Mink Nutrition Research

1967 Progress Report

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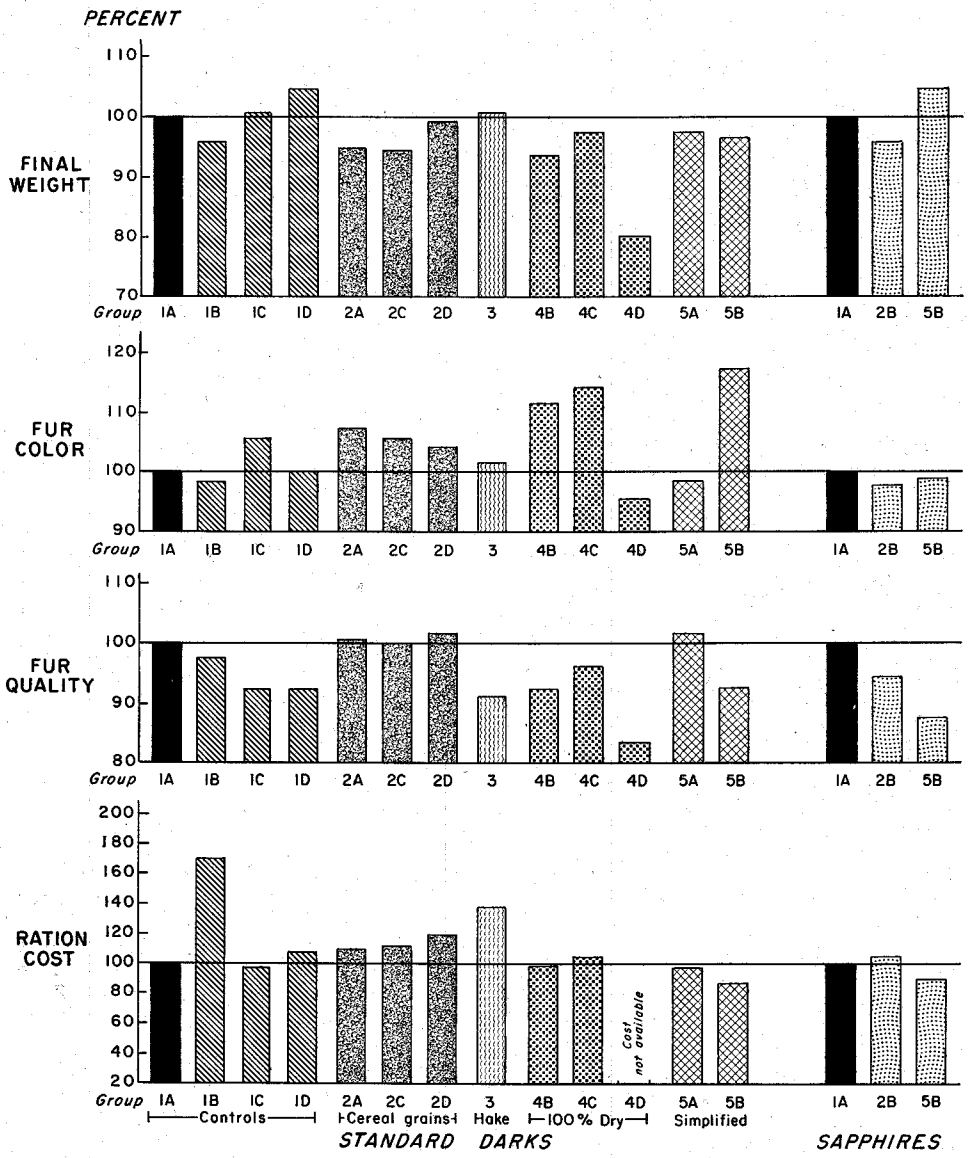
TEST RESULTS AT A GLANCE

Group	Standard Darks
1A	A practical-type ration based on high levels of fish and cereal grains and used as a control for comparison of other groups, economically produced large mink with good fur characteristics.
1B	Original standard reference diet produced somewhat smaller males, but fur characteristics for the group were equivalent to the control at a 70% higher feed cost.
1C	A diet modified from 1A by exclusion of beef liver produced mink of comparable size with better fur color but lower quality at a feed savings of only 3%.
1D	A modification of the control ration composed of readily available ingredients and with wet-belly control features produced large mink with fur color equal to but quality below that of controls at slightly increased cost.
2A	Inclusion of ground, whole oats as a complete replacement for the cereal portion of the control ration, reduced protein and fat levels and resulted in smaller mink with improved fur color and quality equivalent to controls.
2C	Ground, cooked wheat substituted for oat groats but with wheat bran added to counter its laxative effects produced smaller males with color and quality comparable to controls. Feed costs were elevated over controls because of greater wastage.
2D	Ground, cooked corn substituted for oat groats but with wheat bran added to counter its laxative effects produced smaller males, but with better fur characteristics as a group than the control, at a 19% increase in feed cost resulting from excessive feed wastage.
3	Processed Pacific hake as a complete replacement for the fish in the control ration produced animals equivalent in size and fur color but of somewhat lower fur quality.
4B	A ration of completely dry ingredients, formulated to control diet specifications and utilizing 20% of hake meal, produced smaller animals superior in color, but somewhat lower in quality than control animals.
4C	A dry-type ration identical to 4B, but utilizing herring meal instead of hake meal, resulted in improved size and fur characteristics as compared to 4B.
4D	A dry-type ration similar in composition to those above but utilizing a product prepared by acid hydrolysis produced small mink with lowered fur characteristics.
5A	A simplified diet formulated to control ration specifications and based on turbot and cereal grains produced smaller males but larger females with fur characteristics equivalent to control animals.
5B	A simplified diet based on chicken offal and cereal grains produced mink with good fur color but lower quality as compared to controls at 13% lower feed cost.
6A-C	Animals raised in a facility with light controlled to natural day length were not fully prime; others raised with light supplied continuously failed to prime; and mink raised without light were completely prime on December 5.

Group	Sapphires
1A	The control ration, used for comparison of experimental diets fed to sapphire mink and identical in composition to that fed darks, economically produced animals of good size and fur characteristics.
2B	Inclusion of ground, whole oats as a partial replacement for oat groats in the control ration produced smaller mink with lowered quality scores as compared to controls.
5B	A ration based on chicken offal and cereal grains and identical to that fed dark mink produced larger animals which had lower fur quality than control sapphires at a 10% lower feed cost.

COMPARATIVE GROUP PERFORMANCE

(Percent of Control)



Mink Nutrition Research

1967 Progress Report

JOHN ADAIR, F. M. STOUT, and G. E. COSTLEY*

Objectives

This is a concise report of the data collected in a series of mink feeding trials during 1967 at the Experimental Fur Farm of the Oregon Agricultural Experiment Station. The standard format followed is designed so that complete information is easily available for each experiment which is conveniently divided into sections on objectives, methods, results, and discussion. It reports the progress of continuing research on mink feeds and feeding; and more specifically on evaluation of new feedstuffs, new approaches to mink ration formulation, and on solution of problems encountered in previous research, for the purpose of acquiring knowledge which will lead to maximum production efficiency and permit improvement of the product raised.

Six experimental series, as follows, were investigated:

1. *Controls*—provision of both short- and long-range standards for comparison and improvements in both performance and economic aspects.

2. *Cereal grains*—evaluation of new grains, fed individually or in combination, and solution of problems associated with feeding.

3. *Processed hake*—determination of nutrient adequacy and levels of a potentially valuable feed resource.

4. *High dry*—formulation of rations for high production efficiency and evaluation of various components of such rations.

5. *Simplified concept of ration design*—formulation of rations using a minimum of ingredients to achieve nutrient balance.

6. *Environmental control*—accumulation of information on growth and furring as they are controlled by physical factors.

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Experimental procedures

Mink kits were randomly allotted to experimental groups after balancing for sex, litter size, and weaning weight with no group having more than one mink from the same litter in order to minimize inherent and maternal effects. Animals were weaned and separated to individual pens on July 10. Experimental rations were fed from July 28 to pelting on approximately December 1. Mink were weighed on test and at 4-week intervals until October 20 and finally at pelting. Weights were taken in grams to allow more accuracy. Conversion may be made on the basis of 1 pound equals 454 grams. In contrast to previous years when feed was mixed every day, feed was prepared at 3-day intervals and held in cold storage until fed. Water was added to the ingredients composing the ration until a proper feeding consistency was achieved. Vitamin E was added to all groups except 1B as an antioxidant to offset the possibility of incurring steatitis in rations containing easily oxidizable fats. Thiamine was also included as insurance against the possible occurrence of thiaminase in rations containing turbot which may feed on thiaminase-active fish.

All rations were offered *ad libitum* daily. The feed consumption figure reported includes the amount of feed offered minus the amount not eaten and weighed back. It also includes feed wastage not accountable in the weigh back. Mink in test series 1 and 2, except for 19 animals in group 2D, were housed in 14 x 18 x 30-inch cages with a semi-automatic watering system as previously used. All other animals were housed in new cages which were smaller (10½" x 15" x 24") with fiber glass pen dividers and an automatic watering system. Killing was accomplished by injecting a nicotine sulfate solution into the thoracic cavity. Pelts were dried skin side out for darks and fur side out for sapphire mink.

Presentation of results

Rations are described in terms of ingredient composition with and without their natural water content and also on the basis of the nutrients supplied. The "wet basis" composi-

tion pie chart shows actual amounts of various ingredients used in mixing the diet, and the amount of water for mixing is listed below. The "dry basis" chart gives the actual percentage contribution of each feed ingredient with the water removed. Proximate analysis data were figured on both "as fed" and "dry" bases from actual chemical analyses of the mixed ration. Nutrient composition of individual feedstuffs are presented in the appendix table on the last page.

Average male and female growth data for each group are presented as curves with the pattern for control animals superimposed for ease of comparison. Other weight, pelt, and ration data are presented in tabular form. For the first time this year, feed consumption data are given which will help to explain ration cost figures and provide a basis for a feed efficiency figure. Ration costs are presented relative to the control rations and represent basic feed costs (at source) only. Ration costs may be expected to vary considerably with time, location, availability and so forth, and readers are encouraged to figure ration costs based on their own particular situation.

Pelt evaluation

Pelt data, including values for fur color and quality, lengths and weights, and fur blemishes, have been assembled. Color and quality scores were assigned to individual pelts by experienced commercial fur graders who also placed estimated sale values on each pelt. Such values were further adjusted to take into account size difference and occurrence of wet belly. Male pelts were increased or decreased $1.50 for each inch over or under 26 inches, respectively. Female pelts were likewise adjusted by $1.00 per inch over or under 21 inches. Skins showing wet belly, depending on the degree of severity, were reduced by 20, 30, or 40%. Color and quality scores for animals saved as breeders were taken from grader evaluation of the live animal and such information may not be entirely comparable to pelt data. This is of little consequence, however, except in the case of sapphire females, where many were saved as breeders.

Fur Farm production

As previously, all mink produced at the Experimental Fur Farm have been used in some phase of research; however, this publication reports on only part of the total research program. In some instances, it is possible that reproduction may have been adversely affected by previous ration treatment. A case in point was observed for eight females saved from one experimental ration in 1967. Overall kit average for these females was 1.25; of the eight, two would not mate and three did not produce kits. Consequently, it is not possible to directly compare this herd with a commercial operation. Information on reproduction is presented in tabular form below. Unlike other years, kits were counted at birth, and ranch and litter averages were calculated on kits surviving to three weeks of age.

1967 Mink Reproduction

Type	Number of females				Number of kits			
	Breeders saved	Death losses	Not mated	Not producing	Born	Age 3 weeks	Litter average	Ranch average
Standard Dark	137	0	5	23	527	491	4.50	3.58
Sapphire	40	2	1	11	140	128	4.92	3.20
Red hip (pastel)	30	2	2	3	115	99	4.30	3.30
Fur chewer	13	0	0	1	61	57	4.75	4.38
Cotton fur	33	1	9	12	39	34	3.09	1.03

Metric Conversions

One pound = 454 grams or 4.54 kilograms
One inch = 2.54 centimeters

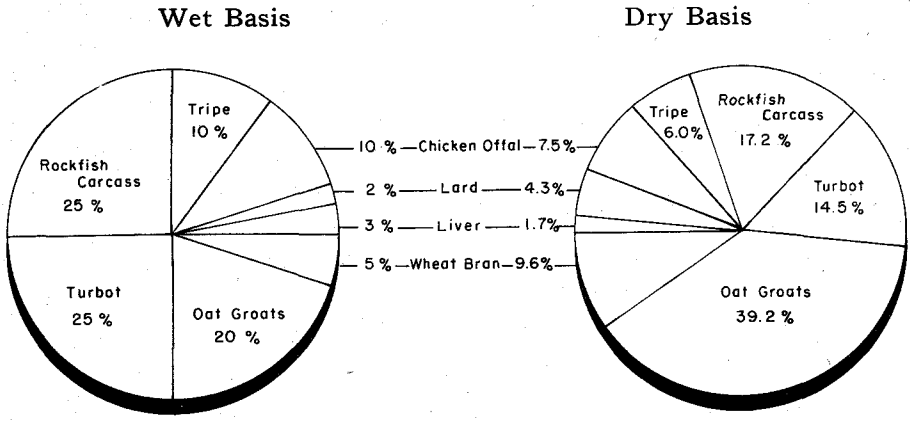
CONTROL RATION

Test Group 1A

Objective: To provide a practical, moderately priced, control ration, proven adequate in composition for rapid body growth and satisfactory fur development, against which animal performance on experimental rations can be compared. This ration is similar to the 1966 control, and it utilizes high levels of cereals and marine fish.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on December 1.

RATION COMPOSITION



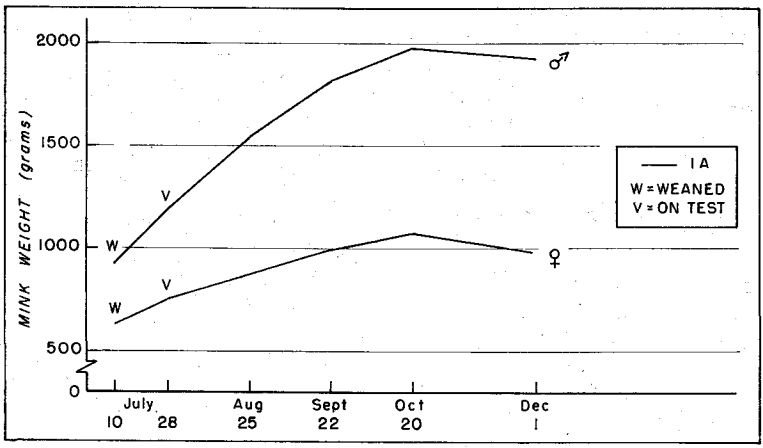
Note: Twenty-five percent additional water was mixed with this ration for proper feeding consistency.
Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.
Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	37.7	100.0
Crude protein	11.7	31.1
Crude fat	8.1	21.5
Crude fiber	0.6	1.6
Ash	3.2	8.4
Nitrogen-free extract	14.1	37.4

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,931	978
Weight gain (gm.)	739	223
Animal length (cm.)	44.0	36.2
Fur color*	183	233
Fur quality*	217	133
Weight of dried skin (gm.)	115	57
Length of dried skin (cm.)	72.4	58.6
Wet-belly incidence (%)	45	.....
Estimated pelt value ($)	19.84	10.75
Feed consumption per mink, as fed (kg.)	29.6	
Feed consumption per mink, dry basis (kg.)	11.2	
Ration cost per mink (% of control)	100	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration specifications were for 35% protein and 23% fat; actual levels were below these and may be attributed to low protein levels in oat groats and low fat in turbot. Cost data show this to be a relatively economical ration for this area; ingredients amounted to 4.8¢ per pound.

Growth was very satisfactory and similar to that recorded for this ration in 1966. There was, however, an unexplained loss of weight after October 20, especially noticeable in females. This held true for many of the experimental groups and was not necessarily related to the ration fed. Although animal lengths were somewhat less than those in 1966, pelt lengths were longer, possibly as a result of the different method of killing.

Fur color for these animals was generally below that of other experimental groups; however, fur quality was superior. Within the group, males had better color but poorer quality than females. Estimated pelt values were good when compared with those for mink on other diets.

Feed consumption, as indicated by the average amount of dry material consumed, was low in relation to most other test groups; consequently, efficiency of feed conversion was relatively good (ratio of average weight gained per unit of feed consumed was 23.3).

Other observations showed that, although high, wet-belly incidence was reduced as compared with previous years. No mortality occurred. One male and two females were retained for breeding.

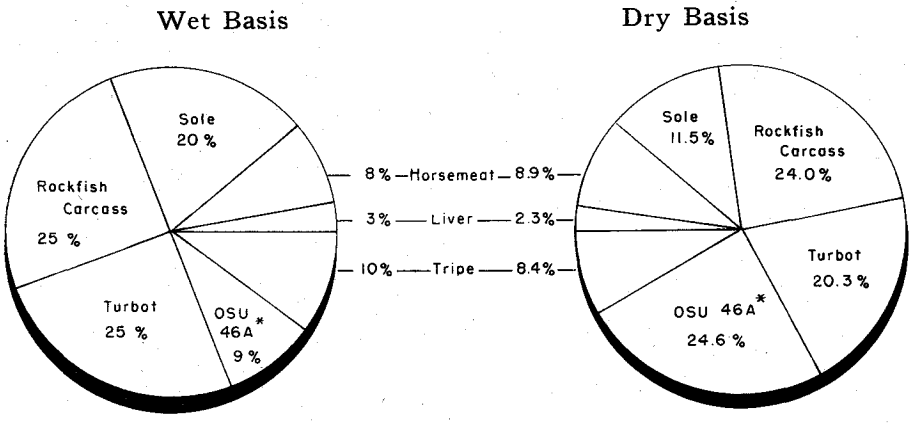
ORIGINAL STANDARD REFERENCE

Test Group 1B

Objective: To provide a standard reference ration (unchanged in formulation for nine years except that rockfish carcass was substituted for whole rockfish this year) which serves as a basis by which to check improvement in the control ration and to evaluate changes in the genetic composition of the experimental mink herd.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on December 1.

RATION COMPOSITION



* Composition of cereal mix OSU 46A, parts as fed: wheat germ, 25; alfalfa meal, 12.5; skim milk powder, 8.3; meat meal, 16.6; soybean oil meal, 16.6; cooked, ground oat groats, 16.6; brewers' yeast, 4.2; 2-4-9-10, 0.4; Terramycin (TM-10), 0.25; and dl-methionine, 0.05.

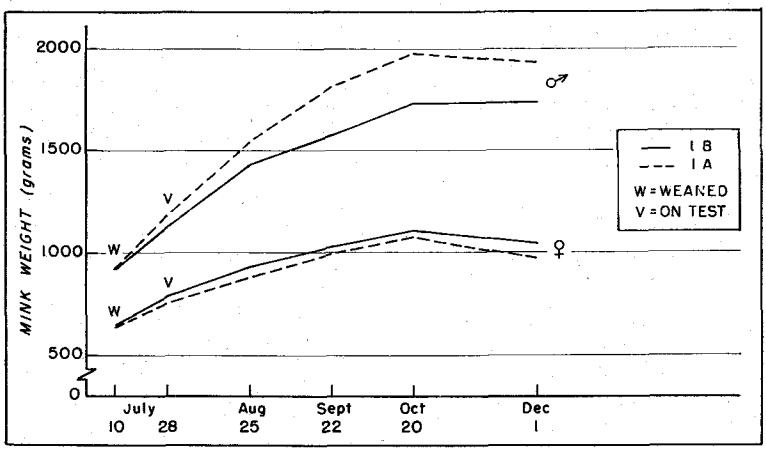
Note: Seven percent additional water was mixed with this ration for proper feeding consistency.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	29.9	100.0
Crude protein	14.3	48.0
Crude fat	6.0	20.0
Crude fiber	0.2	0.6
Ash	3.5	11.7
Nitrogen-free extract	5.9	19.7

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,738	1,048
Weight gain (gm.)	603	258
Animal length (cm.)	43.0	36.2
Fur color*	183	242
Fur quality*	175	192
Weight of dried skin (gm.)	102	57
Length of dried skin (cm.)	68.3	57.8
Wet-belly incidence (%)	60	.....
Estimated pelt value (%)	16.89	10.25
Feed consumption per mink, as fed (kg.)	37.4	
Feed consumption per mink, dry basis (kg.)	11.2	
Ration cost per mink (% of control)	170	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration composition was similar to that used for eight previous years; although, because the latter was not available, rockfish carcass was substituted for whole rockfish. Ingredients were primarily fresh, frozen materials and were substantially higher priced than dry ingredients; consequently, ration cost was almost three-quarters more than for the control ration now used (1A). Cost per pound of ration was 5.5¢; this appears misleadingly low because of the high water content of the ingredients.

Growth of males was below that of animals fed the control (1A) with average final weights off 200 grams; however, females were somewhat larger than 1A females. This reduced size of males was especially evident in pelt lengths, which averaged 4 cm. shorter.

Fur color scores for both sexes were comparable to those of 1A; quality scores were better for males in group 1B than for those in 1A, but the reverse was true for females. Estimated male pelt values were markedly below those of 1A and reflect reduced size and higher wet-belly incidence.

Feed consumption appears high on an as-fed basis but was exactly the same as 1A on a dry-matter basis; however, efficiency of feed conversion was lower and 26.0 units of feed were required per unit of gain. Consumption was very erratic and certain individuals were periodically off feed. Horsemeat supplies may have become rancid at times, and the animals may have reacted adversely since they were not protected by antioxidant supplementation.

Other observations included a high incidence of severe wet belly in males, which has not been unusual for mink fed this diet. There was no mortality. Two males and four females were saved for breeding.

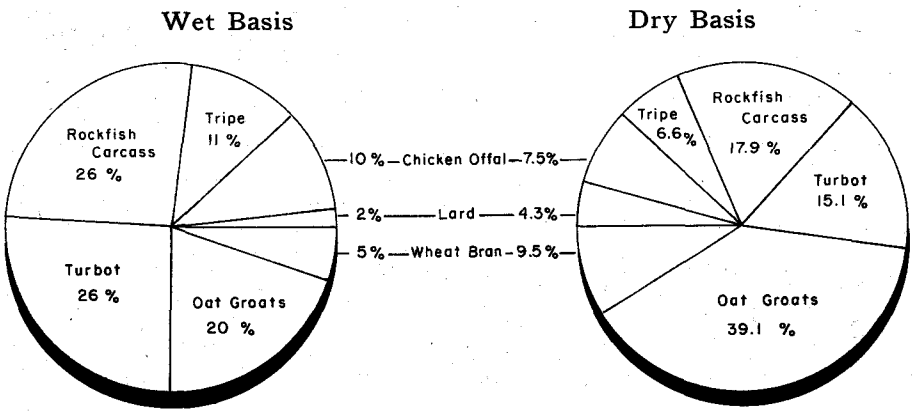
MODIFIED CONTROL

Test Group 1C

Objective: To evaluate the nutritional adequacy for the late growth and furring periods of a ration formula similar to the control but without beef liver as a step in reducing ration costs.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on December 1.

RATION COMPOSITION



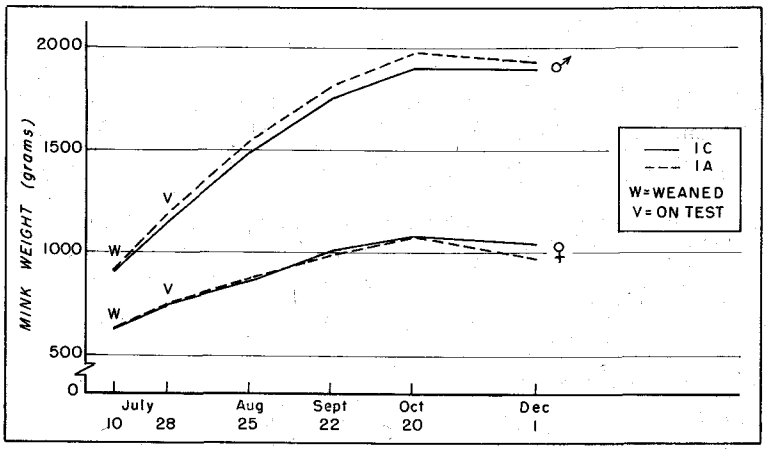
Note: Twenty-five percent additional water was mixed with this ration for proper feeding consistency.
Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.
Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	38.0	100.0
Crude protein	11.2	29.6
Crude fat	8.7	22.9
Crude fiber	0.6	1.5
Ash	2.0	6.5
Nitrogen-free extract	15.0	39.5

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,894	1,028
Weight gain (gm.)	739	283
Animal length (cm.)	43.0	36.3
Fur color*	192	192
Fur quality*	217	183
Weight of dried skin (gm.)	117	59
Length of dried skin (cm.)	72.3	57.8
Wet-belly incidence (%)	50	.....
Estimated pelt value ($)	17.54	11.50
Feed consumption per mink, as fed (kg.)	31.0	
Feed consumption per mink, dry basis (kg.)	11.8	
Ration cost per mink (% of control)	97	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration composition was similar to the control (1A) except that beef liver was excluded and other ingredients were increased to cover the omission. Although beef liver—an ingredient conventionally used as a source of vitamins, trace minerals, and unidentified growth factors—was omitted, the fish and chicken components of the ration contained liver tissue. The 9% economic advantage gained by the exclusion of liver was partially offset by a slightly increased feed consumption.

Growth of animals fed this ration without beef liver was very comparable to that of animals fed diets containing liver, as evidenced by similar final weight and animal and pelt length data.

Fur color was generally improved over the control group, but this was primarily due to higher color scores given to the females. Fur quality in males was identical to controls, whereas female quality values were considerably poorer than 1A. Although pelt characteristics of males were very similar to those of 1A males, estimated prices were reduced and reflect a slightly higher wet-belly incidence and some pelt unprimeness.

Feed consumption per animal increased very slightly over 1A, but the feed conversion rate (23.1) was similar.

Other observations included a 50% wet-belly incidence. No death losses occurred. Two males and four females were kept as breeders.

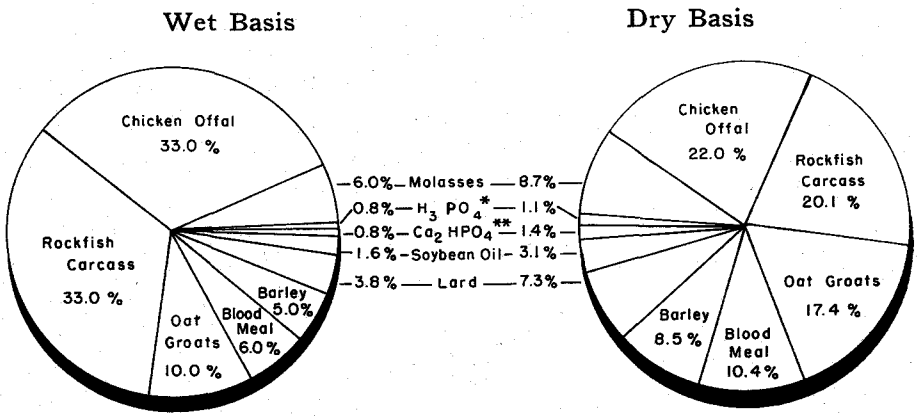
MODIFIED CONTROL

Test Group ID

Objective: To formulate an alternate control ration with nutrient specifications similar to 1A, but utilizing more plentiful feedstuffs and incorporating certain features for wet-belly control.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on December 1.

RATION COMPOSITION



* Phosphoric acid (75%).
** Dicalcium phosphate.

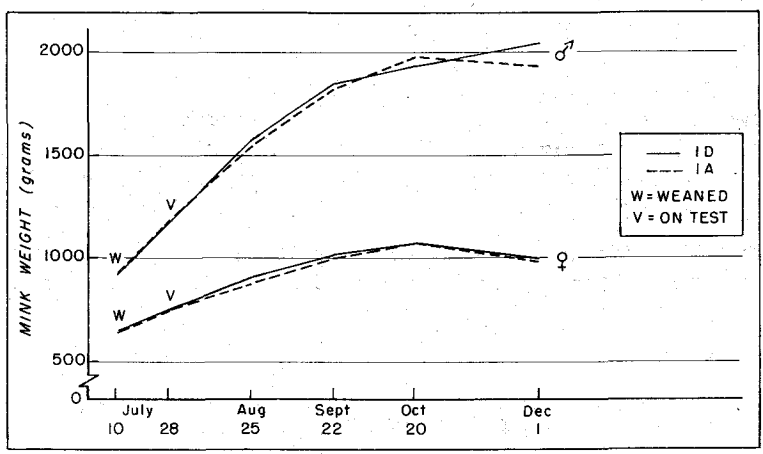
Note: Six percent additional water was mixed with this ration for proper feeding consistency. Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	45.3	100.0
Crude protein	14.5	32.0
Crude fat	10.6	23.4
Crude fiber	0.7	1.6
Ash	4.1	9.1
Nitrogen-free extract	15.4	33.9

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	2,041	998
Weight gain (gm.)	860	250
Animal length (cm.)	44.3	36.0
Fur color*	208	208
Fur quality*	200	200
Weight of dried skin (gm.)	116	58
Length of dried skin (cm.)	73.2	58.9
Wet-belly incidence (%)	50	.....
Estimated pelt value ($)	18.05	11.50
Feed consumption per mink, as fed (kg.)	23.6	
Feed consumption per mink, dry basis (kg.)	10.7	
Ration cost per mink (% of control)	107	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration was designed as an alternate control and was a departure from 1A in composition. Actually, this is a high dry-matter ration with approximately 60% of the nutrients derived from dry sources. The wet ingredients were equally composed of chicken offal and rockfish carcass, both readily available. Ration cost per pound was 5.4¢, slightly more expensive to feed than 1A. Phosphoric acid, dicalcium phosphate, and soybean oil were added as proposed wet-belly deterrents, and they were, in part, responsible for the higher cost per pound.

Growth was better for males and similar for females as compared to animals in the control group, 1A. Growth curves indicate that the males fed this diet did not taper off as did 1A males, and at pelting these males were the largest of any group.

Fur color and quality scores for males and females within the group were identical. Average color ratings were equal to those for controls. Fur quality values, however, were below values assigned to animals fed the control ration. Pelt values were estimated as worth about $1.80 less for males and $.75 more for females.

Feed consumption was somewhat lower than for 1A, but efficiency of feed conversion for this ration was the outstanding one of all groups of dark mink (19.3 units feed per unit gain).

Other observations included the fact that measures taken for wet-belly control did not effectively prevent its occurrence, and half of all males were affected by severe cases of wet belly. No death losses occurred. Two females were saved as breeders.

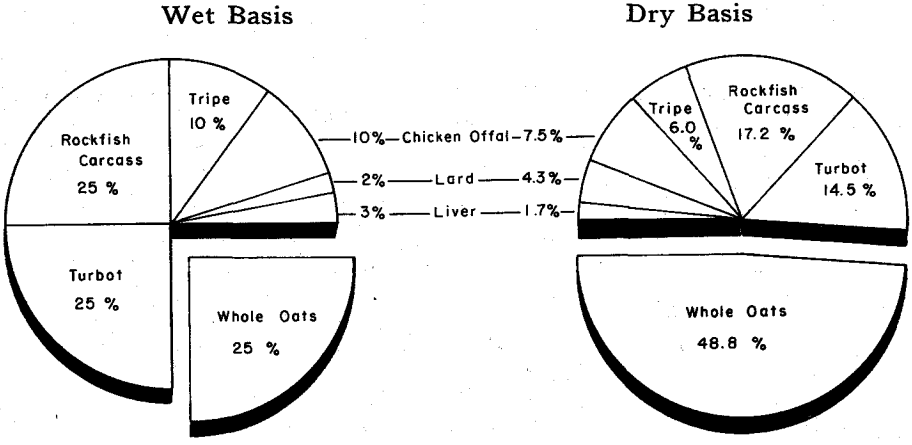
WHOLE OATS

Test Group 2A

Objective: To evaluate the inclusion of 25% of ground, raw, whole oats in a mink growing and furring ration as a less expensive cereal grain with sufficient fiber to prevent scouring, as noted in rations containing less fibrous grains.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on December 1.

RATION COMPOSITION



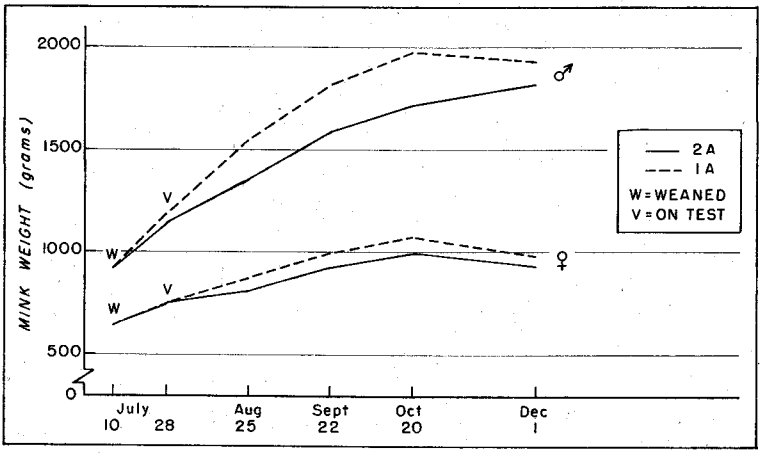
Note: Thirty-two percent additional water was mixed with this ration for proper feeding consistency.
Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.
Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	35.2	100.0
Crude protein	9.9	28.0
Crude fat	7.2	20.5
Crude fiber	1.9	5.5
Ash	2.4	6.8
Nitrogen-free extract	13.8	39.2

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,818	932
Weight gain (gm.)	667	181
Animal length (cm.)	43.4	36.1
Fur color*	155	217
Fur quality*	164	183
Weight of dried skin (gm.)	102	56
Length of dried skin (cm.)	68.7	56.2
Wet-belly incidence (%)	36	.....
Estimated pelt value ($)	19.28	10.58
Feed consumption per mink, as fed (kg.)	36.8	
Feed consumption per mink, dry basis (kg.)	12.9	
Ration cost per mink (% of control)	109	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration composition was the same as 1A except that ground, whole oats replaced oat groats and wheat bran. This modification resulted in lowering the protein level by 3%, fat by 1%, and ash by 1.5% and in raising the crude fiber level by 4%. The oats used were finely ground, but hulls were coarse enough to permit sorting by the mink; consequently feed wastage was relatively high. Substitution of whole oats reduced the price per pound of ration by approximately 10%, but wastage resulted in a slightly higher overall feed cost. The mixed ration lacked the good adhesive consistency which is provided by oat groats.

Growth rates were definitely poorer than for the controls (1A), resulting in the production of smaller pelts.

Fur color was somewhat improved for both males and females and fur quality was equivalent to that of the mink fed the control ration. Estimated pelt prices were quite comparable to control values, even though the mink were smaller.

Feed consumption was greater than for controls, which could be partially attributable to wastage; consequently, feed efficiency was considerably lowered (30.4). The feeding value of whole oats for mink may be improved by even finer grinding to eliminate some wastage.

Other observations included the fact that mink droppings were very firm with no looseness seen at any time, which allowed cages to remain clean. One male died from what appeared to be the result of an injury. Three females were saved as breeders.

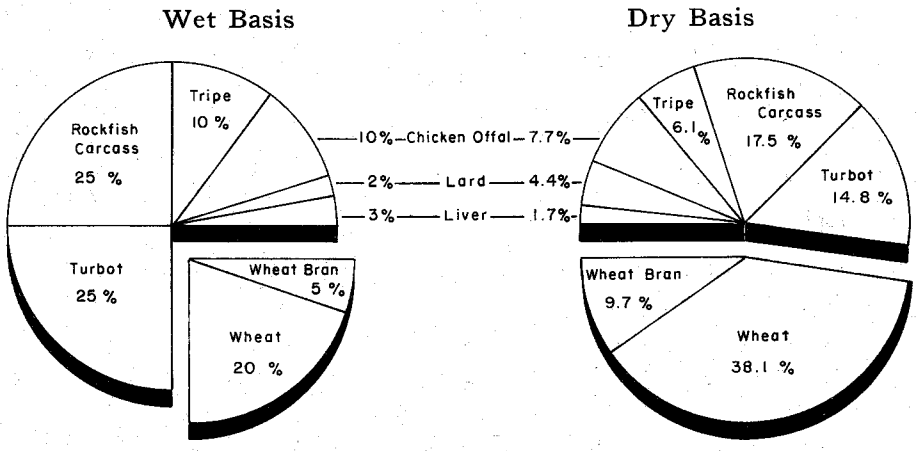
WHEAT

Test Group 2C

Objective: To further evaluate finely ground, cooked wheat as a major constituent in the ration of the growing-furring mink, but with wheat bran added to counter the laxative effect previously noted.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on December 1.

RATION COMPOSITION



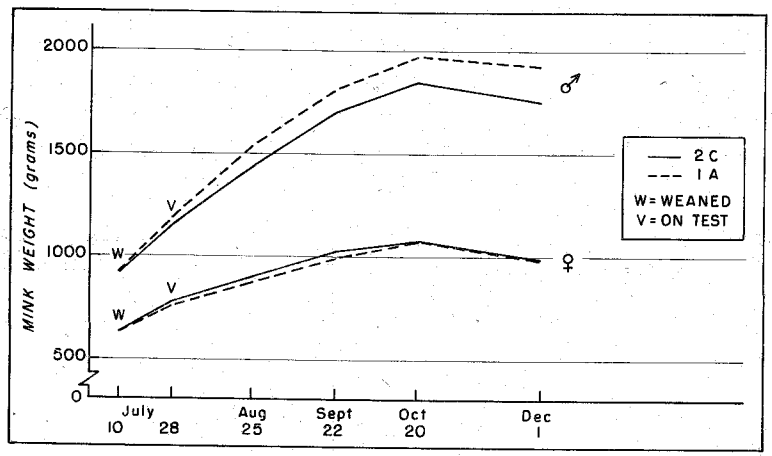
Note: Twenty-five percent additional water was mixed with this ration for proper feeding consistency.
Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.
Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	37.0	100.0
Crude protein	10.5	28.4
Crude fat	7.4	19.9
Crude fiber	0.6	1.8
Ash	2.3	6.1
Nitrogen-free extract	16.2	43.8

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,754	988
Weight gain (gm.)	600	208
Animal length (cm.)	43.3	35.7
Fur color*	183	200
Fur quality*	167	183
Weight of dried skin (gm.)	107	57
Length of dried skin (cm.)	69.5	56.2
Wet-belly incidence (%)	33	.....
Estimated pelt value ($)	18.13	9.92
Feed consumption per mink, as fed (kg.)	34.9	
Feed consumption per mink, dry basis (kg.)	12.9	
Ration cost per mink (% of control)	111	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration featured ground, cooked wheat as a substitute for the oat groats of the control, 1A. This substitution effected a lowering of protein level by 3% and fat by 1.5%. Previous trials showed that mink fed wheat at this level as the only cereal component scoured extensively; and 5% wheat bran was included in this ration as a possible preventive agent. Basic ration cost was lower than 1A, but the increased amount of feed required negated this economy and resulted in an 11% higher cost.

Growth of males was significantly lower, but growth of females was equivalent to corresponding animals in 1A. Male pelt lengths were 3 cm. shorter than controls, and female pelts were shorter by 2 cm., even though body weights were comparable.

Fur color of this group generally was improved over 1A and reflected equal male and improved female values. Quality scores for fur were identical to those of 1A; although males were better and females poorer. Pelt prices were estimated lower, primarily because of smaller pelts.

Feed consumption was apparently increased over 1A, but this probably results from increased wastage. As wheat lacks the adhesive qualities of oat groats, the ration is not held together as well. Feed efficiency was substantially poorer (31.9) than 1A and resulted from wastage and an apparent low digestibility of the larger wheat particles. Grinding to the consistency of flour would perhaps be beneficial for the utilization of wheat in the mink's diet.

Other observations show the effectiveness of adding wheat bran to rations containing high levels of ground wheat in overcoming loose droppings. Wet belly occurred in one third of the male pelts produced. There were no losses. Five females were saved as breeders.

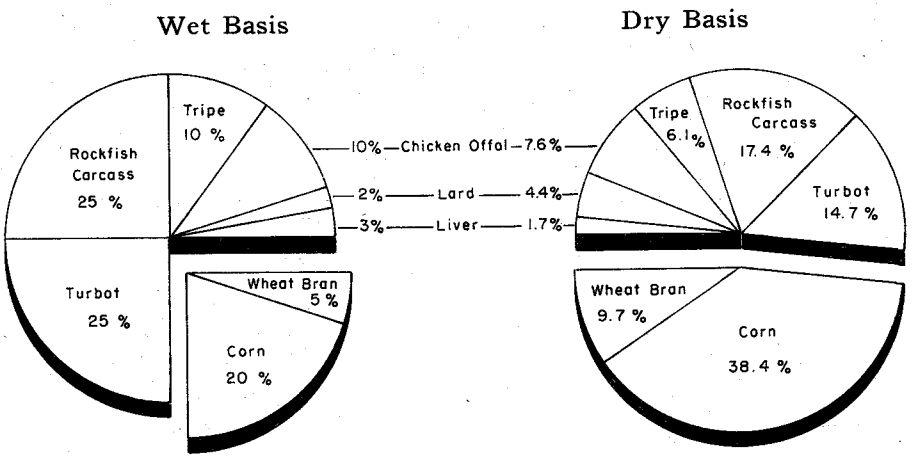
CORN

Test Group 2D

Objective: To further evaluate finely ground, cooked corn as a major constituent in the ration of the growing-furring mink, but with wheat bran added to counter the laxative effect previously noted.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on November 30.

RATION COMPOSITION



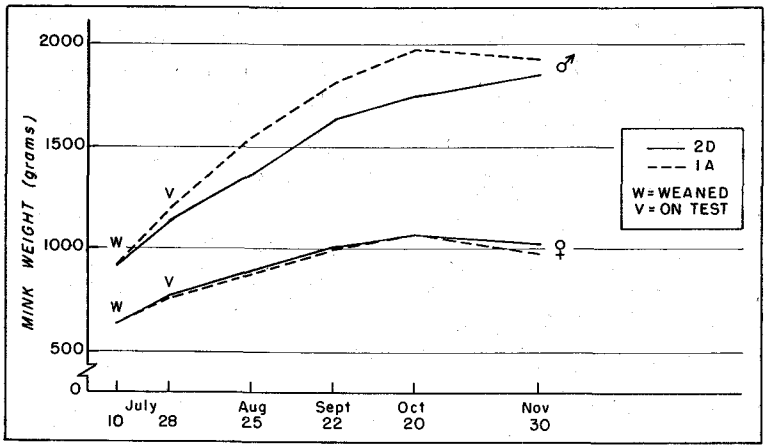
Note: Twenty-eight percent additional water was mixed with this ration for proper feeding consistency.
Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.
Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	36.5	100.0
Crude protein	10.0	27.4
Crude fat	7.7	21.0
Crude fiber	0.7	1.9
Ash	2.1	5.9
Nitrogen-free extract	16.0	43.8

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,854	1,027
Weight gain (gm.)	692	254
Animal length (cm.)	43.0	36.0
Fur color*	182	208
Fur quality*	155	183
Weight of dried skin (gm.)	101	54
Length of dried skin (cm.)	69.5	57.1
Wet-belly incidence (%)	22	.....
Estimated pelt value ($)	19.93	11.42
Feed consumption per mink, as fed (kg.)	38.2	
Feed consumption per mink, dry basis (kg.)	13.9	
Ration cost per mink (% of control)	119	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration composition was altered from 1A by substituting ground, cooked corn for oat groats. This replacement lowered protein and ash levels of the ration by 4% and 2.5%, respectively; fat level was unchanged. Wheat bran was added to prevent the scouring noted when corn alone was fed. Although ration costs were 9% lower, feed consumption was nearly a quarter higher; consequently, feed costs were 19% above 1A.

Growth rate of males was slower than controls, but they continued to gain and at pelting were less than 100 grams below 1A males. Females showed similar growth patterns to 1A females, except that the weight loss noted after October 20 was not as severe in 2D females. Pelt lengths for males were 3 cm. and for females 1.5 cm. shorter than those of 1A animals.

Fur color as a group was slightly improved over 1A, because of better female values. Fur quality was better in males than in females and equivalent to that of controls. This group was typical of the cereal grain series in that color was slightly improved and quality was equivalent to controls. Estimated pelt values were similar for males and higher for females.

Feed consumption was about 12% higher than for controls, largely due to the very crumbly nature of the feed, which resulted in considerable loss through the pen. Feed efficiency, therefore, was not good (29.4). Again, a finer grind may have been helpful in promoting ration adhesiveness and increased digestibility.

Other observations showed that wheat bran effectively prevented the scouring seen when corn alone was fed. Wet-belly incidence was reduced to 22%. One male died late in the experiment, showing hind-quarter paralysis. (A female from the same litter in a different group showed similar problems.) Two males and three females were saved as breeders.

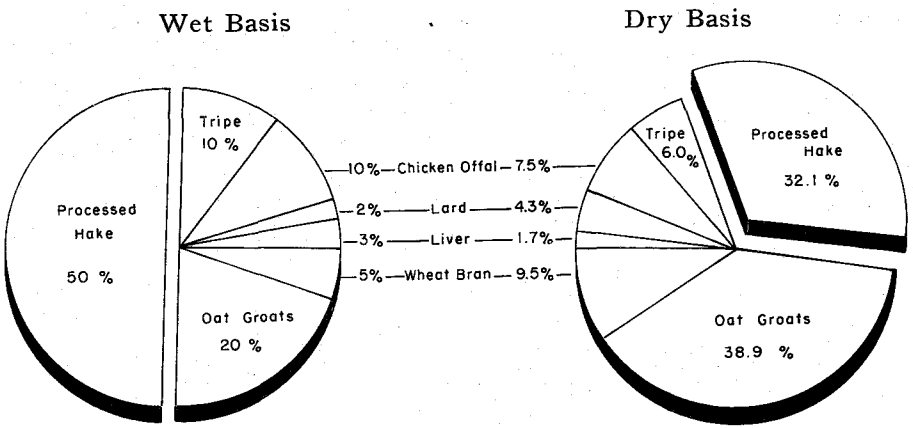
PROCESSED HAKE

Test Group 3

Objective: To evaluate Pacific hake, processed by heating, as a complete replacement for other fish species (rockfish carcass and turbot) used in the control ration, 1A.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on November 30.

RATION COMPOSITION



Note: Sixteen percent additional water was mixed with this ration for proper feeding consistency. Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed. Thiamine HCl was added at .0025% of the ration, as fed.

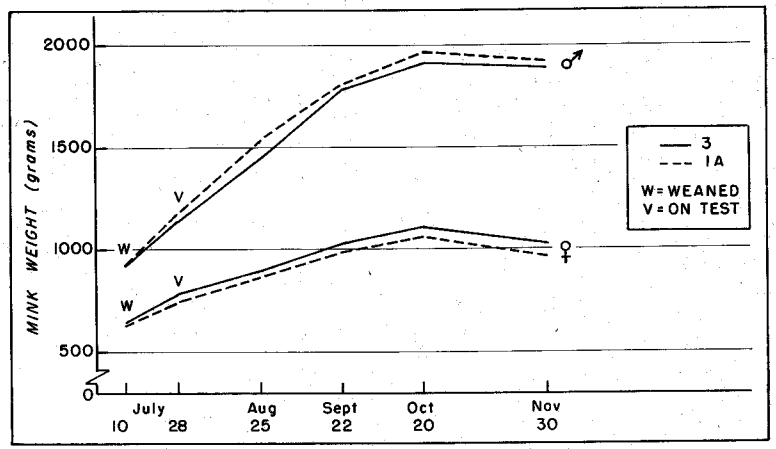
PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	41.1	100.0
Crude protein	13.6	33.2
Crude fat	7.4	17.9
Crude fiber	0.7	1.6
Ash	2.5	6.2
Nitrogen-free extract	16.9	41.1

This research was supported by funds supplied by the U. S. Bureau of Commercial Fisheries, under contract No. 14-17-007-832.

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,893	1,028
Weight gain (gm.)	791	245
Animal length (cm.)	43.6	36.3
Fur color*	192	217
Fur quality*	192	217
Weight of dried skin (gm.)	108	57
Length of dried skin (cm.)	72.3	58.6
Wet-belly incidence (%)	27	.....
Estimated pelt value ($)	19.53	10.25
Feed consumption per mink, as fed (kg.)	30.9	
Feed consumption per mink, dry basis (kg.)	12.7	
Ration cost per mink (% of control)	137	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration formulated to include Pacific hake heated to 190° F for 5 minutes in lieu of the rockfish carcass and turbot of the control ration. This substitution raised the protein level by 2% over 1A and reduced the fat by 3.5% (which was definitely lower than intended). The basic ration cost was high relative to the cost for the control, stemming from the rather arbitrary value used for processed hake which was produced on a pilot-plant basis. Possibly the price would be below this if commercially available.

Growth of this group was generally good. Males were slightly below and females were somewhat larger than control animals. Pelt lengths averaged identical to controls for both sexes.

Fur color scores were slightly poorer for males but better for females; they averaged nearly equal to controls. Quality of fur was slightly better for males, although substantially poorer for females. Some matting was observed in two males and two females in this group, probably resulting from a tendency to add more water than the ration would hold.

Feed consumption was 13% higher than for 1A and probably reflects the lower energy content of the ration as wastage was minimal. Feed efficiency (24.5) was very similar to that of 1A. Probably a higher fat level would have resulted in larger mink.

Other observations were reduced wet-belly incidence (27%); absence of mortality; and selection of one male and 3 females as breeders.

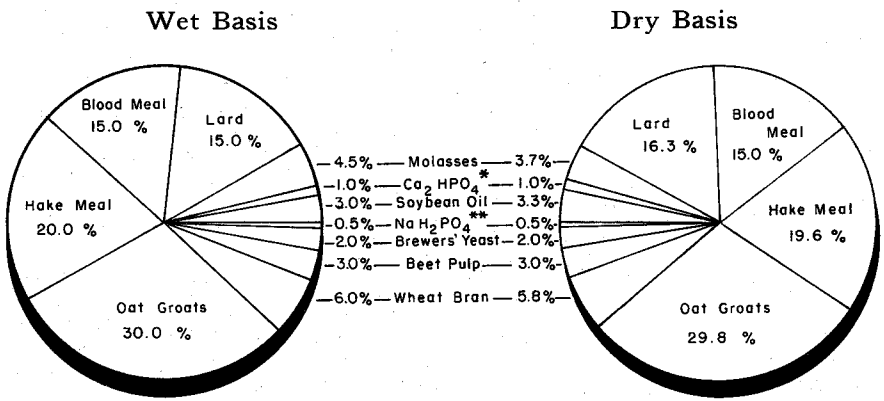
COMPLETELY DRY

Test Group 4B

Objective: To develop a ration composed completely of dry ingredients which would permit optimum performance and production efficiency; and further, to evaluate the protein adequacy of a meal prepared from Pacific hake.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on November 30.

RATION COMPOSITION



* Dicalcium phosphate.
** Monosodium phosphate.

Note: Seventy-six percent additional water was mixed with this ration for proper feeding consistency. Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.

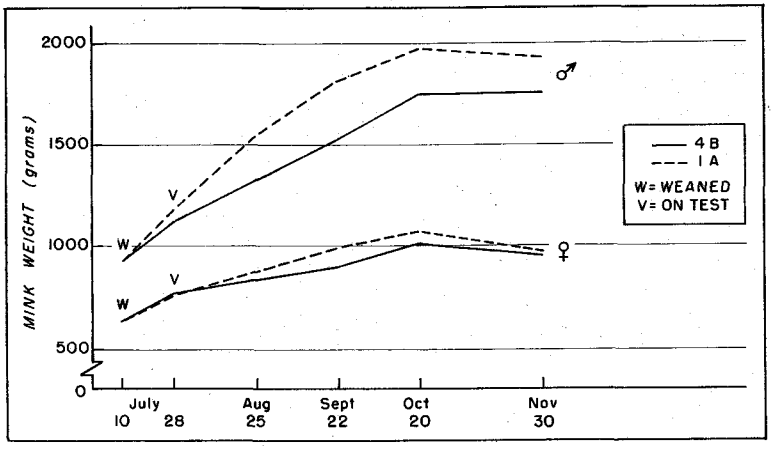
PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	59.0	100.0
Crude protein	20.9	35.4
Crude fat	12.4	21.0
Crude fiber	0.9	1.6
Ash	3.8	6.5
Nitrogen-free extract	21.0	35.5

This research was supported by funds supplied by the U. S. Bureau of Commercial Fisheries, under contract No. 14-17-007-832.

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,759	958
Weight gain (gm.)	636	183
Animal length (cm.)	43.1	35.6
Fur color*	150	200
Fur quality*	200	200
Weight of dried skin (gm.)	103	57
Length of dried skin (cm.)	70.1	57.8
Wet-belly incidence (%)	17	.....
Estimated pelt value ($)	19.86	10.59
Feed consumption per mink, as fed (kg.)	23.5	
Feed consumption per mink, dry basis (kg.)	13.9	
Ration cost per mink (% of control)	99	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration formula was based on experience from earlier trials with completely dry rations; specifications were for 35% protein and 22.5% fat and were nearly met. Major sources of animal protein were a meal commercially prepared from Pacific hake and blood meal. Cost per pound of ration appears high (8.4¢) as compared to 4.8¢ for 1A, but on a dry-matter basis is actually less expensive. Although the ration was more economical to feed, there was no reduction in overall feed cost since increased feed was required.

Growth, as evident from the curves, is not optimum, especially for males, very possibly a result of lack of amino acid balance in the diet. Also, these animals are required to make a rather drastic initial adjustment to the physical nature of this type of feed, which may detract from rapid early gains. Pelt lengths are 2.5 cm. shorter for males and 1 cm. shorter for females than for 1A animals.

Fur color was markedly improved both in males and females, and quality values were better for males but poorer for females compared to the control group (1A). Although pelts were smaller, there were fewer males showing wet belly; consequently, estimated pelt values were very comparable to control-fed mink.

Feed consumption was higher (13.9 kg. dry matter per mink) than for controls (11.2 kg.); this points out a constant difficulty in holding feed on the feeding grid. This is a definite problem with dry rations and hinges on having the water content just right.

Other observations showed that, as indicated from this limited trial, Pacific hake meal was not nutritionally equivalent to herring meal. Wet-belly incidence was 17%. There were no animal losses during the trial. Four females were saved as breeders.

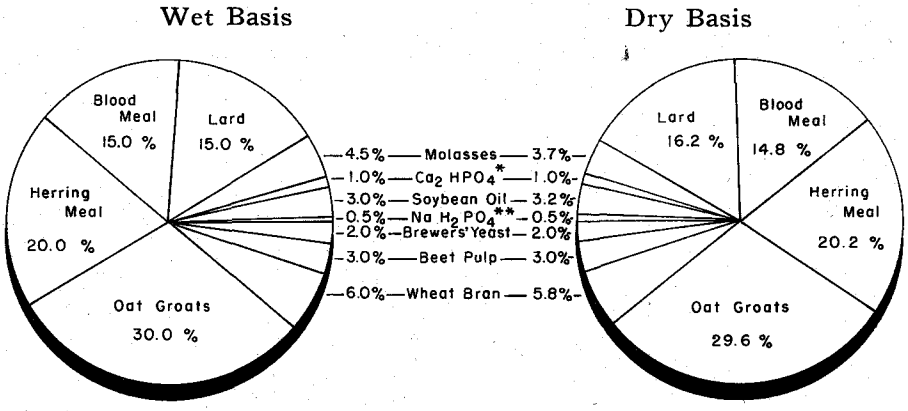
COMPLETELY DRY

Test Group 4C

Objective: To develop a ration composed completely of dry ingredients for mink which will permit optimum performance and production efficiency, utilizing herring and blood meals as protein sources.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on November 30.

RATION COMPOSITION



* Dicalcium phosphate.
** Monosodium phosphate.

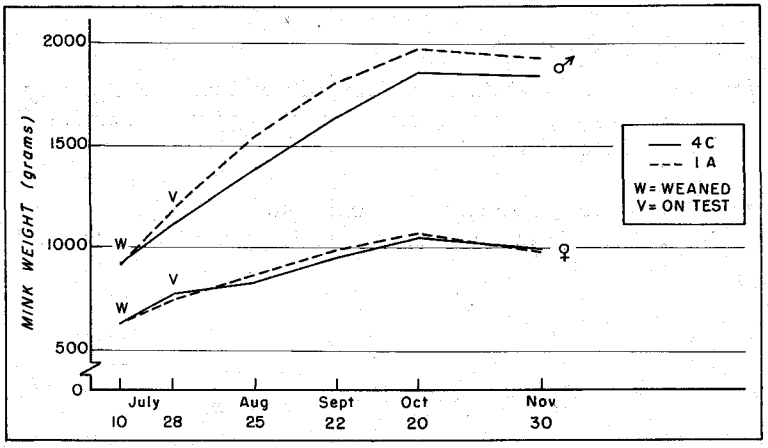
Note: Seventy-six percent additional water was mixed with this ration for proper feeding consistency. Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	59.0	100.0
Crude protein	21.3	36.1
Crude fat	12.4	21.0
Crude fiber	0.9	1.5
Ash	3.2	5.5
Nitrogen-free extract	21.2	35.9

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,838	992
Weight gain (gm.)	723	217
Animal length (cm.)	43.6	35.8
Fur color*	158	175
Fur quality*	217	158
Weight of dried skin (gm.)	111	57
Length of dried skin (cm.)	71.9	56.8
Wet-belly incidence (%)	8	.....
Estimated pelt value ($)	20.89	11.25
Feed consumption per mink, as fed (kg.)	23.4	
Feed consumption per mink, dry basis (kg.)	13.8	
Ration cost per mink (% of control)	104	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration was identical in composition to 4B except for the replacement of hake with herring meal. Analysis showed that this substitution raised the protein level of the ration by 1% and correspondingly lowered the ash level. Cost per pound of ration was increased slightly, resulting from the higher price of herring as compared to hake meal. Again, excessive feed wastage caused overall ration cost to exceed that of the control group.

Growth patterns were similar to those of 4B for both males and females; however, weight gains were improved. Males were below control male weights by less than 100 grams, and females were slightly larger than control females. But even though they weighed more, pelt lengths averaged shorter; male pelt lengths were intermediate between groups 1A and 4B.

Fur color for both males and females was superior to color scores of group 1A animals. Fur quality of males was identical to controls, whereas quality of female pelts was slightly below the control group. As estimated, pelt values of this group averaged higher than for any other experimental group, reflecting better fur characteristics and lower wet-belly incidence.

Feed consumption on a dry-matter basis was increased nearly one-quarter above that for the control group, primarily as a result of feed wastage. To curtail this problem, 0.5% of a water-binding material containing gum arabic and cellulose was added. This resulted in moderate scouring, and was withdrawn from the ration after about one week. Droppings were generally very firm otherwise.

Other observations were the marked reduction in occurrence and severity of wet belly and the fact that no mortality occurred. One female was retained as a breeder.

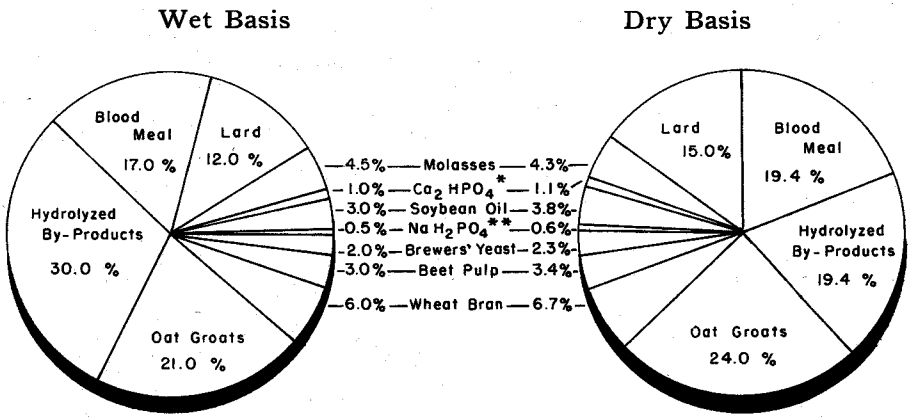
COMPLETELY DRY

Test Group 4D

Objective: To evaluate a product consisting of acid-hydrolyzed poultry offal and livestock carcasses as a component of dry-type rations for the growth and furring phases of mink.

Methods: Twenty-four standard dark mink kits (11 males and 13 females) were fed this ration from July 28 to pelting on December 1.

RATION COMPOSITION



* Dicalcium phosphate.
** Monosodium phosphate.

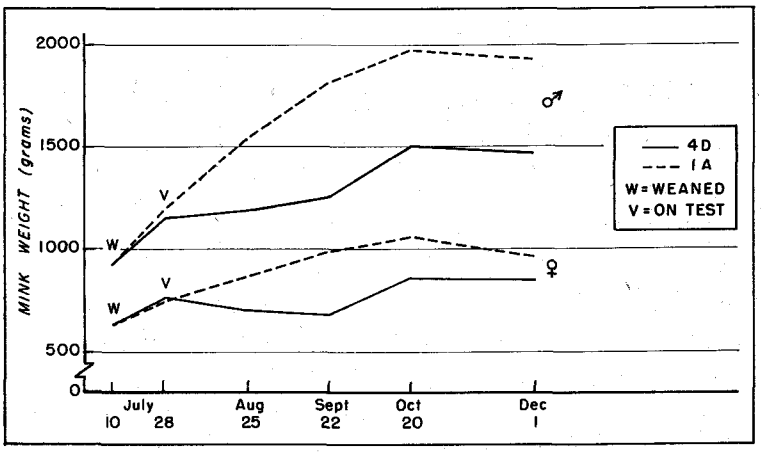
Note: Eighty-four percent additional water was mixed with this ration for proper feeding consistency. Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	48.3	100.0
Crude protein	16.6	34.3
Crude fat	10.7	22.2
Crude fiber	0.8	1.7
Ash	3.8	7.9
Nitrogen-free extract	16.4	33.9

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,473	857
Weight gain (gm.)	316	88
Animal length (cm.)	41.6	34.7
Fur color*	191	246
Fur quality*	218	238
Weight of dried skin (gm.)	90	49
Length of dried skin (cm.)	67.0	55.5
Wet-belly incidence (%)	9	.....
Estimated pelt value ($)	19.09	8.92
Feed consumption per mink, as fed (kg.)	24.3	
Feed consumption per mink, dry basis (kg.)	11.7	
Ration cost per mink (% of control)	not available	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration had similar specifications and content as 4B and C, but utilized an acid-hydrolyzed product made from poultry offal and livestock carcasses in place of fish meals. The product was semi-solid with a paste-like physical consistency, which might be a valuable addition to rations containing all dry materials. The pH of the material was approximately 3 and that of the mixed ration was close to 5. Since this was a trial product and is not commercially produced, cost data were not available.

Growth curves clearly show that the animals grew very poorly on this ration. During the first two months, males gained a scant 8% and females lost 9% of their body weight. Growth picked up the third month and declined again for the remainder of the feeding period. Both male and female pelts were considerably shorter than for 1A or other dry rations.

Fur color scores were reduced in both males and females from 1A and considerably below values for 4B and 4C. Fur quality was correspondingly poor for females, but for males it was equivalent to 1A. Estimates of pelt price were low for females, as expected, but male values were higher than anticipated in view of their size and color. Some of this discrepancy is accounted for by the almost complete absence of wet belly.

Feed consumption was comparable to that for controls. Feed efficiency, on the other hand, was markedly lower (57.9). Actually, feed wastage was high. Mink ate the ration very erractically, and feed consumption tended to follow a cyclical pattern in which animals would eat well and then completely refuse to eat. The acidity of the diet may have reduced palatability or caused irritation to the mouth and esophagus. When the product was neutralized by adding calcium hydroxide, the ration became very crumbly and unsuitable to feed.

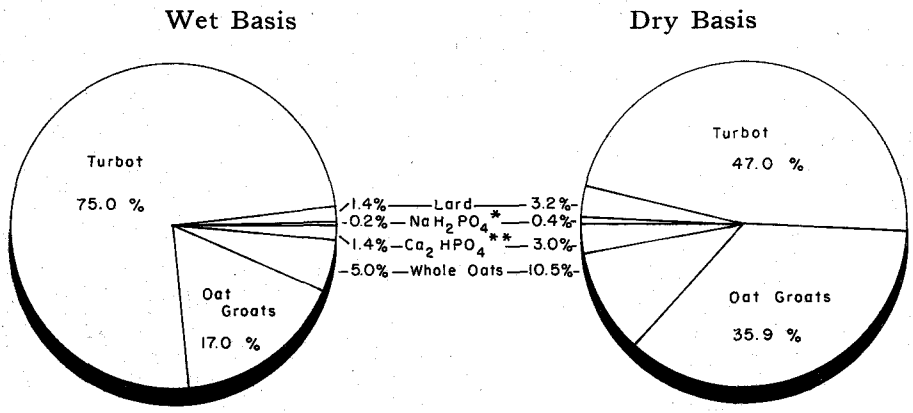
SIMPLIFIED—TURBOT

Test Group 5A

Objective: To formulate a practical mink ration, simplified in composition and based primarily on fish (turbot), which will support optimum growth and furring at economical cost.

Methods: Twenty-four standard dark mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on November 30.

RATION COMPOSITION



* Monosodium phosphate.
** Dicalcium phosphate.

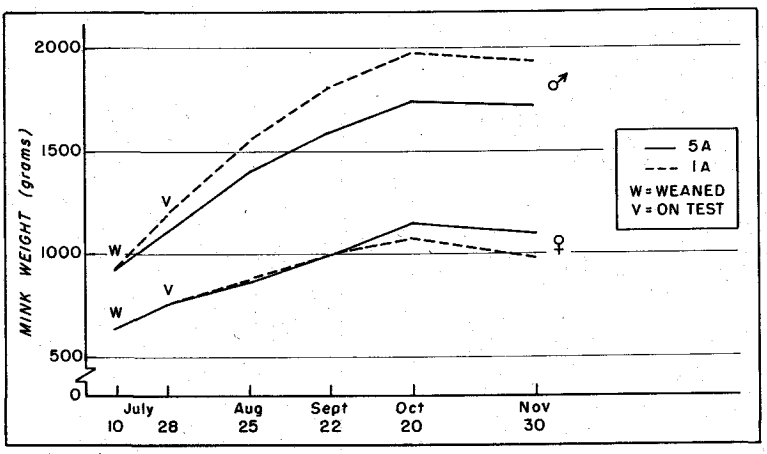
Note: Eighteen percent additional water was mixed with this ration for proper feeding consistency. Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed. Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	36.8	100.0
Crude protein	12.6	34.2
Crude fat	6.1	16.7
Crude fiber	0.8	2.1
Ash	3.1	8.5
Nitrogen-free extract	14.2	38.5

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,722	1,105
Weight gain (gm.)	611	341
Animal length (cm.)	43.0	36.2
Fur color*	217	209
Fur quality*	167	173
Weight of dried skin (gm.)	108	59
Length of dried skin (cm.)	69.5	59.7
Wet-belly incidence (%)	42	.....
Estimated pelt value ($)	15.90	10.08
Feed consumption per mink, as fed (kg.)	32.3	
Feed consumption per mink, dry basis (kg.)	11.9	
Ration cost per mink (% of control)	98	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration 5A was designed as a practical, fish-based diet utilizing as few ingredients as possible to achieve proper nutrient balance. Turbot and oat groats supplied the bulk of the nutrients, with whole oats added for fiber. Specifications were adequately achieved except that fat level at 16.7% was considerably below that specified (22.5%). Accounting for this was the low fat content of the turbot used, 10.6%. Ingredient cost was about 15% below that of the control ration, but this savings was largely offset by an increase in feed consumption.

Growth of males was substantially below that observed for 1A males; this probably results, in part, from the low fat level of the ration. Females, however, were significantly larger than 1A females, and quite possibly this is due to differences in nutrient requirements between males and females. Correspondingly, pelt lengths were shorter for males and longer for females.

Fur color for this group, on the average, was comparable to control mink, although male furs were poorer and female furs better. Quality of fur was also equivalent to controls. Pelt values of males was markedly reduced, reflecting the smaller pelts as well as a fairly high occurrence of severe wet belly.

Feed consumption was increased slightly over controls, probably because of the lower energy level of the ration. Efficiency of feed utilization was a little poorer (25.0) than for the controls.

Other observations included five males showing wet belly, two males with matted fur, one escaped female, and five females saved as breeders.

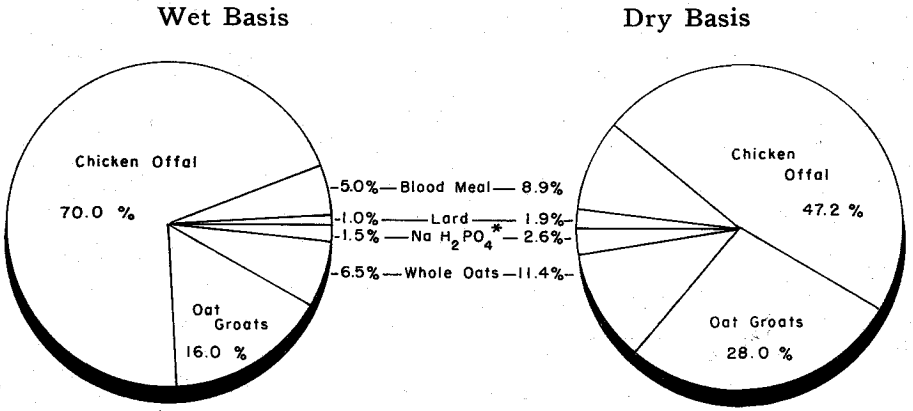
SIMPLIFIED—CHICKEN OFFAL

Test Group 5B

Objective: To formulate a practical mink ration, simplified in composition and based primarily on poultry offal (chicken), which will support optimum growth and furring at economical cost.

Methods: Twenty-four standard dark mink (12 males and 12 females) were fed this ration from July 28 to pelting on November 30.

RATION COMPOSITION



* Monosodium phosphate.

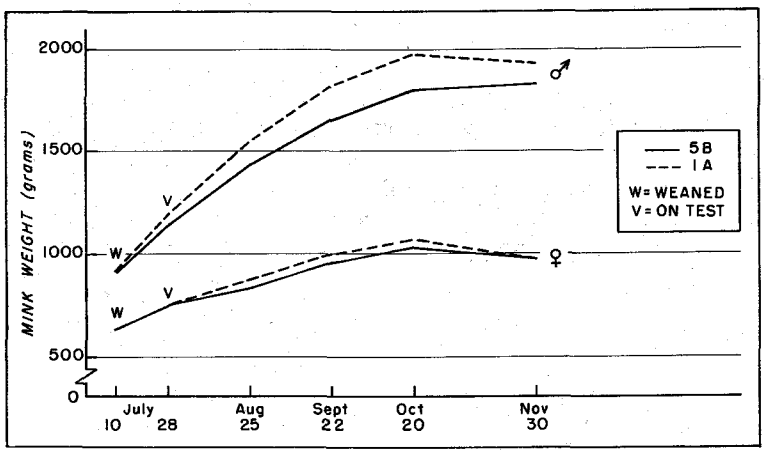
Note: Thirty-one percent additional water was mixed with this ration for proper feeding consistency. Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	44.8	100.0
Crude protein	14.9	33.3
Crude fat	9.7	21.5
Crude fiber	1.1	2.5
Ash	3.6	8.1
Nitrogen-free extract	15.5	34.6

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,825	975
Weight gain (gm.)	677	219
Animal length (cm.)	42.1	35.9
Fur color*	175	125
Fur quality*	200	200
Weight of dried skin (gm.)	108	57
Length of dried skin (cm.)	70.1	57.6
Wet-belly incidence (%)	60	.....
Estimated pelt value ($)	18.32	11.75
Feed consumption per mink, as fed (kg.)	22.3	
Feed consumption per mink, dry basis (kg.)	10.0	
Ration cost per mink (% of control)	87	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration 5B was similar in design to 5A except that it was based on chicken offal rather than fish. Proximate analysis of the mixed ration showed that nutrient specifications were closely met by the ingredients used. Feed cost on a per pound basis was about 1¢ higher than for 1A. This was due to the higher price of chicken offal in relation to fish. However, since feed consumption was down, this was actually the least expensive of all experimental rations to feed.

Growth in males fed this diet, although not poor, was not equal to expectations in view of ration nutrient content. Males averaged about 100 grams less than control males; females, however, were of equal weight. While pelt lengths of females were the same, male pelts were almost an inch shorter.

Fur color was improved for males and considerably improved for females over controls and as a group exceeded all other groups (11.7% of control values). Fur quality values were identical for males and females within the group, but males were better and females poorer compared to 1A. Pelt size and high wet-belly incidence were responsible for reduced pelt prices; pelts were estimated to be worth $1.50 each less than for control males, but female pelts were valued at 75¢ higher.

Feed consumption, 10.0 kg. dry matter per mink, was the lowest for all experimental groups, coupled with relatively good efficiency of feed utilization (22.3 units feed per unit gain).

Other observations included a high occurrence of severe wet-belly cases. No death loss occurred. Two males and six females were retained as breeders.

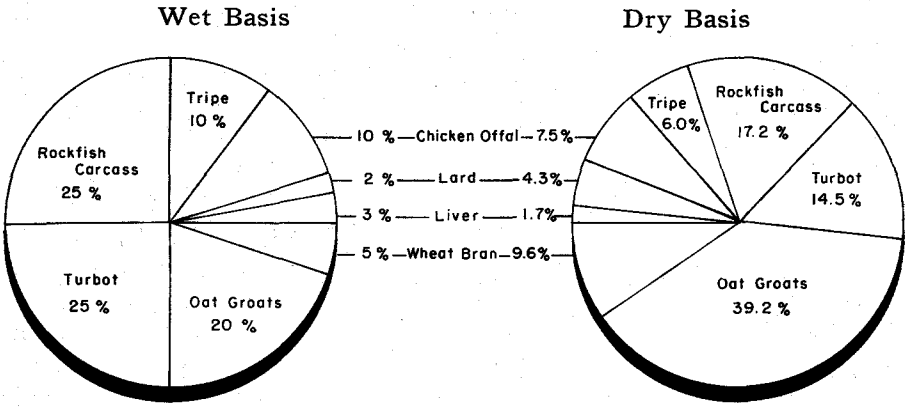
CONTROLLED LIGHT

Test Groups 6A, 6B, 6C

Objective: To determine the effects on mink fur and body growth of controlling exposure to light in an effort to induce earlier fur priming.

Methods: Twenty standard dark mink kits (15 males and 5 females) were fed this ration from July 28 to pelting on December 5. There were five males in each group and, additionally, five females in group 6A.

RATION COMPOSITION



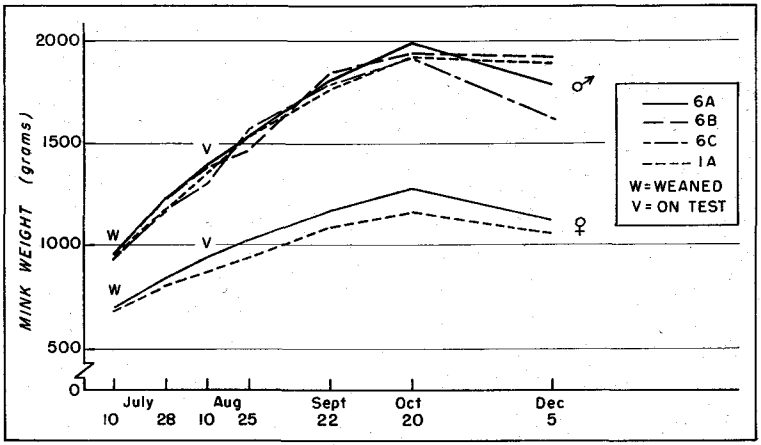
Note: Twenty-five percent additional water was mixed with this ration for proper feeding consistency.
Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.
Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	37.7	100.0
Crude protein	11.7	31.1
Crude fat	8.1	21.5
Crude fiber	0.6	1.6
Ash	3.2	8.4
Nitrogen-free extract	14.1	37.4

Results:

GROWTH CURVES



PRODUCTION DATA

	Males			
	1A	6A	6B	6C
Final weight (gm.)	1,894	1,794	1,922	1,620
Weight gain (gm.)	702	558	696	433
Animal length (cm.)	43.9	43.1	43.1	43.3
Fur color*	200	160	200	225
Fur quality*	200	220	180	300
Weight of dried skin (gm.)	115	112	116	115
Length of dried skin (cm.)	71.4	71.9	72.5	72.4
Wet-belly incidence (%)	40	20	40	25
Estimated pelt value ($)	19.14	15.82	18.06	10.60

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Group 6 animals were housed after August 10 in a facility which permitted control of exposure to light. Patterns of light exposure were varied for experimental groups as follows: Group 6A received light supplied from four 150 watt incandescent bulbs regulated by a time clock programmed to natural day length for this area; Group 6B received no light after August 10 except for short exposure to a small red darkroom bulb during feeding; Group 6C received continuous light from two 100 watt bulbs. Each group was composed of five male mink which had littermates within each other group and also in Group 1A, which was raised conventionally under natural conditions. Group 6A also had five females which were paired with females in 1A. All animals received the control ration as listed. Air was exchanged continuously by a floor-mounted exhaust fan, and waste was handled by a lagoon system.

All animals were removed from treatment and immediately pelted on December 5. Group 1A was pelted on December 1. Animals raised conventionally were completely prime. Littermate males in Group 6A with light controlled to outside conditions were not fully primed—two were classed as slightly and two as moderately unprime, the other male and five females in this group, however, were prime. Animals receiving continuous light (6C) were completely unprime and their pelt leather was black (one severely unprime and three moderately). These animals were shedding actively when pelted, although they began to shed as early as other groups. Animals raised without light (6B) were fully prime when pelted; since they could not be examined earlier, it is not known when priming occurred.

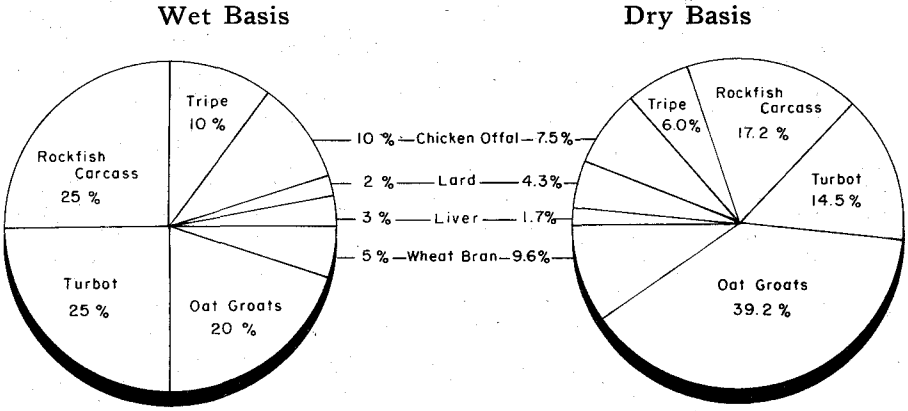
CONTROL RATION

Test Group 1A (Sapphires)

Objective: To provide a practical, moderately priced, control ration for sapphire mink, proven adequate in composition for rapid body growth and satisfactory fur development, against which animal performance on experimental rations can be compared. This is the same control ration as used for the standard dark mink.

Methods: Twenty-four sapphire mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on November 22.

RATION COMPOSITION



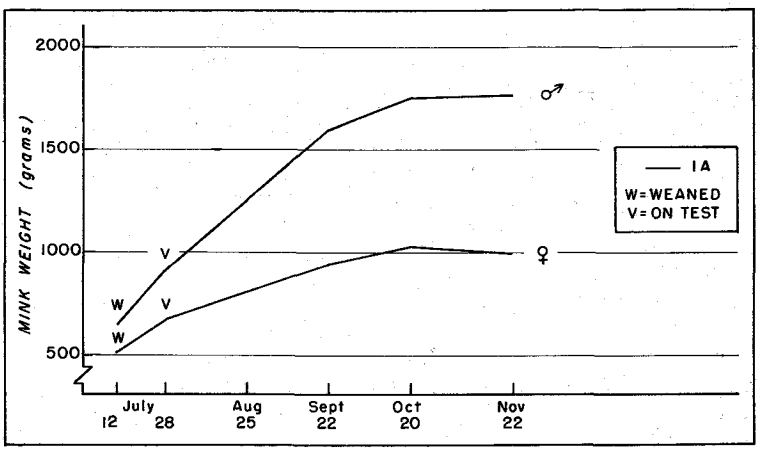
Note: Twenty-five percent additional water was mixed with this ration for proper feeding consistency.
Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.
Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	37.7	100.0
Crude protein	11.7	31.1
Crude fat	8.1	21.5
Crude fiber	0.6	1.6
Ash	3.2	8.4
Nitrogen-free extract	14.1	37.4

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,771	994
Weight gain (gm.)	862	316
Animal length (cm.)	43.8	36.3
Fur color*	150	183
Fur quality*	125	133
Weight of dried skin (gm.)	92	49
Length of dried skin (cm.)	65.7	54.3
Wet-belly incidence (%)	0	.....
Estimated pelt value ($)	18.11	11.00
Feed consumption per mink, as fed (kg.)	31.2	
Feed consumption per mink, dry basis (kg.)	11.8	
Ration cost per mink (% of control)	100	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration fed to this group of control sapphire mink was the same as fed to the control darks. See group 1A darks for comments on this ration.

Growth, as indicated by final weight of males, was less for sapphire mink fed this ration than for dark males; however, larger weight gains were recorded for sapphires as they went on test at lighter weights. Females, on the other hand, finished slightly larger than dark females. No marked drop in body weight was noted after October 20th as with dark mink fed this diet. Carcass lengths of sapphires were similar to those of dark mink, but pelt lengths were considerably shorter—about 3 inches for males and half that for females. Pelt weights were correspondingly lighter for sapphires (20 and 14% for males and females, respectively).

Fur color values, based on designation of shade as either light, medium, or dark, showed these sapphires to be intermediate between the light and medium categories. Fur quality was very good for both sexes and better, relatively, than that of the dark mink. In relation to the other groups of sapphires, estimated pelt values were good.

Feed consumption was higher than for dark mink fed the same ration, but feed conversion efficiency was improved over that of darks (20.0 units feed per unit gain). As a direct result of higher feed consumption, feed cost was higher than for dark mink.

Other observations showed absence of wet belly in males, although the fur-out method of skin preparation makes careful checking of this point difficult. There was no mortality. Three males and 10 females were saved as breeding stock.

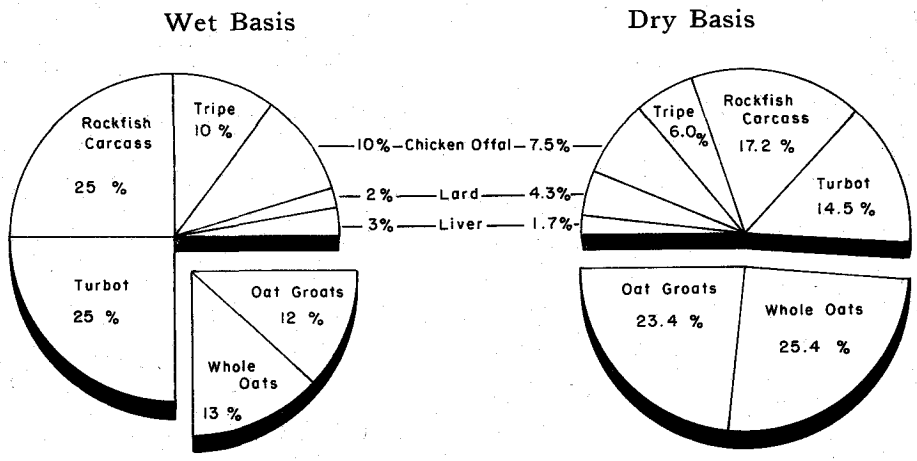
OAT GROATS—WHOLE OATS

Test Group 2B (Sapphires)

Objective: To evaluate a mixture of ground, raw, whole oats and cooked oat groats, added to improve economy and increase dietary fiber level, in a growing-furring ration for sapphire mink.

Methods: Twenty-four sapphire mink kits (12 males and 12 females) were fed this ration from July 28 to pelting on November 27.

RATION COMPOSITION



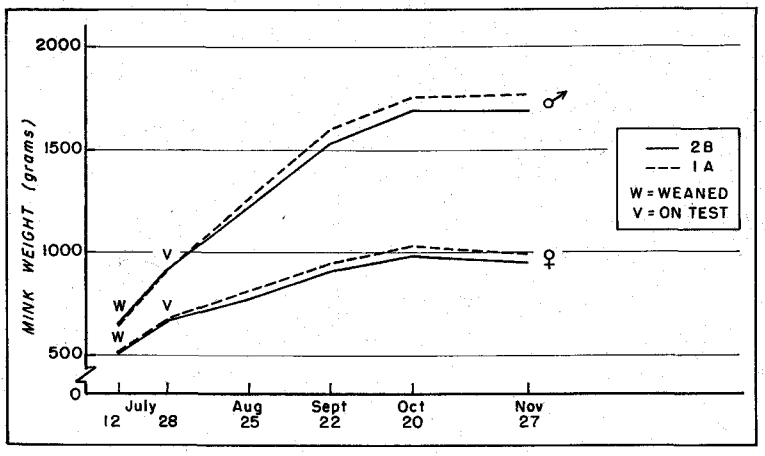
Note: Twenty-five percent additional water was mixed with this ration for proper feeding consistency.
Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.
Thiamine HCl was added at .0025% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	36.4	100.0
Crude protein	10.4	28.4
Crude fat	7.6	21.0
Crude fiber	1.5	4.1
Ash	2.3	6.4
Nitrogen-free extract	14.6	40.1

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,691	949
Weight gain (gm.)	785	288
Animal length (cm.)	43.6	36.4
Fur color*	175	175
Fur quality*	142	158
Weight of dried skin (gm.)	93	53
Length of dried skin (cm.)	64.9	53.8
Wet-belly incidence (%)	27	.....
Estimated pelt value ($)	15.80	10.00
Feed consumption per mink, as fed (kg.)	33.7	
Feed consumption per mink, dry basis (kg.)	12.3	
Ration cost per mink (% of control)	105	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration cereal composition was intermediate between the control utilizing oat groats and ration 2A based solely on ground whole oats. Advantages contemplated in adding whole oats were increased ration economy and higher levels of fiber necessary to maintain firmness of droppings. Proximate composition of the ration indicates that this substitution lowered protein levels by 3% and increased fiber by 2½%. Feeding consistency of this diet was considerably improved over the ration which included only ground whole oats. Ration cost was slightly reduced, but increased feed consumption raised overall cost by 5%.

Growth of both males and females within this group was below that of sapphire controls, but growth patterns were similar. Pelt length differences, however, were negligible.

Fur color was identical for males and females, although comparisons have little economic meaning when compared with color values for dark mink. This is a comparatively light strain of sapphires and variation in color is not marked. Fur quality values are below those of controls. Pelt value estimates were similarly reduced as compared to 1A sapphires, and in males this reflects differences in wet-belly occurrence.

Feed consumption was the highest of the three sapphire groups and feed efficiency the poorest (22.8). Possibly this resulted from increased feed wastage due to the fairly coarse nature of the oat hulls.

Other observations included higher wet-belly incidence with 3 of 11 males affected. No death loss occurred. One male and 10 females were kept as breeders.

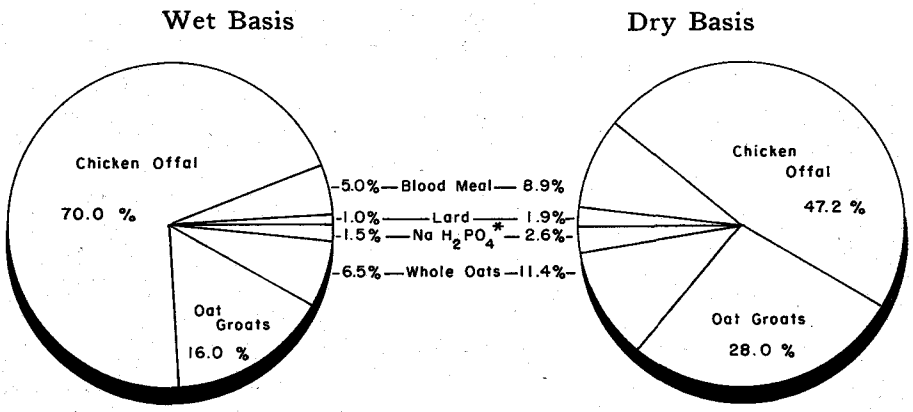
SIMPLIFIED—CHICKEN OFFAL

Test Group 5B (Sapphires)

Objective: To formulate a practical ration for sapphire mink, simplified in composition and based primarily on poultry offal (chicken), which will support optimum growth and furring at economical cost.

Methods: Twenty-four sapphire mink kits (12 males and 12 females) were fed the control ration (1A) from July 28 to August 7; thereafter until pelting on November 27 the ration shown below was fed.

RATION COMPOSITION



* Monosodium phosphate.

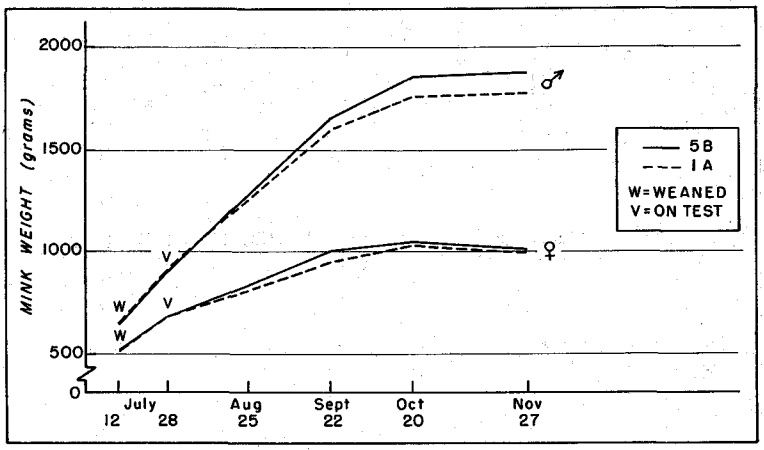
Note: Thirty-one percent additional water was mixed with this ration for proper feeding consistency. Vitamin E (d-alpha tocopheryl acetate) was added at .01% of the ration, as fed.

PROXIMATE ANALYSIS

	As fed	Dry
	%	%
Dry matter	44.8	100.0
Crude protein	14.9	33.3
Crude fat	9.7	21.5
Crude fiber	1.1	2.5
Ash	3.6	8.1
Nitrogen-free extract	15.5	34.6

Results:

GROWTH CURVES



PRODUCTION DATA

	Males	Females
Final weight (gm.)	1,878	1,013
Weight gain (gm.)	978	336
Animal length (cm.)	44.0	36.7
Fur color*	167	175
Fur quality*	175	175
Weight of dried skin (gm.)	96	54
Length of dried skin (cm.)	67.5	55.6
Wet-belly incidence (%)	9	.....
Estimated pelt value ($)	18.71	10.00
Feed consumption per mink, as fed (kg.)	24.3	
Feed consumption per mink, dry basis (kg.)	10.9	
Ration cost per mink (% of control)	90	

* Fur color and quality, taken from dried skins, are rated from 100 (best) to 400 (poorest).

Discussion:

Ration 5B fed to sapphire mink was primarily formulated from chicken offal and oat groats, and it was identical in composition to ration 5B fed to standard dark animals. Basic ration cost, as noted before, was higher than for the control diet, but lowered feed consumption reduced overall cost by 10%, an observation consistent with that noted for dark mink.

Growth was good; both males and females exceeded weights of animals fed the control ration. The reverse of this was true for dark mink fed this ration and control animals were larger. Sapphire pelt lengths also averaged about 2 cm. longer for males and 1 cm. longer for females.

Fur color for animals as a group was equal to that of controls. Fur quality was notably reduced for males and females as compared to quality of control animals. This observation was similar to that noted for dark mink fed this ration. Average pelt values were estimated higher for males even though fur quality was down, possibly due to larger pelt size. Female prices were lower than controls.

Feed consumption was lowest of the three groups of sapphires, and feed efficiency (16.6 units feed per unit gain) was best of any experimental group, including dark mink.

Other observations included one male affected by wet belly, no mortality, and one male and six females saved as breeders.

APPENDIX

Proximate Analysis of Feedstuffs Used in 1967 Feeding Trials

(Dry-Matter Basis)

Item	Dry matter	Crude protein	Crude fat	Crude fiber	Ash	NFE	Calcium	Phosphorus	References
	%	%	%	%	%	%	%	%	
MEATS:									
Chicken offal with feet	30	38.2	40.3	1.4	12.4	7.7	4.04	2.22	OSU[1]
Horsemeat	37	47.6	42.8	0*	3.7	5.9	0.13	1.69	OSU
Lard, stabilized	100	0	100.0	0	0	0	0	0	OSU
Liver, beef	32	61.3	13.9	1.1	4.3	19.4	0.04	0.89	OSU
Tripe, beef	34	45.9	47.7	0.7	2.9	2.8	1.05	0.57	OSU
FISH:									
Hake, processed	23	58.3	22.0	0.2	11.2	8.3	2.55	1.86	OSU
Rockfish, carcass	30	52.0	14.2	0.8	19.0	14.0	6.07	3.32	OSU
Sole	19	72.3	9.1	0*	13.8	4.8	3.32	2.30	OSU
Turbot	25	65.0	10.6	0.1	14.2	10.1	3.37	2.41	OSU
DRIED ANIMAL PRODUCTS:									
Blood meal, spray-dried	91	88.1	0	2.1	2.5	7.3	0.06	1.78	OSU
Hake meal	98	65.3	5.8	0.6	16.0	12.3	3.38	0.84	OSU
Herring meal	93	74.9	6.4	1.1	11.6	6.0	3.20	2.10	NRC 296 & 659
Meat and bone meal	94	54.0	10.7	2.1	33.2	0	10.40	4.50	NRC 296 & OSU
Hydrolyzed animal by-product	52	51.4	12.9	0.6	18.9	16.2	.....	.....	OSU
Skim milk powder	94	36.8	1.3	0.2	8.2	53.5	1.40	1.20	NRC 296, 659 & OSU
DRIED PLANT PRODUCTS:									
Alfalfa meal, sun-cured	91	19.1	2.2	25.8	9.8	43.1	1.50	0.20	NRC 296 & 659
Barley, whole, ground	90	11.6	2.3	9.4	3.3	73.4	0.07	0.47	OSU
Beet pulp	91	8.9	1.1	25.5	4.0	60.5	0.70	0.09	NRC 296 & 659
Brewers' yeast	93	49.9	1.3	3.0	6.9	38.9	0.10	1.60	NRC 296 & 659
Corn, whole, ground, cooked	90	9.7	5.3	0.7	1.2	83.1	0.02	0.30	OSU
Oat groats, ground, cooked	90	14.4	7.5	1.3	1.9	75.1	0.07	0.43	OSU
Oats, whole, ground, cooked	92	10.8	4.3	16.5	4.2	64.2	0.08	0.26	OSU
Molasses, cane	76	4.2	0	0*	10.5	85.3	0.58	0.08	OSU
Soybean oil meal	89	50.9	1.1	6.5	6.5	35.0	0.30	0.70	NRC 296 & 659
Soybean oil	100	0	100.0	0	0	0	0	0	NRC 659
Wheat bran	90	18.0	10.6	2.8	5.4	63.2	0.20	1.40	OSU
Wheat germ meal	90	27.5	7.7	3.3	5.3	56.2	0.08	1.20	NRC 296 & 659
Wheat, whole, ground, cooked	91	14.4	3.3	2.3	1.6	78.4	0.09	0.34	OSU
OTHER:									
2-4-9-10 (vitamin supplement: riboflavin—2 mg., calcium d-pantothenate—4 mg., niacin—9 mg., and choline chloride—10 mg. per pound)									
Methionine, dl									
d-alpha tocopheryl acetate (50,000 International Units of vitamin E per pound)									
Terramycin (10 grams of oxytetracycline per pound)									
Phosphoric acid (75%)									
Thiamine hydrochloride									
Monosodium phosphate									
Dicalcium phosphate									

[1] These data have been compiled from analyses of feedstuffs made at Oregon State University or have been taken from National Research Council publication numbers 296 and 659. * Estimated.