of insemination after physical examination of heat signs (vulvar swelling, cervical consistency). Animals judged to be in maximal heat were assigned to group 5 and animals considered early in heat to group 6. Females in group 6 were inseminated twice within 24 to 36 hours.

The most striking results was the high fertility in all groups expressed in both pregnancy rates and litter sizes. In the random group inseminated with 20 million sperms (group 4) both pregnancy rate and litter size were reduced compared to the other random groups inseminated with higher sperm numbers (groups 1, 2 and 3), although the reduction was not statistically significant. Among the vixens inseminated with 20 million sperms (groups 4, 5 and 6) there was a significant difference in fertility between those animals randomly selected and inseminated once (group 4) and those chosen by the technician for insemination twice (group 6). Results indicate that 20 million sperms are the minimum insemination dose in cross breeding, required for optimal fertility with the present technique for sperm preservation and heat detection.

Table 1. Blue fox vixens inseminated with various dilutions of silver fox semen.

group	no of vixens	insemination dose (sperms in millions)	pregnancy rate (%)	litter size
1 (random)	49	100	85.7	8.2
2 (random)	74	60	81.1	8.3
3 (random)	88	40	85.2	8.1
4 (random)	31	20	74.6	7.8
5 (chosen)	35	20	88.6	8.6
6 (chosen)	48	2x20	83.3	8.9

9 pp, 1 table.
In NORG.

Authors' summary.



Are they artificial
or natural ?

LOW-PROTEIN FEEDING IN MINK: EFFECTS OF DIETARY SUPPLEMENT OF METHIONINE AND LYSINE ON BLOOD PARAMETERS AND FUR QUALITY.

Hans Berg, Jouko Työppönen, Maija Valtonen.

Four groups of mink were fed from weaning to pelting with feed of two different protein levels. The metabolizable energy (ME) from protein amounted to 40/36% in the control group and 25/20% in the three low-protein groups during the early and late growth period, respectively. One of the low-protein groups received an unsupplemented diet, the second diet was supplemented with methionine, and the third with methionine and lysine. The levels of methionine and lysine added in the low-protein feeds were equivalent to the control diet.

In all of the low-protein groups the decreased protein intake was observed as elevated plasma levels of alanine and branched chain amino acids (BCAA) valine, leucine and isoleucine. Clinical blood parameters were similar or better in low-protein groups compared to the control group. The low-protein diet were sufficient for growth and gave larger pelts than the control diet. However, the quality of the pelts produced with the low-protein feeds was significantly reduced as compared to the control group with normal protein level. No improvement in the fur quality was achieved by the dietary supplementation of methionine and lysine as compared to the unsupplemented low-protein feed.

8 pp, 6 tables, 1 fig., 8 references. Authors' summary.
In SWED.

THREE FORMS OF HEREDITARY TYROSINEMIA TYPE II IN MINK.

Birthe Bjerg, Knud Christensen, Per Henriksen, Hilmer Sørensen.

Hereditary tyrosinemia occur in mink (*Mustela vison* Schreb.). The disease may lead to death for animals with homozygotic recessive genes for a deficiency in hepatic tyrosine aminotransferase (EC 2.6.1.5). Three different forms of the disease have been described, where the deficiency at the enzyme for these forms results in insufficient degradation and excretion of tyrosine and phenylalanine.

Methods of analyses have been developed for a fast, simple and efficient detection of the disease. Tyrosinemia type II is caused by insufficient binding of the cofactor pyridoxalphosphate to hepatic tyrosine aminotransferase. These forms of tyrosinemia are different from tyrosinemia type I, which has been described to comprise both defects related to hepatic 4-hydroxyphenylpyruvate dioxygenase (EC 1.13.11.27) and other enzymes.

Metabolism of tyrosine in the animals have been investigated by use of ^{14}C -L-tyrosine as precursor. Kinetics of tyrosine aminotransferase isolated from mink liver have also been utilized in clarification of the enzyme defect leading to tyrosinemia type II. Dietary treatment of affected mink have been promising. Results from the above mentioned investigations will be presented.

13 pp, 1 table, 7 figs., 5 references. Authors' summary.
In DANH.



TRIALS OF HERRING OFFAL.

Georg Hillemann.

Herring offal (*Clupea harengus*) is comparatively new as a feed ingredient for furbearing animals. Although large quantities have been available it has not hitherto been used much largely on account to the high content of oil and thiaminase.

Trials at the Nordjysk Pelsdyrforsøgsfarm in 1984 and 1985 showed however that both frozen, cooled and silaged herring offal produce reasonable results when properly handled.

In 1984 6 groups of 280 mink each had herring offal at the levels of 8 and 16% either frozen, cooled or silaged. In 1985 4 groups of 280 mink had herring offal at the level of 16% either frozen or cooled by 20% frozen, cooled by ice or mixed with traditional fish silage (50/50%), i.e. 4 different methods of preservation.

The animals developed normally. The pelts were slightly smaller from the groups at the high level of herring offal. The high level of herring offal produced shorter underfur in Pastel mink, slightly thinner skin and lower pelt weight. The frozen offal produced the best fur quality. Status of thiaminase appeared to be normal, but the high level of herring offal seems to produce more cases of fat infiltrations in the liver.

It may however be concluded that herring offal in reasonable quantities is suitable as mink feed then produced and used correctly.

21 pp, 11 tables.
In DANH.

Author's summary.

IRON UTILIZATION IN MINK.

Anders Skrede.

Introduction.

Fish-induced iron deficiency anemia is a common problem in mink nutrition. The occurrence of anemia seems to be associated with the feeding of certain fish species and subsequently poor iron absorption.

Supplementation of mink diets with iron.

Studies with mink showed that addition of 40 mg iron per kg wet feed as ferrous sulphate, ferrous fumarate, Fe-EDTA or "Hemax" was inefficient in preventing anemia when the feed was composed to promote low iron availability. In one experiment, where iron was supplemented through a dry vitamin mixture, iron enrichment for kits during the June-November period had little or no positive effect. Experiments in the reproduction period revealed a positive effect of "Hemax" by regular use in the feed production.

Supplementation of mink diets with iron and cysteine.

The amino cysteine form several complexes with ferrous ions, and may thus influence the availability of iron. Addition of cysteine, as L-cysteine monohydrochloride monohydrate, in amounts corresponding to 10 mol per mol added iron as ferrous fumarate appeared to yield efficient protection against iron deficiency anemia in mink. Cysteine supplementation promoted normal hemoglobin and hematocrit values, and a great increase in the amounts of nonheme iron in the liver. Growth and fur color also were improved as a result of supplementation with cysteine.

Experiments with ^{59}Fe -labelled ferrous fumarate revealed increasing absorption in mink with increasing levels of added cysteine. These studies, which involved absorption measurements with whole body counting technique, indicate a possibility of using cysteine as a promotor of increased iron utilization in different species.

10 pp, 3 tables, 5 figs., 3 references. Author's summary.
In NORG.

VARIATION OF HAEMATOLOGICAL INDICES IN MINK - IRON DIET -

Asbjørn Brandt.

Haematological data from four recent experiments are analyzed in order to study following aspects:

1. The effect of different levels and mutual proportions of dietary iron, copper and zinc on growing mink kits.
2. The effect of dietary EDTA, amino acid chelated, and glutamate or sulphate iron on the haematological development of growing mink kits.
3. The effect of repeated phlebotomy on growing mink kits fed large amounts of fish oil or lard.
4. The effect of vitamin-E and fish oil on the haematological development in growing mink kits.

The results are presented in figures and the source and type of the variations is discussed.

In exp. 1, 2 & 3 the low haematocrit, haemoglobin, number of erythrocytes, mean corpuscular volume and transferrin saturation was characterised as iron deficiency anaemia. In exp. 4 low haematocrit and number of erythrocytes combined with high mean corpuscular volume was evaluated as typical of haemolytic anaemia.

5 pp, 4 figs., 2 references. Author's summary.
In ENGL.

TREATED SOYBEAN MEAL.

Liisa Tång.

A more extensive use of soybean meal in the fur animal feed has been restricted by the lower digestibility compared with the animal proteins as well as by the so called biologically active substances found in soya. The digestibility of the soybean meal can, however, be improved with different treatments. These treatments can also inactivate the adverse factors of the soybean meal. In 1984-86 the Feed Division of Finnish Sugar Co. carried out tests to improve the digestibility of the soybean meal. The soybean meal went through both physical and enzymatic treatments as well as their combinations. These treatments can improve the digestibility of the protein in the soybean meal by some 10%. Furthermore the digestibility of carbohydrates has increased up to some 30%. The treatments have also improved the viscosity of the soybean meal. As a result the share of the soybean meal could have been increased in the fur animal feeds.

9 pp, 3 tables, 2 figs., 4 references. Author's summary.
In SWED.

EFFECTS OF SALT LOAD IN MINK.

Lea Eriksson, Maija Valtonen, Jaakko Mäkelä.

Salt (Na^+ , Cl^-) content in fresh mink food varies a lot. Fish and fish offal especially can be salted and cause serious poisonings. Gorham and Farrell (1962) have shown that mink readily eats food with salt content as high as 5% of the wet weight. Already food with 3% salt content causes signs of salt poisoning although water supply is freely available. If water is restricted, even less amounts of salt are toxic.

Effects of both short and long term (10 weeks) salt load were studied in healthy male minks (Eriksson et al., 1984 A + B). Salt was added to the fresh food from 0 to 2% of the wet weight. The basic diet contained Na^+ corresponding to 0.5% NaCl of the wet weight on the short term salt load of 0.3% on the long term load.

The animals showed no signs of discomfort in any test group. On short term salt load daily food consumption was higher in the groups eating diets with 1 and 2% salt addition than in those eating less salty food. On the other hand minks on the long term load consumed somewhat less food fed with the highest salt addition (1 and 2%). Plasma levels of electrolytes and the common clinical parameters did not show any differences between the test group in blood samples collected at the end of long term salt load. Urinary Na^+ excretion increased concurrently with the increase in Na^+ intake. Addition of 0.5% of salt was eliminated by increasing Na^+ concentration in urine. When the salt load was higher, maximum Na^+ concentration (350 mM) was reached and any further increase of Na^+ excretion was caused solely by greater urine volume. Simultaneously urinary osmotic concentration decreased from 2000–3000 mOsm/kg to 1500 mOsm/kg. The increased urinary water loss was compensated by augmented drinking. Compared to urine the changes in faeces were trivial.

Healthy minks tolerate relatively high concentrations of salt in the food the excess being excreted in urine. Sufficient supply of drinking water is of critical importance. With time, however, high salt contents in the food may suppress appetite and growth.

6 pp, 2 tables, 4 figs., 12 references. Authors' summary.
In SWED.

PROTEIN QUALITY IN FISH MEAL FOR USE IN FEED TO FUR ANIMALS.

K.E. Gulbrandsen, T. Hjertnes.

Raw material quality, process equipment, low heat exposure and short resident time in fish meal production are all important elements regarding the final product quality.

Digestibility experiments on mink shows that increased levels of total volatile nitrogen (TVN) in raw material have negative effects on product quality, particularly in connection with high heat exposure.

Examinations of fish meal produced with different heat exposures shows that protein quality decreases with increased temperatures during the drying process.

Commercial fish meal produced in steam drieres have been tested for product quality in digestibility experiments on male pastel minks. The results showed a true protein digestibility of 87% in the samples. The same procedures were also used in quality test for commercial Low-Temperature meals (LT-meal) produced under firm conditions. The true protein digestibility was found to be 92% on average when testing

nearly 65% of the total LT-meal production in Norway in 1985. Growth experiments on mink in the period from July to November with either steam dried fish meal or LT-meal as protein sources in the dry feeds, resulted in significantly higher gain (15-19%) for animals fed LT-meal.

6 pp, 2 tables, 1 fig., 1 reference.
In NORG.

Authors' summary.

BIOGENIC AMINES IN FUR ANIMAL FEED.

Bjørn O. Eggum, Niels Enggaard Hansen, Per Henriksen, Hilmer Sørensen.

Products of animal origin and waste products from fish and poultry industries have a high potentiality as valuable feed for fur animals. However, propitious conditions for putrefaction and degradation occur quite often during preparation and storage of the feed. Possibilities exist for different types of microbial growth and for the formation of a too high concentration of antinutritional and/or toxic constituents in the feed through series of enzyme catalyzed processes. The enzymes can be of microbial origin, possibly excreted from the microorganisms, or from the applied feed.

Biogenic amines and/or products of these are quite often considered to be responsible for reduced quality and toxic effects of feed containing appreciable amounts of waste products from fish and poultry industries as well as different types of animal materials. Information on types, combinations and concentrations of the actually harmful compounds are insufficient. These unsolved problems are again reasons for missing, sufficient simple and reliable methods of analysis which are required for the guidance of those using such feed. Investigations of the above mentioned problems have recently been initiated in a collaborative project based on systematic molecular biological methods and results obtained from these will be presented.

14 pp, 3 tables, 6 figs., 3 references.
In DANH.

Authors' summary.

DIFFERENT ENERGY LEVELS IN FEED FOR LACTATING FEMALES AND ITS EFFECT ON KIT GROWTH.

Anne-Helene Tauson.

In a 2-year study with 4 groups of each 9 standard females and 54 kits (Expt. 1) and 3 groups of each 15 females and 90 kits (Exp. 2) the effects of a varied energy concentration in diets with almost constant fat:carbohydrate ratio on kit growth performance and female live weights from parturition until the age of 8 weeks of the kits were studied. Energy concentration varied between 19.2-16.6 MJ ME/kg DM (Exp. 1) and 17.2-15.4 MJ ME/kg DM (Exp. 2). Feed consumption data indicated that the animals compensated for decreased dietary energy concentration by increased feed consumption. Kit live weights, however, were inferior in groups with low energy concentration, the exception being the highest level in Exp. 1. The detrimental effects of a low energy concentration were most pronounced during the last weeks of the experimental period, when the kits were more dependent on their own feed consumption than on the mother's milk production. For the most low-concentrated diets, however, inferior kit weights were recorded already at a kit age of 21 days. Kit live weights in November and skin length of pelted animals showed that kit performance during the early growth period was

determining for these traits. The lactating females lost about 25% of their body weight from parturition until 8 weeks thereafter. The major weight losses occurred between 35 and 56 days after parturition. Despite the kits were weaned at an age of 42 days, the dams lost weight until the termination of the experiment. There was a tendency for less severe weight losses and a somewhat faster recovery among females on low-concentrated diets. The results of the investigations indicate that 16.0 MJ ME/kg DM is sufficient to support normal kit growth until the kits start to consume feed. From then on 17.3 MJ ME/kg DM appears to be the lowest level required. On the other hand, beneficial effects of an energy concentration above 18.8 MJ ME/kg DM were not documented.

11 pp, 5 tables, 12 references.
In SWED.

Author's summary.

BEHAVIOUR STUDIES IN RELATION TO REPRODUCTION IN FARM FOXES.

Bjarne O. Braastad.

The reproduction results for foxes may vary considerably between farms. In many farms the average litter size at weaning is only about half of the reproduction potential. This may have various causes, but it is reason to believe that reproduction can be considerably improved if the number of aggressive or fearful vixens and vixens which injure their cubs could be reduced.

It is therefore aimed at finding the causes of tail biting and infanticide, particularly in silver fox, by comparing the behaviour of normal vixens with that of cub biters. This study will provide the basis for developing measures to reduce these behavioural disorders.

Video recording of the periparturient behaviour of silver foxes showed that the parturition and initiation of maternal behaviour were normal in all multiparous vixens studied, also in those which later injured their cubs, whereas some primiparous vixens may show inadequate behaviour during parturition.

Cub biting usually started with tail biting, which occurred from a few hours to a couple of days postpartum. Some vixens thereafter continued biting, which might cause death between half a day and five days postnatally (average 1 day 15 h, N=10), and usually during night. The vixens would normally eat all dead cubs, whatever the cause of death, so finding a half eaten cub is no evidence of infanticide.

Analysis of the behaviour indicated that the cub biters were more sensitive to disturbances and were frequently alerted; they looked out of the nest opening more frequently, were more frequently lying down facing the nest opening and slept less than normal vixens, especially during working hours. Results from several years revealed that cub biters almost invariably repeated their abnormal behaviour patterns later years. This, in addition to the clear connection between tail biting and infanticide, shows that one should always eliminate cub biters from the breeding stock. Studies of cub biters in different nest boxes indicate that it might be possible to design nest boxes in which the vixens will be less stressed, and which will improve the welfare of the animals.

In order to achieve a better relationship between animal keepers and the animals, it is imperative that the cubs experience positive interactions with humans in the critical period for primary socialization (4-6 weeks). We are trying to develop simple methods for taming potential breeder vixens within this period. Furthermore, a simply "puppy test" for foxes is being developed, by which farmers can select breeder vixens according

to their behaviour.

14 pp, 1 table, 8 figs.
In NORG.

Author's summary.

PELT DEVELOPMENT OF SILVER FOX.

Leena Blomstedt.

Little research has previously been published on pelt development in the young silver fox. This histological study aims to survey the timing of pelt development. Knowledge of this may aid in improving pelt quality by different means, and in finding the right pelting time; naked eye maturity rating of the pelt has proved difficult.

Skin samples from the hip region were taken every second week during the growth season from four animals (3 males, 1 female). The rates of growing versus mature hairs were calculated. The first samples were taken July 2, the animals being 2.5 months old.

The guard hair in whelp pelt matured around mid July. The first winter pelt guard hairs appeared in the skin in the end of July, and by mid August every whelp guard hair had a growing winter guard hair beside it. The guard hairs of the whelp pelt were moulted in the beginning of September, the down hairs some three weeks later. The whelp pelt had moulted totally in the hip region at the age of a little more than five months.

The animals were pelted on December 18, and the pelts appeared mature to the naked eye. The guard hairs in the hip region were mature, but the rate of mature down varied in the animals (67-96%). Skin samples from the shoulder region were taken for comparison; 90-100% of the guard hairs and 74-96% of the down were mature. Maturation, complete enough for pelting, was thus found in only one male animal, despite the fact that female's whelp pelt moulted two weeks earlier than that of the males.

The growth time and rate vary for different types of hair in a fur. The thick and long guard hairs begin to grow first, however, the thin and short guard hairs mature first. The down hairs grow in number as the animal grows, but a great part of the down mature later than guard hairs. When the whelp pelt changes into the winter pelt of an adult animal old hairs remain attached for some time while new hairs grow next to them. The old hairs protect the new ones from early wear and tear.

2 pp.
In SWED.

Author's summary.

A SEROLOGICAL SURVEY OF NOSEMATOSIS AMONG ICELANDIC ARCTIC FOXES (ALOPEX LAGOPUS).

Eggert Gunnarsson, Páll Hersteinsson, Stefán Aðalsteinsson, Sigríour Hjartardóttir.

During the last couple of years Arctic fox cubs from various parts of Iceland have been caught for use in breeding experiments. 53 litters, consisting of 156 cubs have been tested for the presence of antibodies to Encephalitozoon cuniculi using Carbon Immuno Assay techniques (CIA-test). Positive titres were found among 17 cubs (11%) from 18 different litters (15% of all litters). Most positive cases came from a certain part of the country, Vestfirðir (Northwest Iceland). Thus a positive reaction was found in 45.5% of the litters and 35.1% of the cubs from this region, while only 7.1% of the litters and 3.4% of the cubs from other regions of the

country showed a positiv reaction.

Autopsy revealed that infection by *E. cuniculi* in Icelandic Arctic foxes not only gives positive antibody reaction but can also cause pathological lesions and death.

It is concluded that catching Arctic foxes in Iceland for breeding experiments on normal fox farms carries considerable risks with regard to transmission of nosematosis. The risk is greatest as far as foxes from Vestfiridir is concerned. However, it cannot be excluded, that nosematosis exists among foxes all over the country. A higher frequency of the disease in Vestfiridir probably results from a higher density of the fox population there than elsewhere in the country.

5 pp, 2 tables, 2 figs., 5 references. Authors' summary.
In NORG.

EXPERIMENTAL INFECTION OF BLUE FOX KITS AND PREGNANT VIXENS WITH BLUE FOX PARVOVIRUS.

Pirjo Veijalainen, Erik Smeds, Erkki Neuvonen, Jouni Kangas.

A new parvovirus infection in blue foxes (*Alopex lagopus*) was first recognized during a serological screening of fur animals in the winter 1981-82. Few farms in western Finland had sero-positive animals. Elevations in parvovirus antibody titres has been studied annually ever since. The infection has spread gradually so that in 1985 the whole country can be considered contaminated.

The causative virus was isolated in 1983. It is antigenically closely related to mink enteritis virus, panleukopinia virus and canine parvovirus.

The pathogenic effects induced by blue fox parvovirus in blue foxes have not been clearly established. In apparent or mild clinical signs and only occasional deaths of kits have been seen when the disease has spread to uninfected areas. On the other hand we have associated the infection with reproductive failure on blue fox farms. Parallely with the spreading of blue fox parvovirus, empty females, abortions and neonatal deaths have become more common than earlier.

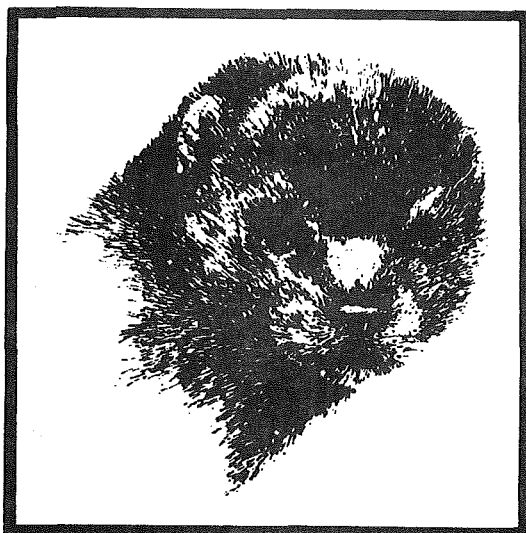
The isolation of the virus provided us the opportunity to study the pathogenicity of the disease with experimental infections. Both kits of varying ages and pregnant vixens were included in these tests. Kits of seronegative females were inoculated with great amounts of virus per os and intraperitoneally 1 day, 2 week, 4 week or 8 week old. During the experiment the kits remained heathy. The results supported our earlier findings in the field that the infection is mild and often symptomless.

The susceptibility of fetuses for this virus was studied by inoculating pregnant vixens intraperitoneally at various stages of gestation. A group of 15 females was infected by blue fox parvovirus. An identical group of 15 was mock infected and served as a control. The control group gave birth to 131 living kits and the infected vixens to 78. Viral inoculations seemed to result in empty females and abortions. Also litter sizes were smaller in the infected group. This was the case especially when fetuses were at early stages of development at time of inoculation. Blue fox parvovirus seems to pass placenta and replicate in fetal tissues.

6 pp, 2 tables, 5 references.
In SWED.

Authors' summary.

COMMUNICATION



RESEARCH REFERENCES ON MINK & FOXES

1986 Edition

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Thank you for your inquiry. We think this letter will answer some of your questions. First, the National Board was founded in 1945 and is a congress-type group made up of 43 mink and fox farmers' associations from coast to coast. Individual fur farms cannot be direct members. Our primary activities are in the fields of legislative contact, research, and education. We do not engage in the sale of breeding stock or the marketing of pelts, nor offer advice on these subjects.

We offer the following publications which should interest you:

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"Mink & Fox Farming Progress"	\$15 postpaid to U. S. and Canada
A similar publication will be available November, 1986,	\$15 postpaid to U. S. and Canada

To other destinations, add postage for six ounces each.

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For current information on mink and fox farming and sources of breeding stock, we suggest Fur Rancher magazine, 7535 Office Ridge Circle, Eden Prairie, MN 55344. Per year (13 issues), \$17 U. S., \$18 Canada, \$19 elsewhere.

For information on the marketing of mink and fox pelts, we suggest Fur Age Weekly, 127 W. 30th St., New York, N. Y. 10001. \$27 per year.

Technical reports from around the world appear in English in Scientifur, 48 H Roskildevej, DK-3400 Hilleroed, Denmark. \$56 per year. from 1987.

If you have further questions, please write us, enclosing a stamped reply envelope. We cannot assist students working on detailed papers nor can we recommend sources of mink and fox breeding stock. These are the only fur-bearer species with which the National Board is involved.

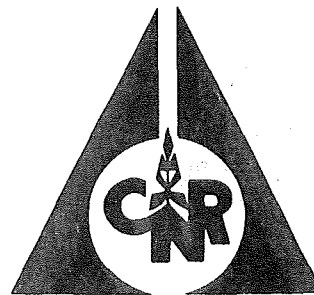
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September 19, 1986

Dr. Gunnar Jorgensen
NJF's Fur Animal Division
SCIENTIFUR
48H, Roskildevej
DK-3400 Hilleroed, Denmark

Dear Dr. Jorgensen:

Thank you for your copy of the SCIENTIFUR which contained a communication concerning the World Furbearer Conference which was held in Maryland, U.S.A. in 1980.

Per your request I have enclosed a number of reprints and monographs which may be of interest to you.

Copies of the Worldwide Furbearer Conference Proceedings and North American Furbearers are still available at a very special price should you or any of your readers be interested. I have included some copies of the order forms for both publications for your use. Also enclosed is the Table of Contents and Introduction to North American Furbearer contemporary reference.

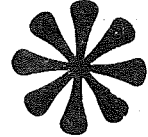
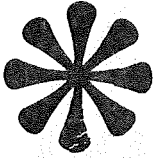
Please note that I have left the University of Maryland and I am now at Utah State University.

Sincerely,



Joseph A. Chapman, Ph.D., FIBiol.
Professor and Department Head

JAC:mf
Enc.



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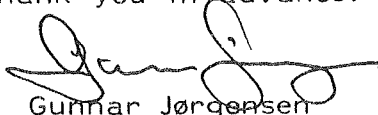
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Thank you in advance.




Gunnar Jørgensen
Editor



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North American Furbearers A Contemporary Reference

1983

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INTRODUCTION

The word "fur" is derived from the old Germanic expression "forre", meaning sheath or scabbard. Apparently wild animals' skins were used for sheaths in the early days of European history, since sheepskins were used for clothing in that period.

Today, a "fur pelt" is defined in the commerce vernacular as an animal skin with all or part of the guard hair and/or fur fibers intact, which is used as an item of apparel for warmth or adornment. Nearly 100 types of animal pelts are utilized in fur trade.

Most fur pelts consist of skin, guard hairs and fur fibers. Guard hairs are long, glossy, strong, elastic hairs that overlie the shorter, soft, and duller fur fibers.

On the living animal, the function of guard hair is primarily one of protection from paludal and atmospheric moisture, while the function of fur fibers is to insulate the skin, especially in cold seasons or climates.

The relative values of fur pelts are dictated by their availability, color, completeness of guard hairs and fur fibers, size and contemporary fashion.

Historically, red and light colored furs were in demand because most furs were used as linings which contrasted stylishly with dark garment materials. Darker furs became more fashionable by the turn of the twentieth century as they were used as outside garment materials.

While wild fur-bearing animals are found in most countries, the United States and Russia produce the largest annual crops and the combined values of the U.S. and Canada's annual fur harvest make the North American wild fur industry the most valuable known in the world.

This book discusses the management, controversy and economic values associated with wild furbearers, and it details the general status of 30 of North America's major terrestrial, semi-aquatic and aquatic furbearers.

Several North American furbearers are not discussed in the species section of this reference because of their relatively small ranges, limited harvests or small economic impact in the wild fur industry. These furbearers are the red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), hog nose skunk (*Conepatus mesoleucus*), hooded skunk (*Mephitis macroura*), jack rabbit (*Lepus townsendii*), swift fox (*Vulpes macrotis*), and kit fox (*Vulpes velox*).

In recent years the combined harvest values of these furbearers has exceeded several million dollars. In some locales, the harvest of these species, especially squirrels and foxes, provides a significant income or service to residents of rural communities.

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5. TAGUNG

ÜBER HALTUNG UND KRANKHEITEN DER PELZTIERE,
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FACHGRUPPE KLEINTIERKRANKHEITEN DER DVG
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WORLD RABBIT SCIENCE ASSOCIATION (WRSA)

TAGUNGSLEITER: PROF. DR. H.-CH. LÖLIGER

CELLE, 30.08. - 01.09.1984

Herausgegeben
von der Deutschen Veterinärmedizinischen Gesellschaft e.V.
Frankfurter Strasse 87, D-6300 Giessen

The meeting discussed breeding and nutrition as well as diseases, of rabbits, mink, foxes, chinchillas and coypu (nutria). There was reference to use of antibiotics in these animals, and problems of hygiene. Pet animals were, in fact, excluded. The German group of the World Rabbit Science Association participated in the meeting, which was under the chairmanship of Prof. H.-C. Lölinger.

Fifth meeting on keeping and diseases of fur bearing animals, rabbits and pets. August 1984.

In GERM.

Titles of the actual reports given at the meeting incl. the addresses of the authors are given in this issue of SCIENTIFUR (marked with *).

The Proceedings (243 pp) can be obtained:

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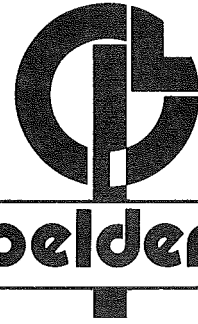
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Ons kenmerk: Welfare mink

Doorkiesnr. 05766-6

THE WELFARE OF RANCH MINK

To whom it may concern

Het telefoonnummer van "Het Spelderholt" is m.i.v. maandag 27 oktober 1986 gewijzigd in:



Dear Sir / Madam,

Recently the Spelderholt Centre published a booklet entiteled "The welfare of the ranch-mink", by de Jonge, Carlstead and Wiepkema. The basis of this publication were obeservations on five Dutch minkfarms and on the farm of the Spelderholt Centre.

This booklet might be of interest for your readers. Therefore I ask you to publisize it in your magazine.

"The welfare of the ranchmink" can be ordered by transferring to the Spelderholt Centre HFL 20,-- per book, exclusive HFL 9,-- per order to cover bankcosts.

Best regards,

The Spelderholt Centre for Poultry research and Extension

G.P. Teunis
Public Relations Officer

*Dear Colleague,
Thank you very much for the report and welcome to a relatively new production industry.
The editor.
G. J. J.*

THE WELFARE OF RANCH MINK

Dr. G. de Jonge
Centre for Poultry Research and Extension, Beekbergen

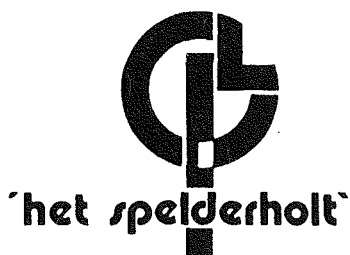
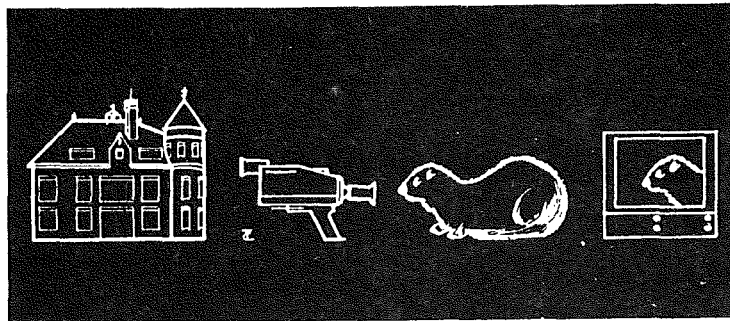
Dr. K. Carlstead
Prof. Dr. P. R. Wiepkema
Agricultural University, Wageningen

JUNE 1986

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THE WELFARE OF RANCH MINK

Summary

Observations were made on five average Dutch minkfarms from March 1984 to March 1985 and on a research farm at "Het Spelderholt" from July 1985 to June 1986 in order to establish the state of well-being of farmed mink.

Housing and daily caretaking accommodate the needs of the mink on many points. The open sheds are sufficient because mink are able to resist wind and cold. The various types of nest boxes in use give sufficient protection. Protection against warmth deserves attention.

Further study is still desirable concerning provision of nesting material in the different seasons.

Pens must not be made smaller, and perhaps should be larger than those currently in use. It might be desirable to isolate breeding females visually from each other; further study is carried out. Mink are not extremely sensitive to disturbances and the present situation gives the animals sufficient rest.

The lack of bath and swimming water could mean a deficiency for the animals. We could not establish however, what the consequences of this deprivation are. An economically and hygienically acceptable solution for this possible deficit requires study, but will not be simply to do.

The health situation and hygiene is not bad, but there is room for improvement. The control of AD can be approached more intensively. There are noticeably few measures taken to prevent diseases from being carried over by ranch visitors. The freshness of food can be better guaranteed. Drinking water provision during frost is a problem for the animals and humans.

Mortality of young animals is acceptably low. Mortality of adults seems to be on the high side.

Two types of abnormal behaviour do occur, i.e. tailbiting and stereotypies. Before the spring moult 17.9% of the females and 10.2% of the males had a damaged tail. In 70% of these cases the damage was no more than a bare tail tip. Further research is needed to make recommendations that will lead to the limitation of this damage. Stereotyped behaviour is performed sometimes by about 70% of the females. Half of the females do it more than an hour per day. The behaviour occurs for a large part in the hours preceding feeding and the behaviour is seen quite often during pairing confrontations if the animals wish to flee. Hence, stereotypies seem to occur when the mink cannot control their situation. It seems unlikely that increasing the pensize will reduce stereotypies.

It may be added that much of the technocracy that has become common in other branches of animal husbandry are absent on the mink ranch. We are thinking of climate regulation and artificial fertility regulation that carry with them the danger of growing into welfare-threatening management systems. For the present there is no desire amongst mink breeders for further technocratization.

Mink husbandry has had not a lot of attention in agricultural research. One of the reasons for this is the fact that mink husbandry is of lower economic importance in agriculture. Critics however, are quick to say that present day mink husbandry is incompatible with the animals' welfare. Most of the criticisms are perhaps unjustified but they cannot be ignored.

Knowledge and research in the field of ethology and welfare of mink is scarce. For this reason the cooperation between the Agricultural University in Wageningen and the Centre for Poultry Research and Extension in Beekbergen is a good thing.

This report is the result of a preliminary research on welfare. Results are presented on husbandry conditions which possibly can favor the welfare of the animals. More research is needed to give detailed instructions for this kind of agriculture.

In view of this research a new accommodation is built at "Spelderholt".

The ethical discussion is not mentioned in this report. Of course, critics put that question. This question, however, never can be solved by scientific research. Ethics are depending on national, cultural and social norms.

Mink producers are producing for the worlds' market and their production is depending from the consumers wishes. It is the task of our Centre for Research to collect knowledge by doing scientific research in the field of mink production.

We are convinced that the presented research contribute to the welfare of mink.

Dr. Ir. W. de Wit
Director of the Spelderholt Centre
for Poultry Research and Extension

Authors summary.

63 pages

6 photos

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91 references.

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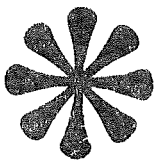
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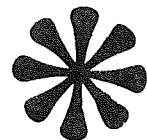
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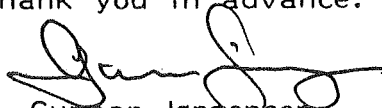
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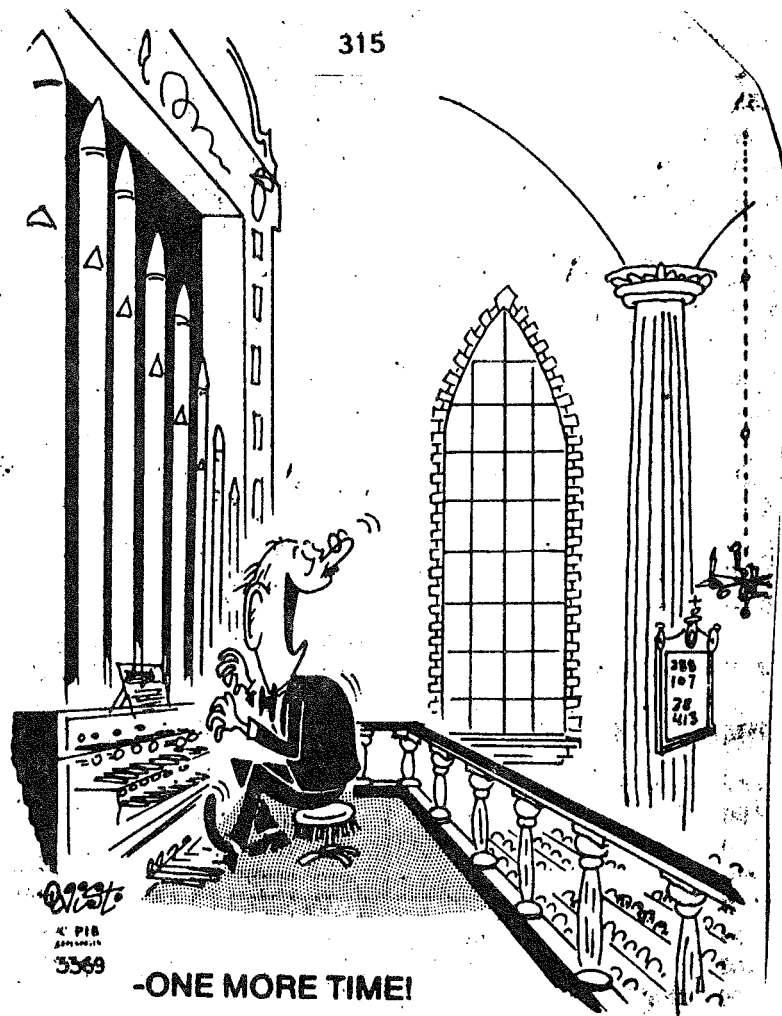
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Gunnar Jørgensen
Editor





MINK PRODUCTION:

Read by A.A. Fowler, Commonwealth Agricultural Bureau,

.... ALL CONSIDERED. THIS BOOK DESERVES A WARM WELCOME FROM ALL THOSE WITH AN INTEREST IN MINK BREEDING, AND SHOULD PROVE PARTICULARLY USEFUL FOR THOSE PARTICULARLY BARKING ON MINK FARMING.

See full
abstract
on next
page !

Scientifur

48 H Roskildevej
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MINK PRODUCTION

Jørgensen, G.

The fact that this is a translation of a mink breeding manual published in 1984 by the Danish Fur Breeders' Association for the benefit of their members is reflected in the scope of the book, which is based on conditions and legal requirements in Denmark, especially as regards the chapters on establishing a mink farm, feed production, feed centres, and advertising and marketing. However, mink breeders everywhere will benefit from reading the sections on machines and equipment, reproduction, anatomy and physiology of the mink pelt, genetics, selection of breeding animals, mating systems, management and husbandry, general nutritional requirements, diseases and hygiene, pelting, and treatment, storage and grading of pelts. Although some future (or existing) mink breeders are assumed to be somewhat ignorant of some facts of life ("The main difference between male and female is that the male's testes produce spermatozoa, while the female's ovaries produce ova. Both male and female are equipped with genital organs"), many chapters, such as those on reproduction, genetics, breeding methods and nutrition, give an admirably clear picture of how to achieve good results. The text is easy on the eye, with useful annotations in the margin, giving the reader quick access to the relevant sections of a chapter. There are many excellent illustrations (some in colour), a 13-page subject index, and a list of translations of some Danish mink breeding terms. All considered, this book deserves a warm welcome from all those with an interest in mink breeding, and should prove particularly useful for those embarking on mink farming.

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