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### CONTENTS

1.	CONTENTS	83
2.	NOTES	92
3.	<u>MULTIDISCIPLINARY</u>	
	INVESTIGATIONS UPON QUALITY OF AMBER GOLD NUTRIA FUR.	
	Stanislaw Niedzwiadek, Jacek Kowalski.	93
	Code 2-4-0.	
	SIGNIFICANCE OF FEET AND VENTRAL SURFACE AS HEAT LOSS ROUTES FOR FARMED RACCOON DOGS AND BLUE FOXES.	
	Hannu Korhonen.	98
	Code 3-2-F-0.	
	A STUDY ON THE USE OF NUTRIA FOR MEAT PRODUCTION.	
	Stanislaw Niedźwiadek, Jacek Kowalski.	103
	Code 14-2-0.	
	ONTOGENY OF MINK PUPS.	
	Birthe Jonasen.	109
	Code 11-M.	
	CHANGES OF THE SKIN, ESPECIALLY HAIR FOLLICLES AND DERMIS, IN MINK GROWTH.	
	Tadayuki Nishiumi, Keiji Kondo, Tsugio Osugi.	111
	Code 2-14-M.	
	INCREASING THE RATE OF MATURATION OF THE COAT IN ARCTIC FOXES UNDER NATURAL DAYLIGHT.	
	A.A. Alymov.	112
	Code 14-10-F.	

<b>GROWTH AND DEVELOPMENT OF YOUNG POLECATS.</b>	
G.P. Kazakova.	113
Code 2-14-0.	
<b>SCIENTIFIC RESEARCH ON NUTRIA.</b>	
Anonymous.	113
Code 14-0.	
<b>CARCASS AND MEAT QUALITY TRAITS OF COYPUS.</b>	
E. Sindilar, Elena Verdes, Alexandrina Boisteanu.	114
Code 2-14-0.	
<b>THE PERFORMANCE OF BLACK NUTRIA HOUSED INDOORS.</b>	
A.V. Shapovalov.	114
Code 12-0.	
<b>THE EFFECT OF TEMPERATURE AND HUMIDITY ON PELT QUALITY OF NUTRIA HOUSED INDOORS.</b>	
V.L. Shevyrkov.	114
Code 10-12-0.	
<b>THE USE OF TWO-TIER CAGES FOR HOUSING FEMALE NUTRIA.</b>	
Yu. A. Yakovenko, V.G. Kozlov, G.A. Kuznetsov.	115
Code 12-5-0.	
<b>THE RACCOON DOG - ANOTHER FUR BEARER ON OUR FARMS.</b>	
Anonymous.	115
Code 1-14-0.	
<b>EFFECT OF SOCIAL COMPETITION ON GROWTH IN RACCOON DOGS.</b>	
Hannu Korhonen, Mikko Harri.	116
Code 11-10-0.	
<b>EFFECTS OF SEASON ON PELT CHARACTERS OF FINNISH RACCOON DOGS.</b>	
Hannu Korhonen, Mikko Harri.	116
Code 2-10-14-0.	
<b>RAISING RACCOONS FOR RELEASE. PART IV. MEDICAL MANAGEMENT AND READINESS FOR THE WILD.</b>	
Adele T. Evans, Richard H. Evans.	116
Code 9-14-12-0.	
<b>A COMPARISON OF TWO DIFFERENT MINK CAGES USED DURING THE BREEDING PERIOD.</b>	
Maria Neil.	117
Code 10-12-14-M.	
<b>MEASURING OF LONG-TERM STRESS.</b>	
Leif Lau Jeppesen, Knud Erik Heller.	117
Code 11-3-12-14-M.	
<b>CONTRIBUTION TO THE ECO-ETHOLOGY OF THE STONE MARTEN (MARTES FOINA) HOME RANGE AND FOOD RESOURCES UTILIZATION STRATEGY. II. RADIO-TRACKING AND GENERAL DISCUSSION.</b>	
José Kalpers.	118
Code 11-1-0.	
<b>ECOLOGY AND EPIDEMIOLOGY OF WILD AND FERAL CANIDS IN THE PALEARCTIC ZONE. MEETING HELD IN NANCY, FRANCE, 9-11 OCTOBER 1984.</b>	
M. Artois, J. Blancou, C. Kempf.	118
Code 1-9-F-0.	

<b>WORLD PRODUCTION OF MINK.</b>	<b>118</b>
Anonymous. Code 13-M.	
<b>POPULATION OF FUR BEARERS IN 1986.</b>	<b>119</b>
Eugenia Jørgensen. Code 13-M-F-0.	
<b>PRODUCTION RECORDING IN FINLAND.</b>	<b>119</b>
Anonymous. Code 13-M-F.	
<b>POPULATION OF BREEDING ANIMALS IN SWEDEN 1986.</b>	<b>119</b>
Anonymous. Code 13-M-F-0.	
<b>SYSTEMATICS, NATURAL HISTORY, KEEPING YOUTH DEVELOPMENT AND POSSIBILITIES TO DETERMINE THE AGE OF CHINCHILLAS.</b>	<b>120</b>
Sylvia Krug. Code 2-14-0.	

Titles of other publications - not abstracted.

**Easy and cheap improvements of the housing system for foxes.**  
Inge Hoffmeyer. (Dansk Pelsdyravl, 48, 11, 744-745, 1985).  
(DANH). Code 10-12-14-F.

**How is the rentability of chinchilla production?**  
Edmund Haferbeck. (Deutscher Pelztierzuchter, 57, 134-136, 1983). (GERM). Code 14-0.

**Behaviour of rabid foxes.** M. Artois, M.F.A. Aubert.  
(Rev.d'Ecologie (la Terre et la Vie) 40, 2, 171-176, 1985, conference proceedings).

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Code 1-0.

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Hiroshi Ikeda. (Rev. d'Ecologie (la Terre et la Vie), 40, 2, 165-169, 1985, conference proceedings). (FREN). Code 1-10-11-0.

**Can the increase of fox density explain the decrease in Lynx number at Donana?** J.R. Rau, J.F. Beltran, M. Delibes.  
(Rev. d'Ecologie (la Terre et la Vie), 40, 1, 145-150, 1985, conference proceedings). Code 1-14-F-0.

**Habitat use by foxes in Edinburgh.** Hugh H. Kolb.  
(Rev. d'Ecologie (la Terre et la Vie) 40, 1, 139-143, 1985, conference proceedings). Code 1-11-10-F.

**Spatial organization, movements and dispersal in a Dutch red fox (*Vulpes vulpes*) population: some preliminary results.**

J.L. Mulder. (Rev. d'Ecologie (la Terre et la vie), 40, 2, 133-138, 1985, conference proceedings). Code 1-11-F.

**Observations on the nesting behaviors of tachytes parvus fox and *T. obductus* fox (Hymenoptera: Sphecidae).**

Frank E. Kurczewski, Margery G. Spofford. (Proc. Entomol. Soc. Wash, 88, 1, 13-24, 1986). Code 9-10-F.

**Method of estimating the circadian activity of radio-tagged carnivores.** M. Aubert, M. Artois, P. Stahl.

(Rev. d'Ecologie (la Terre et la Vie), 40, 2, 177-183, 1985, conference proceedings). (FREN). Code 11-1-F.

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#### 4. GENETICS

##### **EVOLUTIONARY GENETICS OF THE Lpm MULTIGENE FAMILY.**

D.K. Belyaev, O.K. Baranov, V.I. Ermolaev, M.A. Savina, V.V. Filippov, T.V. Kut'yavina. 121  
Code 4-3-M.

##### **REGIONAL ASSIGNMENTS OF EIGHT GENES ON CHROMOSOME 2 IN THE AMERICAN MINK.**

N.S. Zhdanova, A.A. Gradov, N.B. Rubtsov, S.D. Pack, O.L. Serov. 122  
Code 4-3-M.

##### **A CHROMOSOME-BANDING STUDY IN THE FINNISH AND THE JAPANESE RACCOON DOG.**

Auli Mäkinen, Marja-Terttu Kuokkanen, Maija Valtonen. 122  
Code 4-0.

##### **INHERITANCE OF COAT COLOUR IN FERRETS.**

Mohasina Syed, Knut Rønningen, Nils Norodd Nes. 123  
Code 4-0.

##### **QUALITY OF FOX PELTS AND WAYS OF IMPROVING IT.**

N.I. Syrnikov, N.I. Gladinova. 123  
Code 4-14-F.

##### **INHERITANCE OF HAIR LENGTH AND COAT DENSITY IN SABLE MINK.**

N.M. Tsepkov, G.A. Lasaeva. 123  
Code 4-0.

##### **VARIATION OF REPRODUCTIVE PERFORMANCE OF LARGE STANDARD MINK IN THE COURSE OF SELECTION FOR LARGE SIZE.**

Z.A. Mashtak, V.V. Pomerantsev, G. Myasoedova. 124  
Code 4-5-M.

##### **THE USE OF THE COEFFICIENT OF CORRELATION IN EVALUATING SELECTION OF MINK FOR BODY LENGTH.**

S.A. Mashtak, G.A. Kuznetsov, V.V. Pomerantsev. 124  
Code 5-M.

- LONG-HAIRED FOXES AT THE "MADONA" FUR FARM.**  
A.V. Yakovenko, M.F. Atals, V.R. Kuchminskaya. 125  
Code 4-F.
- POSSIBILITIES OF IMPROVING THE REPRODUCTIVE PERFORMANCE IN FUR BEARERS BY MEANS OF SELECTION.**  
Einar J. Einarsson. 125  
Code 4-5-M-F-0.
- HERITABILITY OF LITTER SIZE IN MINK.**  
Suvi Tikkanen. 125  
Code 4-5-M.
- THE EFFECTIVENESS OF THE PROGENY TESTING OF SABLES.** 126  
E.G. Snytko, I.F. Kiriliushkin.  
Code 4-0.
- CROSS BREEDING WITH FOXES - A COLOURFUL FUTURE.** 126  
Einar J. Einarsson.  
Code 4-F.
- PELT QUALITY OF AMERICAN MINK OBTAINED BY CROSSING PARENTS WITH DIFFERENT GENOTYPES.** 126  
V.I. Evsikov, Yu V. Vagin, T.D. Osetrova,  
E.K. Matysko.  
Code 4-M.

Titles of other publications - not abstracted.

**Chinchilla-Sapphire.** Anonymous. (Deutsche Pelztier Züchter, 9, 1982). (GERM). Code 4-0.

## 5. REPRODUCTION

- ESTRUS - INDUCING TRIALS USING OIL PMSH IN MINK.** 127  
S. Jarosz, B. Barabasz, O. Szeleszuk.  
Code 5-3-M.
- QUALITY OF FOX SEMEN AND ITS EFFECT ON BREEDING RESULTS.** 129  
Maija Valtonen, Harri Käyhkö.  
Code 5-F.
- CONCEPTION RATE OF ARTIFICIALLY INSEMINATED VIXENS IN RELATION TO INSEMINATION DOSE AND METHOD.** 129  
E.P. Bautina, V.N. Pymytko, L.E. Pozdnyakova.  
Code 5-F.
- ARTIFICIAL INSEMINATION OF FOXES.** 130  
Jan A. Fougner  
Code 5-F.
- INSEMINATION OF FOXES IN DENMARK.** 131  
Niels Therkildsen, N. Regner Andersen.  
Code 5-F.
- REPRODUCTIVE ABILITY OF "SHADOW" ARCTIC FOXES.** 131  
E.M. Val'tman.  
Code 5-4-F.
- REPRODUCTIVE BEHAVIOUR IN CHINCHILLAS.** 131  
Anonymous.  
Code 5-0.

- THE DURATION OF PREGNANCY IN MINK IN RELATION TO THE DATE OF MATING, AGE AND COLOUR. 132  
V.G. Bernatskii.  
Code 5-14-M.
- THE RELATIONSHIP OF REPRODUCTIVE PERFORMANCE OF MINK WITH THE TIME AND ORGANISATION OF MATING. 132  
V.G. Bernatskii, Z.A. Mashtak.  
Code 5-M.
- REPRODUCTIVE PERFORMANCE OF NUTRIA OF DIFFERENT AGES HOUSED INDOORS. 132  
N.A. Tsepkova.  
Code 5-12-0.
- REPRODUCTIVE ABILITY OF FEMALE SABLES OF DIFFERENT AGE AND SIZES. 133  
E.G. Sergeev.  
Code 5-14-0.
- PERIPHERAL PLASMA PROGESTERONE CONCENTRATION AND HAEMATOLOGICAL INDICES DURING NORMAL PREGNANCY OF CHINCHILLAS (CHINCHILLA LANIGER M.). 133  
J. Gromadzka-Ostrowska, B. Zalewska,  
E. Szylarska-Góźdz.  
Code 3-5-0.
- PREDICTING THE PERCENTAGE OF NON-CONCEIVING FEMALE SABLES FROM THE CONCENTRATION OF PROGESTERONE IN THE BLOOD. 134  
T.G. Novikova, Yu V. Polyntsev, E.G. Snytko, V.N. Naumova.  
Code 5-3-0.
- THE CONCENTRATION OF SEX HORMONES IN FEMALE ARCTIC FOXES DURING THE REPRODUCTIVE CYCLE. 134  
T.G. Novikova, A.V. Sobol', G.M. Diveeva.  
Code 5-3-F.
- RESULTS FROM THE 1984 MATING SEASON. 135  
Gabrielle Lagerkvist, Lars Elofson, Hans Gustafsson.  
Code 5-M.
- LOOKING AHEAD TO THE 1985 MATING SEASON. 135  
Gabrielle Lagerkvist.  
Code 4-M.

Titles of other publications - not abstracted.

**Facts about the reproduction biology of Chinchilla.**

Anonymous. (Deutsche Pelztier Züchter, 95-96, 1982) (GERM).  
Code 5-14-0.

**Parturition in the silver fox.** Anonymous. (Deutsche Pelztier Züchter, 60, 6, 95-97, 1986). (GERM). Code 4-14-F.

<b>6.</b>	<b><u>NUTRITION AND FOOD TECHNOLOGY</u></b>	
	<b>ZINC METABOLISM IN MINK.</b>	<b>136</b>
	Heddie Mejbørn. Code 6-M.	
	<b>COMPARISON OF SOYBEAN MEAL AND HERRING MEAL IN DIETS FOR GROWING-FURRING MINK.</b>	<b>137</b>
	Alain Andersen. Code 7-M.	
	<b>TOLERANCE OF GROWING-FURRING MINK FOR METABOLIS- ABLE ENERGY AND PROTEINS.</b>	<b>137</b>
	Michel Flamand. Code 6-M.	
	<b>USE OF ALTERNATIVE PROTEIN-FEEDSTUFFS IN MINK FEEDING.</b>	<b>138</b>
	Hans Berg. Code 7-M.	
	<b>COMPARISON OF 3 FEEDING SYSTEMS FOR GROWING-FUR- RING MINK: CONVENTIONAL vs SEMI-COMPLETE vs PEL- LETS.</b>	<b>139</b>
	Johanne Laplante. Code 6-7-M.	
	<b>CORRELATIONS BETWEEN THE B<sub>6</sub> AVITAMINOSIS AND THE REPRODUCTION TROUBLES IN MINK.</b>	<b>140</b>
	N. Pâstîrnac, R. Gruia. Code 6-5-M.	
	<b>CONTRIBUTIONS CONCERNING THE INFLUENCE OF THE PYRIDOXINE DEFICIT UPON THE FUR QUALITY AT MINK.</b>	<b>140</b>
	R. Gruia, N. Pâstîrnac. Code 6-2-14-M.	
	<b>A METHOD OF ECONOMIZING ON FEEDS FOR MINK.</b>	<b>141</b>
	N.A. Balakirev. Code 6-M.	
	<b>THE EFFECT OF CEREALS ON GROWTH, PELTQUALITY AND REPRODUCTION OF BLUE FOXES IN THE NETHERLANDS.</b>	<b>142</b>
	G. de Jonge, H.J. Hof, E.J. Weerd. Code 7-6-14-F.	
	<b>TRIALS WITH DRY FEED.</b>	<b>142</b>
	Georg Hillemann. Code 7-6-M.	
	<b>HERRING SCRAPS - SUITABLE FOR MINK.</b>	<b>143</b>
	Georg Hillemann. Code 7-M.	
	<b>EXPERIMENTS WITH PIG PULP FOR MINK.</b>	<b>143</b>
	Georg Hillemann. Code 7-M.	
	<b>DRY FEED IS A REALISTIC ALTERNATIVE TO TRADITION- AL FEED FOR FUR ANIMALS.</b>	<b>143</b>
	Georg Hillemann. Code 7-6-M.	
	<b>FEEDING TRIALS WITH ARCTIC FOXES IN 1984.</b>	<b>144</b>
	H. Konnerup-Madsen. Code 6-7-F.	

- FITCH FEEDING IN RELATION TO HYDATIDS CONTROL. 144  
David Heath.  
Code 6-9-0.
- THE COLONIC SEPARATION MECHANISM IN THE GUINEA-  
PIG (*CAVIA PORCELLUS*) AND THE CHINCHILLA (*CHIN-  
CHILLA LANIGER*). 144  
Kjelle Holtenius, Göran Björnhag.  
Code 2-6-0.
7. VETERINARY SCIENCE
- A CASE OF FEED-BORNE VIRUS TRANSMISSION IN AN  
EPIDEMIC OUTBREAK OF MINK VIRUS ENTERITIS. 146  
Per Henriksen.  
Code 9-10-7-M.
- PRE-CLINICAL DIAGNOSTICS OF THIAMINE DEFICIENCY  
IN FUR-BEARING ANIMALS. 148  
V. Berestov, G. Petrova, S. Izotova.  
Code 9-3-6-7-M.
- ADHERENCE OF *PSEUDOMONAS AERUGINOSA* TO TRACHEAL  
EPITHELIAL CELLS OF MINK. STUDIES ON BACTERIAL  
HYDROPHOBICITY AND ELASTASE PRODUCTION. 151  
E.L. Elsheikh, S. Abaas, B. Wretlind. Code 9-8-14-M.
- FREQUENCY OF CANINE PARVOVIRUS AND ROTAVIRUS IN-  
FECTIONS AMONG FOXES IN FRANCE. 152  
A. Schwers, J. Barrat, J. Blancou, M. Maenhoudt,  
P.-P. Pastoret.  
Code 9-F.
- COLLABORATIVE SEROLOGICAL TESTING OF RED FOXES  
AT LIBERTY IN FRANCE. 152  
J. Barrat, J. Blancou, C. Chastel, A. Schwers, M.M.  
Maenhoudt, P. Biront, P.-P. Pastoret, U. Kihm, J.M.  
Baradel, D. Gavant, O. Roboly.  
Code 9-F.
- PREVALENCE OF *TOXOPLASMA GONDII* IN MYOCASTOR. 153  
Ivan Literák, Zdeněk Mlcak.  
Code 9-0.
- ENCEPHALITOOZONOSIS IN FARM BREEDING OF BLUE  
FORM OF ARCTIC FOX (*ALOPEX LAGOPUS*). 153  
M. Persin, J. Dousek.  
Code 9-F.
- DATA ON THE PATHOGENESIS OF *TOXASCARIS* INFECTION  
IN ARCTIC FOXES. 153  
L.V. Anikieva, N.N. Tyutyunnik, V.S. Anikanova,  
V.A. Kulikov, V. V. Ostashkova.  
Code 9-F.
- HELMINTH PARASITES OF THE RACCOON (*PROCYON LOTOR*)  
FROM TENNESSEE AND KENTUCKY. 154  
Richard A. Smith, Michael L. Kennedy, Walter E. Wil-  
helm.  
Code 9-0.



Titles of other publications - not abstracted.

- Anaphylactic Shock After Vaccination.** T.M. Schwartz.  
(Blue Book for Fur Farming, 1986, pp 57) Code 9-14-M.
- Disease problems in Norwegian fur farms in 1985.**  
G. Loftsgaard. (Norsk Veterinærtidsskrift, 98, 2, 134-136, 1986). (NORG). Code 9-14-M-F.
- The spreading of Sarcoptic mange among Swedish red foxes (*Vulpes vulpes* L) in relation to fox population dynamics.**  
Erik Lindström, Torsten Mörner. (Rev. Ecol. (Terre Vie), vol. 40, 211-216, 1985). Code 9-1-F.
- Distribution of Echinococcus multilocularis in its natural hosts.** R. Houin, M. Liance. (Rev. Ecol. (Terre Vie), vol. 40, 2, 225-230, 1985). (FREN). Code 9-F-0.
- Sarcoptic mange in foxes in Switzerland.**  
Alexander I. Wandeler, Andreas Kappeler, Simon Capt.  
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- The red fox (*Vulpes vulpes* L.), a reservoir of parasitic zoonoses in Italy.** Edoardo Pozio. (Rev. Ecol. (Terre Vie), vol. 40, 2, 240, 1985). Code 9-F.

**8. COMMUNICATION**

- MINK.** Johnny Birks. 155  
Code 1-14-M.
- WILDLIFE MONOGRAPHS. 65, 1979.** 156  
Gale R. Willner, Joseph A. Chapman, Duane Pursley.  
Code 14-M-F-0.
- DISEASE IN FUR BEARING ANIMALS.** 158  
Ulf D. Wenzel, V.A. Berestov.  
Code 9-2-3-14-M-F.
- CHINCHILLA REARING.** 160  
Stanislaw Jarosz, Wladyslaw Rzewski.  
Code 14-2-4-9-12-0.
- 4th International Scientific Congress in  
Fur Animal Production.** 161  
Toronto - Wisconsin, August 21-28, 1988.
- IV WORLD CONFERENCE ON ANIMAL PRODUCTION.** 163  
Finland, 27th June - 1st July 1988.
- List of addresses.** 167



## NOTES

SCIENTIFUR, Vol. 11, No. 2, 1987.

During the days 8-10 April 1987 a seminarium regarding FUR DEVELOPMENT AND FUR CHARACTERISTICS IN FUR ANIMALS AND SHEEP was held in the regi of the Scandinavian Association of Agricultural Scientists, Animal Division. The seminarium (No.120) took place in Espoo, Finland, and was attended by more than 60 scientists from Australia, Denmark, Finland, Iceland, Norway and Sweden. Reports from the seminarium will be abstracted in a later issue of SCIENTIFUR. Proceedings from the meeting will be produced by the Association.

We are just going to finish the SCIENTIFUR INDEX. After printing it will be sent to our subscribers - hopefully primo June 1987. Further copies of the Index will be available at a price of Dkr. 350.- each + postage. The same applies of non-subscribers to SCIENTIFUR.

We regret very much the delay of the Index, but hope that it will be helpful for everyone who wishes to be familiar with the international research of fur animals during the latest 10-15 years.

THE FOURTH INTERNATIONAL SCIENTIFIC CONGRESS IN FUR ANIMAL PRODUCTION is planned to be held in Toronto, Canada, and Wisconsin, USA, August 21-28, 1988. See announcement under Communication.

For the time being we are working very hard with preparation of the new book "Beauties of Farmed Fur Animals - and their colour genetics". As far as we can see today the book will be printed in 5 languages, namely in Norwegian, Finnish, Swedish, Danish and English. The Norwegian edition is planned to be ready on the market approximately July this year, and the other editions approximately November this year.

We appreciate still pre-orders, because these will bring us in a better position to calculate the number of books necessary for each edition.

Have a good summer.

Your Editor

Gunnar Jørgensen



Original report

# Investigations Upon Quality of Amber Gold Nutria Fur

Stanislaw Niedzwiadek and Jacek Kowalski Institut of Zootechnics. Dep. of Fur Animal Breeding 32-083 Balice n. Krakow, Poland

Almost 3 million nutria furs are produced in Poland yearly. Of the total amount of furs about 65% are colored. Of the numerous colored strains of nutria there are also Amber Gold nutria. In Poland there are farms designated for the breeding and reproduction of this strain. From these farms breeding is carried out on a massive scale throughout the country. The number of Amber Gold furs is not great although these furs are in great demand in the fur industry.

## Materials and Methods

The research material included 24 furs from Amber Gold nutria of which 12 were from males and 12 from females. The nutria were reared in cages without bathing facilities and fed farm produced fodder in amounts meeting the nutritive requirements of this animal. The mean weight before slaughter for males was 4425 g and for females, 4182 g. Slaughter was done during the winter months at 7,5 - 8 months of age.

The following physical traits were analyzed and hair covering determined according to:

1. weight of rough skin and tanned fur,
2. surface area of rough skin and tanned fur,
3. weight of 1 dm<sup>2</sup> skin,
4. length of skin,
5. compactness of hair (SGM) - tanned fur,
6. thickness of down and cover hairs,
7. length of down and cover hairs,
8. denseness of cover hairs.

The traits of cover hairs (points 5 - 8) were examined in 7 topographical areas of the skin (ill. 1). Physical traits were measured according to the methods developed for this type of skin by Kaszowski and Kawińska (1960).

## Results

There were differences between sexes for the rough skin weights (tab. 1). Males had heavier weights. The differences was statistically significant.

Also heavier weights of 1 dm<sup>2</sup> rough skin were found in males than in females. The differences was statistically significant. The surface area of rough skin for both sexes was similar and was 15,3 - 15,6 dm<sup>2</sup>: Skin length for both sexes was on a similar level (77,8 - 78,3 cm). The greatest variability characterized skin weight ( $v = 13,5 - 10,2\%$ ). The variability of the re-

maining rough skin traits ranged from 8,9 to 11,9%. The same parameters measured for tanned furs were approximately 24% less for skin weight and 12% less for the surface area, 15% less for the weight of 1 dm<sup>2</sup> and approximately 30% less for skin length (tab. 1). The difference between sexes of the analyzed skin traits was not statistically significant. The analyzed values of tanned fur traits were characterized by less variability in comparison to rough skin.

The cover hair compactness in 7 topographical areas of tanned fur was similar for the sexes in the appropriate samples (tab. 2). The mean cover hair compactness for females was 5,35 mm, and for males,

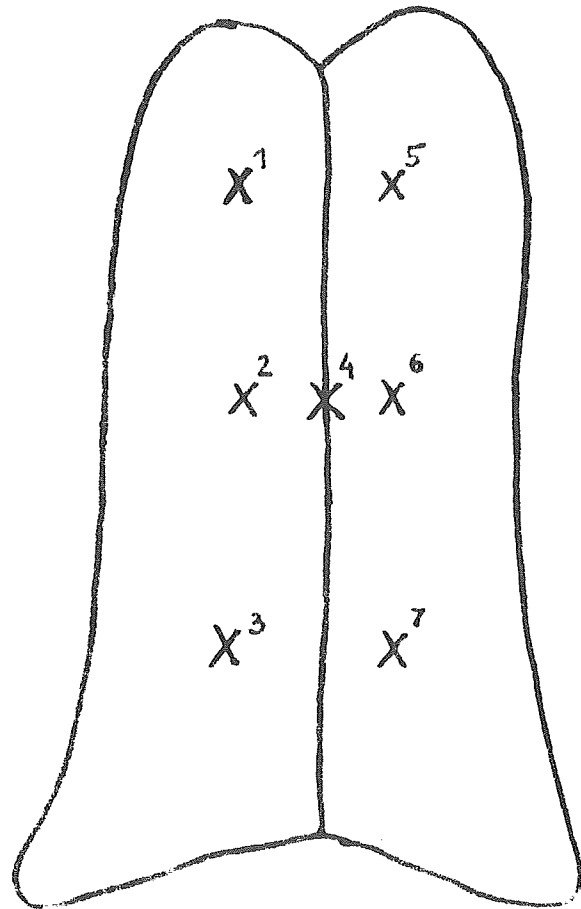


Fig. 1. Sampling areas.

- 1,2,3 - ventral part
- 4 - lateral part
- 5,6,7 - dorsal part

TABLE 1.

## PARAMETERS OF ROUGH AND DRESSED NUTRIAS SKINS

SPECIFICATION	ROUGH SKINS				DRESSED SKINS				
	WEIGHT /G/	AREA /DM <sup>2</sup> /	WEIGHT /1DM <sup>2</sup> /	LENGHT /CM/	WEIGHT /G/	AREA /DM <sup>2</sup> /	WEIGHT /1DM <sup>2</sup> /	LENGTH /CM/	
FEM.	$\bar{x}$	185,4 <sup>A</sup>	15,6	11,8 <sup>B</sup>	77,8	143,3	13,3	10,8	54,2
	v	13,5	11,9	10,8	-	12,0	10,9	10,4	-
MALES	$\bar{x}$	202,9 <sup>A</sup>	15,3	13,1 <sup>B</sup>	78,4	149,0	13,9	10,6	55,1
	v	10,2	8,9	9,9	-	8,6	7,9	8,9	-
TOTAL	$\bar{x}$	195,2	15,5	12,6	78,3	147,0	13,7	10,7	54,7
	v	14,2	10,1	11,3	-	10,8	9,2	9,7	-

MEANS FOLLOWED BY SOME LETTERS ARE SIGNIFICANTLY DIFFERENT  $P < 0.05$ .

5,77 mm. The furs of females had a total SGM of 37,54 mm and of males, 40,42 mm. The difference was not however statistically significant.

The compactness of cover hair from female skins was characterized by greater variability of compactness calculated as a mean from 7 samples and total SGM ( $v = 10,6 - 10,8\%$ ). The variability of compactness of cover hairs of males was less and was respectively 6,76 and 6,65%.

The thickness of down hairs, depending on the topographical area, for females ranged from 10,8 to 12,9 microns. However in males it ranged from 10,9 to 13,2 microns (tab. 3).

The variability of down hair thickness was similar for both sexes and ranged from 9,1 to 14,9%. The

mean thickness of cover hairs for the entire skin, for females, was 11,6 and in males, 11,8 microns ( $v = 12,8$  and 13,1%).

The thickness of cover hairs for both sexes in appropriate samples was on a similar level and ranged from 93,8 to 130,3 microns (tab. 3). The mean thickness of cover hairs for the entire fur was, in females 106,2 and in males 107,2 microns. The variability of cover hair thickness was greater than for down hairs. The mean for the entire fur was, in females 22,1% and in males 23,8%.

Down hair length for both sexes was in the appropriate samples on a similar level and was from 10,0 to 20,0 mm (tab. 4). Greater down hair length were obtained for both sexes in samples 4 - 7. The mean down

TABLE 2.

## COMPACTNESS OF HAIR COVER IN TOPOGRAPHICAL PARTS OF SKIN /MM/

SPECIFICATION	SAMPLES							$\bar{x}$ SGM	AVERAGE FROM 7 SAMPLES	
	1	2	3	4	5	6	7			
FEMALES	$\bar{x}$	4,52	5,38	5,04	5,56	5,78	5,92	5,31	37,51	5,35
	v	-	-	-	-	-	-	-	10,8	10,6
MALES	$\bar{x}$	4,87	5,81	5,71	5,70	6,45	6,18	5,67	40,42	5,77
	v	-	-	-	-	-	-	-	6,65	6,76
TOTAL	$\bar{x}$	4,71	5,58	5,38	5,64	6,17	6,04	5,51	39,08	5,57
	v	-	-	-	-	-	-	-	8,2	7,9

TABLE 3.

SPECIFIC- CATION	THICKNESS OF HAIR / MICRONS /														AVERAGE FROM 7 SAMPLES		
	S A M P L E S																
	1		2		3		4		5		6		7		DOWN	COVER	
	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	
FEMALES	$\bar{x}$	11.0	95.3	10.8	95.4	11.2	93.8	11.9	99.4	11.3	104.7	12.9	127.0	11.3	123.8	11.6	106.2
	v	12.8	25.8	14.0	24.8	10.9	25.3	13.9	18.5	14.1	21.1	12.6	20.4	14.6	18.7	12.8	22.1
MALES	$\bar{x}$	10.9	97.2	11.3	96.7	11.9	96.1	12.2	102.8	10.9	103.3	13.2	130.3	11.6	120.8	11.8	107.2
	v	13.7	25.5	10.8	21.6	13.5	24.9	9.1	24.1	12.7	22.2	11.9	28.9	14.9	25.1	13.1	23.2
TOTAL	$\bar{x}$	11.0	96.8	11.1	96.3	11.7	94.9	12.1	101.2	11.2	104.2	13.1	128.7	11.5	122.3	11.8	107.1
	v	14.7	25.9	13.2	23.7	12.3	25.1	12.3	22.3	15.3	21.9	12.3	25.4	14.8	22.7	13.3	23.8

TABLE 4.

SPECIFIC- CATION	LENGHT OF HAIRS / MM /														AVERAGE FROM 7 SAMPLES		
	S A M P L E S																
	1		2		3		4		5		6		7		DOWN	COVER	
	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	
FEMALES	$\bar{x}$	11.0	26.0	11.0	34.0	10.0	34.5	16.0	41.0	18.0	48.0	19.0	51.0	12.0	32.0	13.9	38.3
	v	15.4	16.5	8.8	9.7	16.7	12.0	15.0	17.2	11.2	9.5	8.7	9.6	10.2	9.8	12.8	14.7
MALES	$\bar{x}$	12.0	23.0	13.0	31.0	11.0	33.0	14.5	39.0	18.0	49.0	20.0	53.0	14.0	34.0	14.3	37.9
	v	17.5	15.6	12.2	10.3	18.3	14.5	14.0	15.2	12.1	10.2	11.2	10.5	9.8	10.2	13.6	14.5
TOTAL	$\bar{x}$	12.0	25.0	12.8	33.0	11.4	34.1	15.8	40.8	18.0	48.7	19.6	52.4	13.7	33.6	13.2	38.1
	v	17.1	15.9	11.6	10.2	17.6	13.7	14.8	16.3	11.7	9.9	10.8	10.1	10.1	10.0	12.7	14.7

TABLE 5.

HAIR DENSITY OF NUTRIA FOR 1 CM<sup>2</sup> OF SKIN

SPECIFIC- CATION	S A M P L E S														AVERAGE FROM 7 SAMPLES		
	S A M P L E S																
	1		2		3		4		5		6		7		DOWN	COVER	
	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	DOWN	COVER	
FEMALES	$\bar{x}$	18753	165	17775	144	14492	136	12088	119	8206	135	9216	122	7709	106	12625	133
	v	18.3	23.7	17.3	28.3	21.3	27.1	19.3	30.1	23.2	28.3	18.3	27.4	24.3	28.4	21.3	26.7
MALES	$\bar{x}$	18830	170	17840	147	14335	122	11985	115	8139	128	9138	119	7988	104	12620	130
	v	18.9	22.8	16.8	29.1	20.8	28.3	20.2	29.7	22.7	30.1	19.2	28.3	23.7	26.3	22.3	26.2
TOTAL	$\bar{x}$	18795	168	17805	146	14425	131	12018	118	8198	132	9189	121	7895	105	12618	132
	v	18.7	23.3	17.1	28.9	21.2	27.9	19.8	29.8	23.1	29.7	18.8	28.1	24.1	27.7	21.8	26.6

hair length calculated for the entire fur was, in females 13,9 mm and in males 14,3 mm.

The length of cover hairs was on a similar level for both sexes in individual samples and ranged from 23,0 to 53,0 mm. The mean length for the fur was, in females 38,3 mm and in males 37,9 mm.

The variability of cover and down hair length for both sexes was on a similar level and in the examined tests was from 8,7 to 18,3%. However the variability coefficient of the mean down hair length for the entire fur in males and females ranged from 12,8 to 13,6%, and for cover hairs from 14,5 to 14,8%.

The density of down hairs on 1 cm<sup>2</sup> of skin differed according to the topographical area (tab. 5). In both sexes there was a greater density in samples 1 - 4. The mean density of down hair for the entire skin in females was 12615, and in males 12620 hairs on 1 cm<sup>2</sup> of skin.

The number of cover hairs showed less differences depending on the topographical area. The mean number of cover hairs on 1 cm<sup>2</sup> of skin in females was 133 and in males 130 hairs per 1 cm<sup>2</sup> of skin.

The variability of down hair density in individual skin samples of males and females was similar and ranged from 16,8 to 24,3%. A greater variability coefficient was found for the number of cover hairs ( $v = 22,8 - 30,1\%$ ).

The percentage of down hairs in cover hairs differed according to the topographical area. In samples 1 - 4 for both sexes the percentage of down hairs was from 59,42 to 74,84%. However in samples 5 - 7 it was lower and was from 52,08 to 56,35%. The mean percentage of down hair for the entire skin in both males and females was similar and ranged from 61,64 to 61,71%.

## Discussion

Standard nutria strains, inspite of their high fur value are not in terribly high demand both within Poland and abroad. In adapting to the needs of the market many efforts have been taken to alter the structure of the nutria population in order to increase the amount of colored strains. Presently approximately 65% of the nutria furs purchased in Poland are colored. The main strain is the Greenland nutria. The percentage of Golden Amber nutria furs is relatively small. However Polands fur industry is very interested in this strain. The attractive color of the cover hairs means that it can be processed in their natural state.

Golden Amber nutria are in a group of dominating strains. They are noted for their strong and stocky bodies. Their cover hairs are an even reddish gold with slightly lighter hairs near the skin (Bettin, 1973; Scheelje, 1978).

The skins of the Golden Amber nutria used in this study were from animals reared in cages without bathing facilities. This rearing system still under question, does not lower the quality of the hair cover (Niedzwiadek and Kawinska, 1980).

Nutria, slaughtered at 7,5 - 8,0 months of age, had skins more than 77 cm in length. The surface area of

rough skins was more than 15 dm<sup>2</sup>. Both surface area and weight of 1 dm<sup>2</sup> of rough skin were greater than values found in the White Non Albinotit and Black strains which were also slaughtered at this same age (Niedzwiadek, 1982).

The weight of the entire skin and weight of 1 dm<sup>2</sup> of rough skin showed significant differences between sexes. The skins of males had significantly heavier weights.

After tanning the examined traits of the fur were less, which is typical for the proper tanning of nutria skin (Ptak, 1970, Kawinska et al., 1975). The compactness of cover hairs, together with the SGM value, was high, reaching 39 mm. In comparison to White Black or Greenland furs this is a value higher by approximately 5 - 7 mm (Kawinska et al., 1975, Niedzwiadek, 1982).

The thickness of down hair was more than 10 microns which meets requirements of the fur industry (Hunger, 1974; Kopański 1965). The thickness of the down hairs is on the level of data given for standard nutria as well as for White Black and Greenland nutria (Kawinska et al., 1975; Niedzwiadek, 1982).

In the process of improving nutria furs the down hair in the stomach part is not sheared. In relation to this it is important that the length of the entire stomach be even. Such was the case in the examined furs. The cover hairs play a more important role when improving the spinal part or processing the skin in a natural state (Hunger, 1974).

Cover hair density is one of the most important parameters determining the value of a fur. The density obtained shows a definite differentiation depending on the topographical area. A similar relationship of density was observed by Cerevitinov (1958), Kaszowski and Kawinska (1960), Ptak (1972). The mean down hair density for the entire skin was higher than that for Black nutria and was on the same level as for White and Greenland nutria (Niedzwiadek 1982).

The percentage of down hair in their covering of Golden Amber nutria was more than 60% (Mean for the skin) and was similar to that of other strains, such as White, Black and Greenland (Kawinska et al., 1975; Niedzwiadek 1982).

Since there is a lack of data dealing with the objective evaluation of individual parameters of fur quality and hair covering of Golden Amber nutria they are characterized in the summary.

Of the nutria slaughtered at 7,5 - 8,0 months of age a surface area of 15,5 dm<sup>2</sup> and a length of 78,3 cm was obtained. The dried skin weighed 195,2 g and 1 dm<sup>2</sup> of skin weighed 12,6 g.

The hair of Golden Amber nutria had a high compactness, together with the SGM value 39,08 mm.

The thickness of down hair in individual topographical areas ranged from 11,0 to 13,1 microns, and cover hairs from 94,0 to 128,7 microns.

Down hair length ranged from 11,4 to 19,6 mm and cover hairs, from 25 to 52 mm.

Down hair density for the stomach part was from

14425 to 18795 hairs per 1 cm<sup>2</sup> skin. Mean density of hairs was 12618 per 1 cm<sup>2</sup> skin. The number of cover hairs was 132 per 1 cm<sup>2</sup> skin.

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*Original Report*

# Significance of Feet and Ventral Surface as Heat Loss Routes for Farmed Raccoon Dogs and Blue Foxes

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## Summary

Significance of feet and ventral surface as heat loss routes were studied in farmed raccoon dogs (*Nyctereutes procyonoides*, Gray 1834) and blue foxes (*Alopex lagopus*). The results showed that heat loss from these regions occurs in both species, and that it is somewhat higher for the raccoon dog. To provide the animals some kind of sleeping plate, rest-shelf or winter nest recommended.

## Introduction

Farmed raccoon dogs (*Nyctereutes procyonoides*, Gray 1834) and blue foxes (*Alopex lagopus*) are generally caged out-of-doors throughout the year. Metabolic measurements (Korhonen et al., 1983; Korhonen and Harri, 1984; Korhonen et al., 1985) have shown that during normal Finnish winter weather they have to increase their metabolic rate to maintain homothermy. Furthermore, body cooling, fur insulation and infrared thermography data (Korhonen et al., 1984; 1985; Korhonen and Harri, 1985; 1986) have shown that there is a significant heat loss from their ventral surface to the environment under farm conditions.

In the present study, the significance of feet as a heat loss route for these species was evaluated by physical, histological and infrared thermographic methods. Further data on heat loss from the other regions of the body were also gathered.

## Materials and methods

### *General procedures*

The experiments were carried out on the research fur farm of Kuopio University, in eastern Finland, during the years 1985 - 1987. All animals used were farmborn and in good condition. They were housed alone in standard rearing cages 60 cm long  $\times$  105 cm wide  $\times$  60 cm high. Feed, about 400 g per animal, was offered once a day. The feed was manufactured by a local feed kitchen, and its content met the standards of the Finnish Fur Breeders' Association as far as possible (c.f. Korhonen and Harri, 1986). Water was supplied by an automatic water system.

### *Fur samples and analyses*

Animals were pelted in December. The pelts were ranked subjectively by professional sorters (The Finnish Fur Sales Ltd.) into one of 10 groups (1 = poorest, 10 = best) according to mass, quality, cover, overall impression and purity. From these, five pelts of both species were selected for detailed analyses. These pelts were of equal quality (quality group = 6, representing medium quality pelts).

Skin samples were taken by using a cork borer with a diameter of 19 mm. Skin samples with hairs were weighed with an accuracy of  $\pm 1$  mg, after which hairs were removed with a scalpel. Guard hair and underfur were weighed separately. Length of guard hair and underfur were measured with a ruler to the nearest 1 mm. Skin thickness was measured with a ROCT 577-68 dial micrometer to the nearest 0,01 mm.

For microscopic observations, skin samples were softened over night in 50% acetic acid. After dehydration with alcohol and embedding in paraffin, 10  $\mu$ m longitudinal sections were stained with hematoxylin-eosin. Hair density was determined with the aid of a projection microscope by counting the number of hair follicles contained in each follicular bundle.

### *Thermograph pictures*

The differences in heat loss of various body regions were evaluated by using an AGA Thermovision 720 infrared system. By means of this thermographic method, warmer regions of the body appeared lighter than the colder ones (for the method see Borg, 1968; Veghte, 1975). The animals were thermographed outside the nest in late January at a  $T_a$  of  $\pm 10^\circ\text{C}$ .

### *Skin and Rectal temperatures*

Skin and rectal temperatures were measured with Ellab touch thermocouples connected to an Ellab du 3s (Copenhagen) thermometer. During the measurements, the animal was held tightly by hands and head tongs. Excitement and muscular activity were kept at a minimum. The procedure for taking temperature readings was the same each time. The hair was permitted to cover the thermocouple before the reading was taken.



Table 1. A comparison of hair coat characteristics in feet of winter-furred blue foxes and raccoon dogs. Values are expressed as mean  $\pm$  SD.

VARIABLE MEASURED		BLUE FOX	RACCOON DOG	S
SKIN WEIGHT, MG/CM <sup>2</sup>	1	68.6 $\pm$ 18.4	69.3 $\pm$ 3.5	NS
	2	60.1 $\pm$ 11.6	69.4 $\pm$ 16.1	NS
	3	58.2 $\pm$ 9.2	65.0 $\pm$ 10.5	NS
	S	NS	NS	
HAIR WEIGHT, MG/CM <sup>2</sup>	1	97.8 $\pm$ 11.6	63.0 $\pm$ 5.4	***
	2	94.1 $\pm$ 8.3	63.3 $\pm$ 13.2	**
	3	93.8 $\pm$ 20.2	72.9 $\pm$ 4.7	*
	S	NS	*	
HAIR LENGTH, CM	1	1.7 $\pm$ 2.1	2.3 $\pm$ 4.2	NS
	2	1.9 $\pm$ 9.3	2.5 $\pm$ 8.3	NS
	3	3.5 $\pm$ 7.1	3.9 $\pm$ 9.7	NS
	S	**	*	
SKIN THICKNESS, 0.01 MM	1	45.4 $\pm$ 12.1	50.2 $\pm$ 5.0	NS
	2	41.2 $\pm$ 6.9	47.8 $\pm$ 6.9	NS
	3	36.6 $\pm$ 9.3	51.2 $\pm$ 9.1	NS
	S	NS	NS	
NUMBER OF HAIR FOLLIC- LES IN A BUNDLE UNIT	1	24.8 $\pm$ 1.9	22.6 $\pm$ 2.2	NS
	2	25.0 $\pm$ 1.2	23.4 $\pm$ 2.3	NS
	3	24.0 $\pm$ 1.3	22.4 $\pm$ 1.3	NS
	S	NS	NS	
NUMBER OF BUNDLE UNITS/ MM <sup>2</sup>	1	13.8 $\pm$ 1.6	7.8 $\pm$ 1.8	***
	2	14.0 $\pm$ 2.0	8.0 $\pm$ 1.0	***
	3	14.8 $\pm$ 1.3	8.8 $\pm$ 1.9	***
	S	NS	NS	
HAIR DENSITY, HAIR/MM <sup>2</sup>	1	342 $\pm$ 50	176 $\pm$ 42	***
	2	350 $\pm$ 54	188 $\pm$ 35	***
	3	356 $\pm$ 40	197 $\pm$ 42	***
	S	NS	NS	

SIGNIFICANCE: \*P<0.05, \*\*P<0.01, \*\*\*P<0.001, NS=NOT SIGNIFICANT (ANALYSIS OF VARIANCE).

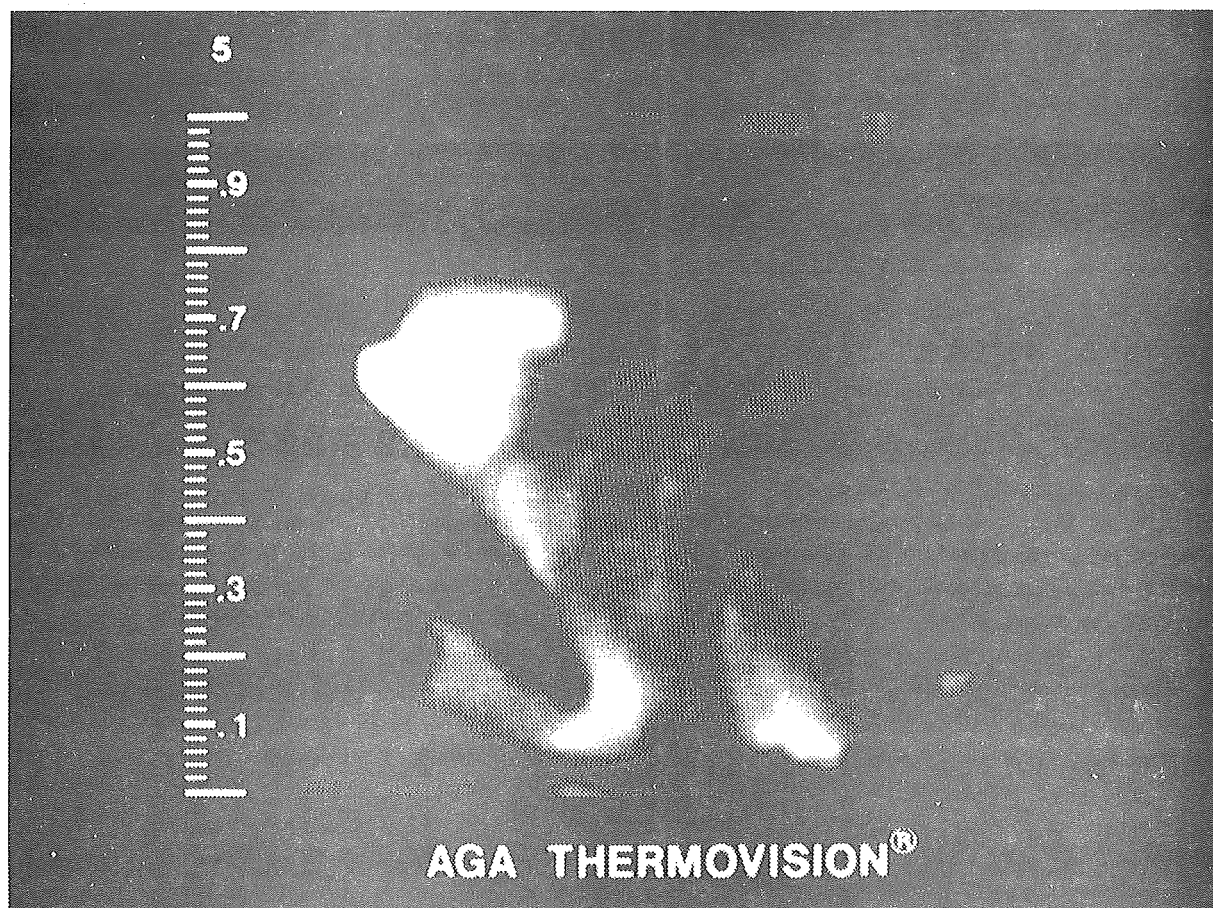


Fig. 1. A representative lateral thermograph of a raccoon dog exposed to a ambient air temperature of  $\pm 10^{\circ}\text{C}$ . The lighter shades of grey and white represent warm regions while darker areas are cooler. A temperature differences of  $5^{\circ}\text{C}$  is shown by different light intensities of the picture (if the difference is higher than  $5^{\circ}\text{C}$ , of course, the area is totally white).

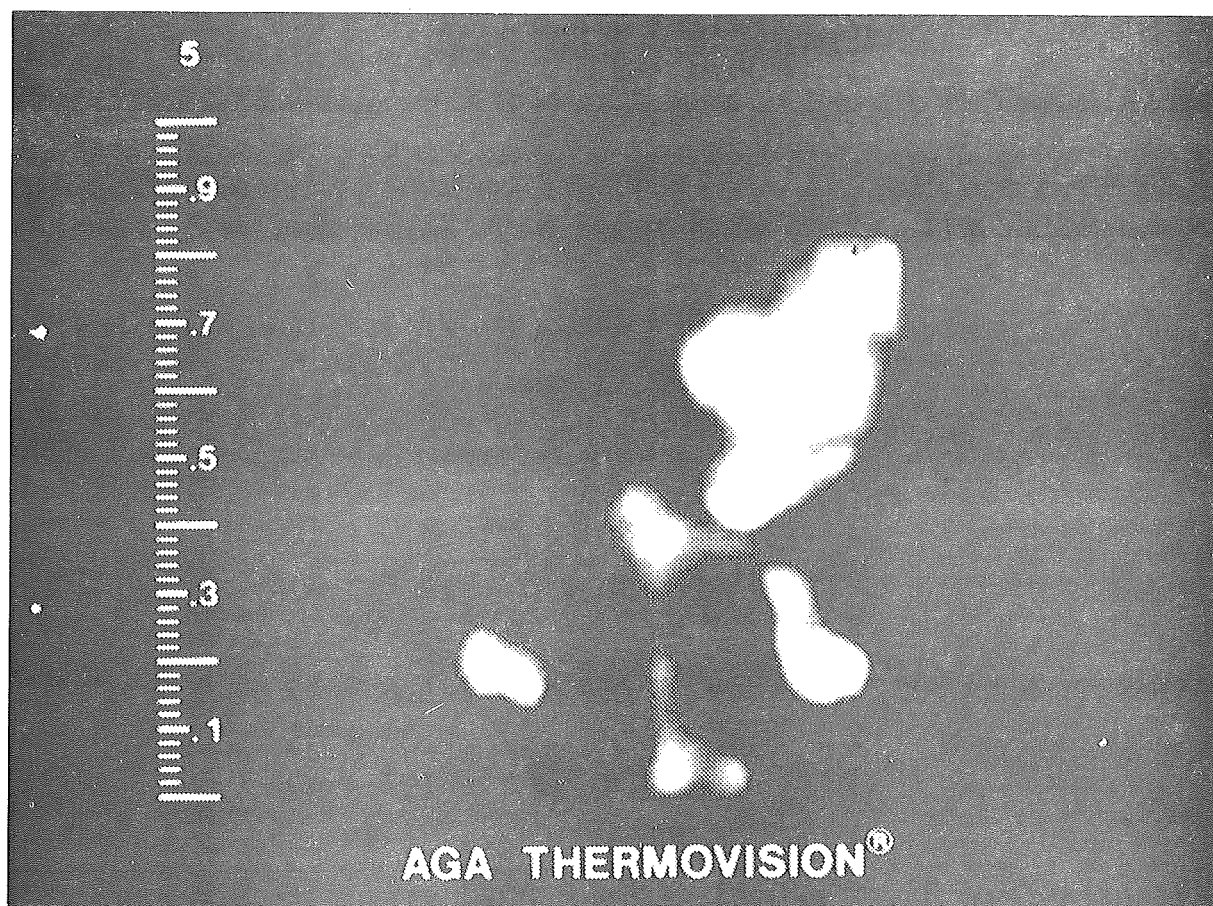


Fig. 2. A representative thermograph of a blue fox taken front at a temperature of  $\pm 10^{\circ}\text{C}$ . For the other explanations see Fig. 1.

Table 2. A comparison of skin and rectal temperatures between farmed raccoon dogs and blue foxes. Values are given as mean  $\pm$  SD.

REGION MEASURED	RACCOON DOG		BLUE FOX	
	TEMPERATURE, °C	N	TEMPERATURE, °C	N
AMBIENT AIR	-21		-21	
SKIN ON DORSAL BACK	36.2 $\pm$ 1.2	6	35.4 $\pm$ 0.6	4
SKIN ON LATERAL ABDOMEN	36.7 $\pm$ 1.0	6	35.7 $\pm$ 0.9	4
SKIN ON FOREHEAD	35.6 $\pm$ 1.0	4	35.4 $\pm$ 0.4	4
RECTUM	38.6 $\pm$ 0.1	3	38.6 <sup>A</sup>	3
NOSE	9.0 $\pm$ 0.3	2	-	-
FEET	9.4 $\pm$ 0.4 <sup>B</sup>	2	6.2 $\pm$ 0.2 <sup>B</sup>	3
PAW PAD	9.8 $\pm$ 3.3	6	10.4 $\pm$ 2.7	6

<sup>A</sup>BY CASEY ET AL., 1979

<sup>B</sup>BY THERMOVISION

#### Statistical treatment

The results are expressed as mean  $\pm$  SD. Statistical analyses were computed by analysis of variance combined with Student's t-test. Data were processed by the VAX 11/780 computer and SPSS (Statistical Package for Social Sciences) program.

#### Results

A comparison of hair coat characteristics of the feet for blue foxes and raccoon dogs is given in Table 1. Significant differences in hair weight, hair density and number of bundle units per surface area were found between the species, and these were higher for the blue fox. No marked site-specific variations in morphological traits of feet fur were found.

Thermograph data are presented in Figs. 1 and 2. For both species, the surface temperatures on the face, chest and feet were higher than those of the other body surfaces, and a high surface temperature means a high rate of heat loss. No marked species-specific differences were observed.

Mean values for temperatures of the skin and rectum, as determined with the touch thermocouples and infrared thermopictures, are given in Table 2. Rectal temperatures of both species were similar. Skin surface temperatures of the raccoon dog were somewhat higher than those of the blue fox. However, no marked species-specific differences were found.

#### Discussion

The results revealed that heat loss occurs from the ventral surface of the body for both species. These results agree with our previous findings (Korhonen et al., 1984; Korhonen, and Harri, 1986), and suggest that heat loss seems to be somewhat higher for the raccoon dog. The results also support the previous hypothesis (Korhonen et al., 1985; Korhonen 1987) that some kind of sleeping plate, rest-shelf or nest box would provide energetic advantages for both species

under farm conditions. Studies to find the best systems to prevent excessive heat loss from the ventral body surface are proceeding.

Experience on farms has shown that during winter the foot pads of raccoon dogs can freeze when they are caged on bare wire-mesh nets. Blue foxes, on the other hand, have well-insulated foot pads which are adapted to extreme cold (Scholander et al., 1950). They have been found to maintain foot pad temperatures close to their freezing point (Henshaw et al., 1971). The present results agree with this conclusion while showing that hair density on the feet of raccoon dogs is significantly less than that of blue foxes.

Previous metabolic studies support the conclusions of the thermoregulatory properties of both species drawn in this paper (Korhonen et al., 1985). The conclusion, based on these results, is that heat loss to the environment from the raccoon dog's body is greater than that from the body of the blue fox due to the raccoon dog's higher surface temperatures.

#### Acknowledgements

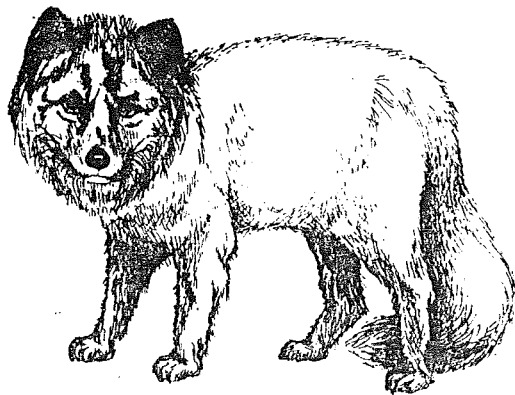
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SCIENTIFUR VOL. 11, NO. 2 1987



Original Report

# A Study on The Use of Nutria for Meat Production

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In order for nutria to become more popular greater attention needs to be paid to the use of this animal as meat in order to increase profitability. Nutria meat in its original homelands - Argentina, Brazil, Chile, Uruguay - is eaten and is considered to be a delicacy. In Poland there is a bias against nutria meat probably due to the animals ugly appearance. Attempts to popularize nutria meat are not new. At the end of 1950s, during a low point in the rearing and breeding of nutria in Poland, Juny and Chelkowski (1959) focused attention on the use of nutria for meat in order to improve profitability. Later, Kawecka - Bentyn (1965), Gedymin and Cholewa (1959) and Kuźniewics and Wojsyk - Kuźniewicz (1978) dealt with this same problem.

In european countries such as Czechoslovakia, the USSR, West Germany and others where nutria breeding is well - developed, nutria is not used for consumption and the following research attempted to break down the barriers: Skrivan and Sima, 1978; Zajasz et al., 1980 Heupel, 1981.

Yearly production of nutria in Poland averages about 2,5 million with a mean slaughter weight of approximately 4 kg, giving approximately 5,000 tons of usable nutria carcass. It therefore is in a potential position to meet market needs.

## Material and Methods

The experiments was carried out in the Zator Zootechnical Experimental Station. It included 240 Greenland nutria. The animals were divided into 4 groups according to body weight before slaughter. The 4 groups were as follows:

- Group I - body weight before slaughter 3,0-3,9 kg
- Group II - body weight before slaughter 4,0-4,9 kg
- Group III - body weight before slaughter 5,0-5,9 kg
- Group IV - body weight before slaughter 6,0-7,0 kg

Each group had even numbers of males and females. Slaughter analysis and carcass cuts were done as for rabbits (Niedźwiadek, 1974). Detailed dissection of all carcasses separated individual tissues - meat, bone and fat. Chemical analysis of the meat was done on 48 meat samples with 12 samples from each group. Meat quality was determined according to:

PH/24 hrs. after slaughter (color, mioglobin, water absorbability) determined according to the method of Znaniecki et al. (1974).

For complete evaluation of nutria meat an organoleptic team compared tastiness with other meats, namely veal, beef and rabbit. In the organoleptic evaluation the following traits were considered: Tenderness, juiciness and aroma in the following manner:

		<i>Tenderness</i>				
points	1	2	3	4	5	
	very tough	tough	average	tender	very tender	
		<i>Juiciness</i>				
points	1	2	3	4	5	
	very dry	dry	average	juicy	very juicy	
		<i>Aroma</i>				
points	1	2	3	4	5	
	very strong	strong	average	faint	very faint	

## Results

The warm carcass weight without the head depended on the weight before slaughter (Tab. 1). The variability of carcass weights in all groups was similar and ranged from 5,0 to 9,7%. Liver weight was also dependent on the weight before slaughter. The variability of liver weight was differentiated and was from 13,6 in the females of group IV to 28,8 in the males of group I. Statistically significant differences between sexes in groups III and IV were found for heart, kidney and lung weights.

The weight edible parts in group I was from 1985,4 to 2020,8 g. In group II it was more than 2500,0 g for females. In group II it was approximately 3000,0 g and more than 3700,0 g in group IV.

Carcass dressing percentage ranged from 52,2% in the males of group I to 55,7% in the females of group IV. The greatest dressing percentage of edible parts characterized the nutria of group IV - 60,0 - 61,0%. Carcass length in group I was 34,7 - 35,2 cm and reached 43 cm in group IV.

TABLE 1.

## RESULTS OF SLAUGHTER ANALYSIS OF NUTRIA - EATABLE PARTS

ITEM	GROUP:	I		II		III		IV	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
WEIGHT OF NUTRIAS AT SLAUGHTER	$\bar{x}$	3490.7	3434.1	4430.9	4440.2	5325.0	5210.0	6186.0	6162.5
	v	7.7	7.9	6.3	6.2	4.9	4.7	4.7	4.4
WEIGHT /G/ CARCASS WITHOUT HEAD	$\bar{x}$	1820.7	1856.6	2382.3	2384.9	2937.0 <sup>A</sup>	2795.0 <sup>A</sup>	3419.4	3435.0
	v	9.1	9.7	7.7	7.5	7.2	7.7	5.0	9.3
LIVER	$\bar{x}$	109.6	104.0	123.7	129.9	152.0	145.0	190.8 <sup>B</sup>	219.5 <sup>B</sup>
	v	28.8	22.8	21.8	17.8	16.5	17.1	23.5	13.6
HEART, KIDNEYS, LUNGS	$\bar{x}$	56.9	62.1	73.0	69.9	82.0 <sup>C</sup>	109.0 <sup>C</sup>	97.6 <sup>D</sup>	121.0 <sup>D</sup>
	v	22.7	18.2	22.5	26.4	21.7	36.9	17.8	37.4
TOTAL EDIBLE PARTS /G/	$\bar{x}$	1985.4	2020.8	2575.0	2587.0	3172.0	3050.0	3707.0	3775.5
	v	9.1	9.3	7.8	7.5	6.6	7.1	4.9	10.5
DRESSING PERCENTAGE /%/	$\bar{x}$	52.2	54.0	53.8	53.7	55.1	53.6	55.3	55.7
TOTAL EDIBLE PARTS /%/	$\bar{x}$	56.8	58.8	58.1	58.3	59.4	58.6	60.0	61.0
LENGTH OF CARCASS /CM/	$\bar{x}$	34.7	35.2	40.6	39.7	42.9	42.8	43.0	43.0
	v	10.9	10.5	9.4	5.4	5.7	7.6	7.3	6.8

MEAN FOLLOWED BY THE SAME LETTER ARE SIGNIFICANTLY DIFFERENT  $P \leq 0.05$ .

TABLE 2.

## RESULTS OF SLAUGHTER ANALYSIS OF NUTRIA - NON EATABLE PARTS

ITEM	GROUP:	I		II		III		IV	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
WEIGHT /G/:									
HEAD	$\bar{x}$	357.4	324.4	432.2	407.1	518.0	496.0	640.0	603.5
	v	10.2	9.8	11.9	11.7	10.6	5.9	5.7	8.3
BLOOD	$\bar{x}$	92.3	89.6	118.5	109.4	121.0 <sup>A</sup>	148.0 <sup>A</sup>	182.4	170.0
	v	21.6	22.4	23.6	28.2	25.8	28.2	13.6	27.7
SKIN	$\bar{x}$	315.5	313.7	388.6	398.3	452.0 <sup>B</sup>	490.0 <sup>B</sup>	519.2	504.0
	v	12.0	11.3	10.1	14.6	5.8	12.3	13.4	19.9
LEGS AND TAIL	$\bar{x}$	222.4	212.4	275.4	261.1	301.1	299.0	308.0	310.7
	v	12.2	11.1	15.4	12.7	12.0	7.0	9.4	14.4
DIGESTIVE TRACT	$\bar{x}$	433.2	400.1	514.5	525.4	641.0	600.0	748.8	702.6
	v	16.9	14.1	18.1	14.9	19.3	19.4	17.2	24.7
TOTAL OFFAL	$\bar{x}$	1422.8	1340.8	1730.8	1703.2	2032.7	2032.8	2398.1	2290.0
	v	8.5	10.0	7.7	10.7	10.1	13.9	10.7	19.9
SLAUGHTER LOSSES	$\bar{x}$	84.3	72.5	125.1	150.0	120.3	127.2	80.9	97.0
	v	56.5	62.3	72.3	67.5	73.6	69.0	86.5	57.1

MEAN FOLLOWED BY SOME LETTER ARE SIGNIFICANTLY DIFFERENT  $P \leq 0.05$ .

TABLE 3.

## WEIGHT OF PRIMAL CUTS OF CARCASS/G/.

GROUP	FRONT PART				LOIN				BACK PART			
	MALES		FEMALES		MALES		FEMALES		MALES		FEMALES	
	$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v
I	763.6	10.1	780.7	9.8	225.2	12.1	208.3	13.0	765.5	9.1	772.6	10.2
II	1077.7	8.8	1019.0	10.1	290.4	13.1	284.5	13.4	899.1	9.8	930.5	11.6
III	1261.2	8.8	1230.0	12.6	377.1 <sup>A</sup>	12.9	307.5 <sup>A</sup>	10.3	1070.0	8.6	1167.5	12.5
IV	1505.2	10.6	1512.2	13.7	384.8	12.3	385.0	11.4	1480.0	11.3	1491.5	10.8

MEAN FOLLOWED BY THE SAME LETTER ARE SIGNIFICANTLY DIFFERENT  $P \leq 0.05$ .

TABLE 4.

## PART OF PRIMAL CUTS IN CARCASS %/.

GROUP	FRONT PART		LOIN		BACK PART	
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
I	43.5	44.3	12.9	11.9	43.6	43.8
II	47.5	45.6	12.9	12.8	39.6	41.6
III	46.6	45.5	13.9	11.3	39.5	43.2
IV	44.7	44.6	11.4	11.4	43.9	44.0

Table 2 presents the weight of indible parts. The heaviest part was the digestive tract, then the head, skin, paws and tail. The weight of indible parts was clearly dependent on the weight before slaughter. Also the weight of primal cuts depended on the weight before slaughter. (Tab. 3).

When expressing the primal cuts in percentage the front part comprised 43,5 to 47,5% and the back part from 39,5 to 44,0%. The loin weighed from 11,4 to 13,9% of the carcass weight (tab. 4).

In group I the weight of the front parts was 510 g, increased in the subsequent groups, and reached a weight of 968 g in the males of group IV (tab.5). The heaviest meat weight was observed in the loins of group IV - 270 g and the lightest was in the females of group I - 138 g. Meat in the back parts was on a somewhat lower level than in the front parts and ranged from 503,3 g in the females of group I to 918 g in the males of group IV.

The meat of the whole carcass, dependent on the slaughter weight, was for group I - 1151,8 g - 1205,1 g to 2142,9 - 2156,1 g in group IV.

The heaviest bones were in the front parts, from 91,6 g in the females of group I to 190,0 g in the males of group IV. The back parts bones weighed from 83,3 to 176,2 g. In the whole carcass bone weight increased from 191,6 in the females of group I to 398,0 g in the males of group IV.

Gedymin and Cholewa (1972) obtained a dressing percentage of 55%, and of edible parts, 58 - 59%. Skrivan and Sima (1977) for 2 - year old males had a dressing percentage of 60% and for females, 50%. Velkov et al. (1983) gave a dressing percentage for nutria slaughtered at weights from 4,0 to 5,0 kg of 54%. In general, for most analyzed traits differences between sexes were not statistically significant. Statistically significant differences were only seen in the group slaughtered with weights of 5,2 - 5,3 kg and for the weights of heart, kidney and lung of this same group as well as for nutria slaughtered at weights of more than 6,1 kg. The weight of indible parts tended to increase together with increased body weights before slaughter. The heaviest weight, almost 750 g was that of the alimentary canal of the heaviest nutria. The weight of

TABLE 5.

## RESULTS OF DISSECTION ANALYSIS OF CARCASS/G/.

ITEM	GROUPS: I		II				III				IV					
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES				
	$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v	$\bar{x}$	v				
WEIGHT OF CARCASS	1754.3	9.5	1761.6	9.2	2267.0	8.2	2234.0	9.8	2708.3	5.2	2705.0	8.3	3370.0	8.7	3388.7	10.6
WEIGHT OF MEAT IN																
FRONT PART	510.6	11.9	510.0	8.6	732.5 <sup>A</sup>	9.3	637.5 <sup>A</sup>	10.8	883.7 <sup>B</sup>	13.7	800.0 <sup>B</sup>	17.6	968.0	12.1	965.2	11.9
LOIN	183.2	11.0	138.3	12.1	195.0	14.7	196.5	15.0	261.2	17.7	205.0	13.4	270.0	13.4	270.2	14.6
BACK PART	511.3	9.2	503.3	13.5	628.7	8.4	623.5	7.1	778.7	12.5	810.0	13.3	918.0	14.2	907.5	14.8
WHOLE CARCASS	1205.1	10.4	1151.8	11.3	1556.2 <sup>C</sup>	8.3	1459.1 <sup>C</sup>	8.3	1923.7 <sup>D</sup>	12.6	1815.0 <sup>D</sup>	16.4	2156.1	13.7	2142.9	16.0
WEIGHT OF BONES IN:																
FRONT PART	97.1	11.5	91.6	7.4	125.4	14.0	113.5	7.2	131.2	16.5	147.5	13.6	190.1	10.2	187.0	9.1
LOIN	14.5	10.1	16.6	11.0	22.5	11.7	20.5	16.8	25.0	16.3	20.0	15.3	33.2	14.3	32.5	15.3
BACK PART	100.4	9.7	83.3	15.9	114.5	9.5	102.5	11.3	122.5	12.6	135.0	14.6	174.8	14.2	176.2	12.9
WHOLE CARCASS	211.6	9.8	191.6	9.1	262.5	8.9	236.5	9.1	278.8	14.1	302.7	15.2	398.0	13.7	395.7	13.0
WEIGHT OF FAT IN:																
FRONT PART	46.8 <sup>E</sup>	39.8	66.0 <sup>E</sup>	47.6	95.8 <sup>F</sup>	60.3	123.5 <sup>F</sup>	60.9	108.9	63.7	85.0	62.4	170.0	54.1	173.7	53.1
LOIN	10.0	64.7	17.5	62.3	32.9	80.2	31.5	63.9	33.7	82.3	27.5	65.6	43.0	53.8	45.0	52.8
BACK PART	56.5	59.0	67.5	54.3	88.3 <sup>G</sup>	54.7	128.0 <sup>G</sup>	55.5	93.7	58.1	95.0	64.2	221.0	57.2	241.2	57.4
WHOLE CARCASS	123.8 <sup>H</sup>	55.7	141.6 <sup>H</sup>	55.6	218.2 <sup>K</sup>	57.9	282.8 <sup>K</sup>	59.2	236.3	62.1	207.8	62.1	434.0	55.8	459.9	56.4
WEIGHT OF UNDERSKIN																
FAT	181.9	22.6	212.5	15.1	194.1	14.2	200.0	16.3	223.7	16.4	332.5	17.2	351.0	14.2	370.0	13.9
DISSECTION LOSSES	32.5	-	64.1	-	36.0	-	56.5	-	45.8	-	47.0	-	31.0	-	20.2	-

MEAN FOLLOWED BY SAME LETTER ARE SIGNIFICANTLY DIFFERENT  $P \leq 0.05$ .

the head was also significant - up to 640 g and in each group the males had heavier heads than the females which can be related to the anatomical build and sexual dimorphism.

Content of the primal cuts of the nutria carcasses indicated that the front and back parts in all groups was on a similar level. The most valuable cuts, namely the loin and hind parts, comprised approximately 53 - 57%. In comparison to the mean for rabbits the front and back parts were greater by approximately 5 - 7% and the loin by approximately 10% (Niedźwiadek, 1983). An analysis of the meat in individual parts showed that front and back parts were in individual groups on a similar level.

Content of meat in the loin was not much different from the fraction of meat in the above mentioned cuts except in the group of nutria weighing more than 6 kg. The percentage of meat in the entire carcass was from 63,2 to 79,0%. The meatiest carcasses were those of animals weighing 4,0 - 5,0 kg. Kuźniewicz et al. (1980) gave the percentage of meat in nutria carcasses as being 63,5 - 66,5%. These nutria had slaughter weights of 3,1 - 3,3 kg. Higher amounts of meat, 70,0 - 79,0% in nutria carcasses was given by Zitenko et al. (1981).

Content of bone in the front and back parts was on similar level for the groups and sexes within a group. The percentage of bone in the whole carcass consisted of 10,5 - 12,0%. Higher values by approximately 6 - 7% were given by Kuźniewicz et al. (1980) and by 4 - 6% (Zitenko et al. 1981). Significant differences in fat and its percentage in individual cuts were observed as well as in the whole carcass. It increased together with the slaughter weight of the nutria. The amount of fat in

the nutria carcass was on the level given by Kuźniewicz et al. (1980) and Zitenko et al. (1981). The different data concerning meat value and bone in individual cuts as well as in the entire carcass resulted from various states of nutrition, age and various methods of dissection analysis.

Dry matter in the nutria meat for both sexes and the different groups did not show much differentiation and was on the level of that given by other authors (Gedymin and Cholewa, 1972; Juny and Chelkowski, 1959; Kawecka - Bentyn, 1965; Kuźniewicz et al., 1980; Zitenko et al., 1981).

Nutria meat is characterized by a high protein content, as high as 20% and a high mineral content. The values obtained in this experiment agree with the data presented by Gedymin and Cholewa (1972), Kuźniewicz et al. (1980), Zajac et al. (1980) and Zitenko (1981).

Fat in the front parts ranged from 46,8 g in the males of group IV to 173,7 g in the females of group IV. In the loin it was from 10,0 g to 45,0 g and in the back parts from 56,5 to 241,2 g. Statistically significant differences were noted between sexes in group I and II for the front parts and in group III for the back parts. In the whole carcass, fat in group I was 123,8 g in the males and ranged to 459,0 g in the females of group IV. Statistically significant differences between sexes were observed in groups I and II.

An analysis of the tissues of the cuts showed that the loin had the greatest meatiness except in group III where it was in the back parts (Tab. 6). Meat in the whole carcass ranged from 63,2% in the females of group IV to 70,0% in the males of group III. Bones in the front parts were from 10,4 to 12,7%, in the loin

TABLE 6.

CONTENT OF MEAT, BONES AND FAT IN PRIMAL CUTS AND NUTRIAS CARCASS/%/.

ITEM	GROUP:	I		II		III		IV	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
MEAT IN:									
FRONT PART		66,8	65,3	67,9	62,5	70,0	65,0	64,3	63,8
LOIN		81,3	66,4	67,1	69,0	69,3	66,6	70,1	70,2
BACK PART		66,7	65,1	69,9	67,0	72,7	69,4	62,0	60,8
WHOLE CARCASS		68,7	65,4	68,6	65,3	70,0	67,1	63,9	63,2
BONES IN:									
FRONT PART		12,7	11,7	11,6	11,1	10,4	11,9	12,6	12,3
LOIN		6,4	7,9	7,7	7,2	6,6	6,5	8,6	8,4
BACK PART		13,1	10,7	12,7	11,0	11,4	11,5	11,8	11,8
WHOLE CARCASS		12,0	10,8	11,5	10,5	10,3	11,2	11,8	11,6
FAT IN:									
FRONT PART		6,1	8,4	8,9	12,1	8,6	6,9	11,3	11,4
LOIN		4,4	8,4	11,3	11,0	8,9	8,9	11,1	11,6
BACK PART		7,4	7,4	9,8	13,7	8,5	8,1	14,9	16,1
WHOLE CARCASS		7,0	8,0	9,6	12,6	8,7	7,7	12,8	13,5
UNDERSKIN FAT		10,3	12,0	8,5	8,9	8,2	12,3	10,4	10,9



TABLE 7.

## CHEMICAL ANALYSIS AND QUALITY PARAMETERS OF NUTRIA MEAT.

ITEM	GROUP:	I		II		III		IV	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
DRY MATTER/%/		30,1	30,2	32,0	33,5	31,8	32,4	33,4	34,3
TOTAL PROTEIN/%/		19,9	20,1	20,2	20,7	19,8	20,1	20,2	20,4
ETHER EXTRACT/%/		9,1	9,7	10,7	11,7	10,9	11,2	12,1	12,8
ASH/%/		1,15	1,14	1,10	1,12	1,13	1,15	1,10	1,12
PH		5,9	5,9	5,9	6,0	5,9	5,9	6,0	5,9
MIOGLOBIN/PPM/		108,2	111,3	116,7	108,2	114,5	117,2	116,6	118,2
COLOURS/PPM/		132,6	130,9	137,7	135,2	139,4	137,8	136,8	138,2
WATER HOLDING CAPACITY/%/		22,6	21,8	23,1	22,7	24,7	22,9	23,3	24,8

from 6,4 to 8,6%, and in the back parts, 10,7 to 13,1%. In the whole carcass bones ranged from 13,3 to 12,0%.

Fat values were very differentiated. The fattiest were the back parts of group IV (14,9 - 16,1%). In the whole carcass fat content increased from 7,0 to 8,0% in group I to 13,5% in group IV.

Chemical analysis showed that dry matter was from 29,7 to 31,0% and did not differentiate between sexes and groups. Protein in the nutria meat ranged from 19,9 to 20,7% and also did not differentiate between sexes and groups. Fat values differentiated between groups. The lowest was seen in group I, 9,1 - 10,7 and increased to 12,1 - 12,8% in group IV.

Mioglobin, PH, color and water absorbability values were on similar levels between groups and sexes (Tab. 7).

Organoleptic evaluation of tastiness indicated that the meat of nutria was less tender than that of rabbit, beef and veal and was rated with 2,3 points (Tab. 8). However juiciness equaled that of rabbit - 3,3 points. It also got high aroma ratings (4,3 points). In total, nutria meat received 9,9 points, second after rabbit meat. It had points on the level of veal and was 2,2 points higher than beef.

**Discussion**

Our discussion of the value of nutria meat begins with the carcass dressing percentage which is most commonly used coefficient. Dressing percentage was from 52,2 to 55,7% and was slightly higher in nutria with heavier body weights. Taking the viscera (liver, heart, kidneys and heart) into consideration, the dressing percentage of edible parts increased approximately 3 - 4%, becoming 56,8 - 61,0%. Warm carcass weight depended on the slaughter weight in the individual groups and increased about 500 g. Weight of viscera (liver, heart, kidney, heart) also tended to increase with heavier body weights of the nutria before slaughter. The dressing percentage is difficult to compare with other authors since slaughter weights were so different. Kuźniewicz and Wojsyk - Kuźniewicz (1978) gave a dressing percentage of 51% for nutria slaughtered with a body weight of 3495 g.

Nutria meat, besides its high protein and mineral content, is characterized by high fat content which undoubtedly influences its high caloric value.

The remaining parameters examined: PH, mioglobin and water absorbability also high values. This was confirmed by sensory evaluation. This evaluation in-

TABLE 8.

## RESULTS OF SENSORIC EVALUATION OF NUTRIA MEAT/POINTS/.

TYPES OF MEAT	TENDERNES	JUICYNESS	AROMA	TOTAL POINTS
NUTRIA	2,3	3,3	4,3	9,9
RABBIT	4,3	3,3	4,6	12,2
BEEF	3,8	2,2	1,7	7,7
VEAL	3,9	2,2	3,7	9,8

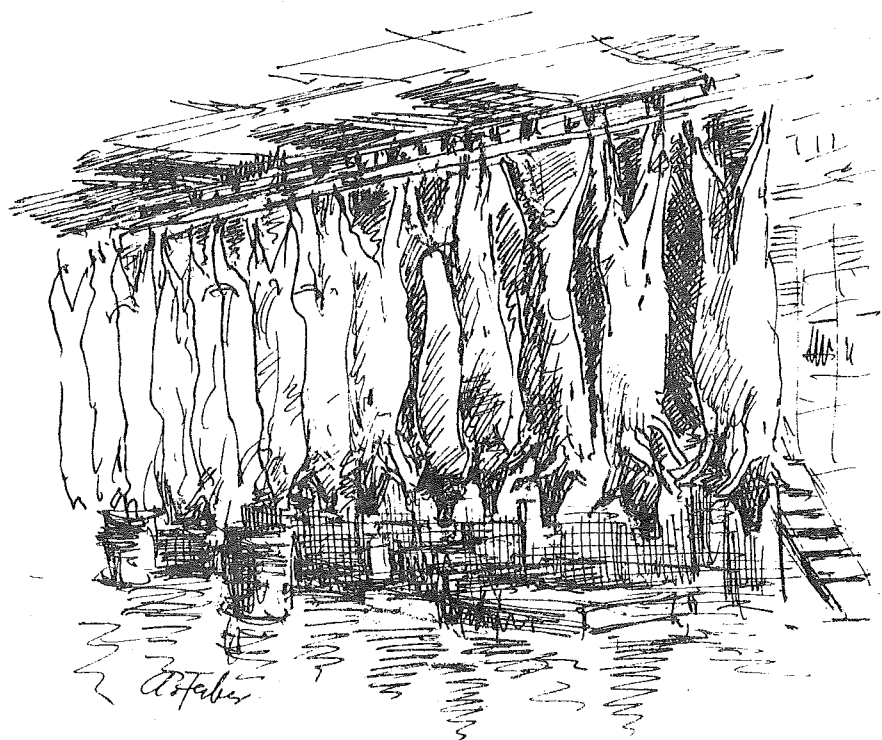
licated that nutria meat is juicy and without a specific aroma. In total evaluation it was rated higher than beef and was evaluated as being on the same level as veal. It can be therefore concluded that it is not poorer in quality than the meat of other species of farm animals and in some cases is of better nutritional and taste quality.

In summary, nutria, besides having valuable fur, can supply a significant amount of meat of high nutritional and taste quality. This meat should be properly and rationally introduced to the public market.

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Scientifur VOL. 11, NO. 2 1987



# Ontogeny of Mink Pups

Birthe Jonassen, Institute of Population-biology, University of Copenhagen

## Introduction

This paper presents a summary of the behavioural development of minkpups (*Mustela vison* Schreber) from birth till around 16th. week of life. The results were obtained from a etology project done at the Natl. Inst. of Animal Science dept. of Fur Bearing animals in Hillerød during the spring and summer 1985. The study was done to get finishing degree of Kandidate in Etology at the University of Copenhagen in april 1987.

## Behavioural Development

Not much is known about the behavioural development of minkpups, the only larger work that is available is the Doctoral Thesis of Kuby 1982, which I have used as an inspiration to my own work.

The minkpups used for this study lived in two different environments. Most of them were raised in ordinary farm cages (approx. 0,3 m<sup>2</sup>) under normal farm-routine, and two litters were raised in a semi-natural environment (approx. 9 m<sup>2</sup>). This environment gave the animals acces to water, grass and more than one nestbox with straw.

The pups were observed for long periods of time and their morfological and behavioural development were registered.

The most obvious differences between the two groups of animals were that the semi-natural animals showed more »hide and seek« play, more running and swimming. The farm-animals started to climb on the cagewire about one week before the other group did.

The explanation for these differences is that the semi-natural animals had much opportunities and room for more locomotional movements, and the farm-animals had a small and stimulus-poor environment, because their cages were deprived of anything except a nest box with straw.

In all other situations their behavioural development were similar, though with a lot of individual differences.

## Phases in development

The development of behaviour can be divided in different phases covering the time from birth to dispersal:

a. Neonatalphase	birth - 3	weeks
b. Motorphase	3 - 5½	-
c. Socializationphase	5½ - 8	-
d. Explorationsphase	8 - 13½	-
e. Disperalphase	13½ - 16	-

## Description of the phases:

*Phase a.* The first three weeks are the pups dependent on the bitch, and they are born naked and blind. The olfactory- and tactile sense are functioning from birth, which help the pups to locate their siblings and the bitch.

*Phase b.* The next two weeks the locomotional skills enhances, and around day 36 the eyes and ears open. This is an important stage, where the fear-reaction is closely related to the maturing of senses. It is possible that the sensitive phase of socialization begins at the end of the 5.th. week.

*Phase c.* This phase is the play-period. The pups get better at walking and running, and the »hide and seek« play and »playfighting« occupies most of the pups active time (= time they are awake).

They start to get interested in drinking water, probably because the bitch begins to reject the big and fastgrowing pups. In the end of this period the weaning starts gradually.

*Phase d.* If the pups have access to water, they will start to swim in the beginning of this period. They still play a lot and explore everything in their surroundings.

Some presexual behaviour is seen in this phase. The male-pups mount their siblings or the bitch, grab them at the neck and drag them around. If there are only female-pups in the litter, there will be no mounting, only dragging.

*Phase e.* In this period the litter starts to dissolve, and in nature the pups disappear out of the territory of the bitch.

My semi-natural pups escaped from their area, by climbing and jumping the 1,2 m fence that surrounded their »cage«. We gave up putting them back after a few trials, and instead they were placed in a normal farmcages.

## References

Kuby F. 1982. Über die Verhaltensontogenese von Farmnerzen (*Mustela vison*) in Grossgehegen. I-naugural Dissertation Tierärztliche Hochschule Hannover. Vol. 82, 12, 1-121.

To get the rest of the thesis references please contact the author.

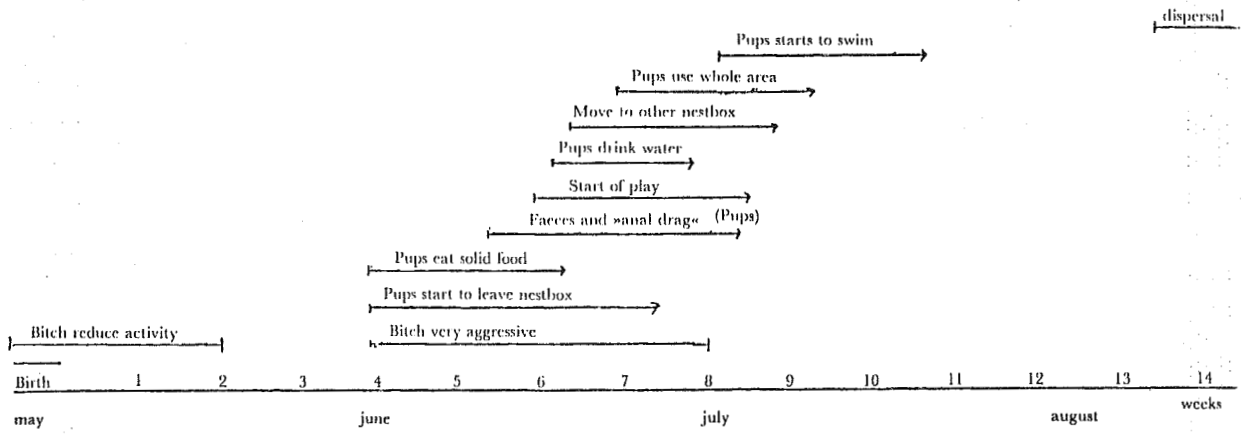


Fig. 1. Show the behaviour of the bitch and pups during the parturition, birth and postnatal development in the semi-natural environment.

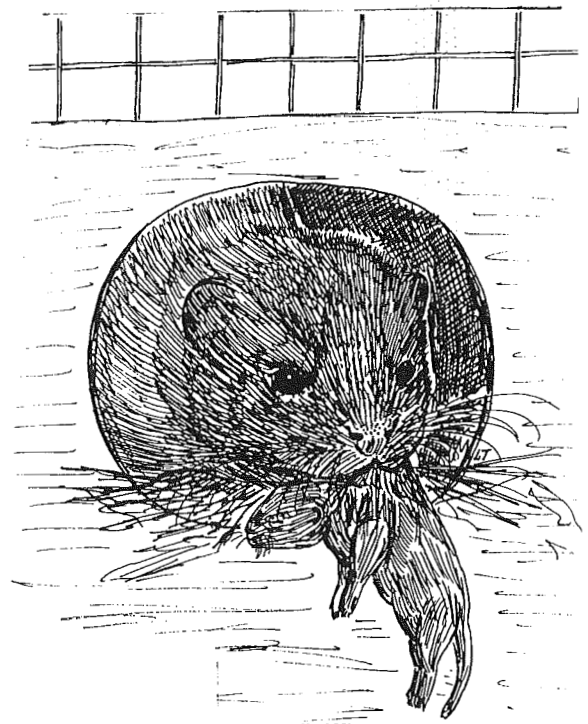
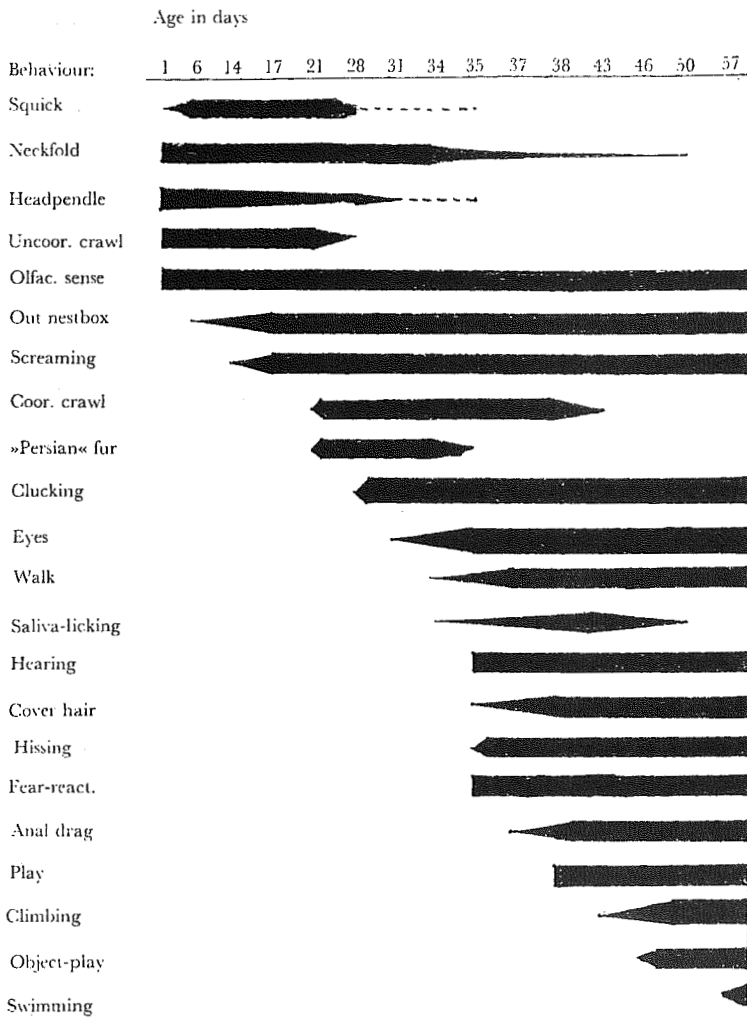


Fig. 11. Show the mainpoints of the pupbehaviour. The first apperance and duration of the single behavioural elements. (Scale: Age in days). The thickness of the arrows indicate relative frequencies of the behaviour. The dotted lines indicate, that the duration of the element has not been observed after the time indicated at the end of the dotted line.

## CHANGES OF THE SKIN, ESPECIALLY HAIR FOLLICLES AND DERMIS, IN MINK GROWTH.

### ミンクの皮膚，特に毛包と真皮の成長に伴う変化

Tadayuki Nishiumi, Keiji Kondo, Tsugio Osugi.

Hair development in the mink was observed under a light microscope. Samples were taken from the mid-dorsal regions and were usually cut into 8-12  $\mu$ m in thickness with a freezing microtome. Staining of the sections was accomplished by the hematoxylin-eosin method. Using the minks from birth to 30 weeks old, the histological changes in the skin, mainly the hair follicles, were studied on the number of underfur per pore and per follicle group, the hair activity, the thickness of epidermis and dermis and the length and depth of follicle.

From this study the following results were obtained.

1. Of summer coat, the number of underfur per pore and per follicle group increased before 10 weeks old and was unchanged at 12-14 between 10 and 16 weeks old. Of winter coat, the number of underfur dramatically increased just after beginning of the moulting, ie. 18 weeks old, and was unchanged at 22-26 afterward.

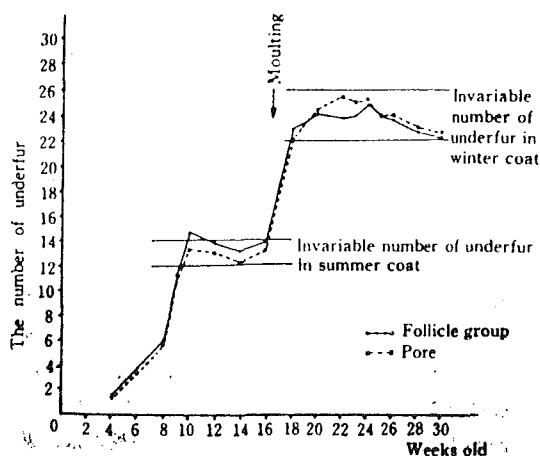


Fig. 1. The number of underfur per pore and per follicle group in mink.

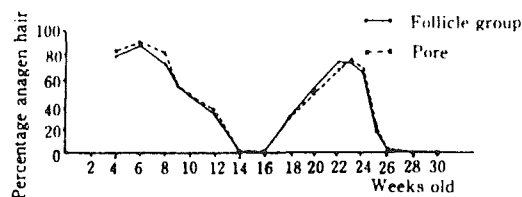


Fig. 2. Hair activity in mink.

2. The hair activity of summer coat was the highest (90%) in 6 weeks old and was the lowest (0-3%) in 14-16 weeks old. On the other hand, that of winter coat was the highest (80%) in 22 weeks old and was the lowest (0%) in 26-30 weeks old.

3. The dermis of both summer and winter coat was thick in anagen, but was thin in telogen. Especially, the dermis of winter coat in telogen was the thinnest (0.7 mm). Furthermore, it was observed that the dermis became thin when the hair follicles became shallow.

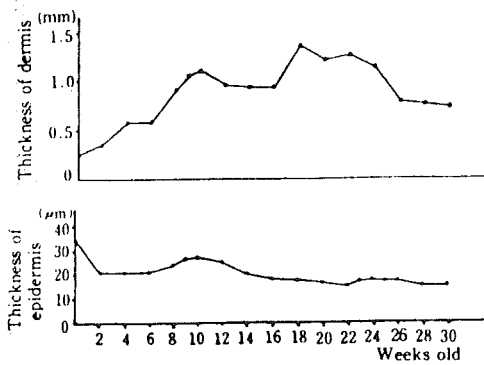


Fig. 3. Change in the thickness of epidermis and dermis.

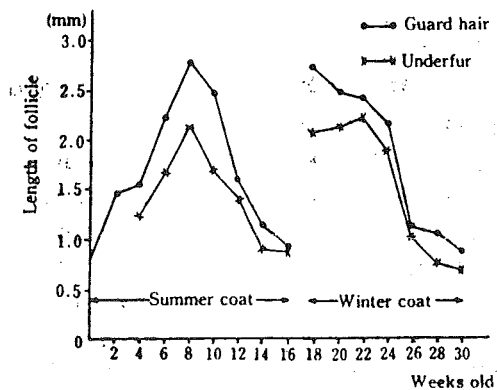


Fig. 4. Change in the length of follicle in mink.

4. Of both guard hairs and underfurs, the hair follicles in telogen became to be about 1/3 in length of those in anagen, never invaded the subcutis and shortened as far as the sebaceous gland. The guard hair follicles changed earlier than the underfur follicles.

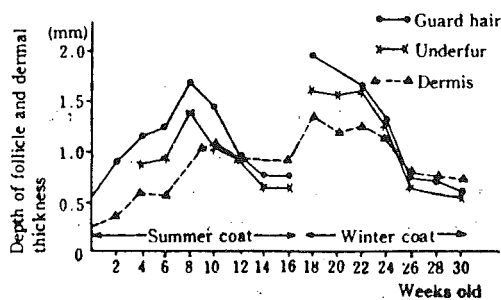


Fig. 5. Change in the depth of follicle in mink, and the relationship between the dermal thickness and the depth of follicle.

(皮革化学 Vol.32, No.3, pp.145~151 (1986))

In JAPN. Summary ENGL.

Authors' abstract.

#### INCREASING THE RATE OF MATURATION OF THE COAT IN ARCTIC FOXES UNDER NATURAL DAYLIGHT.

#### УСКОРЕНИЕ СОЗРЕВАНИЯ ВОЛОСЯНОГО ПОКРОВА У ПЕСЦОВ ПРИ ЕСТЕСТВЕННОЙ ДЛИНЕ СВЕТОВОГО ДНЯ

A.A. Alymov.

Data were obtained on 8 groups of arctic foxes (40 animals per group). Animals in the first 6 groups were allowed natural daylight (1st group, 25-40 lux; 2nd, 6-20 lux; 3rd, less than or equal to 5 lux; 4th, 40 lux for 8 h and 20-25 lux thereafter; 5th, 40 lux for 8 h and 10 lux thereafter; 6th, 40 lux for 8 h and 5 lux thereafter). In the last 2 groups, which served as controls, light intensity was 600 and 13,000 lux resp. during the hours of natural daylight, and 70 and 1500 lux thereafter. In the 8 groups, guard hair length on 1 Sep. averaged 2.6, 2.6, 2.9, 2.2, 2.1, 2.7, 2.0 and 1.0 cm resp. in females and 2.4, 2.8, 3.1, 2.2, 2.3, 2.6, 2.0 and 1.3 cm in males; undercoat length was 0-0.9 cm. At cropping (28 Sep.-17 Nov.), guard hair length averaged 5.3, 5.4, 5.6, 5.1, 5.5, 5.5, 5.6 and 5.6 cm in females and 5.5, 5.5, 5.5, 5.4, 5.5, 5.5, 5.5

and 5.5 in males, and undercoat length 4.6, 4.7, 4.8, 4.2, 4.7, 4.7, 4.9 and 4.8 cm in females and 4.8, 4.6, 4.6, 4.6, 4.8, 4.7, 4.8 and 4.8 cm in males. The percentages of defective skins in the 8 groups were 10.9, 11.4, 5.2, 12.8, 9.5, 4.9, 12.1 and 19.4. It was concluded that light intensities of 2-40 lux allowed pelting to be carried out 34-41 days earlier than under higher light intensity.

Nauchnye Trudy, Nauchno-Issledovatel'skii Institut Pushnogo Zverovodstva i Krolikovodstva, 29, 22-28, 1983.

3 tables, 3 references.

In RUSS.

CAB-abstract.

### GROWTH AND DEVELOPMENT OF YOUNG POLECATS.

#### РОСТ И РАЗВИТИЕ МОЛОДНЯКА ХОРЬКОВ

#### Кандидат сельскохозяйственных наук

G.P. Kazakova.

Data were obtained on 53 females and 70 males born in May, and 20 females and 13 males born in August. For the 4 groups resp., body weight averaged 9.5, 10.0, 9.9 and 10.6 g at birth, 268.2, 313.7, 251.5 and 277.5 g at weaning at 40 days of age, and 960, 1720, 810 and 1680 g at 5.5 months of age. Body length averaged 6.7, 7.0, 7.2 and 7.0 cm at birth, 26.1, 27.3, 25.2 and 26.2 cm at weaning, and 36.8, 42.3, 36.8 and 42.4 cm at 5.5 months. Guard hair length in the 4 groups averaged 2.2, 2.3, 2.7 and 2.7 cm at 2 months and 3.6, 3.9, 3.7 and 4.0 cm at 5.5 months, the corresponding lengths of undercoat being 1.5, 1.6, 1.8, 1.9, 2.9, 2.4, 2.3 and 2.4 cm.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst., Pushnogo Zverovodstva i Krolikovodstva, 29, 183-190, 1983.

4 tables, 2 references.

In RUSS.

CAB-abstract.

### SCIENTIFIC RESEARCH ON NUTRIA.

#### (Wissenschaftliche Arbeiten auf dem Gebiet der Sumpfbiberzucht).

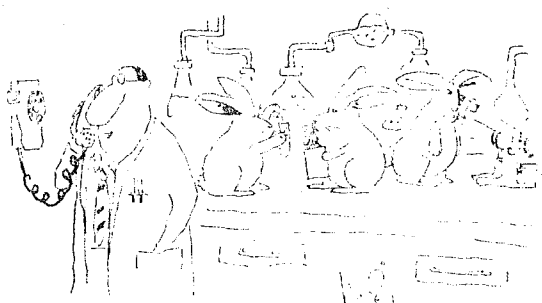
Anonymous.

Recent work carried out in Poland, Czechoslovakia and the USSR on various aspects of reproduction, feeding, growth, pelt quality and carcass quality in nutria is summarised.

Deutsche Pelztierzüchter, 60, 6, 98-99, 1986.

In GERM.

CAB-abstract.



"Oh, nothing much. Just experimenting with some rabbits."

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### CARCASS AND MEAT QUALITY TRAITS OF COYPUS.

(Studiul indicatorilor de calitate ai carcasei si carni de nutrie).

E. Sindilar, Elena Verdes, Alexandrina Boisteanu.

Researches were carried out on a group of young coypus of 8-9 months and on a group of adult coypus of 2-3 years, at which killing output, by products indices and the quality of carcasses and meat were established. The killing output varied according to age and corporal weight, having on an average values of 48.44% in the youngs and 54.13 in the adults. Indices of edible organs taken in all represents 5.58% out of live weight in youngs and 4.93% in adults. Out of all organs the largest share belongs to the liver - 3.54%. In adults the carcasses were well fleshed and had fat deposits. The muscular tissue had a high percentage of proteins having an average value of 22.03% in youngs and 21.59% in adults.

Lucrari Stiintifice, Inst. Agron. "Ion Ionescu de la Brad" Iasi, 11, 26: 53-55, 1982, publ. 1984.

2 tables, 4 references.

In ROMN. Summary in ENGL.

Authors' summary.

### THE PERFORMANCE OF BLACK NUTRIA HOUSED INDOORS.

#### ПРОДУКТИВНОСТЬ ЧЕРНЫХ НУТРИЙ В ЗАКРЫТОМ ПОМЕЩЕНИИ

A.V. Shapovalov.

Data were obtained on a population which comprised 600 female and 200 male Standard nutria in 1979, and in which there were 32 males and 31 females with black markings, and 234 young nutria homozygous (ZZ) or heterozygous (Zz) for black colour. In 1982, female nutria which were ZZ or Zz were mated with ZZ males, and zz females were mated with ZZ or Zz males. Of 324 females, 41.0% conceived, 1.85% had to be slaughtered, 1.2% aborted, and 38.0% whelped. 571 young were liveborn and 105 were stillborn. Litter size averaged 5.5, the number of young registered per whelping female 4.6, and the number registered per housed female 4.3. Corresponding figures obtained for 106 black females in 1983 were 59.4%, 1.9%, 1.9%, 55.7%, 296, 52, 5.9, 5.0 and 4.7.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 78-80, 1983.

2 tables.

In RUSS.

CAB-abstract.

### THE EFFECT OF TEMPERATURE AND HUMIDITY ON PELT QUALITY OF NUTRIA HOUSED INDOORS.

#### ВЛИЯНИЕ ТЕМПЕРАТУРНОГО И ВОДНОГО РЕЖИМОВ НА КАЧЕСТВО ШКУРОК НУТРИЙ, СОДЕРЖАВШИХСЯ В ЗАКРЫТОМ ПОМЕЩЕНИИ

V.L. Shevyrkov.

Young nutria (50 per group) were housed in closed sheds, with temps. inside in winter maintained at 14 deg.-16 deg.C in 1 shed, at these



temps. with twice daily spraying with water in the 2nd shed, and at 5 deg. -7 deg. in the 3rd. Coat density was assessed visually. The percentage of animals with the best coat-density category in the 3 sheds was 4.0, 1.7 and 5.1 at 3 months of age, 20.0, 29.3 and 26.3 at 4 months, 14.0, 50.0 and 42.8 at 5 months, and 21.4, 50 and 39.3 at 6 months. Body weight at 6 months averaged 4.54, 4.44 and 4.39 kg in the 3 sheds.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 72-77, 1983.

3 tables, 4 references.

In RUSS.

CAB-abstract.

#### THE USE OF TWO-TIER CAGES FOR HOUSING FEMALE NUTRIA.

#### ИСПЫТАНИЯ ДВУХЪЯРУСНЫХ ВЫГУЛОВ ДЛЯ СОДЕРЖАНИЯ САМОК НУТРИИ ОСНОВНОГО СТАДА

Yu A. Yakovenko, V.G. Kozlov, G.A. Kuznetsov.

Data were obtained at a farm using 2-tier outdoor cages without litter and nests; the tiers were separated only by wire netting, which served as a floor for the upper tier and a ceiling for the lower tier. A simple dung through was fitted under the floor net. Each cage (2000 x 700 x 450 mm) housed 5-6 young nutria, or was divided into 3 compartments, each housing a breeding female. For 32 females housed in the upper tier, 32 housed in the lower tier, and 35 housed in a single-tier cage (controls), mortality during pregnancy was 0, 3.1 and 8.6% resp., the percentage not conceiving 3.1, 9.4 and 8.6, and the percentage whelping 96.9, 87.5 and 82.8; litter size averaged 6.3, 5.9 and 5.5, and the number of young weaned 5.68, 5.18 and 4.86 per whelping female and 5.50, 4.53 and 4.83 per housed female. No contamination of fur by feed, urine or droppings from the upper tier was observed in the lower tier.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 53-56, 1983.

1 tables, 1 references.

In RUSS.

CAB-abstract.

#### THE RACCOON DOG - ANOTHER FUR BEARER ON OUR FARMS.

(Der Marderhund - ein weiteres Pelztier auf unseren Farmen).

Anonymous.

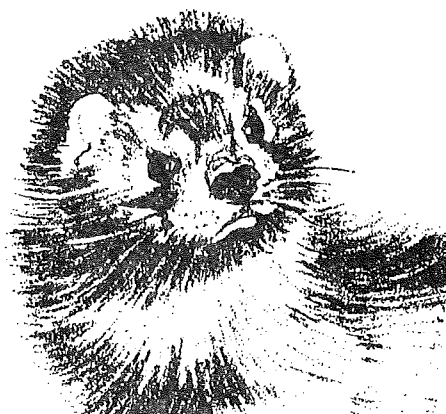
An account is given of reproduction, pelt characters, feeding and diseases of raccoon dogs in Finland.

Deutsche Pelztierzuchter, 60, 8, 125-127, 1986.

1 figur.

In GERM.

CAB-abstract.



## EFFECT OF SOCIAL COMPETITION ON GROWTH IN RACCOON DOGS.

(Social tävlans inverkan på finnsjubbens tillväxt).

Hannu Korhonen, Mikko Harri.

From 25 June to 28 Oct., 56 male and female raccoon dogs were fed ad lib and housed in cages with 1, 2 or 3 animals (groups 1, 2 and 3), fed a restricted diet (550 g per day in June-Aug. and 430 g per day in Sep.-Nov.) and housed in cages with 1, 2 or 3 animals (groups 4, 5 and 6), or housed in cages with shelter and with 2 animals per cage (group 7). In the 7 groups resp., body weight on 28 Oct. averaged 8.4 plus or minus 1.3, 7.2 plus or minus 0.3, 7.6 plus or minus 1.1, 7.4 plus or minus 1.0, 8.4 plus or minus 1.3, 7.6 plus or minus 1.2 and 8.7 plus or minus 1.2 kg; type of feeding had a significant effect on body weight, but housing density and sex did not. Housing density had no significant effect on pelt quality.

Finsk Pälstidskrift, 20, 5, 276-279, 1986.

3 tables, 1 figs., 3 references.

In SWED.

CAB-abstract.

## EFFECTS OF SEASON ON PELT CHARACTERS OF FINNISH RACCOON DOGS.

(Hur finnsjubbens pälsegenskaper påverkas av årstidernas växling).

Hannu Korhonen, Mikko Harri.

Young raccoon dogs were pelted in June, Aug., Sep. or Dec. at the ages of 2, 3.5, 5 and 7 months resp.; and adult animals were pelted in winter and summer. In young animals, pelt weight increased steadily from the end of Aug. until Nov.-Dec., but the weight of guard hairs reached its maximum in Aug.-Sep. Pelts from animals killed in summer had the thickest and heaviest leather. Details are given of hair length and weight and of weight and thickness of leather in samples from different parts of the body.

Finsk Pälstidskrift, 19, 5, 295-298, 1985.

1 table, 5 figs., 2 references.

In SWED.

CAB-abstract.

## RAISING RACCOONS FOR RELEASE.

### PART IV. MEDICAL MANAGEMENT AND READINESS FOR THE WILD.

Adele T. Evans, Richard H. Evans.

Parts I, II, and III of this four-part series, which appeared in the May, June, and September issues, respectively, described the history and physical development of raccoons, the initial phases of rehabilitation, and the common nutritional problems encountered. In this last article of the series, the authors discuss briefly the injuries, diseases, and parasites that are seen in young raccoons. Advice and treatment recommendations are given, but the authors in no way condone rehabilitation by inexperienced individuals. Even more experienced rehabilitators and veterinary technicians should not carry out the suggested treatments without the consent, knowledge, and supervision of a veterinarian. The article also details ane-

sthetics that have been used successfully in treating raccoons and gives results of experimental vaccine trials.

Vet. Tech., 7, 1, 37-48, 1986.

The original monograph from which this series of articles is drawn was published in April 1985 by Natural Wildlife Rehabilitators Association (modified with permission).

7 tables, 9 figs., 17 references.

Authors' heading.

#### A COMPARISON OF TWO DIFFERENT MINK CAGES USED DURING THE BREEDING PERIOD.

(Jämförelse av två olika lyor för mink under avelsperioden).

Maria Neil.

The performance was compared of 68 Pastel mink females housed in standard Swedish wooden cages (27 cm high) or in Danish wooden cages with a plastic interior and measuring 16 cm in height. Type of cage had no significant effect on the number of kits born per female or surviving 3, 10, 21 and 42 days after whelping, on kit body weight at birth and at 21 and 42 days of age, or body weight of the female 21 og 42 days after whelping. Age of female significantly affected date of whelping, kit mortality to 10 days of age, body weight of female, and kit body weight 21 and 42 days after whelping. Litter size significantly affected body weight of the female and that of the kits 21 and 42 days after parturition.

Våra Pälsdjur, 56, 2, 55-56, 1985.

2 tables, 2 references.

In SWED.

CAB-abstract.

#### MEASURING OF LONG-TERM STRESS.

(Måling af langtidsstress).

Leif Lau Jeppesen, Knud Erik Heller.

The possibility of avoid harms caused by long-term stress has as a condition that the long-term stress status can be measured in time by an easy and cheap method before the harms have grown serious.

In the actual and in a serie of previous investigations it have been shown that the concentration of circulating eosinophilic leucocytes is a stable standard for experimentally and social caused long-term stress.

Standard behaviour based on the fact that long-term stress increase the motivation for escapement and reduce the aggression and exploration can also be used.

Concentration of glucocorticoides in the blood are frequently used as a standard for stress, but the actual investigation shows only very slight correlation to the experimentally induced stress. The value of glucocorticoides as a standard for long-term stress will be further examined.

Statens Husdyrbrugsforsøg, Meddelelse No. 614, 1986.

8 references, 4 pp.

In DANH.

Authors summary  
translated by Gunnar Jørgensen.

**CONTRIBUTION TO THE ECO-ETHOLOGY OF THE STONE MARTEN (MARTES FOINA)  
HOME RANGE AND FOOD RESOURCES UTILIZATION STRATEGY.**

**II. RADIO TRACKING AND GENERAL DISCUSSION.**

**(Contribution à l'étude éco-éthologique de la fouine (Martes foina):  
Stratégie d'utilisation du domaine vital et des ressources alimentaires.**

**II. Radio-reperage et discussion generale).**

José Kalpers.

This second paper concerning the Stone marten (*Martes foina*) deals with the space and time utilization, using radio-telemetry methods, in one male individual. The collar-transmitter had a weight of 40 gr. and a frequency of 167.225 Mhz.

The home range during the study period covered some 60 ha; the activity centers moved from an area to another for periods of about one month. Movement patterns, daily activities and resting-places utilization were also observed. The comparison between our data and those of other authors studying other related species is discussed.

Cahiers d'Ethologie appl., 4, 1, 11-26, 1984.

1 table, 7 figs., 35 references.

In FREV. Summary ENGL.

Author's abstract.

**ECOLOGY AND EPIDEMIOLOGY OF WILD AND FERAL CANIDS IN THE  
PALEARCTIC ZONE. MEETING HELD IN NANCY, FRANCE,  
9-11 OCTOBER 1984.**

**(Éco-Pathologie des canidés sauvages ou errants en zone paléarctique).**

M. Artois, J. Blancou, C. Kempf.

The conference, organized by French National Centre for the Study of Rabies and by WHO, discussed the ecology of foxes and stray dogs in Europe, including their role in the epidemiology of rabies (6 contributions) and their parasites (4 contributions).

Rev. d'Ecologie (la Terre et la Vie) 40, 2, 1985.

Conference proceedings. 287 pp.

CAB-abstract.

**WORLD PRODUCTION OF MINK.**

**(Nerz-Weldproduktion).**

Anonymous.

In 1985-86, the world production of mink pelts totalled 32,500,000 vs. 30,380,000 in 1984-85. The main producing countries were Denmark (8,300,000 pelts), Finland (4,600,000), USA (4,500,000), USSR (3,900,000), China (2,400,000) and Sweden (1,870,000). Production is compared with that in the 2 previous years.

Deutscher Pelztierzuchter, 60, 5, 86, 1986.

1 table.

In GERM.

CAB-abstract.



## POPULATION OF FUR BEARERS IN 1986.

(Pelsdyrbestanden 1986).

Eugenia Jørgensen.

In 1986, in Denmark, there were 2,143,213 mink, 28,274 blue fox, 18,993 silver fox, 6,426 shadow fox, 2520 polecat, 612 raccoon dog and 6500 chinchilla breeding females. There were 4236 mink and 843 fox farms. Of the mink breeding females, 42.8% were Scan Black, 20.5% Scan Brown, 21.1% Pastel and 8.4% Pearl. Compared with 1985, the numbers of mink, fox, polecat and raccoon dog females increased by 15.4, 18.9, 65.5 and 23.5% resp. Data are tabulated by district.

Dansk Pelsdyravl, 49, 7, 432-434, 1986.

6 tables.

In DANH.

CAB-abstract.

## PRODUCTION RECORDING IN FINLAND.

(Finsk produktionskontroll).

Anonymous.

In 1985, in Finland, mortality at 120 farms with 40,000 foxes and 96,000 mink averaged 0.4, 0.3 and 0.6% for male and female foxes and weaned cubs resp., and 0.6, 0.7 and 0.8% for male and female mink and weaned kits. There was some seasonal variation in mortality. Feed consumption averaged 203 g per day (268 kcal) for mink, 508 g (707 kcal) for blue foxes and 561 g (795 kcal) for silver foxes.

Våra Pälsdjur, 57, 7, 235-236, 1986.

3 tables.

In SWED.

CAB-abstract.

## POPULATION OF BREEDING ANIMALS IN SWEDEN 1986.

(Avelsdjursbestandet i Sverige 1986).

Anonymous.

In 1986, in Sweden, there were 469,059 mink breeding females (vs. 469,920 in 1985), of which 197,185 were Scan Black, 30,273 White, 76,221 Pastel, 14,644 Silverblu, 32,929 Sapphire and 26,483 Black Cross. There were 5345 silver fox, 12,646 blue fox, 2005 chinchilla and 552 polecat breeding females vs. 4836, 14,208, 1893 and 1605 resp. in 1985. Data are tabulated by district.

Våra Pälsdjur, 57, 5-6, 1988.

2 tables.

In SWED.

CAB-abstract.



**SYSTEMATICS, NATURAL HISTORY, KEEPING YOUTH DEVELOPMENT AND  
POSSIBILITIES TO DETERMINE THE AGE OF CHINCHILLAS.**

**(Systematik, Naturgeschichte, Haltung, Jungendentwicklung und  
Möglichkeiten der Altersbestimmung beim Chinchilla).**

Sylvia Krug.

This work deals with the systematics and natural history of the Chinchilla. In this connection, it has turned out that today no specific type is used for breeding purposes within a species of the Chinchilla family, but a hybrid type.

Furthermore, the reproduction is the subject of further investigation in this work as well as the breeding of these valuable animals.

By examining and observing about 75 living Chinchillas and 16 skeletons together with 10 radiographs of these animals, I was in a position to determine the age of these fur-bearing animals. Totally, you can say that an age determination before birth can be made rather well by palpation of pregnant females (a method used for examining guinea pigs) together with the weight control of pregnant females, knowing the standard weight before the mating.

Age determination on dead embryos is easily done by means of embryonic weights in grammes and the top-tail root length in mm. These age values are to be compared with the age values obtained by the above-mentioned methods.

The possibilities of an age determination after birth, are being reduced to an examination of body weights in grammes, the development of the body- and tail length in mm and, to a small extent, examination of the hair length and colour baar. On age determination of the Chinchilla by means of the set of teeth is not possible with that kind of fur-bearing animals, because the permanent set of teeth already exist in the first days of life.

Due to the fact that all the teeth have open roots, they are preserved by constant growth. That is to say that an age determination cannot be based upon the degree of tooth wear either. As to living and dead animals, a classification of a specific age group is possible by means of the epiphyseal ossification of the skeleton, provable with radiographs of living animals and with the very skeleton of dead animals. The bone measures, especially the length of the long tubular bones, or some measures of the skull such as the length of the upper part of the skull and the pre- and post-orbital width, give less information about the age. Sex-linked differences of the Chinchilla are primarily found in the development of the body weight, in spite of the fact that these differences are very small, too.

The change in body- and tail length in the course of the growth period proceeds almost equally fast with females and males.

Inaugural-Dissertation" Justus Liebig-Universität, Giessen, Fachbereich Veterinärmedizin und Tierzucht, 1983

22 tables, 19 figures and drawings, 15 photos, 29 references, 168 pp.

In GERM.

Author's summary

translated by

Palle V. Rasmussen/Charlotte Schomacker



EVOLUTIONARY GENETICS OF THE *Lpm* MULTIGENE FAMILY.

ЭВОЛЮЦИОННАЯ ГЕНЕТИКА  
МУЛЬТИГЕННОГО СЕМЕЙСТВА *Lpm*

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

A review of the genetic control of allotypic determinants of very high density alpha2-lipoproteins in mink.

Nauka, Moscow, USSR, 176-184, 1985.

1 table, 3 figs., 20 references.

In RUSS.

CAB-abstract.

REGIONAL ASSIGNMENTS OF EIGHT GENES ON CHROMOSOME 2 IN THE  
AMERICAN MINK.

N.S. Zhdanova, A.A. Gradov, N.B. Rubtsov, S.D. Pack, O.L. Serov.

Chromosomal rearrangements involving mink chromosome 2 in mink-Chinese hamster and mink-mouse hepatoma somatic hybrids were identified. By means of these rearrangements, the genes for hexokinase-1, glutamate-oxaloacetate transaminase 1, and inorganic pyrophosphatase were assigned to 2pter'right arrow'p22, those for 6-phosphoglucomate dehydrogenase, phosphoglucomutase-1 and enolase-1 to 2q24.4'right arrow'qter, and those for purine nucleoside phosphorylase and adenosine kinase to 2pter'right arrow'p11,1.

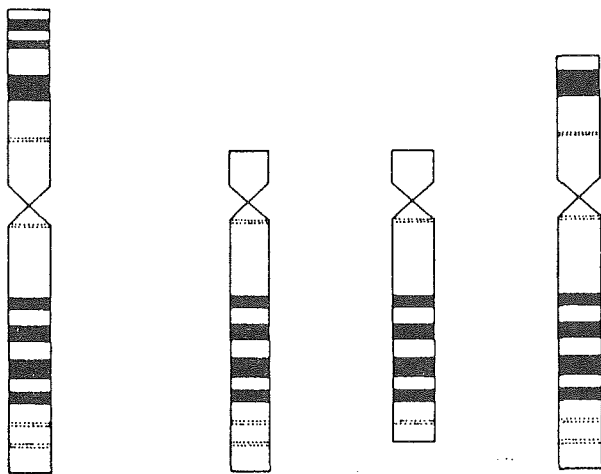


Fig 2. Diagram suggested for the rearrangements of G-banded mink chromosome 2. From left to right, intact chromosome, 2del:(p11.1→qter), region 2p11.1→q24.4, and 2del:(p22→qter).

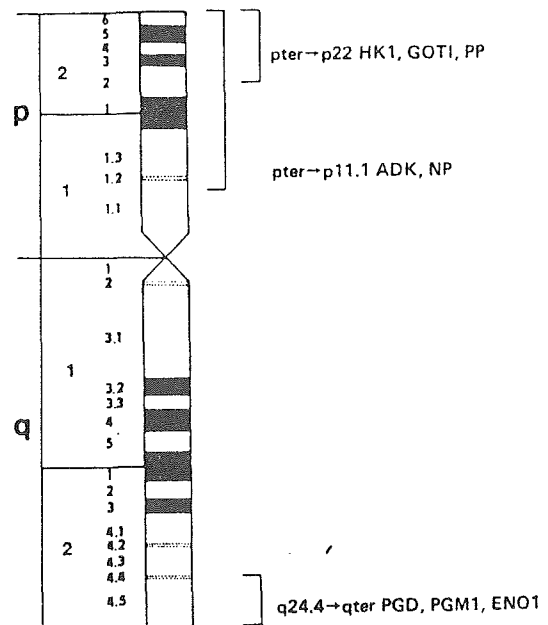


Fig 3. Localization of the genes for PGD, PGM1, HK1, ENO1, GOT1, PP, NP, and ADK on mink chromosome 2.

Cytogenet Cell Genet, 39, 296-298, 1985.

1 table, 3 figs., 11 references.

In ENGL.

Authors' summary.

generation. The differences between hair length in Sable and Standard animals were significant. It was concluded that the inheritance of hair length in Sable mink is controlled by a major gene recessive to the factor controlling hair length in Standard mink.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 3-14, 1983.

4 tables, 4 figs.

In RUSS.

CAB-abstract.

**VARIATION OF REPRODUCTIVE PERFORMANCE OF LARGE STANDARD MINK  
IN THE COURSE OF SELECTION FOR LARGE SIZE.**

**ИЗМЕНЧИВОСТЬ ВОСПРОИЗВОДИТЕЛЬНЫХ КАЧЕСТВ КРУПНЫХ  
СТАНДАРТНЫХ НОРОК ПРИ СЕЛЕКЦИИ НА УКРУПНЕНИЕ**

Z.A. Mashtak, V.V. Pomerantsev, G.K. Myasoedova

Data were obtained over a 5-yr period. Animals were classified on body length as large (males, 48.9-50.0 cm; females, 39.2-40.7 cm) or extra large (males, 52.0-52.4 cm; females 41.6-43.5 cm). For 3624 extra large and 11,123 large young females, and 4123 extra large and 12,069 large mature females assortatively mated with males according to size, whelping rate was 76.6, 80.1, 86.8 and 87.4% resp., and litter size averaged 6.77, 6.48, 6.84 and 6.51. The correlation of fertility with litter size was 0.115.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 43-53, 1983.

4 tables, 3 figs.

In RUSS.

CAB-abstract.

**THE USE OF THE COEFFICIENT OF CORRELATION IN EVALUATING  
SELECTION OF MINK FOR BODY LENGTH.**

**ИСПОЛЬЗОВАНИЕ КОЭФФИЦИЕНТА КОРРЕЛЯЦИИ ДЛЯ ОЦЕНКИ  
ПОДБОРА НОРОК ПО ДЛИНЕ ТЕЛА**

S.A. Mashtak, G.A. Kuznetsov, V.V. Pomerantsev.

At the annual assessment, body length of animals in 4 breeding nuclei at a mink farm was 48-56 cm for males and 38-48 cm for females. Selection at the farm was aimed at obtaining the largest possible number of progeny of large size. Mating plans were constructed so that max. use was made of large animals which, however, were the least numerous. The correlation of body length of male with that of female offspring was 0.56-0.86 at the 4 nuclei.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 38-43, 1983.

3 tables.

In RUSS.

CAB-abstract.



**LONG-HAIRED FOXES AT THE "MADONA" FUR FARM.**

**ДЛИННОВОЛОСЯЯ ЛИСИЦА ЗВЕРОВОДОХОЗА "МАДОНА"**

A.V. Yakovenko, M.F. Atals, V.R. Kuchminskaya.

Silver fox males were mated assortatively with silver fox females for guard hair length (84, 82-83 and 82 mm). For the 3 types of mating, guard hair length averaged 82.6, 81.5 and 80.3 mm in 472, 343 and 80 female offspring resp., and 83.5, 81.3 and 78.9 mm in 571, 405 and 108 male offspring.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst., Pushnogo Zverovodstva i Krolikovodstva, 29, 15-17, 1983.

3 tables.

In RUSS.

CAB-abstract.

**POSSIBILITIES OF IMPROVING THE REPRODUCTIVE PERFORMANCE IN FUR BEARERS BY MEANS OF SELECTION.**

**(Avelsmessige muligheter for å bedre reproduksjonen hos pelsdyr).**

Einar J. Einarsson.

Possibilities of improving the reproductive performance of mink and blue foxes by means of selecting for larger litters and for reduced kit mortality are discussed. It is concluded that it should be possible to achieve genetic progress of 0.1 kit per generation using a litter size index incorporating information on the sire and dam and their ancestors rather than basing selection only on the size of the litters into which the animals are born.

Norsk Pelsdyrblad, 60, 3, 144-146, 1986.

4 figs.

In NORG.

CAB-abstract.

**HERITABILITY OF LITTER SIZE IN MINK.**

**(Kullstorlekens ärftlighet hos minkar).**

Suvi Tikkanen.

Data on 5030 Scan Black and 4965 Pastel mink females in Finland were analysed. The number of kits surviving to 2 wk of age per mated female averaged 3.7, ranging from 2.7 to 4.7 for Scan Black and from 3.2 to 4.2 for Pastel females. Females aged 2 yr had the largest and those aged 1 yr the smallest litters. The percentage of infertile females was 25.9 for Scan Blacks (26.5 and 19.7 resp. for females aged 1 and 2 yr) and 20.7 for Pastels (21.4 and 14.4). For Scan Black females aged 1, 2 or 3 yr, the litter size of their dams averaged 5.8, 6.1 and 5.7 resp. vs. 5.7, 5.9 and 5.4 for Pastels. Based on dam-daughter regressions, the  $h^2$  of litter size was 0.19 plus or minus 0.07 and 0.14 plus or minus 0.07 resp. for Scan Black and Pastel females aged 1 yr, and 0.14 plus or minus 0.05 and 0.11 plus or minus 0.07 for females aged 1-7 yr.

Finsk Pälstidskrift, 20, 7-8, 425-427, 1986.

8 tables.

In SWED.

CAB-abstract.

THE EFFECTIVENESS OF THE PROGENY TESTING OF SABLES.

ЭФФЕКТИВНОСТЬ ОЦЕНКИ СОБОЛЕЙ ПО КАЧЕСТВУ ПОТОМСТВА

E.G. Snytko, I.F. Kirillushkin.

At a fur farm maintaining 653 females and 219 males in a breeding nucleus, 9 sire lines were identified using breeding records. The origin could not be identified for 56 of the males, 3590 offspring were assessed for size, coat quality and colour using a 5-point scale for each trait. Of the 219 sires, 37 from 3 lines were found to be improvers of colour, 28 from 2 lines improved coat quality, and 61 from 3 lines improved body size. 18 sires from 2 lines were improvers of 2 traits (body size and coat quality), but none improved all 3 traits. Sires that were improvers of colour ranked lowest for coat quality and body size.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 190-197, 1983.

3 tables, 4 references.

In RUSS.

CAB-abstract.

CROSS BREEDING WITH FOXES - A COLOURFUL FUTURE.

(Kryssingsavl med rev - en fargerik framtid).

Einar J. Einarsson.

Data are tabulated on the gene symbols for recessive and dominant red fox, silver fox and blue fox mutations in Norway. Descriptions are given of some recent mutations, including the recessive silver fox mutations Burgundy, Colicott, Mansfield Pearl, Pearl and Radium.

Norsk Pelsdyrblad, 60, 5, 241-245, 1986.

1 table, 8 figs.

In NORG.

CAB-abstract.

PELT QUALITY OF AMERICAN MINK OBTAINED BY CROSSING PARENTS WITH DIFFERENT GENOTYPES.

КАЧЕСТВО МЕХА АМЕРИКАНСКИХ НОРОК, ПОЛУЧЕННЫХ В УСЛОВИЯХ ГЕТЕРОГЕННЫХ СКРЕЩИВАНИЙ

V.I. Evsikov, Yu V. Vagin, T.D. Osetrova, E.K. Matysko.

It is shown that the price of mink pelts is higher when the animals are hybrids, than when they are inbred ones. Such an effect of superiority is achieved due to an increase in the pelt sizes and relatively lower quantity of defects.

Isitologiya i Genetika, 19, 6, 443-446, 1985.

2 tables, 4 figs., 5 references.

In RUSS. Summary ENGL.

Authors' summary.



Original report

## Estrus - Inducing Trials Using Oil PMSG in Mink

Jarosz S., Barabasz B., Szeleszczuk O., Dept. of Fur Animal Husbandry, Agricultural University, 30-059 Krakow, Al. Mickiekiewicza 24/28, Poland

The estrus phase in mink is regulated by day lights length. Under our climatic conditions the estrus occurs in March, reaching the highest intensity from 10 to 24 March. However, the best reproduction results can be obtained after matings performed during the term from 10 to 20 March. In some female mink (10-15%) latent estrus or its concious delaying can be observed which has a negative influence on reproductive results.

Taking in consideration economical and organizational aspects attempts are undertaken to perform matings during an optimal copulation season. One of the methods allowing to solve this problem at least partially can be hormonal induction of estrus.

Till now only a few experiments have been made on this subject. Biernackij (1974) received positive results with induction of estrus in mink after injection of 50 i. u. of PMSG per female. In foxes positive results with induction of estrus, using PMSG, were recieved by Biedrov (1977), Benjaminsen et. al. (1974) and Vladi-mirow et al. (1977). The aim of our work was to determine an optimal dose of PMSG in oil suspension to induce estrus in mink which failed to mate during a full copulation season.

### Material and methods

The experiment was started in 1982 and conducted for two years. During the first year the experiment included 30 female mink of standard strain, which up to 23 march had not mated (no estrus symptoms). They were divided into 3 groups of 10 and were given intramuscular injections of PMSG as follows:

- group I - 20 i.u. each female
- group II - 40 i.u. each female
- group III - 60 i.u. each female

Based on the results of the preliminary studies during the next year a field trial in 2 mink farms with the induction of estrus in female mink using oil PMSG was performed.

Thirty females in Farm I and fourty females in Farm II, which in full copulation season (Farm I March 11, Farm II march 16) had not shown estrus symptoms were not divided into experimental and control groups. Experimental females were given 20 i. u. of oil PMSG each. When estrus symptoms appeared the females of both groups were subjected to the mating trials.

### Results

The results of estrus induction in preliminary trials with the use of various doses of oil PMSG (serogonadin) in mink which failed to mate during full copulation season are presented in Table 1. Due to the loss of twelve females through out the experiment and on account of relatively small number of animals in groups the results obtained are to be treated tentatively. As concerns the PMSG doses used, the highest indices for conception rates (80%), mean litter size (2.73 kits), fecundity (2.25), were obtained in group I given 20 i.u. of PMSG per female. With increasing doses of PMSG up to 40 i.u. in group II and 60 i.u. in group III, a decrease in conception rate was found to 60 and 37,5% respectively. In group III also a decrease was found in mean litter size to 1,65 kits.

Results of estrus induction in field trials carried out during the next year are presented in Table 2. As can be seen the percentages of mated females in both farms were significantly higher in experimental females injected 20 i.u. of PMSG (Farm I - 100%, Farm II - 84%) than in control females (Farm I - 86,6%, Farm II -

Table 1. Reproductive results in mink given various doses of PMSG to induce estrus (1982)

Group	No. of animals	Dose of PMSG	Mating time	Time of delivery	Conception rate	Mean length of pregnancy (days)	Mean litter size (No. of kits)	Fecundity
I	5	0,1 ml (20 i.u.)	March 25-28	May 6-10	80,0	42,7 ± 2,1	2,75	2,25
II	5	0,2 ml (40 i.u.)	March 25-29	May 8-13	60,0	43,7 ± 1,5	2,33	1,33
III	8	0,3 ml (60 i.u.)	March 25-28	May 7-10	37,5	43,0 ± 1,0	1,67	-

Table 2. Reproductive results with estrus induction using one dose of oil PMSG in mink, which did not mate during full copulation season.

No. of farm	Group	No. of animals	Date of PMSG injection (dose)	% of mated males	% of delivered females	Litter size	Mortality rate in % days after delivery			
							1 - 4	5 - 28	29 - 42	Total
I	Exper.	15	March 11 (20 i.u.)	100	73,3	4,27 ± 2,37	12,77	2,12	4,25	19,15
	Control	15	-	86,6	53,8	5,14 ± 1,68	0	12,90	19,35	32,23
II	Exper.	25	March 16 (20 i.u.)	84,0	57,1	4,75 ± 2,96	6,12	16,32	4,08	26,53
	Control	23	-	73,9	94,1	4,06 ± 1,65	14,30	10,52	1,75	26,31

73,9%). Percentage of delivered females was different in particular farms. In Farm I (experimental) 73,3% of the females delivered kits compared to only 53,8% on control groups. In Farm II the results were reverse only 57,1% of experimental females and 94,1% of control females delivered kits.

The litter size was similar in both control and experimental females amounting to over 4 kits per female.

Mortality rate was found to be different in particular groups of females in both farms. The highest early postnatal mortality rate (from birth to 4 days, including stillborn) was found in control group in Farm II (14,3%) and in experimental group in Farm I (12,7%). Mortality in kits between birth and weaning (42 days of age) was the highest in control females (32,23%) and the lowest in experimental ones (19,15%) in Farm I. In Farm II mortality rate from birth to weaning was similar in both groups of females amounting to 26,3 - 26,5% in spite of great differences found in the first term after parturition (1 - 4 days of age) where mortality was only 6,1% in experimental and 14,3% in control females.

### Discussion and Conclusions

The results obtained in the first stage of experiment indicate, that estrus symptoms in female mink which had not been mated during full copulation season, can be induced successfully using oil PMSG in a single dose of 20 - 40 i.u. An increase in the PMSG dose leads to poorer results in fertility and fecundity which is confirmed by Biernacki et al., (1974). It seems that responsiveness to the magnitude of PMSG dose depends on physiological condition of female. The results obtained in field test of the second stage under two different climatic environments, where PMSG was used in a low dose of 20 i.u., indicate to a positive effect of PMSG on estrus induction, compared to control groups. However, based on the number of females which delivered kits and on the fact that the results obtained with experimental females were reverse on either farm, compared to the control, it is difficult to infer about a positive or negative effect of PMSG on

mink fertility. Based on the data for litter size, which were similar, one can assume that PMSG at a dose of 20 i.u. had no defined effect on litter size per delivering female.

Postembryonal mortality in the period from birth to weaning, although displayed various courses in groups at different stages was within limits (19-32%) found also by other authors (Einarsson, 1980) and considered normal for this species. Summing up, a conclusion can be drawn, that oil PMSG injected to mink females in the final copulation season, at dose 20-40 i.u. has a positive result on estrus induction.

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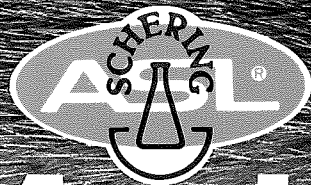
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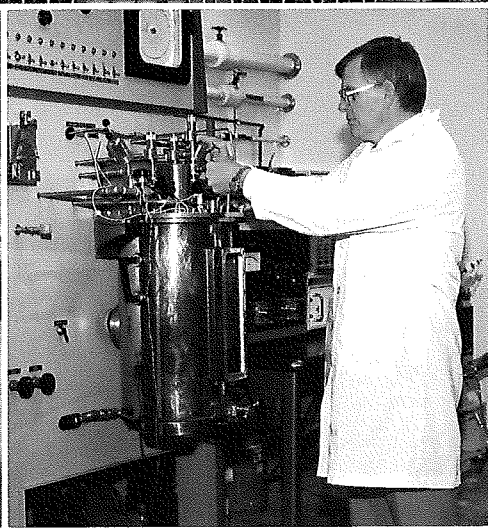
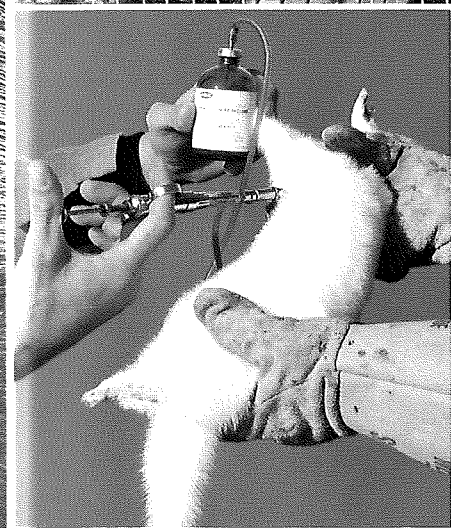
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**QUALITY OF FOX SEMEN AND ITS EFFECT ON BREEDING RESULTS.**

(Rävpermans kvalitet och kvalitetens inverkan på avelsresultatet).

Maija Valtonen, Harri Käyhkö.

Manual semen collection was attempted from 134 silver, platinum and cross-bred foxes. It was not possible to collect semen from 17 of the males. Semen quality was assessed on a 5-point scale according to sperm number per ejaculate (ranging from 1 point for 100-300 million to 5 points for 800-1000 million), the percentage of live spermatozoa (from 20-60 to 75-100%) and sperm motility (from weak to very good). For silver fox females mated with males producing the 5 classes of semen, CR was 85, 90, 79, 83 and 83% resp., the number of cubs born per female mated averaged 3.42, 4.80, 3.71, 4.17 and 4.35, and the number of cubs born per female whelping 4.00, 5.31, 4.70, 5.02 and 5.24. For blue fox females inseminated with silver fox semen of the 5 classes, the CR was 0, 50, 69, 71 and 86% resp., the number of cubs born per inseminated female averaged 0, 0.75, 3.07, 5.14 and 6.00, and the number of cubs born per female whelping 0, 1.50, 4.44, 7.20 and 7.00.

Finsk Pälstidskrift, 57, 3, 141-143, 1985.

4 tables, 2figs., 6 references.

In SWED.

CAB-abstract.

**CONCEPTION RATE OF ARTIFICIALLY INSEMINATED VIXENS IN RELATION TO INSEMINATION DOSE AND METHOD.**

ОПЛОДОТВОРЯЕМОСТЬ ЛИСИЦ ПРИ ИСКУССТВЕННОМ ОСЕМЕНИИ В ЗАВИСИМОСТИ ОТ ДОЗЫ И СПОСОБА ВВЕДЕНИЯ СЕМЕНИ

E.P. Bautina, V.N. Pomytko, L.E. Pozdnyakova.

Red fox and arctic fox females were inseminated using a catheter and  $427 \times 10^6$  spermatozoa/ml diluted semen in insemination doses of 1.5-2 ml, or "paracervically" using  $762 \times 10^6$  spermatozoa/ml in insemination doses of 1.5-2 ml. For 20 and 157 red fox females inseminated using the 2 methods, CR was 90 and 76% resp., whelping rate was 75 and 66%, litter size averaged 5.4 and 4.4, and the number of weaned cubs per inseminated female 3.4 and 2.5. Corresponding figures for 10 naturally mated controls were 90, 90, 6.6 and 5.0. For the 2 groups of artificially inseminated arctic fox females, CR was 94 and 47%, whelping rate was 88 and 27%, litter size averaged 7.3 and 9.9, and the number of cubs weaned per inseminated female 4.6 and 1.0. For red fox females (15-35 per group), inseminated using the catheter and doses of  $20 \times 10^6$  spermatozoa in 2 ml,  $20 \times 10^6$  in 1 ml,  $60-80 \times 10^6$  in 1.5 ml, and naturally mated controls, CR was 86, 80, 86 and 89% resp., and the percentage whelping 73, 60, 77 and 77; litter size averaged 5.3, 4.7, 5.2 and 5.9, and the number of cubs weaned per inseminated female 3.2, 2.1, 3.4 and 3.6.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 109-114, 1983.

3 tables, 1 reference.

In RUSS.

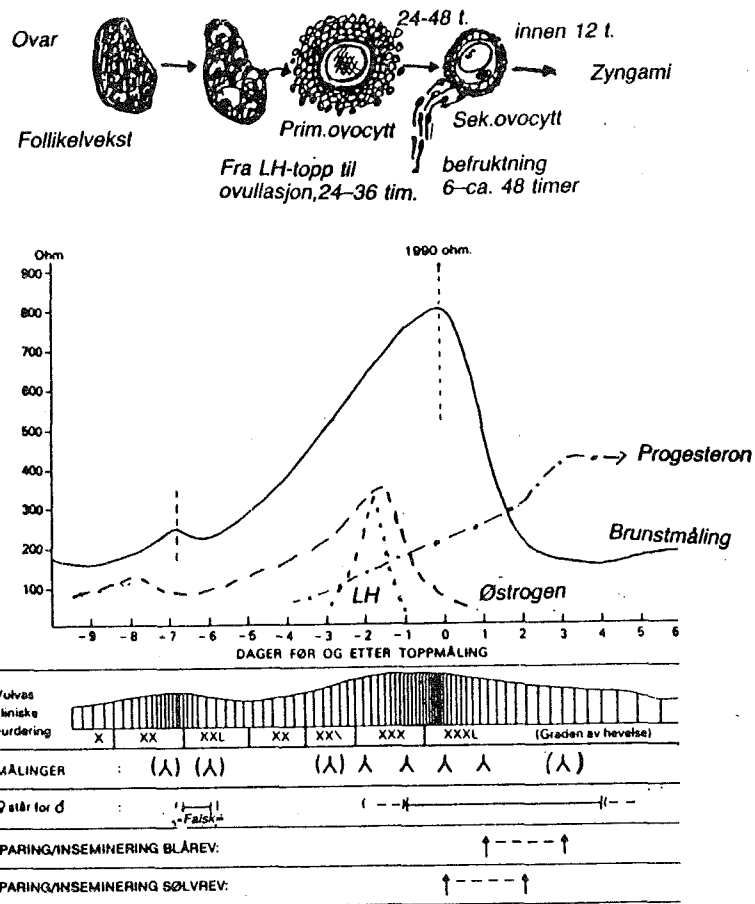
CAB-abstract.

ARTIFICIAL INSEMINATION OF FOXES.

(Kunstig sædoverføring i avlsarbeidet med rev).

Jan A. Fougner.

Of 24,054 blue fox and 9476 silver fox females inseminated with fresh semen in Norway in 1985, 73 and 67.8% resp. conceived. The number of cubs weaned per inseminated female averaged 4.18 for blue fox females inseminated with blue fox semen, 3.95 for blue fox females inseminated with semen from males of other species and 2.04 for silver fox females. An account is given of oestrus, semen collection and dilution, insemination techniques, cub mortality and the effect of insemination dose on fertility.



Figur 1. Brunstutvikling, brunstkontroll og rett tid for paring/inseminering av rev.

Norsk Veterinærtidsskrift, 98, 2, 127-133, 1986.  
 1 table, 4 figs., 15 references.  
 In NORG.

CAB-abstract.



### INSEMINATION OF FOXES IN DENMARK.

(Insemination af ræve i Danmark).

Niels Therkildsen, N. Regner Andersen.

In 1985, in Denmark, approx. 8000 fox females were inseminated with semen from 20 breeding stations. An account is given of the organisation of breeding stations and the training of inseminators, and the use of frozen semen is discussed.

Dansk Pelsdyravl, 48, 2, 819-822, 1985.

3 figs., 819-822, 1985.

In DANH.

CAB-abstract.

### REPRODUCTIVE ABILITY OF "SHADOW" ARCTIC FOXES.

ВОСПРОИЗВОДИТЕЛЬНАЯ СПОСОБНОСТЬ ПЕСЦОВ ТЕНЬ ПРИ  
РАЗНЫХ МЕТОДАХ РАЗВЕДЕНИЯ

E.M. Val'tman.

The "Shadow" mutation of blue arctic foxes expressed as white spotting, is controlled by an autosomal dominant gene SH, which, in heterozygous animals, may cause abnormalities of the genitalia in females and a lower viability of young, and in homozygous animals may have a lethal effect. When 63 Shadow females were mated with Shadow males, 66% of 527 young were Shadow and 34.0% were veiled; litter size averaged 8.36. When 144 Shadow females were mated with veiled males 51.1% of 1593 young were Shadow and 48.9% were veiled; litter size averaged 11.06. For 7 Shadow females mated with Shadow males, the number of corpora lutea averaged 15.4, the number of implantation sites 12.3, litter size 7.9, and embryo mortality was 49.1% (20.4%, preimplantation and 28.7% postimplantation).

Corresponding figures for 8 Shadow females mated with veiled males were 15.8, 13.1, 12.1, 23.0%, 16.7% and 6.3%. For 592 young born to Shadow females that had been mated with veiled males and 969 young born to veiled females that had been mated with Shadow males, 7.4 and 4.8% resp. were stillborn, and 18.5 and 11.5% died before weaning.

Nauchnye Trudy, nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 17-21, 1983.

3 tables, 4 references.

In RUSS.

CAB-abstract.

### REPRODUCTIVE BEHAVIOUR IN CHINCHILLAS.

(Zum Fortpflanzungsverhalten bei den Chinchillas).

Anonymous.

The mating behaviour of 7 males and 7 females was observed. Of a total of 62 matings, 64% were successfully completed at the first attempt. The number of matings per breeding pair for chinchillas mating more than once ranged from 2 to 19.

Deutscher Pelztierzüchter, 60, 7, 115-118, 1986.

2 tables, 1 fig.

In GERM.

CAB-abstract.

THE DURATION OF PREGNANCY IN MINK IN RELATION TO THE DATE OF  
MATING, AGE AND COLOUR.

ДЛИТЕЛЬНОСТЬ БЕРЕМЕННОСТИ НОРОК В ЗАВИСИМОСТИ ОТ  
ВРЕМЕНИ СПАРывАНИЯ, ВОЗРАСТА И ЦВЕТОВОГО ТИПА

V.G. Bernatskii.

Pregnancy duration averaged 51.2 (41-69), 49.3 (41-66) and 49.1 (41-66) days in Standard females mated on 10, 12 and 14 March, resp.; corresponding figures for Pastel females were 53.7 (41-70), 53.0 (41-68) and 51.5 (43-64), and for Ampalo Silver females 55.4 (42-70), 52.4 (42-68) and 51.0 (42-66). The wide range in pregnancy duration was due to variation in (1) the time from ovulation to mating, (2) the duration of passage of ova through oviducts, and (3) the duration of the postimplantation stage of development. The duration of embryonic diapause was 2-31 days. Pregnancy duration was up to 1.2 days longer in young than in mature females.

The number of liveborn young was 0.8-1.9 greater for short pregnancies than for long pregnancies.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 93-100, 1983.

3 tables, 9 references.

In RUSS.

CAB-abstract.

THE RELATIONSHIP OF REPRODUCTIVE PERFORMANCE OF MINK  
WITH THE TIME AND ORGANISATION OF MATING.

ВОСПРОИЗВОДИТЕЛЬНАЯ СПОСОБНОСТЬ НОРОК В ЗАВИСИМОСТИ  
ОТ СРОКОВ И СИСТЕМ СПАРывАНИЯ

V.G. Bernatskii, Z.A. Mashtak.

Data are given in graphs on the CR, return to oestrus, and percentage of infertile females at 3 mink farms, mated within several 3-day periods from 5 to 25 March. Some differences in the av. date of last mating were observed between colour types (Standard, 16.00 h on 14 March; Ampalo Silver, 07.00 h on 15 March; Pastel, 16.00 h on 13 March). At the 3 farms, the period of the highest incidence of mating was 9-16, 13-20 and 9-20 March, and the highest CR was obtained on 9-16, 10-19 and 13-25 March, resp.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 101-109, 1983.

6 figs., 7 references.

In RUSS.

CAB-abstract.

REPRODUCTIVE PERFORMANCE OF NUTRIA OF DIFFERENT AGES HOUSED INDOORS.

ВОСПРОИЗВОДИТЕЛЬНАЯ СПОСОБНОСТЬ НУТРИЙ РАЗНОГО  
ВОЗРАСТА В ЗАКРЫТОМ ПОМЕЩЕНИИ

N.A. Tsepkova.

Female nutria (30-76 per group) that had been weaned from their dams at 45-60 days of age were jointed with males at 4, 5, 6 or 7 months of age.

The males were 2 months older and 1-2 kg heavier than the females. Body weight of females averaged 2950, 3150, 3700 and 4304 g at the 4 joining ages resp., and 4612, 4718, 4731 and 5351 g at whelping. Mortality up to whelping was 23.3, 13.2, 17.2 and 15.7% resp., CR 40.0, 50.0, 43.4 and 45.7%, and the percentage of abortions 16.6, 5.3, 6.1 and 9.4; litter size averaged 6.3, 6.1, 6.4 and 6.5, and the number of liveborn young 6.2, 5.7, 5.7 and 6.1 per female whelping and 2.1, 2.7, 2.3 and 2.5 per housed female.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 57-62, 1983.

4 tables, 5 references.

In RUSS.

CAB-abstract.

#### REPRODUCTIVE ABILITY OF FEMALE SABLES OF DIFFERENT AGES AND SIZES.

#### ВОСПРОИЗВОДИТЕЛЬНАЯ СПОСОБНОСТЬ САМОК СОБОЛЕЙ В ЗАВИСИМОСТИ ОТ ВОЗРАСТА И ДЛИНЫ ТЕЛА

E.G. Sergeev.

400 females at a farm were grouped according to body length as follows: (1) 0.5 sigma above the mean, (2) mean plus of minus 0.5 sigma, and (3) 0.5 sigma below the mean. In the 1st breeding season the percentage of females mated was 28, 33 and 23 in the 3 groups; of these, 97.3, 97.5 and 57.1 resp. failed to conceive. In the 2nd breeding season, 97, 97 and 96% of females were mated, and 70.3, 66.4 and 62.3% failed to conceive. In the 3rd season, the corresponding percentages were 100, 99, 100, 51.1, 50.4 and 39.9, in the 4th season 99, 100, 199, 36.4, 36.4 and 27.6, and in the 5th season 100, 100, 100, 18.0, 20.0 and 25.0. It was concluded that whilst the reproductive performance improved with parity, the differences between body size groups were non-significant.

nauchnye Trudy, Nauchno-Issledovatel'skii Inst., Pushnogo Zverovodstva i Krolikovodstva, 29, 203-207, 1983.

1 table, 7 references.

In RUSS.

CAB-abstract.

#### PERIPHERAL PLASMA PROGESTERONE CONCENTRATION AND HAEMATOLOGICAL INDICES DURING NORMAL PREGNANCY OF CHINCHILLAS (CHINCHILLA LANIGER, M.)

J. Gromadzka-Ostrowska, B. Zalewska, E. Szylarska-Gożdż.

1. Peripheral plasma progesterone concentration and some haematological indices in pregnant chinchillas were studied.

2. As pregnancy advanced progesterone concentration showed a marked change from high values in early pregnancy (days 9-29), to undetectable values by days 40-60, and from high values in the latter stages of pregnancy (days 70-80), to very low values during the 39 days before parturition.

3. Haematocrit value and mean erythrocyte volume change inversely to progesterone concentration fluctuations.

4. White blood cell parameters increased during the first half of pregnancy, then increased to the lowest level before parturition.

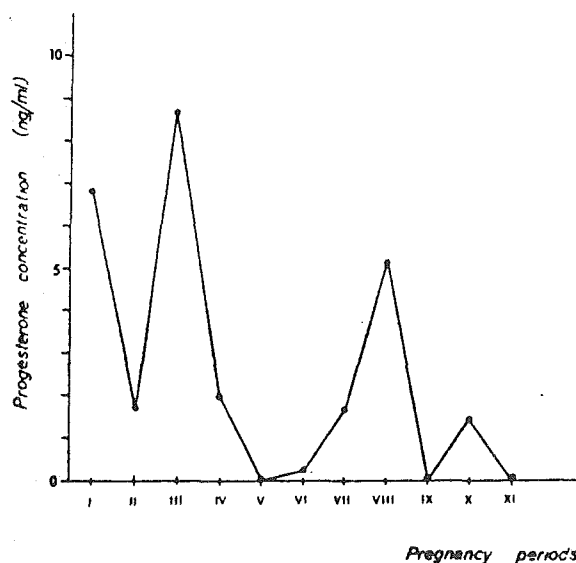


Fig. 1. Peripheral plasma progesterone concentrations during chinchilla's pregnancy. Points represent mean data from 13 females.

Comp. Biochem. Physiol., 82A, 3, 661-665, 1985.  
2 tables, 3 figs. 23 references.

Authors' abstract.

#### PREDICTING THE PERCENTAGE OF NON-CONCEIVING FEMALE SABLES FROM THE CONCENTRATION OF PROGESTERONE IN THE BLOOD.

T.G. Novikova, Yu V. Polyntsev, E.G. Snytko, V.N. Naumova.

23, 116, 35 and 197 females were investigated in 4 yr. For females with progesterone concentration 500 pg/ml in Aug., the percentage not conceiving was 100, 91.4, 100 and 88.2 in the 4 yr; corresponding percentages for females with 500-800 pg/mg 100, 73.7, 100 and 70.0, and for females with 800 pg/ml they were 28.3, 29.7, 15.4 and 39.2.

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst., Pushnogo Zverovodstva i Krolikovodstva, 29, 89-92, 1983.

1 table, 5 references.

In RUSS.

CAB-abstract.

#### THE CONCENTRATION OF SEX HORMONES IN FEMALE ARCTIC FOXES DURING THE REPRODUCTIVE CYCLE.

#### УРОВЕНЬ ПОЛОВЫХ ГОРМОНОВ У САМОК ПЕСЦОВ В ПЕРИОД РАЗМНОЖЕНИЯ

T.G. Novikova, A.V. Sobol', G.M. Diveeva.

Data were obtained on 23 females which had given birth to more than or equal to 8 cubs. The concentrations of progesterone, oestradiol and testosterone were estimated at 1- to 10-day intervals from 15 days before mating to whelping. The results are given in graphs. The concentration of progesterone rose from approx. 0.4 ng/ml 15 days before mating (pro-oestrus) to 24 ng/ml at mating and 43 ng/ml 15 days after mating, and declined to 18 ng/ml 45 days after mating and to 6 ng/ml at whelping. The peak concentration of oestradiol (140 pg/ml) was recorded at the end of pro-oestrus (6-3 days before mating); it decreased to 70 pg/ml during oestrus, rose to 90 pg/ml at whelping, and declined to 40 pg/ml after conception. The concentration of testosterone increased from 330 pg/ml during pro-oestrus to 830 pg/ml 4 days before mating, and declined to the original level at mating, and to 100 pg/ml during pregnancy. Swelling of the vulva

was correlated with the percentage of epithelial cells in vaginal smears (0.69), the concentration of progesterone (0.62), and the concentration of oestradiol (0.35).

Nauchnye Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 29, 81-88, 1983.

1 table, 3 figs., 7 references.

In RUSS.

CAB-abstract.

#### RESULTS FROM THE 1984 MATING SEASON.

(Resultat från parningssäsongen 1984).

Gabrielle Lagerkvist, Lars Elofson, Hans Gustafsson.

429 mink females were mated twice, the 2nd mating occurring 9 days or 1 day after the 1st mating (groups 1 and 2). For young females in group 1, whose 1st mating occurred on 8, 12 or 15 March, the percentage of infertile females was 8, 8 and 9 vs. 8, 3 and 8 for adult females in the same group, litter size at birth averaged 5.8, 6.8 and 5.7 vs. 5.5, 6.2 and 6.4, and the number of kits per mated female at 3 wk averaged 4.5, 4.7 and 4.1 vs. 4.4, 4.9 and 4.7. For young females in group 2, whose 1st mating took place on 10, 13, 16, 19, 22 or 25 March, the percentage of infertile females was 50, 7, 15, 7, 7 and 0 vs. 19, 0, 0, 5, 5 and 11 for adult females, litter size at birth averaged 4.3, 6.4, 6.4, 5.5, 5.9 and 6.3 vs. 6.8, 6.2, 6.8, 6.6, 6.8 and 7.9, and the number of kits per mated female at 3 wk averaged 1.5, 4.5, 3.8, 4.2, 4.0 and 4.6 vs. 4.4, 4.4, 5.8, 5.5, 5.7 and 6.1. It was concluded that young females should be mated for the 2nd time 9 days after the 1st mating, but that adult females should be remated the day after the 1st mating. Date of 1st mating did not significantly affect litter size of young females, but adult females mated late in the season performed better than those mated early. A study of ovaries and embryos from 30 females killed 3 days after the 2nd mating, from 36 female killed 1 month after the 2nd mating, and from 16 females which were not mated confirmed the above findings.

Våra Pälsdjur, 56, 2, 44-47, 1985.

4 tables.

In SWED.

CAB-abstract.

#### LOOKING AHEAD TO THE 1985 MATING SEASON.

(Inför avelssäsongen 1985).

Gabrielle Lagerkvist.

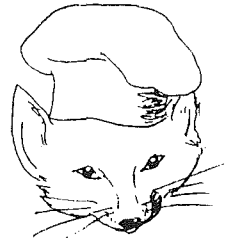
An account is given of mating combinations that may be used to produce Black Cross, Blue Cross, Brown Cross, Shadow and Scan Brown mink, and Albino (Frett) and Pastel polecats.

Våra Pälsdjur, 56, 2, 40-42, 1985.

2 tables, 5 figs.

In SWED.

CAB-abstract.



ZINC METABOLISM IN MINK.  
(Zinkomsætning hos mink).

NUTRITION

Heddie Mejborn.

The effect of zinc content in the diet on the zinc metabolism was investigated.

In balance studies with growing and adult male mink it was shown that the zinc balance (mg) increased with increasing zinc intake and that most zinc was excreted in the faeces. In percent of intake the zinc excretion in faeces was rather constant, 60% in adult and 80% in growing mink receiving normal to high amount of zinc (40-340 mg/kg dry matter) while it was lower in animals fed less than 25 mg zinc/kg dry matter. Excretion of zinc in urine increased with increasing zinc intake. In percent of zinc intake the excretion was highest (up to 31%) in animals fed diets with low zinc concentrations and lower (2-15%) in animals fed normal and high amounts of zinc.

The endogenous zinc excretion to the digestibility tract was measured using the radioisotope dilution technique adapted to mink. At very low zinc intake ( $\leq 12$  mg/kg dry matter), the endogenous zinc excretion was low but it accounted for an important part (57%) of the total amount of faecal zinc. At very high zinc intake (500 mg/kg dry matter), the absolute amount of endogenous zinc was higher but in percent of total faecal zinc excretion it was a less important part (7%).

There was no significant difference among mink receiving diets with 10, 130 and 555 mg zinc/kg dry matter in the turnover of zinc in the plasma pool. Turnover rate was about 15% of the pool per minute. It seemed likely that the liver played an important role in regulation of zinc metabolism. However, the zinc concentration in the liver was no good indication for the zinc status. For that purpose zinc concentration in pancreas and bone (femur) was shown to be more useful.

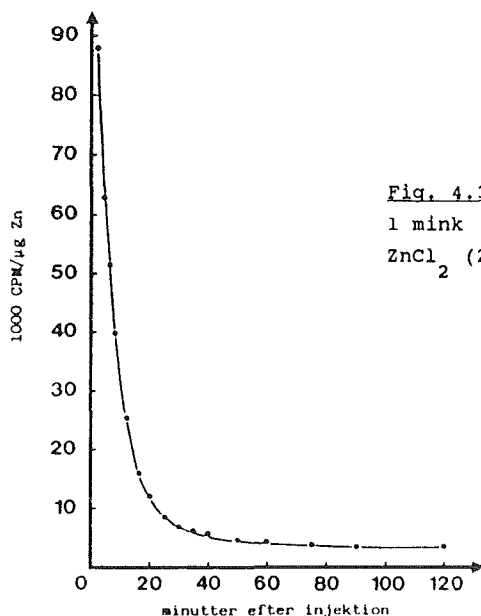
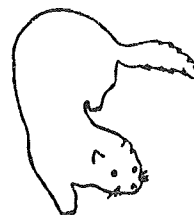


Fig. 4.3. Specifik aktivitet af  $^{65}\text{Zn}$  (1000 CPM/ $\mu\text{g}$  Zn) i plasma fra 1 mink som funktion af tiden efter intravenøs injektion af  $^{65}\text{Zn}-\text{ZnCl}_2$  (24  $\mu\text{Ci}$ ). Foderets zinkindhold var 32 ppm i vådfoder.



Dissertation, Inst. of Animal Physiology, The Royal Vet.- and Agricultural University, Copenhagen, Denmark.

26 tables, 12 figs., 108 references. 128 pp.

In DANH.

Author's abstract

### COMPARISON OF SOYBEAN MEAL AND HERRING MEAL IN DIETS FOR GROWING-FURRING MINK.

(Utilisation du tourteau de soya et de la farine de hareng dans l'alimentation du vison).

Alain Andersen.

Dehulled soybean meal (SM) and herring meal (HM) were examined for their respective capacity to partially replace fresh and frozen meats in diets for growing-furring mink.

A conventional meat-based diet served as a control diet (diet no. 1) and was compared to 4 other diets in which 25% of the meat proteins were replaced by SBM (diet no. 2), by a mixture consisting of 2/3 SBM + 1/3 HM (diet no.3); by a mixture consisting of 1/3 SBM + 2/3 HM (diet no. 4); by HM (diet no. 5). There were 40 male Pastel kits per treatment and all the animals were housed in individual cages. There was a positive significant correlation between weight gain and the level of HM used in the diet, so that the lowest gains were obtained with SM (diet no. 2) (515 g) and the highest gains with HM (diet no. 5) (755 g). Mixtures of SBM + HM gave intermediate results (diet no. 3: 566 g) (diet no. 4: 639 g). Furthermore, the HM containing diet (no. 5) (710 g) yielded higher weight gains than the conventional control diet (no. 1). (755 g). In general, pelt length measurements followed those for weight gains so that diet no. 2 yielded the shortest pelts (68.0 cm), whereas, the longest pelts were obtained for diets no. 1 (72.2 cm) and no. 5 (72.3 cm). Diets no. 3 and no. 4 gave intermediate values (70.5 cm and 70.4 cm, respectively). In respect to fur quality, the assessment yielded almost the same value for all diets. Dry matter digestibility data collected on 7 mink per treatment indicated that the presence of SBM lowered the values: no. 1 (71.4%); diet no. 2 (66.0%); diet no. 3 (65.4%); diet no. 4 (70.5%); diet no. 5 (71.5%).

MSC. thesis, (1979), Université Laval, Quebec, Canada. 123 pp.

12 tables, 3 figs., 13 appendixes, 35 references.

In FREN.

Author's abstract.

### TOLERANCE OF GROWING-FURRING MINK FOR METABOLISABLE ENERGY AND PROTEINS.

(Performances des visonneaux soumis a des regimes dont la composition en energie metabolisable et en proteies est variable).

Michel Flamand.

This experiment was carried out in order to verify the tolerance level for metabolisable energy and proteins of growing-furring mink fed conventional type diets.

To carry out the experiment, conventional diets were prepared in which, on a dry matter basis, the levels of metabolisable energy were 3900, 4200 and 4500 kcal/kg, and in which the levels of proteins were 34, 38 and 42%.

There were 30 Pastel males per dietary treatment for a total of 180 mink. The experiment lasted approx. 20 wks (weaning to pelting). The animals were kept in individual cages and fed ad libitum. The measures made were: body weight gains, pelt lengths and fur quality. During the growing period, 4 kits per diet were placed in metabolic cages and submitted to digestibility and Nitrogen retention measurements.

Best body weight gains were achieved when the animals were fed diets high in metabolisable energy and high in protein contents, whereas, the lowest gains were obtained when the diets were low in metabolisable energy and high in protein contents. The linear effect between energy level and weight gain was highly significant. Quite similar results were obtained in respect to pelt length since there was a highly significant positive linear effect between weight gain and pelt length. However, the energy or protein level of the diet had no effect on the quality of the fur.

When the energy level of the diet increased, the dry matter and protein digestibilities also increased in a significant linear fashion. There was a highly significant positive effect between the protein level of the diet and the level of Nitrogen retention. However, as the level of protein intake increased, the level of Nitrogen retention was reduced.

In summary, these results tend to show that, within a fairly wide range of energy and protein levels, these nutrients may affect live performance of growing-furring mink as well as the length of their pelts. However, these nutrients seem to have little or no effect on the quality of the fur.

M. Sc. thesis, Université Laval, Québec, Canada, 1986, 100 pp.

10 tables, 6 figs., 20 appendixes, 40 references.

In FREN.

Author's summary.

#### USE OF ALTERNATIVE PROTEIN-FEEDSTUFFS IN MINK FEEDING.

(Användning av alternativa proteinfodermedel i minkens utfodring).

Hans Berg.

The feed stuffs, wheat gluten, potato protein (Protamyl) and feather-chicken meal, has been tested, during production- and digestibility trials, for digestibility, influence and growth on fur characteristics in mink and compared to other dried feedstuffs regarding protein quality.

In the growth trial some of the fish and slaughterhouse offal in a ordinary diet was replaced by 4% wheat gluten or potato protein and 6 or 12% feather-chicken meal. Compared to the control groups and the experimental groups, except of the 12% feather-chicken meal group, no statistical difference regarding growth was noticed, but in the 12% groups the growth was statistical significant reduced.

Only the males were pelted. Any statistical significant effects on skin characteristics were found except of the fact that the group given wheat gluten had larger skins than that of the other groups.

In the digestibility trials the protein quality was evaluated in soya meal, potato protein, fish meal, feather-chicken meal, wheat gluten, Pekilo (a fermentation product) and meat meal. The actual feed stuffs were given as the only protein source in the diet, and there was used a three-days pre-period and four days collecting period. Quantitative collection was used.



The true protein digestibility was highest for wheat gluten (95.8%) followed by potato protein (88.9%). The worse digestibility was found in feather-chicken meal (56.2%).

The nitrogen balances and the biological values was low. The amino acid content of the feed stuffs examined was in agreement with other findings.

The results of the actual investigation indicate that wheat gluten, potato protein and feather-chicken meal of the proved qualities can replace about 20% of the total protein content in the feed mix for mink. Wheat gluten and potato protein has a protein quality equal to the ordinary used fish meal. Feather-chicken meal cannot reach this level.

Fur Animal studies, No. 4, 1981.

Helves Stiftelse, Vanda. Dissertation, Helsinki University.

28 tables, 1 fig., 117 references, 25 appedixes, 118 pp.

In SWED. Author's summary translated by G. Jørgensen.

#### COMPARISON OF 3 FEEDING SYSTEMS FOR GROWING-FURRING MINK: CONVENTIONAL vs SEMI-COMPLETE vs. PELLETS.

(Etude comparative de l'alimentation du vison avec une nourriture conventionnelle, une nourriture semi-complète ou une nourriture complète sèche en comprimés).

Johanne Laplante.

Under certain circumstances, conventional feeding (high level of meats) may be somewhat difficult or costly. Therefore, it appeared useful to compare this feeding system with other feeding systems, namely, semi-complete (meats + fish meal) and pellets.

In a first experiment, we compared groups of 50 male and 50 female Pastel kits fed a conventional diet with similar groups of mink fed commercial pellets. Results indicate that kits from both sexes fed a conventional diet yielded better growth rate and carcasses with more fat than those fed pellets. For the males, similar results were obtained for pelt length but, for females, pelt length was essentially the same for both groups. Fur quality was essentially the same among groups. The reduced growth effect for the pellet group may be partly due to the fact that the weaned kits were not initially adapted to eating pellets so that pellets refusal and wastage occurred during the first 6 weeks of the experimental period.

In a second experiment, we compared a group of 50 male and 50 female Pastel kit fed a conventional diet with similar groups of mink fed either a semi-complete diet (94 males and 77 females) or a pelleted diet (99 males and 89 females fully adapted to pellets). Results showed that the best body growth for both sexes was achieved using the semi-complete diet followed in order by the conventional diet and the pellets, even through the pelts from the conventional diet were the longest. For both sexes, the highest fur quality was obtained when the animal had received pellets.

Other studies indicated that feed intake was as good using pellets than wet feeds and that feed cost may be reduced by as much as \$1.50 per pelt using pellets.

M.Sc. thesis, Université Laval, Québec, Canada, 1985, 124 pp.

23 tables, 11 figs., 21 appendixes, 53 references.

In FREN.

Author's summary.

## CORRELATIONS BETWEEN THE B<sub>6</sub> AVITAMINOSIS AND THE REPRODUCTION TROUBLES IN MINK.

(Corelatii intre avitaminoza B<sub>6</sub> si tulburarile de reproducie la nurca).

N. Pâstîrnac, R. Gruia.

In the report has been done a series of observations referring to the influence of the pyridoxine deficit upon the reproduction of Standard mink females and, respectively, to the annihilation of B<sub>6</sub> vitamine deficiency, the experiment having two distinct stages.

The first stage (december-april) had as aim the reduction of B<sub>6</sub> vitamine level at a lot of 120 females and the kits obtained, the results being compared to a witness lot of the same size. The experimental vitamine deficit was obtained by administrating the hydrazide of the nicotine acid under a 10 mg/animal per day dose, in a ratio whose protein contribution was calculated at 11.08 g prot./100 kcal.

There were watched all the stages characteristic to mink reproduction, beginning with mating up to hits wearing, analyzing the manner in which the little by little installation of pyridoxine deficiency influences each stage. Besides registering the reproduction indicators, were also done some ethologic observations referring to certain behaviours characteristic to the respective vitamine deficiency.

The B<sub>6</sub> vitamine deficit at the experimental lot determined, at mink females, a 22.6% higher infecundity, at well as the reduction of the number of weaned kits with 1.8 per reproductive female, in comparison to the control lot.

The second stage (beginning with the end of April) had in view the recovery of the pyridoxine deficiency lot through the B<sub>6</sub> vitamine administration in the ratio in 1.5 mg and, respectively, 3 mg doses at 1 kg of food, and concomitently, the taking the antivitamin element out from the food.

The study aimed to the reduction or even to the annihilation of the deficiency, but also to establish the deficiency threshold of B<sub>6</sub> vitamine, that's why the affected minks (resulting from the first stage of the experiment) were parted in two lots to which were administrated two different levels of pyridoxine: 0.12 mg/100 kcal and 0.24 mg/100 kcal. If, at the first level, the deficiency symptom persisted, at the threshold of 0.24 mg pyridoxine at 100 kcal the deficiency symptoms were annihilated.

Productia animala - zootehnie si medicina veterinara, 1, 50-53, 1987.

1 table, 1 fig., 8 references.

In ROMN. Abstract in ENGL.

Authors' abstract.

## CONTRIBUTIONS CONCERNING THE INFLUENCE OF THE PYRIDOXINE DEFICIT UPON THE FUR QUALITY AT MINK.

(Influenta deficitului de piridoxina asupra calitatii invelisului pilos la nurca).

R. Gruia, N. Pastîrnac.

The study described some aspects referring to the physiological elements of the fur formation and growth at mink furs, under conditions of B<sub>6</sub> vitamine deficiency in the ration.

The experiments were done from July to November upon a lot of Standard mink young males compared to a control lot (having 120 mink each). The experimental lot didn't benefit by pyridoxine contribution from the premix, which was taken out from the ration. On the other side, the B<sub>6</sub> vitamine inactivation from the food was done through a daily administration of nicotine acid hydrazide under a 10 mg/animal dose, in a ration whose proteic contribution was calculated at 9.1 g prot./100 kcal.

Were analyzed the elements linked to the fur morphostructure characteristic to each stage of its season evolution. The moulting disorders were studied comparatively to the installation of vitamine deficiency, but correlated also to the dynamics of the body weight at mink males in growth. The anatomopathological observations completed the image of the influence of B<sub>6</sub> vitamine deficiency upon mink furs, more precisely upon the considerable depreciation of their quality.

The reduced contribution of nourishing substances from the mink body, consecutive to a reduced consumption of food and to pyridoxine deficiency, favoured the obtainance of animals with a reduced weight at sacrificing and, implicitly, of furs with a reduced surface. At the same time, the pyridoxine deficiency led to mortality growth during sacrificing extraseason, resulting a reduction of winter furs with 2.5% in comparison to the control lot.

Due to the association of the B<sub>6</sub> vitamine deficiency to the appearance of different nutrition diseases specific to mink resulted the significant increase (with 22.5%) of furs with different degrees of defects, most of them very serious, but also of moderate seriousness, but with evident economic consequences.

Productia animala - zootehnie si medicina veterinara, 1, 54-58, 1987.

2 tables, 1 fig., 10 references.

In ROMN. Abstract in ENGL.

Authors' abstract.

#### A METHOD OF ECONOMIZING ON FEEDS FOR MINK.

#### Один из путей

#### экономии кормов

N.A. Balakirev.

Mink were in 4 groups. The mashed diet for group 1 was covered with metallic caps to prevent pecking by birds, and in the inside of the cage feeding stands each 10 x 14 cm<sup>2</sup> were provided. Group 2 was provided only with the feeding stands each 16 x 20 cm<sup>2</sup>, whereas group 3 had neither feeding stands nor the metallic cap covering. Group 4 was the control kept traditionally and provided with feeding stands 10 x 14 cm<sup>2</sup> area. The diet was complete and contained 7.7 to 8.7 g digestible protein, 5.0 to 5.2 g fat and 4.1 to 4.5 g carbohydrate per 100 kcal metabolizable energy (ME). For 4 months the daily intake of ME was 433, 427, 372 and 419 kcal for the 4 groups, respectively. Initial bodyweight was 1047, 1037, 1047 and 1045 g and final bodyweight 2035, 2095, 1926 and 1985 g. Percentage of pelts of class-A large size was 18.2, 17.6, 0 and 0, and of class-B large size 45.5, 52.9, 75.0 and 82.7.

Krolikovodstvo i Zverovodstvo, 2, 9, 1985.

1 table.

In RUSS.

CAB-abstract.

**THE EFFECT OF CEREALS ON GROWTH, PELTQUALITY AND REPRODUCTION  
OF BLUE FOXES IN THE NETHERLANDS.**

G. de Jonge, H.J. Hof, E.J. de Weerd.

From August 1985 until November 1986 Blue foxes and their offspring at the experimental farm "The Spelderholt" were fed on a diet without cereals. The diet consisted of raw chicken and plaice offal supplemented with a traditional Premix of vitamins and minerals. From weaning until pelting, the chicken-plaice ratio was 2:1.

The control group was fed on a similar diet except that of mixture of cereals was added (10% cereals and 15% water).

Both in 1985 and 1986 young males and females of the experimental group (receiving no cereals) became about 0.5 kg heavier and developed a slightly better peltquality than did the controls.

On the other hand, in the experimental group kit mortality during nursing approximated 40%. From practically every litter, some young died whereas the survivors developed better (see above) than did the larger number of survivors of the control groups.

It is concluded that it is cheaper and better for the foxes to omit cereals from weaning until pelting. Addition of cereals during the remaining part of the year is required.

De Pelsdierenfokker, 37, 1, 8-12-1987.

5 tables, 2 references.

In DUTH.

Authors' summary.

**TRIALS WITH DRY FEED.**

**(Forsøg med tørfoder).**

Georg Hillemann.

In trials on standard and pastel mink breeding results and weight of young at 42 days were satisfactory with pelleted feed, compared with control diet. During the growing period, from July to November, groups of 280 young mink had freely 1 of 3 types of pellet, control feed, moist feed on weekdays and pellets at weekends, or diet with 5% powdered dry feed plus water replacing 15% of the complete feed. Behaviour and appetite were normal in all groups. Weight gain was least with pellets. Pelts (male only) were smaller, but of higher quality, with pellets and pelt price was less than for controls. With the other experimental variants results were about the same as for controls. Cost of feed per mink was most with pellets and least with added dry feed or with pellets at weekends.

Dansk Pelsdyravl, 48, 19, 638-641, 1985.

9 tables.

In DANH.

CAB-abstract.



**HERRING SCRAPS - SUITABLE FOR MINK.****(Silde-afskær - velegnet til minkfoder).**

Georg Hillemann.

From July to November 7 groups of 280 young mink, standard and pastel, male and female, had freely a traditional farm mixture (control) or with 8 or 16% frozen, chilled or ensiled herring scraps. Behaviour, appetite and growth were normal. Thiamin status, assessed from urine in 3 of the groups, was considered satisfactory. Pelt characteristics and price (male only assessed) were poorer with ensiled material added to a mixture already containing 10% fish silage. Fatty infiltration of liver was commonest with chilled material.

Dansk Pelsdyravl, 48, 7, 435-437, 1985.

6 tables, 1 fig.

In DANH.

CAB-abstract.

**EXPERIMENTS WITH PIG PULP FOR MINK.****(Forsøg med svinepulp til mink).**

Georg Hillemann.

Two groups of 200 young mink, standard and pastel, male and female, were given freely feed with 0 or 12% heat-treated pig carcass waste preserved with HCl and formic acid, plus antioxidant. Handling, consistency and keeping quality of the pulp presented no problems. Behaviour and appetite were normal, but weight gain was less and faecal consistency slightly changed with pulp. Pelt quality, especially silkiness, was clearly improved and pastel pelt size slightly less with pulp, but average pelt prices were about the same in both groups.

Dansk Pelsdyravl, 48, 6, 373, 375, 1985.

5 tables, 2 pp.

In DANH.

CAB-abstract.

**DRY FEED IS A REALISTIC ALTERNATIVE TO TRADITIONAL FEED FOR FUR ANIMALS.****(Tørfoder er realistisk alternativ til traditionelt pelsdyr-foder).**

Georg Hillemann.

From mid-July till pelting 2 groups of 280 young mink, standard and pastel, male and female, had freely a traditional mixture (control) or pelleted dry feed. Behaviour and appetite were normal, but faecal consistency was affected by pellets. Pastel pelt size was slightly less, but quality, especially for pastel, was improved and there were fewer flat pelts with pellets. Only male pelts were assessed. Pelt prices were somewhat higher, especially for pastel, but feed cost was more than in the control group.

Dansk Pelsdyravl, 48, 5, 306-307, 1985.

5 tables.

In DANH.

CAB-abstract.

## FEEDING TRIALS WITH ARCTIC FOXES IN 1984.

(Fodringsforsøg med blåsræve i 1984).

H. Konnerup-Madsen.

For 85 days 5 groups of 80 young foxes had conventional mink feed (control), 8 or 16% frozen herring waste, with fat adjustment, at expense of cod waste, 16%, as in group 3, plus 5% barley and 0.5% fat, replacing fish and fish waste, or Kemovit dry feed pellets. Use of frozen herring waste had no effect on pelt size or colour, but impaired the quality. Poorer result was partly offset financially by 5% reduction in feed intake.

Dansk Pelsdyravl, 48, 7, 455, 1985.

1 table.

In DANH.

CAB-abstract.

## FITCH FEEDING IN RELATION TO HYDATIDS CONTROL.

David Heath.

The feeding of raw sheep meat and offal to fitch *Mustela putorius* is considered a safe practice. In experiments in which fitch were fed sheep or inoculated with *Echinococcus granulosus* or *Taenia ovis*, no tapeworms developed. Dogs however must be kept away from fitch cages so they cannot eat the raw meat or offal.

N.Z. Journ.of Agric., 150, 6, 52, 1985.

CAB-abstract.

## THE COLONIC SEPARATION MECHANISM IN THE GUINEA-PIG (*CAVIA PORCELLUS*) AND THE CHINCHILLA (*CHINCHILLA LANIGER*).

Kjell Holtenius, Göran Björnhag.

The proximal part of the guinea-pig and chinchilla colon are provided with a longitudinal furrow between two mucosa folds. The function of the furrow in connection with the digesta passage was studied in 45 guinea-pigs. The nitrogen concentration of the contents of the furrow was on average 1.6 times as high as in the main lumen contents. The amount of viable bacteria decreased along the proximal colon. It was on average 1.7 times as high in the furrow as in the main lumen contents. Labelled bacteria infused through a cannula into the proximal colon of guinea-pigs were transported in the furrow towards and into the caecum.

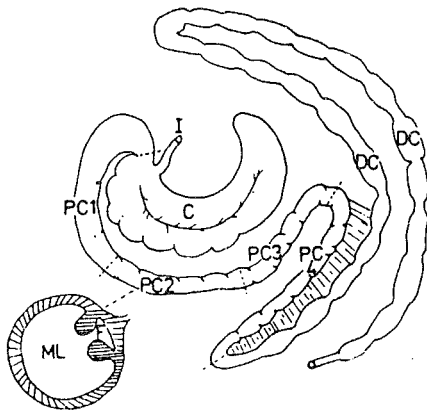


Fig. 1. The large intestine of caviomorph rodents, a schematic view. I = ileum, C = caecum, PC1-4 = proximal colon parts 1-4, DC = distal colon, F = furrow, ML = main lumen.

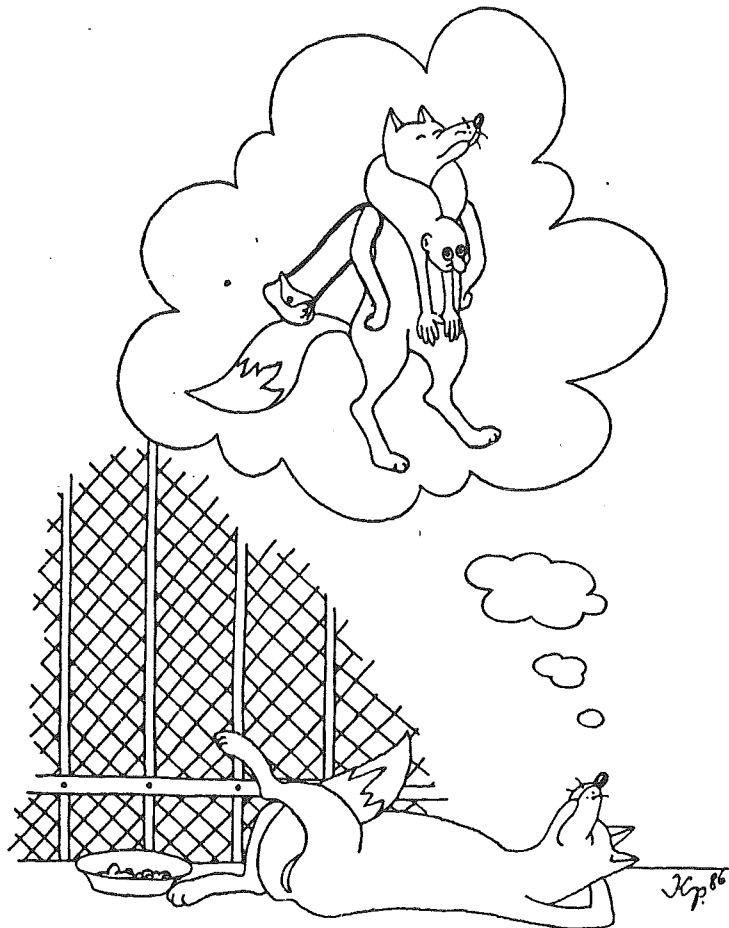
Changes in nitrogen concentration in the proximal colon was observed in the guinea pigs and also in 16 chinchillas. The concentration decreased successively along the proximal colon in both species. Two types of pellets were found in the distal colon, one with high and one with low nitrogen content. The high nitrogen pellets are never found in the delivered faeces. They are thus used for caecotrophy.

It can be concluded that the furrow in the proximal colon of both species is part of a separation mechanism by which bacteria are moved towards the caecum by means of antiperistalsis. The accumulation of bacteria in the caecum allows a high fermentation rate. The separation mechanism ceases to function with certain intervals and caecotrophes are then formed.

Comp. Biochem. Physiol., 82A, 3, 537-542, 1985.

3 tables, 2 figs., 21 references.

Authors' summary.



*Original Report*

# A Case of Feed-Borne Virus Transmission in an Epidemic Outbreak of Mink Virus Enteritis

*Per Henriksen*, National Veterinary Laboratory, 2 Hangøvej, DK-8200 Århus N

## Introduction

Mink virus enteritis (MVE) is an acute viral enteritis caused by a stable parvo virus. The disease was first described by Schoefield (1949) in Fort William in Ontario, which led to first name i.e., Fort-William-Disease.

The disease is endemic in most mink-producing countries including Denmark. Knox (1958) made the first diagnosis of MVE in Denmark. The symptoms are anorexia, diarrhoea with fibrin and blood and dehydration. The incubation time is usually 4-9 days (Löfliger 1970). The mortality rate varies a great deal, but is between 2-10% in an average outbreak of MVE in Denmark. The average number of MVE outbreaks is usually around 50.

The route of transmission is introduction of virus-containing faeces or utensilia in the farms. This can happen by transporting mink during the incubation time or by clinically healthy mink with faecal virus excretion. Another possibility is feed-borne transmission of virus.

A large epidemic outbreak in Denmark took place in the autumn of 1986. Approximately 95 cases of MVE were diagnosed among the customers of a feed-producing factory corresponding to 30% of the total number of customers. The factory had a minkfarm situated at the factory ground. The first cases of MVE were diagnosed in the second week of July. The minkfarm at the factory revealed the typical symptoms of MVE the 10th of July.

The aim of the present study was to evaluate the possible route of transmission of MVE in this large outbreak. There were two obvious possibilities of the origin of the MVE-virus: (I) The MVE was introduced in the factory minkfarm and then accidentally contaminating the feed or (II) the virus was introduced in the factory by viruscontaminated raw-materials as for example by-products from the fishing industry.

## Materials and methods

Every factory in Denmark producing mink feed has to deep-freeze 1 kg of the daily production, to be analysed in a retrospective study if outbreaks of diarrhoea occur among the customers of the factory.

From the factory with the many MVE outbreaks 1 kg feed samples were obtained from the following production days: 01.-05.86, 08.-12.07.86 and 14.-15.07.86.

Twelve mink of the pastel genotype (6 males and 6 females) from an area in Himmerland (Jutland) without MVE and prophylactic vaccination for at least five years were used as research animals. The age of the mink were around 4 months. The mink were housed at the laboratory in conventional cages a week prior to the feeding regime started. In this acclimatization period the mink were fed with a commercial dry diet from Kemovit<sup>®</sup>. The obtained feed samples were fed to the mink according to the following scheme:

*Feed from the factory with the listed production days*

Feeding at the lab.	Group 1	Group 2	Group 3
26.08.86	01.07	05.07	11.07
27.08.86	02.07	08.07	12.07
28.08.86	03.07	09.07	14.07
29.08.86	04.07	10.07	15.07

Each group consisted of 2 males and 2 females.

Faeces samples were collected prior to the experimental start (26.08.86) and daily before feeding until the 5th of September. The samples were frozen and stored until examination for MVE-virus. The faeces were analyzed at the National Veterinary Institute for virus research, Lindholm\* by ELIZA and electron microscopy.

The feed samples were also evaluated by a total bacterial count (Bloodagar) at 37° C and by use of selective media (Potassium tetrathionate bouillon, 42° C) for salmonella. The 6th of September the mink were euthanized.

## Results

None of the 12 mink showed diarrhoea neither in the feeding period nor in the observation period. A slight reduced appetite was observed the first day of the study. The results of the virus identifications in the faecal samples are shown in table 1. The bacterial count of the feed samples showed between 600 and 19.000 aerobic bacteria/g. Salmonella bacteries were not isolated.

\*) The examination for virus was carried by Dr. J.C. Lei whose work is greatly appreciated.



Table 1. Excretion of MVE-virus in the faeces

	Days with collection of faecal samples				
	26.08	31.08	02.09	04.09	05.09
Group 1	-	++	+	-	-
Group 2	-	-	-	-	-
Group 3	-	-	-	-	-

- : No virus identification in the faeces samples  
 + : MVE-virus in the faeces samples  
 ++: MVE-virus in the faeces samples, higher amount than in (+).

### Discussion

The study revealed MVE-virus excretion in the mink fed with samples produced in the period 01.-04.07.86. The mink only excreted virus a few days, which is typical for parvo virus infection in the gut. The two other groups excreted no MVE-virus. The first symptoms of MVE at the minkfarm at the factory appeared the 10th of July, and because the incubation time usually is a week (Löfliger 1970), the introduction of virus must have taken place in the first days of July.

This strongly indicates that the MVE-virus initially was introduced in the factory with secondary transmission to the belonging minkfarm and to other customers. The virus might have been transported to the factory by raw materials. By-products from the fishing industry are collected in open containers and then brought to the feed-producing factory in open lorries.

These containers with fish products are nearly covered with gulls and the containers are always polluted by gull faeces. The hypothesis with virus-contaminated fish by-products can easily explain, why the whole daily production of feed contains MVE-virus. A spread from the minkfarm to the factory can only with great difficulty contaminate a whole daily production.

The area, where the fishing industry is situated, is approximately 100 km from the factory. The area is intensively populated with minkfarms. MVE is a common disease in this area. The gulls can easily have picked up the virus in the minkfarms and since parvo virus is very stable, it might have passed the gull intestine without damage, making the gull faeces infectious. This possibility will be dealt in a later study.

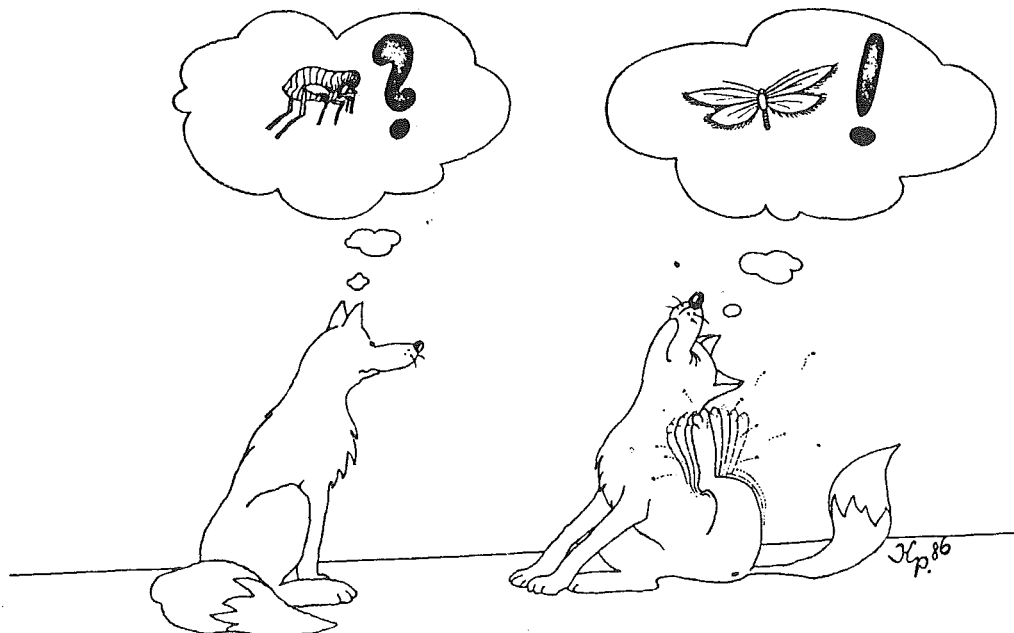
### Conclusion

The epidemic outbreak of MVE among the customers of a large feed-producing factory was most likely caused by virus-contaminated products from the fishing industry situated in an area with endemic MVE. Gulls are a possible vector for transmission of virus from infested farms to the by-products containing jars.

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SCIENTIFUR VOL. 11 NO. 2 1987



Original report

## Pre-Clinical Diagnostics of Thiamine Deficiency in Fur-Bearing Animals

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The problem of thiamine deficiency is actual in fur breeding due to the absence of thiamine synthesis in the intestine of carnivora and the presence of raw fish by-products in the ration containing the enzyme thiaminase, which inactivates vitamin B<sub>1</sub> in the feed. When animals are fed such fish, measures directed on preventing avitaminosis are taken: Alteration of rations, injection of thiamine, boiling fish and siloing of fish with acids, the use of benphothiamine which has a prolonging effect (Khudyakova and Kirillov, 1974; Khudyakova, 1983; Rapoport et al., 1984; Taranov and Kvarnikova, 1985; Jørgensen, 1974 and others). Due to these measures the outbreaks of B<sub>1</sub> avitaminosis with characteristic clinical symptoms (disturbance of co-ordination of movements, cuts of extremities, paralysis) observed at late stages of the deficiency are re-

gistered more rarely than earlier, at present, latent deficiency is more common. It differs on the absence of nervous symptoms and it failed to be diagnosed according to clinical symptoms.

In this connection it is necessary to elucidate clinical microsymptoms of B<sub>1</sub> hypovitaminosis favouring its early diagnostics.

Determination of the activity of thiamine-bearing enzyme of transketolase of blood erythrocytes and especially its stimulation with exogenic co-enzyme thiaminediphosphate (TDP) is a specific and sensitive index of the provision of the organism with thiamine. In the conditions of vitamin deficiency the addition of TDP in vitro activates transketolase. The degree of stimulation or so-called thiaminediphosphate effect (the TDP-effect) is regarded as the measure of thiamine deficiency (Boston, 1975; Trebukhina 1984; Vertongen, 1981 and others). The value of the TDP-effect less than 15% is thought to show the adequate provision, that from 15 to 30% - slight deficiency, from

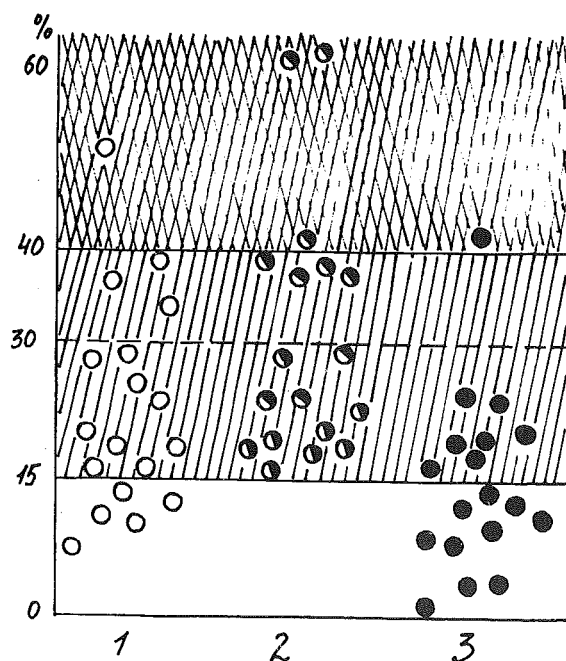


Fig. 1. The effect of different rations on the value of the TDP-effect in experimental minks.

The abscissa groups: 1st - 34% of raw caplin by-products of the protein of meat-fish feed and 1 mg of thiamine per mink/a day; 2nd - 50% of raw caplin by-products of the protein of meat-fish feed for 3 weeks and 70-90% on the fourth week without the addition of thiamine; 3rd - horse-flesh and boiled food of farm ration with daily addition of 1 mg of thiamine per animal. The ordinate - the value of the TDP-effect, %.

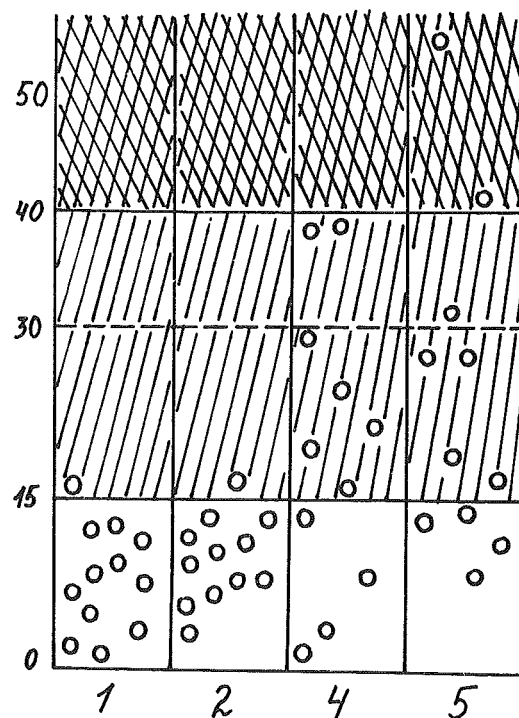


Fig. 2. Distribution of individuals depending on the TDP-effect.

The abscissa - the age, months; the ordinate - the TDP-effect, %.

30 to 40% temperate and above 40% - high deficiency (Brian, Danon, 1970).

In model experiments and in industrial production we have studied the possibility to use the TDP-effect for early diagnostics of thiamine deficiency in animals fed the rations containing different amount of raw thiamine-bearing fish.

The activity of transketolase was determined by Brunés method described by V.V Spirichev et al. (1973) and modified by I. Ya Koń and I.I. Kondrateva (1982).

Stimulation of the deficiency in adult mink females has shown that the number of animals with TDP-effect above 15% increased simultaneously with increased amount of raw thiaminase-bearing fish in the ration (Fig. 1). In 28% of the animals from group I fed with farm rations (34% of raw fodder caplin of the protein of meat-fish feed and 1 gr of thiamine per mink (a day) normal provision with thiamine was recorded; in 50% slight deficiency was observed; in 17% - temperate and in 6% - pronounced biochemical deficiency. On the average, the group is characterized by slight deficiency (TDP-effect is 23%).

For 3 weeks the minks from group II were fed the ration containing 50% of raw thiaminase-bearing fish of the protein of meatfish feed without the addition of vitamin B<sub>1</sub>, and on the fourth week they were fed practically only capelin (70 - 90%). After 20 days, some animals began to ignore the feed, and the biochemical picture of deficiency was aggravated. On the average, the TDP-effect in the group comprised 30% which characterized temperate deficiency. No animals with normal provision were found, in 61% slight deficiency was observed, in 22% - temperate and in 17% - serious deficiency was recorded. The deficiency increases depending on the duration of fish feeding. After 3 weeks the average TDP-effect in the group was 25%; and after 4 weeks - 41%, i.e. it characterized pronounced deficiency with clinical symptoms (denying food). At the same time in Group III which had no thiaminase-bearing fish, the average TDP-effect made up to 14,7%, i.e. it was within the norm.

Studies on the age changes in the activity of transketolase and TDP-effect have revealed the same picture (an increase in the TDP-effect is synchronous to the increased amount of raw thiaminase-bearing fish, Fig. II.). Practically all one- and two-month old minks were adequately provided with the vitamin, while with age the deficiency grew. In five-month old minks, in particular, whose ration contained 37% of by-pro-

ducts of raw thiaminase-bearing fish of the animal food protein and 0,77 mg of thiamine per kit, the deficiency of different degree was observed, and in two minks (18%) the TDP-effect was more than 40% that characterized deep biochemical deficiency.

Adult and nine-month old minks and polar foxes from two fur breeding farms were also studied in the period of preparation for rutting (in January - February) (Table I).

It was found that on the first farm more than half of the minks, fed rations containing 9,6% of by-products of raw caplin of the meat-fish feed protein and 0,9 mg of other thiamine per animal were characterized by adequate provision, and the others - by slight deficiency. The use of the same rations with the addition of 1,71 mg of thiamine per animal resulted in normal provision of most polar foxes.

On the second farm, long feeding (for 6 months) of 20-30% of raw thiaminase-bearing fish by-products of the animal feed protein, though large doses of thiamine were added (18,6% of caplin and 2,2 mg of thiamine per mink and 3,4 mg per polar fox in the period of investigations) resulted in the increased biochemical deficiency of thiamine in the organism.

At the same time, in summer (July) when such fish was absent in the ration, the TDP-effect in animals of both farms was the same (2,4 and 9,4%) and indicated normal provision.

The reability of the method is also borne out by the normalization of this value (on the average 16%) in minks with spontaneous avitaminosis (the TDP-effect-48%) after single intramuscular injection of thiamine-bromide (60 mg per male). At the same time the injection of large (60 mg for three days) and small doses (0,1 mg for five days) of the vitamin to the animals with adequate provision (the TDP-effect - 15 and 16%, respectively) practically did not decrease it (2 and 14%).

Thus studies have shown that the values of the TDP-effect in fur-bearing animals depends on the provision with thiamine, and this test may be used for early diagnostics of hypovitaminous states.

In conditions of fur farms the TDP-effect less than 15% indicates high provision with thiamine, that of 30% is regarded as the permissible value, and the presence in the stock of animals with a higher effect shows that measures must be taken to eliminate the deficiency (especially in the main periods preparing for rutting, pregnancy).

Table I. Distribution of individuals in terms of the TDP-effect value, %

TDP-effect	1st farm		2nd farm	
	minks	polar foxes	minks	polar foxes
Less than 15% - (norm)	56	70	16	13
15 - 30% (slightly deficiency)	44	20	42	69
30 - 40% (temperate deficiency)	-	-	37	6
above 40% (pronounced deficiency)	-	10	5	12

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SCIENTIFUR VOL. 11, NO 2 1987



ADHERENCE OF PSEUDOMONAS AERUGINOSA TO TRACHEAL EPITHELIAL CELLS  
OF MINK.  
STUDIES ON BACTERIAL HYDROPHOBICITY AND ELASTASE PRODUCTION.

E.L. Elsheikh, S. Abaas, B. Wretlind.

*Pseudomonas aeruginosa* strains, producing variable elastase activity, were evaluated for adherence ability to mink tracheal epithelial cells. Attachment was studied in relation to surface hydrophobic properties of bacteria. Elastase production and bacterial hydrophobicity were measured during growth up to 48 hr. A high elastasolytic strain B1 adhered well; it exhibited a mean of 39.0 bacteria per epithelial cell.

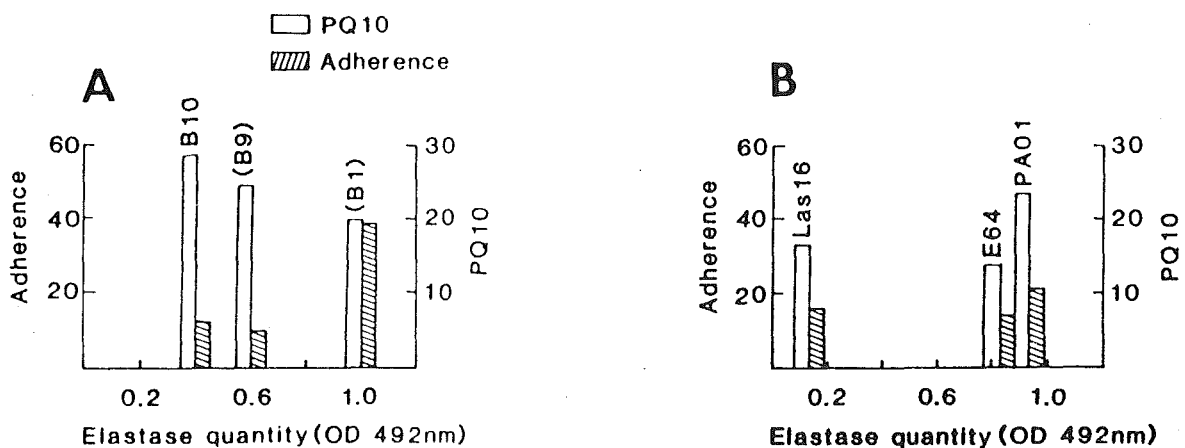


Fig. 3. Surface hydrophobic character (PQ10) of washed *P. aeruginosa* in relation to adherence ability to mink tracheal epithelial cells, and elastase quantity (OD 492 nm). Adherence expressed as mean number of bacteria/epithelial cell. Bacterial strains were grown in TSB for 18 h at 37 °C, mink, isolates (A), laboratory strains (B).

Adherence of the organisms was not correlated with the degree of hydrophobicity, since more hydrophobic strains do not adhere better. Bacterial surface becomes less hydrophobic during exponential growth-phase (up to 6 h). Hydrophobicity then slightly increases up to 48 h. No correlation between elastase production and changes in surface hydrophobicity was found, since treatment of washed bacteria from either early exponential or later decline-growth phases with different concentrations of elastase did not markedly affect bacterial hydrophobicity. The results indicate that strains with high or active elastase production adhered better than low or inactive elastase-producing strains. Furthermore, bacterial surface hydrophobicity does not seem to play a major role in adherence.

Acta path. microbiol. immunol. scand. Sect. B, 93, 417-422, 1985.  
1 table, 3 figs., 29 references.

Authors' summary.

## FREQUENCY OF CANINE PARVOVIRUS AND ROTAVIRUS INFECTIONS AMONG FOXES IN FRANCE.

(Frequence des infections par le parvovirus canin et le rotavirus chez le renard roux en France).

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

Test of 270 serum samples collected from foxes between 1979 and 1984 revealed no evidence of canine parvovirus antibody before 1982. Since that date it has been found in only 10 of 206 samples. Rotavirus antibody was present in 101 of 270 samples.

Revue d'Ecologie (la Terre et la Vie), 40, 2, 142, 1985.

(Conference proceedings). Only abstract.

2 references.

CAB-abstract.

## COLLABORATIVE SEROLOGICAL TESTING OF RED FOXES AT LIBERTY IN FRANCE.

(Reactions serologiques du renard roux, bilan d'une etude sur des animaux vivant en liberte en France).

J. Barrat, J. Blancou, C. Chastel, A. Schwers, M.M. Maenhoudt, P. Biront, P.P. Pastoret, U. Kihm, J.M. Baradel, D. Gavant, O. Roboly.

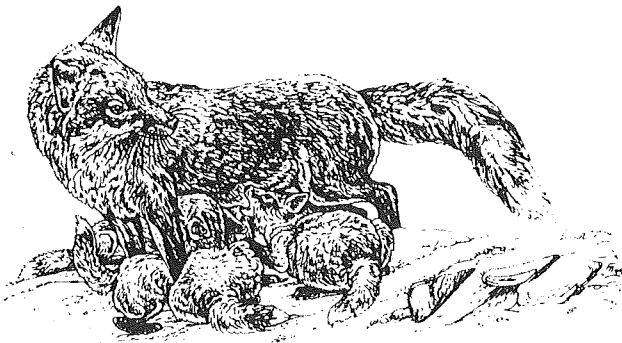
At four centres in NE, SE, SW and central France, antibodies to rotavirus were found in 42 of 106 foxes, to canine parvovirus in 7, to Pasteurella multocida in 20, to Toxoplasma gondii in 46 of 115, to Aspergillus in 62 of 135 and to Leptospira in 20 of 142. No antibodies were detected to rabies virus, Dermatophilus, distemper virus or Brucella.

Revue d'Ecologie (la Terre et la Vie) 40, 2, 241-242, 1985.

(Conference proceedings). Only abstract.

1 table.

CAB-abstract.



**PREVALENCE OF TOXOPLASMA GONDII IN MYOCASTOR.**

(Výskyt toxoplasma gondii u nutrií).

Ivan Literák, Zdeněk Mlčák.

In May–July, 1984, Sabin–Feldman dye tests were carried out in 62 coypus from large farms and 125 from small farms; 3 (4.8%) and 24 (19.2%) were positive, respectively. Mouse inoculation revealed *T. gondii* in 18 (15%) of 119 coypus from small farms and in none of 37 from large farms.

Veterinarství, 36, 2, 81–82, 1986.

1 fig., 2 tables.

In CZECH.

CAB–abstract.

**ENCEPHALITOOZONOSIS IN FARM BREEDING OF BLUE FORM OF ARCTIC FOX  
(ALOPEX LAGOPUS).**

(Encefalitozoonoza ve faremním chovu modrých pesců polárních  
(*Alopex lagopus*)).

M. Persin, J. Dousek.

Occurrence of encephalitozoonosis in farm breeding of blue fox is described. Fifty young of eight breeding females were infected, mortality was 88%. The main clinical symptoms of the disease were somnolence, ataxia, vision disorders, clonic spasms, at a protracted course also retarded growth. Typical nonpurulent microgranulomata with occurrence of individual spores and cysts of *Encephalitozoon cuniculi* were demonstrated in liver and central nervous system. Further, diffusion interstitial nephritis and necrotizing angiitis were determined. In breeding females, chronic interstitial nephritis was determined, without detection of the causative agent. A probable source of infection was the feeding of dead rabbits with subsequent transmission to progeny.

Veterinarní Medicina, 31, 1, 1986.

2 figs., 14 references.

In CZECH. Summary ENGL, GERM, RUSS.

Authors' summary

**DATA ON THE PATHOGENESIS OF TOXASCARIS INFECTION IN ARCTIC FOXES.**

**МАТЕРИАЛЫ ПО ПАТОГЕНЕЗУ  
ТОКСАСКАРИДОЗА ПЕСЦОВ**

L.V. Anikieva, N.N. Tyutyunnik, V.S. Anikanova, V.A. Kulikov,  
V.V. Ostashkova.

Four groups of arctic fox cubs were infected with 0, 10, 100 or 1000 toxascaris larvae and were used for the study of the effect of infection intensity on the biology and physiology of the nematode and also for an assessment of the pathogenesis of infection. Detailed results of both studies are presented. The changes observed in blood indicators (erythrocyte numbers, haemoglobin, proteins), in enzymic activity (lactate dehydrogenase, aminotransferases, alkaline phosphatase and cholinesterase) and in the humoral non-specific immunity indicators (activities of lysozyme, beta-lysin and complement) are discussed in relation to the intensity of infection and to the phase of nematode development. The weight of experimental animals was somewhat lower than that of controls and the size and quality of their skins were decreased, especially in those given 1000 larvae.

Petrozavodsk, USSR, Karel'skii Filial Akademii Nauk SSR, 129–142, 1980.

5 figs., 6 tables, 9 references.

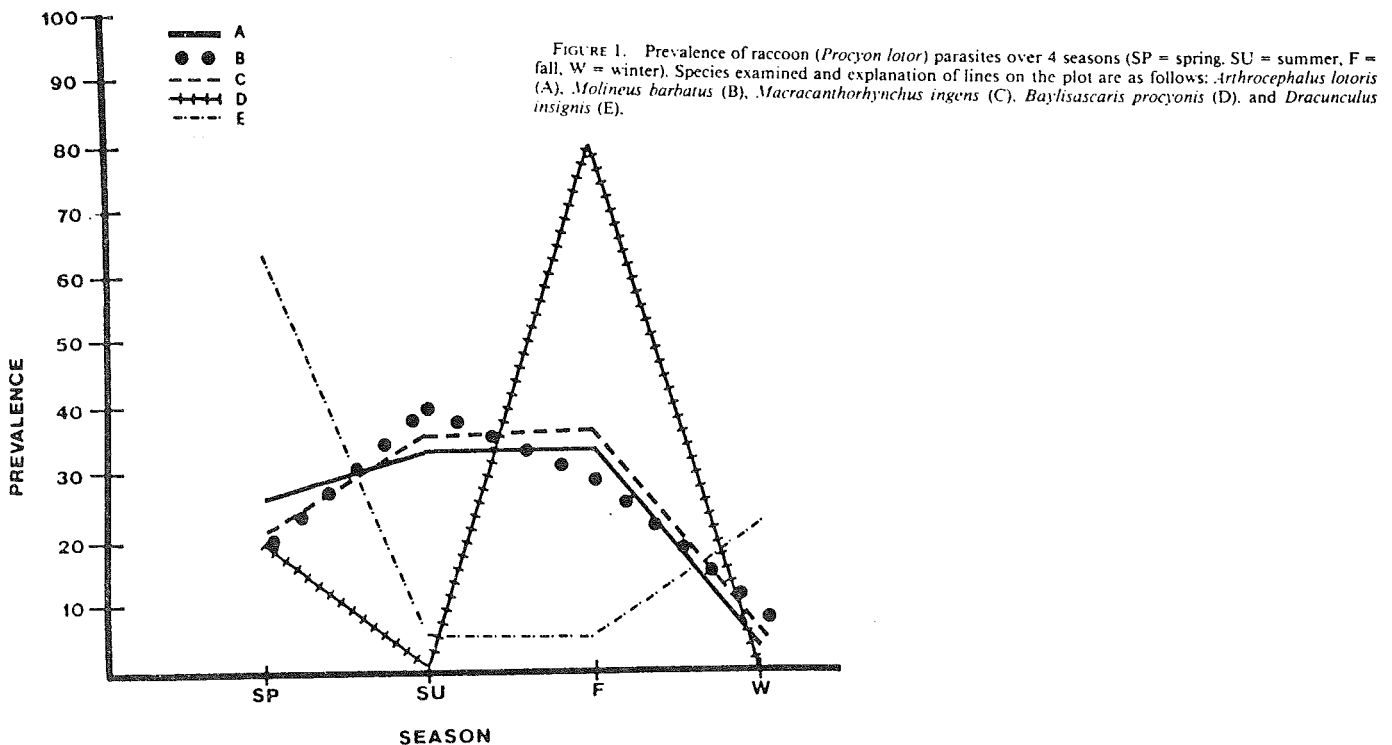
In RUSS.

CAB–abstract.

## HELMINTH PARASITES OF THE RACCOON (*PROCYON LOTOR*) FROM TENNESSEE AND KENTUCKY.

Richard A. Smith, Michael L. Kennedy, Walter E. Wilhelm.

From December 1980 through November 1981, 145 raccoons (*Procyon lotor*) from Land Between The Lakes in Stewart County, Tennessee, and Lyon and Trigg counties, Kentucky, were examined for helminth parasites. Diaphragms were examined for *Trichinella spiralis* and gastrointestinal tracts for other helminth parasites. Ten species were found including 7 nematodes (*T. spiralis*, *Physaloptera rara*, *Arthrocephalus lotoris*, *Molineus barbatus*, *Baylisascaris procyonis*, *Gnathostoma procyonis*, *Dracunculus insignis*), 2 cestodes (*Mesocestoides variabilis*, *Atrioaenia procyonis*), and 1 acanthocephalan (*Macracanthorhynchus ingens*). *Dracunculus insignis* is reported from Tennessee and Kentucky raccoons for the first time. Of the parasites detected, only *T. spiralis* showed a statistically significant preference for one sex (male) over the other. It was also the only parasite found in greater prevalence in relation to age classes (highest in age classes III and IV). *Arthrocephalus lotoris*, *M. barbatus*, *B. procyonis*, *M. ingens*, and *D. insignis* all had seasonal trends in prevalence, and winter intensity of parasites was found to be most similar to that of spring, spring to summer, and summer to fall.



J. Parasit. 7, 5, 599-603, 1985.  
2 tables, 1 figs., 25 references.

Authors' abstract.



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Gunnar Jørgensen.

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Johnny Birks

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# Mink

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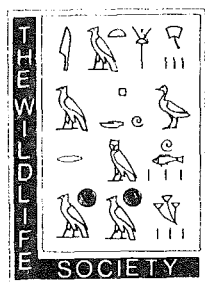
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## WILDLIFE MONOGRAPHS

APRIL 1979

No. 65

A Publication of The Wildlife Society



REPRODUCTION, PHYSIOLOGICAL RESPONSES,  
FOOD HABITS, AND ABUNDANCE OF NUTRIA  
ON MARYLAND MARSHES

by

GALE R. WILLNER, JOSEPH A. CHAPMAN,  
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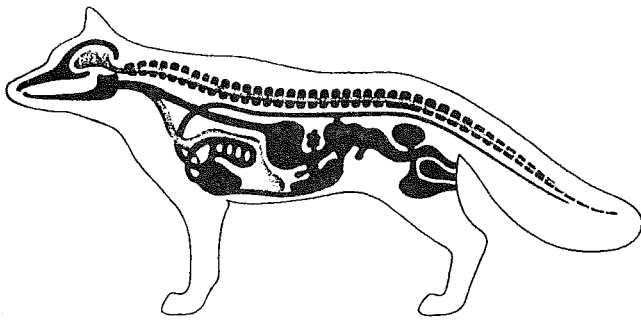
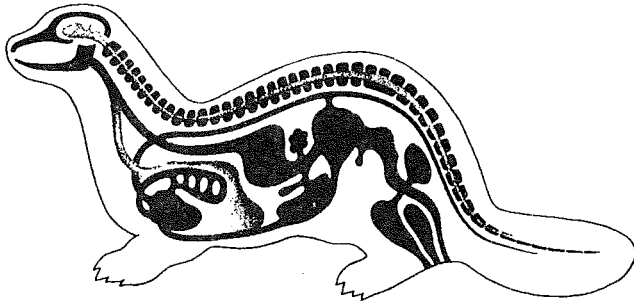
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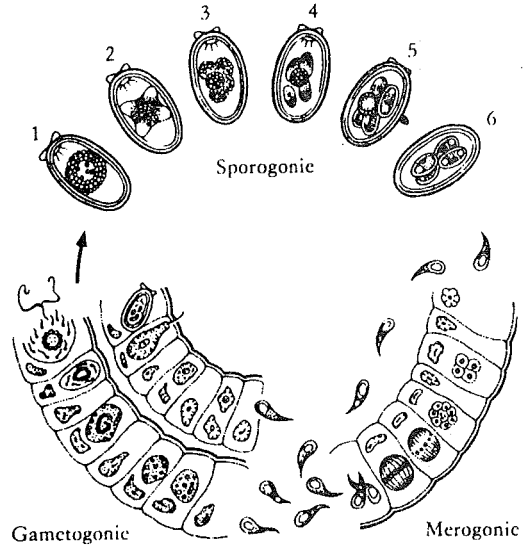
by  
U.D. Wenzel and V.A. Berestov.

# Pelztierkrankheiten

Ein Ratgeber für Züchter und Halter



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Veterinärarzt Dr. Ulf D. Wenzel  
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**Pelztier krankheiten**  
**Ein Ratgeber für Züchter und Halter.**

(Diseases in Fur bearing Animals).

U.D. Wenzel, V.A. Berestov.

The book is published by VEB Deutscher Landwirtschaftsverlag Berlin (DDR) 1986.

The authors Dr. Wenzel and Dr. Berestov are internationally known for their work with diseases among mink and foxes.

According to the preface the purpose of the book is to bring the newest knowledge about the most important diseases in mink and foxes to breeders and veterinarians.

The book is divided in a general part with clinical examination, anaesthetics, artificial insemination, hygiene and euthanasia at pelting time and a special part dealing with diseases.

The general part (about 1/3 of the total number of pages) has very many details and is of great value as a source of normal parameters in clinical pathology. The artificial insemination in foxes is dealt with very shortly but should have deserved a greater attention because of the fact that 25-40% of all female foxes in Scandinavia are inseminated. Descriptions of techniques in detail and available semen diluters are lacking in the book.

The section dealing with hygiene and animal housing is excellent and have very good colour illustrations. The special part dealing with diseases starts with infectious diseases and this section covers all the important diseases in mink and foxes.

The figures (mainly colour photos) with each disease are very illustrative and are excellent for teaching breeders.

The section dealing with parasite problems has perhaps a little too many details when put in relation to the importance of parasites in mink and foxes.

The multifactorial diseases as nursing sickness, preweaning diarrhoea and muscular dystrophy in fast-growing mink kits deserved a much more detailed description since they are among the most important diseases in modern mink and fox production.

As conclusion, the book is well written and very useful for the veterinarian and the advanced breeder in daily work with mink and foxes.

176 pages, rich in colour photos, illustrative drawings and tables.

Per Henriksen.

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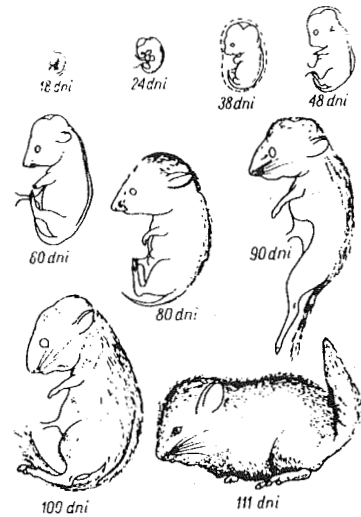
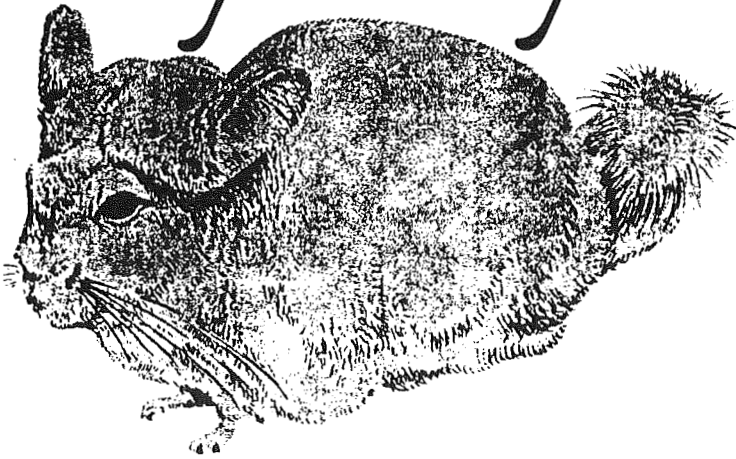
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by

Stanisław Jarosz and Władysław Rzewski.

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Stanisław Jarosz  
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Państwowe Wydawnictwo Rolnicze i Leśne, Warszawa 1985

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August 21 - 28, 1988

Dear Participant:

Enclosed please find a copy of the preliminary announcement of the Fourth International Scientific Congress in Fur Animal Production to be held in Toronto, Canada and Wisconsin, USA, August 21-28, 1988. The call for papers will be issued in approximately six months.

We look forward to an exciting and fruitful Congress, so please consider participating. Please circulate the enclosed poster as widely as possible so that all Fur Scientists will be informed of the Congress.

*Bruce D. Murphy*  
 BRUCE D. MURPHY, Ph.D.  
 Scientific Chairman

BDM/ejp  
 Enclosure



## **Preliminary Announcement**

The Fourth International Scientific Congress in Fur Animal Production will be held in Toronto, Canada and Wisconsin USA, August 21-28, 1988. The programme will consist of contributed papers, workshops, and tours of university, vaccine and ranch facilities.

For further information write:

**Ms. Diane Valoroso  
c/o Canada Mink Breeders  
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Second Announcement  
August 1986

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Theme: Recent developments in research for better utilisation of feed and animal resources.

#### Keynote lectures:

1. Improvement of pasture areas and natural vegetation (highland, lowland, tropical and dry regions). Dr. T. Henzell, CSIRO, Australia
2. Application of biotechnology to animal production. Dr. J.F. Quirke, Ireland

#### Invited papers:

1. Preservation and supplementation of forages. Prof. Dr. M. Lampila, Finland
2. Feed processing technology to improve nutritive values. Dr. E. Villagran, Mexico
3. Development and utilisation of animal genetic resources. Mr. F. Grosclaude, France
4. Health and welfare of farm animals and their impact on the livestock industry. Prof. Dr. I. Ekesbo, Sweden

### Plenary Session II,

Wednesday, 29th June from 8.30 to 12.00

Theme: More effective transfer of scientific knowledge into practical application.

#### Keynote lectures:

1. Education programmes with emphasis on extension personnel and farmers. Dr. P. Mahadevan, ACIAR, Australia
2. Evolution of support services for livestock producers in developed and developing economies. Dr. M. Walshe, World Bank, USA

#### Invited papers:

1. The role of veterinarians in the education of farmers for disease prevention. Prof. Dr. J.E. Huhn, Fed. Rep. of Germany
2. Farmers' cooperatives as agencies for providing information and farm inputs. Dr. I. Vainio-Mattila, Finland
3. The use of new communications technology in supporting livestock producers (lecture to include demonstration). Dr. E. Jørgensen, Denmark

### Plenary Session III,

Thursday, 30th June from 8.30 to 12.00

Theme: Learning from experience — aspects of successful livestock development projects.

#### Keynote lectures:

1. The role of international organisations in promoting animal production in developing countries. Dr. P. Brumby, ILCA, Ethiopia
2. Analysis of a successful livestock project. Dr. R.D. Havener, Winrock, USA

#### Invited papers:

1. Why do so many development projects fail? Dr. T. R. Preston, Columbia
2. The role of women in the adoption of new practices. Mrs. Ruth Finney, FAO, Italy
3. Small animals for household husbandry. Prof. Dr. I. Tasaki, Japan
4. The blue revolution — aquaculture for protein production. Dr. T. Gjedrem, Norway

## Short Papers and Poster Presentations

The scientific programme will also include parallel sessions for short oral contributions and poster presentations covering the following subjects:

- education and information
- breeding and genetics
- feed resources and improvement of feeding values
- nutrition, physiology and metabolism
- reproduction
- management and health
- animal products
- production systems
- economic aspects in animal production

## CALL FOR PAPERS

All participants are invited to contribute to the scientific programme by presenting a paper or poster in any one of the subject areas listed above.

If you wish to offer a contribution to the conference, please complete and return the reply card on page 14 before *31st March 1987*.

The Scientific Programme Committee reserves the right to make final decisions on the acceptance of papers and to choose the way the papers will be presented.

Authors of accepted contributed papers or posters will receive instructions concerning the preparation of abstracts to be published in the Conference Proceedings.

## PROCEEDINGS

All invited papers in full and abstracts of free contributions to be presented at the Conference will be pre-printed and distributed to all participants at registration.

## LANGUAGE

The official language of the Conference will be English.



**VI WORLD CONFERENCE ON ANIMAL PRODUCTION  
HELSINKI, FINLAND**

**27th June — 1st July 1988**

**PRELIMINARY ADVICE FORM**

Please complete and return to:  
The Conference Secretariat,  
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Title of the paper / poster \_\_\_\_\_

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\_\_\_\_\_

Subject session (see page 5) \_\_\_\_\_

\_\_\_\_\_

Name of presenting author \_\_\_\_\_

Name(s) of co-author(s) \_\_\_\_\_

Institution \_\_\_\_\_

\_\_\_\_\_

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Please note that the titles of papers or posters must be submitted to the Conference Secretariat *not later than 31st March 1987*, for consideration by the Scientific Programme Committee.

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