THE EFFECTS OF CERTAIN MARINE FISHES IN THE DIETS OF MINK

by

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THE EFFECTS OF CERTAIN MARINE FISHES IN THE DIETS OF MINK

INTRODUCTION

This report is the result of a nutritional study conducted with ranch mink, Mustela vison (Schreber) (6, p.235), during the period from May 1950 to January 1951, at the Oregon State College Experimental Fur Farm, to determine if three marine fishes, when included in the rations, would affect the growth and fur quality of mink. The three marine fish, which occur abundantly off the Oregon coast, were Pacific hake, Merluccius productus (Ayres), arrowtoothed halibut, Atheresthes stomias (Jordan and Gilbert), and black rockfish, Sebastodes melanops (Girard). Each diet has been evaluated as to growth value, effect on fur color, and pelt quality, as well as to the amount consumed of each ration.

The project was inaugurated upon the suggestions of the members of the Oregon Fox and Mink Association, and was conducted under the supervision of the Department of Fish and Game Management, Oregon Agriculture Experiment Station. Since the investigation involved three species of little utilized Oregon marine fishes, the marine biologists of the Oregon Fish Commission, also, indicated interest in the observations.

The Oregon State College Experimental Fur Farm, located at Corvallis, Oregon, was first established in 1937 from funds provided by the Oregon legislature and

the United States Department of Agriculture, Office of Agriculture Experiment Stations (5, p.1-2). After considering problems dealing with 1. reproduction in regard to the artificial light factor (7, p.1), 2. "Chastek" paralysis in mink caused from diets including Eulachon, Thaleichthys pacificus (Richardson) (11, p.1), and 3. artificial insemination of foxes, Vulpes fulva (Desmarest) (7, p.3), the fur farm was inactivated in 1942 because of war conditions. After that time, activities, for a few months, were devoted to rabbit production problems.

As a result of the expansion of the fur farming industry in Oregon during the post-war period, and because of the growing need for research in this industry, the 1949 Assembly of the Oregon legislature appropriated funds for the reestablishment of the experimental fur farm. It was through the interest of the members of the Oregon Fox and Mink Association that this was accomplished and the experimental farm was reactivated in July 1949.

In October 1949, the work was begun on the fur farm to renovate the buildings formerly used for experimental purposes. Two breeder buildings, figures 1 and 2, and a feed room, figure 3, were finished in January 1950. During the summer of 1950, a small

refrigeration unit and a pelter building, figures 10 and 11, containing 170 pens, were completed.

In February 1950, 40 female and 10 male mink were delivered here. These mink were donated by the Oregon Fox and Mink Association, whose members had financially contributed for the purchase of them from two ranches. The mink were selected, by a committee of fur farmers, from the ranches of Mr. Ted Jacobs, Tillamook, and Mr. Victor Gibson, Salem.

The purpose of the Oregon State Experimental Fur Farm is to serve the industry by experimentally working with the problems of the fur farmers, and to conduct the research along the lines believed to be of a pertinent value by the industry. It is the desire of the experimental workers to keep the research as close to the industry as possible. It was with this idea in mind that this study was conducted utilizing the three marine fishes as suggested by the board of directors of the Oregon Fox and Mink Association.

METHODS AND MATERIALS

THE PROBLEM.

Experimental diets, including three seldom-utilized marine fishes, were given to mink to determine if they

could be included, in part, in rations commonly fed on Oregon fur farms. These widely-fed rations utilize the carcass* forms of frequently caught human food fishes, but during periods of low supply of carcasses of filleted fish, the mink producers have found it necessary to feed some whole fish. Therefore, it was desirable to find other adequate sources from which the fur breeder could fill his needs while, at the same time, not being in conflict with the problem of declining stocks of some commercial fishes. With this idea in mind, the experimental work was undertaken.

In April 1950, the board of directors of the Oregon Fox and Mink Association met with members of the Department of Fish and Game Management at Oregon State College. During this meeting, suggestions were obtained from the fur farmers which were incorporated into the plan of the year's research, and three fish, Pacific hake, arrowtoothed halibut, and black rockfish, were selected for use in the experimental diets.

THE EXPERIMENTAL ANIMALS.

In February 1950, forty female and ten male mink

* Explanation of carcass: Racks, or what remains after fillets have been taken from a fish.

Figure 1. Exterior of building in which breeder mink were housed

were received from the Oregon Fox and Mink Association. During March 1950, these mink were mated, and as a result of the matings, 155 kittens were born during the first two weeks of May. Of these 155 kittens, 75 were males and 80 were females.

These mink remained in litters until July 28. At that time they were separated into the experimental pens, figure 12, and started on the special diets. Although the most desirable date of separation would have been July 1, experimental pens were not completed until late July.

A basic group of four males and ten females was selected at the time of separating the litters. This group was formed with the emphasis on large litter size since the mink from this group now form part of the brood stock for the coming year. The diet fed these mink was a proven one in which the known requirements of the mink were met in order to form a basis with which to compare the other experimental diet groups.

At the suggestion of Dr. J. R. Haag of the Department of Agricultural Chemistry, Oregon State College, all mink were weighed as they were placed in the groups so that all diet groups were as even in average weight as thought to be experimentally expedient and, therefore, were comparable in results.

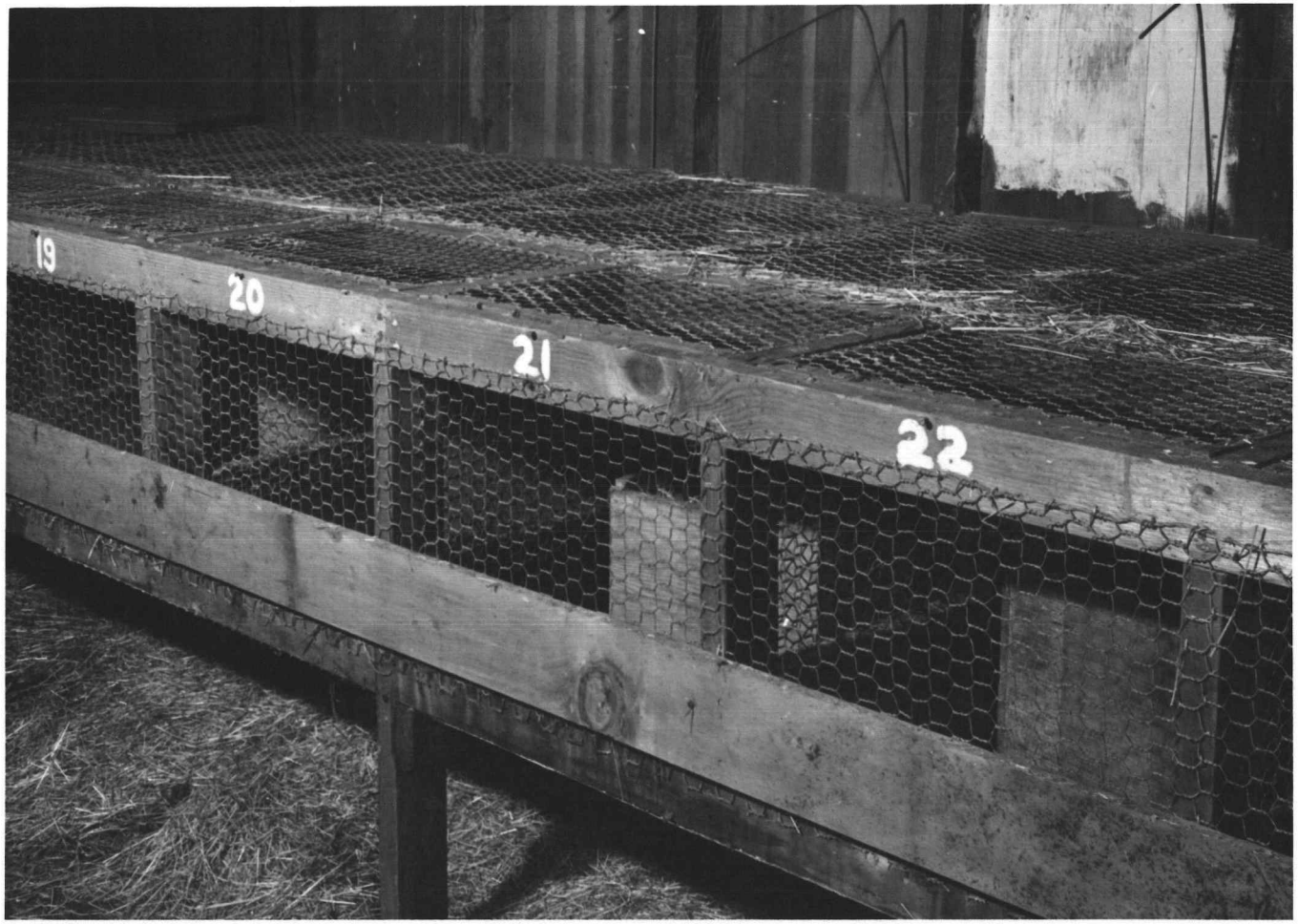

Figure 2. Interior of breeder building showing type of breeder pen used

Since litter size was thought to have some bearing on the ultimate size of the mink, the experimental groups were distributed as to litter size as well as to weight. The average litter size was five kittens. One-fourth of the offspring were from litters containing one, two, three or four kittens. These litters were designated as small. One-half of the kittens were from litters of five, six or seven young mink and were designated as from medium-sized litters. One-fourth of the offspring were from large litters containing eight or nine kittens with litters containing seven kittens falling into the large class one-third of the time.

After ten females and four males had been selected for the basic group, designated as Group I, from the total young stock of 80 females and 75 males, there remained 71 males and 70 females for distribution to other diets.

It was thought that if three diets, containing varied percentages of each experimental fish, were fed to the experimental groups of mink, accurate observations of the specific fish's adequacy could be made. Since there were three experimental fish, three gradations of each totaled nine diets. Each group included seven females and seven males, totaling

14 mink on each diet. Thus, 126 mink were distributed on nine diets, leaving 15 young mink for use in other feeding trials.

To distribute each groups, as evenly as possible, as to sexes, litter sizes and weights, two females were taken from small, three from medium and two from large litters. A similar procedure was followed in selecting the males for these groups.

Three additional diet groups were organized to include the remaining 15 young mink, together with 11 adult females and two adult males which had failed to reproduce. Each of these three groups contained six females and three males. The females on each of the diets consisted of three or four adult females, and the remainder, of young stock. The adult males were placed in Groups XII and XIII, and the remaining males were kittens. The Groups XII and XIII, just mentioned, will be further explained under the heading, The Diets.

The terms group and diet will be interchanged; that is, Group III is synonymous with diet III.

THE EXPERIMENTAL DIETS.

After consulting with several fur farmers on the subject of the rations they were feeding to their animals, a basic diet was formulated. This diet was

intended to be fully adequate in every way so as to produce and maintain a healthy group of young mink with which to compare the mink fed the experimental rations.

This basic diet included the following ingredients:

Basic meat	25.7%
Red rockfish	24.7%
Mixed flatfishes	42.2%
Basic cereal	7.4%

Since the research was to concern, primarily, the fish portion of each diet, basic meat and basic cereal portions were calculated for all diets. These, too, were the result of a comparison of the ideas of several ranchers, and moderate amounts of cereal and meat were included as part of each diet.

The basic meat consisted of

13.8%	tripe
7.3%	horsemeat
4.6%	liver
25.7%	of total diet, by weight.

The basic cereal consisted of

1.85%	wheat germ
1.40%	yeast
1.40%	alfalfa
1.85%	Cerl-meal (a Crown Mills product)
.90%	bone meal
7.40%	of the total diet, by weight.

All diets were supplemented with 2,000 I. U. of Vitamin A for each mink. A concentrated fish oil was used as the source. The above proportions of the basic meat and cereal portions, expressed in percentages, by

weight, remained constant throughout all the diets, so that the fish employed were the only variable portions of the diets. Each of the three experimental fish was included in diets containing 66.9%, 50.3% or 33.7% of each experimental fish. These expressed percentages are of the total diet, by weight. Using this range, it was thought that a fair indication of the particular fish's adequacy in the diet could be evaluated. Table I gives constituents for each diet.

Since there were adult mink in diet Groups XI, XII, and XIII, these particular groups were not comparable to the preceding groups, I through X, but served as indicators of growth and pelt value because these groups, containing older mink did not produce conclusive evidence of growth and pelt value in comparison with the diet groups containing more and younger mink.

All mink in litters were fed twice daily from May 28 to July 28. The morning feed during this period was saturated with whole milk. After July 28, when they were separated into experimental diet groups, the young mink were fed once daily.

While on the diets, the mink were always fed more than they would consume so that the remaining portion could be weighed in order to calculate the food consumed on each diet. All fish used in the diets were caught

TABLE I

CONSTITUENTS OF THE EXPERIMENTAL DIETS

Experimental Diet Groups	Percentages of Total Diets by Weight
Group I (Basic)	
Basic meat	25.7
Red rockfish (carcass*)	24.7
Mixed sole**	42.2
Basic cereal	7.4
Group II	
Basic meat	25.7
Hake	66.9
Basic cereal	7.4
Group III	
Basic meat	25.7
Hake	50.3
Red rockfish (carcass)	16.6
Basic cereal	7.4
Group IV	
Basic meat	25.7
Hake	33.7
Red rockfish (carcass)	16.6
Mixed sole	16.6
Basic cereal	7.4
Group V	
Basic meat	25.7
Arrowtoothed halibut	66.9
Basic cereal	7.4
Group VI	
Basic meat	25.7
Arrowtoothed halibut	50.3
Red rockfish (carcass)	16.6
Basic cereal	7.4

TABLE I--continued

Experimental Diet Groups	Percentages of Total Diets by Weight
Group VII	
Basic meat	25.7
Arrowtoothed halibut	33.7
Red rockfish (carcass)	16.6
Mixed sole	16.6
Basic cereal	7.4
Group VIII	
Basic meat	25.7
Black rockfish	66.9
Basic cereal	7.4
Group IX	
Basic meat	25.7
Black rockfish	50.3
Red rockfish	16.6
Basic cereal	7.4
Group X	
Basic meat	25.7
Black rockfish	33.7
Red rockfish	16.6
Mixed sole	16.6
Basic cereal	7.4
Group XI	
Basic meat	25.7
Hake	22.3
Red rockfish	22.3
Mixed sole	22.3
Basic cereal	7.4
Group XII	
Basic meat	25.7
Arrowtoothed halibut	22.3
Red rockfish	22.3
Mixed sole	22.3
Basic cereal	7.4

TABLE I--continued

Experimental Diet Groups	Percentages of Total Diets by Weight
Group XIII	
Basic meat	25.7
Black rockfish	22.3
Red rockfish	22.3
Mixed sole	22.3
Basic cereal	7.4

*Carcass: Definition--racks or what remains after filleting.

**Mixed sole: Contained slippery flounder, lemon flounder, longfinned flounder, and roundnose flounder. The lemon flounder and roundnose flounder were mostly carcasses.

off the Oregon coast and quick frozen upon arrival in Corvallis. The tripe, liver and horsemeat were obtained locally and were also quick frozen.

All feed was prepared daily, having been thawed by flowing tap water, and ground and mixed just prior to feeding. Extreme care was taken to be certain that all feed was fresh and uncontaminated. The fish used in the diets were deviscerated, since the food value of the fish varies with the kinds and amounts of feed in the entrails.

THE FISH.

A short description of each fish used in the diets is listed below. This information is supplemented by the identifying taxonomic characteristics which have been listed in appendix I. The biochemical analyses of each fish may be found in appendix IV.

Black rockfish. Sebastodes melanops (Girard)

This fish, figure 4, is a member of the genus Sebastodes, of which 24 species have been recorded as occurring off the Oregon coast (12, pp.73-75). It has been seldom used as a human food fish because of a color change in the flesh, from a natural whiteness to a very definite green, which occurs upon cold storage.

Figure 3. Equipment used in preparing mink rations

Black rockfish range from southern Alaska to Point Arguello, California, and will grow to a length of 20 inches (12, p.73). Other names sometimes used when referring to this fish are black rock-cod, black bass, bluefish and cherna (2, p.19).

Early in the experiments it became apparent that another species of Sebastodes was accompanying, in varying amounts, the supplies of the black rockfish. Upon examination, the fish, commonly called gray cod, figure 5, checked with Sebastodes mystinus (Jordan and Gilbert), with the accepted common name of priest fish, except for the following characters:

1. Sebastodes mystinus has 9 or 10 anal rays; the gray cod, on hand, have 8.

2. The gray cod has small postocular spines and also possesses supraocular and tympanic spines; Sebastodes mystinus does not.

Pacific hake. Merluccius productus (Ayres)

A member of the family, Merlucciidae, which is sometimes listed as a sub-family of the cods, Gadidae, the Pacific hake, figure 6, is seldom used on the Pacific coast for human consumption (11, p.46). This is because of its soft flesh, which has a high water content and is, therefore, a very poor keeper. It has a range of from

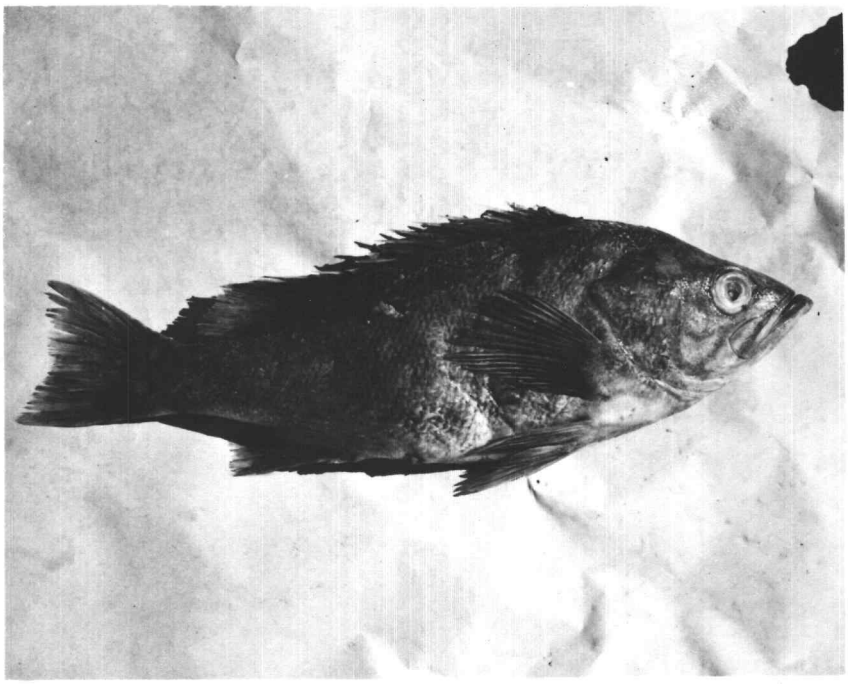

Figure 4. Black rockfish, Sebastodes melanops

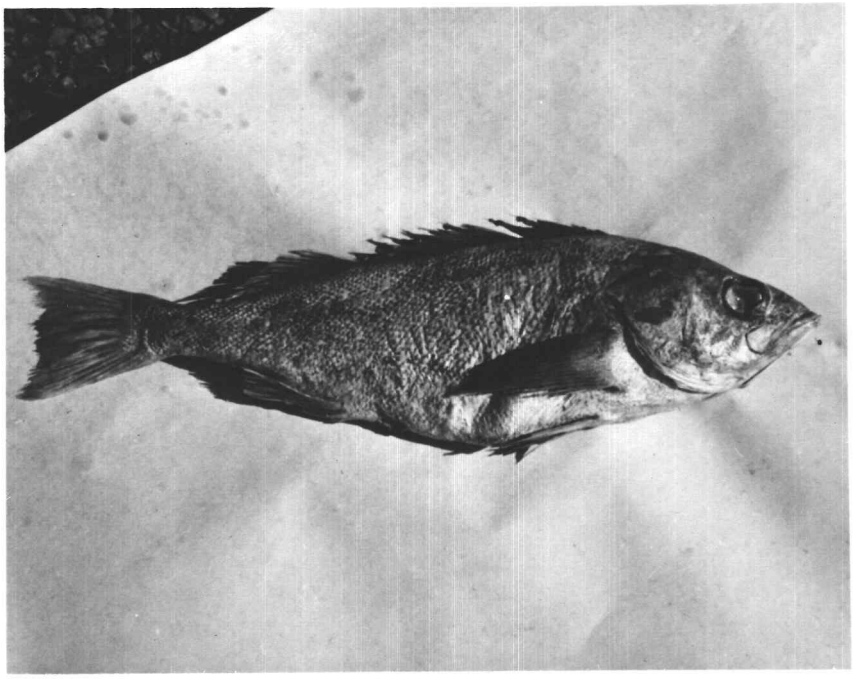

Figure 5. Priest fish, Sebastodes mystinus

Alaska to the Gulf of California (12, p.65), and grows to a length of about three feet. Other names for this fish are whitefish, "haddock", and "butterfish" (2, p.12).

Arrowtoothed halibut. Atheresthes stomias (Jordan and Gilbert)

This flatfish, figure 7, is soft-fleshed, which makes it of small demand by humans for food, although it has been filleted for market upon rare occasions. The range is from the Bering Sea to San Francisco (12, p.66). It occurs abundantly off Astoria, Oregon, during the summer months (8), and sometimes grows to a length of about three feet (3, pp.310,311). Other names employed when referring to this fish are turbot, arrowtoothed sole, longjawed flounder and diamond-toothed sole (2, p.12).

The above three fish were those used in the feeding experiments to determine if they could be used wholly or in part to substitute for the fish listed below, which are commonly used in rations on Oregon mink farms.

The following fish were used as certain percentages, by weight, of supplements to the above fish, as may be observed in table I.

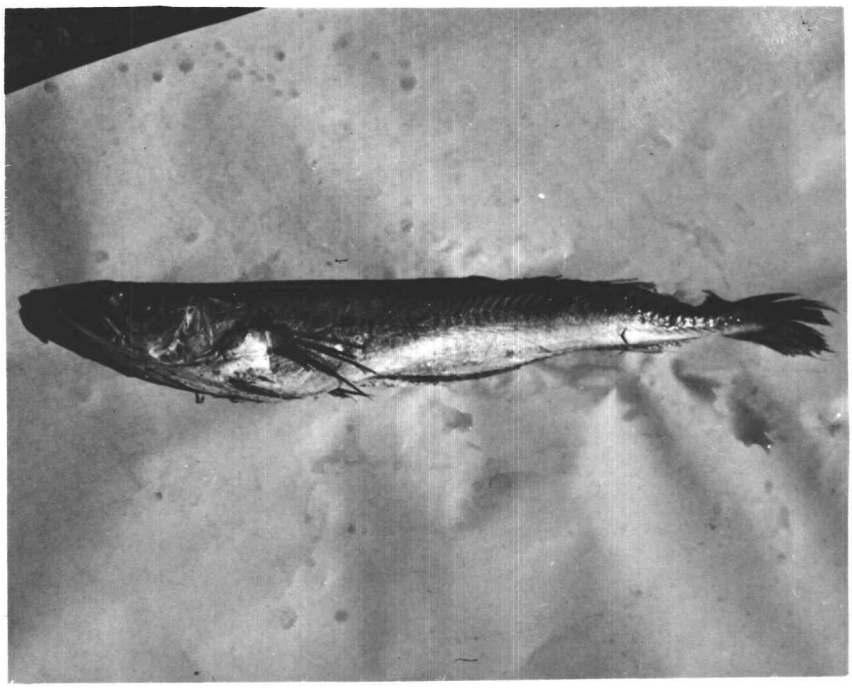

Figure 6. Pacific hake, Merluccius productus

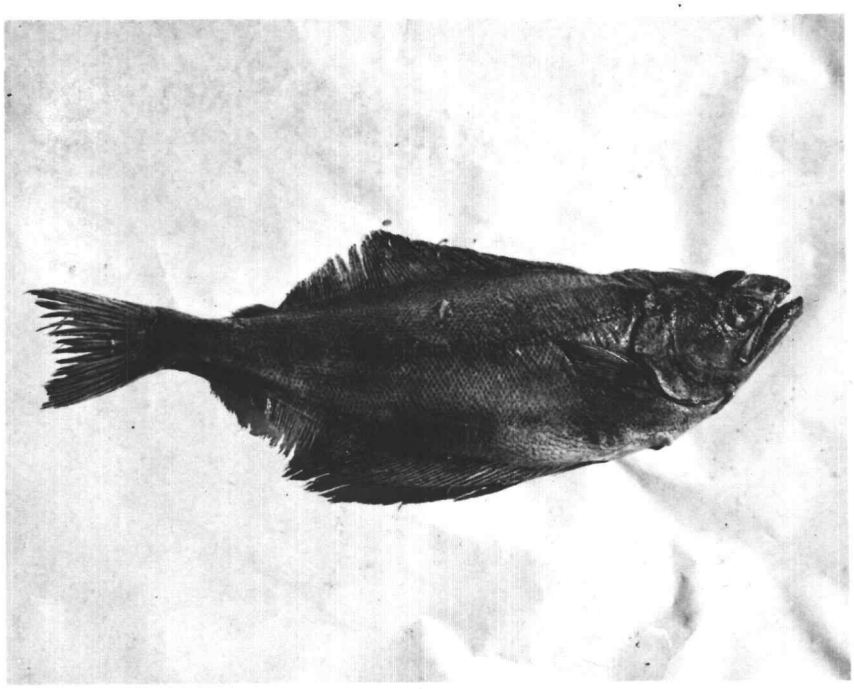

Figure 7. Arrowtoothed halibut, Atheresthes stomias

Roundnose flounder. Eopsetti jordani (Lockington)

Since this fish is a desirable food fish, it has, for many years, been a main source for the filleting industry. It is second only to halibut in commercial importance of the members of Pleuronectides (11, p.133). This desirability stems from the fact that a large steak of fish flesh may easily be taken from the carcass. For this reason, most of this species utilized in these tests were in carcass form. It grows to a length of 24 inches and ranges from Unalaska to San Diego bay (12, p.67). Other names used for this fish are brill, petrale and roundnose sole (2, p.12).

Lemon flounder. Parophrys vetulus (Girard)

This fish is used, on a large scale, by the fishing industry as a source of fillets for human consumption (3, pp.321,322). For this reason, most of the lemon flounder used in the experimental diets was in carcass form. This fish has a range of from Unalaska to San Diego (12, p.68), and grows to a length of 21 inches. Other names are pointed-nose sole, common sole and English sole (2, p.13).

Longfinned flounder. Glyptocephalus zachirus (Lockington)

This is a long, slender flatfish, seldom used as a fillet fish because a large steak cannot be taken from it. Most of the longfinned flounder used in the experiments were whole fish. The range is from the north Pacific to San Pedro bay (12, p.69). It sometimes grows up to 20 inches (3, p.326). Another name for the fish is rex sole (2, p.13).

Slippery flounder. Microstomus pacificus Lockington)

Until 1947, this fish was seldom utilized as human food in Oregon, but since then has been filleted in large volume. The slippery flounder tends to be somewhat soft-fleshed and gives off large amounts of mucous. In the experiments, about half of this flounder included in the diets was used in the carcass form. The range is from Alaska to San Diego, California (12, p.69), and reaches a length of 21 inches (3, p.327). Other names are slime sole and Dover sole (2, p.13).

Red rockfish. Sebastodes ruberimmus (Cramer)

Red rockfish is a member of the genus Sebastodes,

or rockfishes. This fish is of great commercial importance, and forms the largest portion of the rockfish filleting industry. All of this species of fish used in the rations were carcasses. The range is from southeastern Alaska to San Diego (12, p.75). It is sometimes called red rock cod and red snapper (2, p.19).

THE BIOCHEMICAL ANALYSES

Because the responses to these different diets were not alike, it was hoped that certain reasons might be discovered for these differences through biochemical analyses of the constituents of the various diets and of some of the individual fishes used. Each diet was analyzed for percentages of protein, fat, ash and water.

These analyses were conducted by Dr. J. R. Haag and Howard Griffen, research assistant, of the Agriculture Chemistry Department.

The diet analyses are presented in table VI, and the individual fish analyses may be seen in appendix IV.

PROCEDURE IN WEIGHING

All experimental mink were weighed, figure 8, to within one ounce every two weeks. This weighing was done by two people; one weighed mink while the other caught

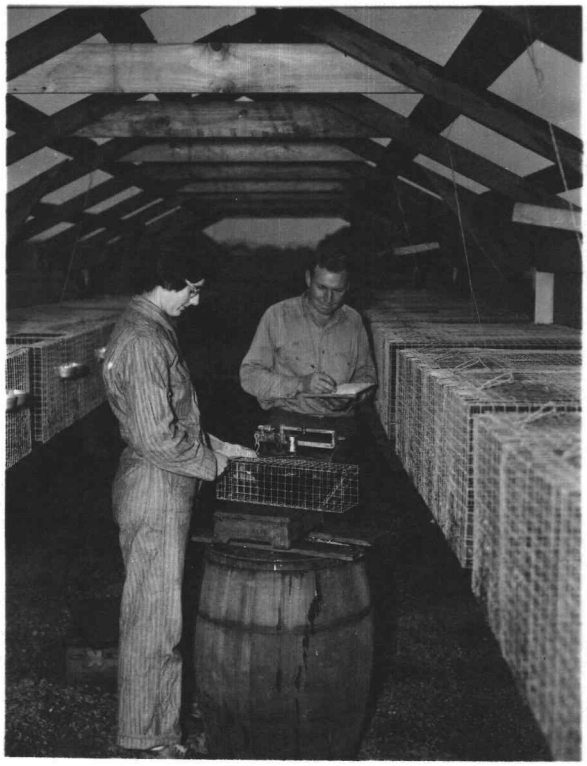

Figure 8. Weighing an experimental animal

Figure 9. Selecting breeder mink
from young stock

and trapped the animals.

Uneaten food was weighed three times weekly during August and September, and at less frequent intervals during October and November. The uneaten food was weighed as pertaining to each diet group in order to calculate the rate of consumption.

PROCEDURE IN RATING OF FUR COLOR OF LIVE ANIMALS.

On November 1, 1950, Mr. Micheal Dederer, president of the Seattle Fur Exchange, graded the experimental animals in regard to fur color.

He rated the mink in the following manner:

#1 -- exceedingly dark color
#2 -- dark color
#3 -- brownish and light color
#4 -- very poor color

To report all groups on a comparable, arbitrary point basis, 100 was considered to be a perfect score for a group containing all #1 mink. Since the groups contained 14 mink and $\frac{100}{14}$ = approximately seven, #1 was given a value of seven points. Number 2 was designated as worth six points, #3 as five points and #4 as worth four points.

Using the grades of Group I as an example, the total score has been calculated below.

Five mink rated as #1	5 x 7 pts. = 35
Eight mink rated as #2	8 x 6 pts. = 48
One mink rated as #3	1 x 5 pts. = 5
	Total 88

This system was arbitrarily chosen to facilitate comparing the various groups on the basis of fur color. All groups were rated as above, and the total fur point values are listed in table III.

PROCEDURE IN PELTING AND RATING OF PELTS.

Usually during the month of November, in western Oregon, a mink's fur becomes prime, and for a period of two to three days the fur quality of the animal is at its peak. It is at this time that the pelt should be taken.

Partly to expand the breeding stock of the experimental fur farm, and partly to collect data on reproduction, breeders were selected from each group diet, figure 9. They were picked according to diet group in order to be continued on the experimental diets to collect breeding and reproduction data. The best animals from each diet group were kept, being selected by the fur quality ratings of color made by Mr. Dederer, and as indicated by comparison of all members of the groups at pelting time.

Appendix II lists the mink kept for breeding and the diet groups to which they belonged.

As each mink was pelted, it was tagged according to the diet which it had received. The date of pelting was

recorded in order to observe if the period during which the fur became prime could be attributed to diet. The killing and skinning was done by Sidney Fisher, a student at Oregon State College, who is skilled in the procedures of pelting.

The finished pelts were offered for sale at the December 12, 1950, public auction of the Seattle Fur Exchange. Prior to the sale, each pelt was graded and given an individual price rating as listed in appendix II. This grading was done by Mr. Dederer and members of his staff. The mink pelts were then placed in two groups, one of males and one of females. Six of the poorest mink were placed in smaller lots so as not to lower the price average of the larger groups.

Fifty-seven males were sold for $25.00 apiece, and the 51 females for $15.25 each, which, plus the prices received for the part-lotted mink, brought a gain of $2,064.11.

Data on the results of the pelt sales in regard to each experimental group may be found in table III.

OBSERVATIONS

In the section called Discussion, all pertinent items will be discussed under each individual diet group, while under this section of observations, all group diets have

been discussed in regard to pelt value, growth studies, food consumption, etc.

FUR COLOR RATING.

As stated above, on November 1, 1950, Mr. Micheal Dederer graded each experimental animal on the basis of fur color quality. Since these ratings were closely correlated with the actual group pelt price averages they have been listed together in one table, table III.

The color ratings of the different animals are listed below as to diet groups. Computation of the arbitrary total point values for each group was carried out, using the method described above in Methods and Materials.

Group I. (Basic diet)

The total score for this group amounted to 88 points. The group contained five #1 animals, two of which were females and the remainder, males. Eight mink, seven females and one male, were rated as #2, with the one remaining female rated as #3. The fur of the animals of this group was generally even, in above-average color with that of one female being exceptionally fine and dark.

Group II. (66.9% hake)

One male and one female were rated as #1, while four

females and three males were rated #2 in this group. Two of each sex rated #3, and one male was regarded as #4. The total group point score was 80. It was noted that a majority of this group was especially thin-furred.

Group III. (50.3% hake)

This group's total color score was 82 points. Number 1's included two females and one male. Five males and one female were rated #2, and four females and one male as #3. Mink in this group tended to be brownish and sparsely furred.

Group IV. (33.7% hake)

In this group were three mink rated as #1, one female and two males; four as #2, two of each sex; and seven as #3, four females and three males, to bring the total score to 80 points. Mink in this group had brownish underfur.

Group V. (66.9% arrowtoothed halibut)

Four animals rated as #1 in this group, two mink of each sex. Four were #2, two of each sex, and six were #3, three males and three females, to give a group total of 82 points. These mink tended to be brownish.

Group VI. (50.3% arrowtoothed halibut)

The total rating of this group was 83 points. This included three mink as #1, one male and two females; seven as #2, three females and four males; and four as #3, two of each sex. The color of the fur of these animals was undesirably brown.

Group VII. (33.7% arrowtoothed halibut)

Two mink, one of each sex, rated #1; ten as #2, four females and six males; and 2 as #3, both females. These values totaled 84 points. Some of the mink in this group had a brownish cast in their fur.

Group VIII. (66.9% black rockfish)

This black rockfish group received a score of 90 points. It contained six #1 mink, four females and two males; seven as #2, three females and four males. One male was not rated because its fur was not properly shed at the time of these ratings. This male, when pelted, had a $24.00 value. The fur of the mink from this diet was very dark in color and evenly dark throughout the group.

Group IX. (50.3% black rockfish)

The total rating for this group of mink was 88 points.

It contained five mink as #1, two females and three males; seven as #2, four females and three males; and one as #3, a female. One male from this diet died on August 20, 1950. The death was not attributed to a faulty diet but to heat exhaustion.

Group X. (33.7% black rockfish)

Eighty-five was the total score of this group containing three rated as #1, two females and one male; nine as #2, four females and five males; and two as #3, one of each sex.

Groups VIII, IX and X were noted for their fine color. Each of these three groups mentioned was even in color, and these mink, especially in Groups VIII and IX, were very dark, both in underfur and guard hair.

Groups XI, XII and XIII were rated but are not comparable to the above groups. Since these three groups contained adult mink, the ratings were on a different basis. They will not be discussed here, but it is well to say that they were nearly equal with one another, with Group XIII slightly lower than the other two groups in score value.

DATE OF PELTING

Since effectiveness of the ration seemed to affect the time when the fur becomes prime, a record was kept of the day when each mink was pelted. Although the results were not clear-cut, as may be seen by consulting table II, certain indications may be considered. On the average, the diets containing hake and arrowtoothed halibut produced mink which were later in priming than were those from the rockfish groups. Although there were only two animals pelted from Group I, most of the mink on the diet primed near the 21st of November. As the arrowtoothed halibut content of the diet decreased, the priming date of the mink came nearer the usual date of pelting of between the 21st and 28th of November.

Groups XI, XII, and XIII were split more widely into groups of priming because of the usual early priming of adults.

OCCURRENCE OF ABNORMALITIES

Very few mink on any of the experimental rations showed extreme abnormalities. However, a few did show red hips, a condition in which the fur was not properly shed on the hip or hips. Three animals had serious cases of wet belly, commonly called "acidosis" by members of the

TABLE II

DATE OF PELTING IN RELATION TO GROUP DIET

Group No.	Total Number Pelted from Each Group	Percentage Experimental Fish in Diet	Date of Pelting				
			Nov. 12	Nov. 19	Nov. 21	Nov. 28	Dec. 3
I	2	Basic			2		
II	9	66.9% Hake			4		5
III	10	50.3% Hake			4		6
IV	10	33.7% Hake			5		5
V	9	66.9% Arrowtoothed halibut			4	1	4
VI	9	50.3% Arrowtoothed halibut			4	2	3
VII	9	33.7% Arrowtoothed halibut		2	2	5	
VIII	9	66.9% Black rockfish	1	3		4	1
IX	8	50.3% Black rockfish	1	3		4	
X	10	33.7% Black rockfish	2		1	7	
XI	9	22.3% Hake	1			7	1
XII	9	22.3% Arrowtoothed halibut	2			4	3
XIII	9	22.3% Black rockfish	4			1	4

industry. One mink died on August 20 of heat exhaustion. He was a member of diet group IX, and in no way could the diet be considered as a cause of the death.

The anomalies which occurred are listed below as to diet.

The red-hipped mink were in groups IV, VII, and X, one male on each diet. Diet groups VI, VIII, and XII contained the mink which had "acidosis", and all were males. An adult male mink in diet group XIII was extremely late in shedding. Diet groups IV, VII and X all contained 16.6% mixed flatfish. Further research was needed before the occurrence of these defects could be attributed to the diets. Diet group VI contained 50.3% arrowtoothed halibut, diet VIII contained 66.9% black rockfish, and diet group XI contained 22.3% hake. The occurrence of "acidosis" in these cases has not been attributed to diet cause but to chance.

PELTING STATISTICS

The observations described below were an average of the actual sale value of each mink that had been pelted and the estimated pelt value of the mink of each group which were kept for breeders. These averages are presented in table III. For information on estimated and actual pelt prices, see appendix II. The pelts

which averaged the highest price were from the basic group diet, both in the price averages of the females and males. Group IX, containing 50.3% black rockfish, produced males which averaged the next highest price average of $26.42 and merited so on the basis of their fine color. Group VI, containing 50.3% arrowtoothed halibut, produced mink rating a high price average because of the large size of the pelt.

Group I. (Basic)

The pelts from females averaged $18.15 with a range of from $17.00 to $20.00. The pelts of the males brought an average of $27.93, ranging from $26.00 to $29.50. The average of the male and female pelts combined was $23.04.

Group II. (66.9% hake)

Pelts of the females in this group averaged $13.14 with a range of from $10.00 to $15.00. The male pelts ranged from $26.50 to $6.00, to average $19.36. The average of the total male and female pelts was $16.25.

Group III. (50.3% hake)

In this group the females averaged $13.66 and ranged from $12.50 to $15.00. The average price for the males was $23.06 with a range of from $17.50 to $26.00. One

female was mistakenly rated as a male in this pelt group, so its $23.00 value was averaged with the male group. The total pelt group average was $18.36.

Group IV. (33.7% hake)

With a range of from $12.50 to $15.00, the pelts of these females averaged $13.43. The male pelts averaged $23.21 and ranged from $17.50 to $27.50. The group average pelt value was $18.32.

Groups II, III, and IV averages have been averaged to indicate the value of the group diets containing hake. This average was $17.64.

Group V. (66.9% arrowtoothed halibut)

The average pelt price of this group was $19.00, with the female pelts averaging $13.50 and the males', averaging $24.50. The price of the female pelts ranged from $12.50 to $15.00 while the price range of the male pelts was from $22.00 to $28.00.

Group VI. (50.3% arrowtoothed halibut)

Female pelts in this group ranged from $10.00 to $18.00, averaging $15.21. The male pelts brought from $19.00 to $28.00 and averaged $25.07. The average pelt value for the mink of this group was $20.14.

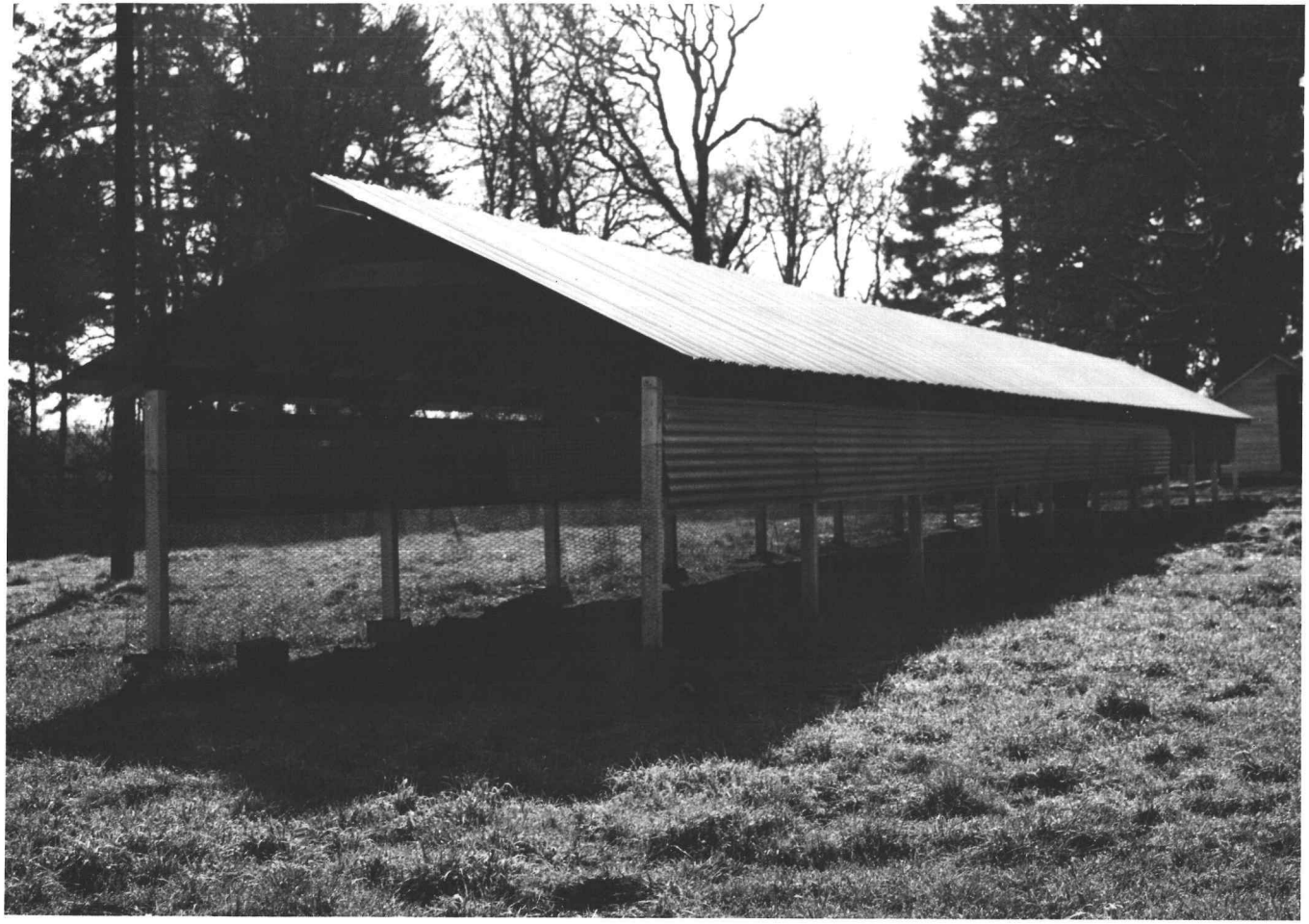

Figure 10. Exterior of building in which pelter mink were housed

Group VII. (33.7% arrowtoothed halibut)

The price of the female pelts of this group varied from $12.00 to $19.00. They averaged $17.07, while the males' averaged $24.50 with a price distribution of $21.00 to $30.00. Total group pelt price average was $20.79.

The above three groups have been averaged to indicate the value of including arrowtoothed halibut in the diet. This average was $19.98.

Group VIII. (66.9% black rockfish)

These male pelts varied from $20.00 to $25.00 to average $22.43. The female pelts averaged $16.71 with a price distribution of $14.00 to $18.00. The total pelt average value for the group was $19.57.

Group IX. (50.3% black rockfish)

The pelt price average for this group was $21.28, the females averaging $16.14 and the males, $26.42. The price of the female pelts ranged from $14.00 to $18.00 and the male pelts from $23.00 to $28.50.

Group X. (33.7% black rockfish)

The price of these female pelts varied from $12.00 to $18.50 and averaged $16.07. Price of the male pelts

TABLE III

PRICE AVERAGES OF PELT VALUES, AND TOTAL SCORE VALUES OF FUR COLOR RATINGS, BY DIET

Group No.	Percentage Experimental Fish in Diet	Average Price-- Females	Average Price-- Males	Average Price / Group	Average Price / Fish Group	Total Points of Groups in Fur Color Grading
		(Prices listed in dollars and cents)				
I	Basic	18.15	27.93	23.04		88
II	66.9% Hake	13.14	19.36	16.25	17.64	80
III	50.3% Hake	13.66	23.06	18.36	17.64	82
IV	33.7% Hake	13.43	23.21	18.32	17.64	80
V	66.9% Arrowtoothed halibut	13.50	24.50	19.00	19.98	82
VI	50.3% Arrowtoothed halibut	15.21	25.07	20.14	19.98	83
VII	33.7% Arrowtoothed halibut	17.07	24.50	20.79	19.98	84
VIII	66.9% Black rockfish	16.71	22.43	19.57	20.18	90
IX	50.3% Black rockfish	16.14	26.42	21.28	20.18	88
X	33.7% Black rockfish	16.07	23.29	19.68	20.18	85
XI	22.3% Hake	15.50	23.83	19.67		87
XII	22.3% Arrowtoothed halibut	17.50	24.00	20.75		82
XIII	22.3% Black rockfish	14.92	22.33	18.63		82

ranged from $18.00 to $28.00 with the average of $23.29. Total group pelt average was $19.68.

The above three groups pelt average was $20.18 to indicate the relative value of including black rockfish in the rations.

The three following diet groups should not be compared to the above groups when considering pelt value. They may be compared with one another to serve as indicators of relative pelt value. All mink in the groups below were pelted. Price ranges have not been given as they would not be accurate when including adults and young mink.

Group XI (22.3% hake)

Pelt price average for this group was $19.68 with females averaging $15.50 and the males $23.83.

Group XII (22.3% arrowtoothed halibut)

Female pelts in this group averaged $17.50 and the male pelts, $24.00, to give a total average of $20.75.

Group XIII (22.3% black rockfish)

The total pelt average price for this group was $18.63. The females brought $14.92 average and the males $22.33.

The significance of these pelt values in relation to the experimental diet has been discussed under the individual diet groups in the section called Discussion.

FOOD CONSUMPTION

The average daily consumption of each ration has been tabulated and has been listed below. This factor of amount of feed consumed becomes very important to the fur farmer when he deals, not in ounces, but in hundreds of pounds of feed each day. The average ounces consumed daily by each mink on a ration between August 14 and November 10 are listed in table IV. It was noted here that the growth rate table V might also be considered at this point. It was found that as weather conditions fluctuated, so did the food consumption rate. A typical diet group showing such fluctuation is shown in figure 14.

Group I (Basic) consumed, on the average, 6.38 ounces of food per mink per day for the period during which the ration was fed, specifically between August 14 and November 10.

Group II (66.9% hake) had the highest consumption rate with 7.33 ounces of food per mink per day.

Group III (50.3% hake) was next highest in rate of food consumption with 7.28 ounces per mink per day,

Figure 11. Interior of pelter building

TABLE IV

AVERAGE DAILY FOOD CONSUMPTION OF MINK
IN EXPERIMENTAL DIET GROUPS
FROM AUGUST 14 TO NOVEMBER 28

Group No.	Percentage Experimental Fish	Ounces Per Mink
I	Basic	6.38
II	66.9% Hake	7.33
III	50.3% Hake	7.28
IV	33.7% Hake	7.23
V	66.9% Arrowtoothed halibut	5.47
VI	50.3% Arrowtoothed halibut	5.41
VII	33.7% Arrowtoothed halibut	6.15
VIII	66.9% Black rockfish	6.43
IX	50.3% Black rockfish	5.80
X	33.7% Black rockfish	6.57
XI	22.3% Hake	5.82
XII	22.3% Arrowtoothed halibut	5.11
XIII	22.3% Black rockfish	5.64

followed by Group IV (33.7% hake) with 7.23 ounces. All diets containing hake had high consumption rates and were the only groups to exceed the maximum daily allowance of 5/8 lb. per mink fed on all diets during the duration of the experiments.

The consumption rate in Group V (66.9% arrowtoothed halibut) was 5.47 ounces per mink per day which, with that of 5.41 ounces per mink per day of Group VI (50.3% arrowtoothed halibut), constituted the lowest consumption rates when considering all rations.

Group VII (33.7% arrowtoothed halibut) had a somewhat higher consumption rate at 6.15 ounces per mink

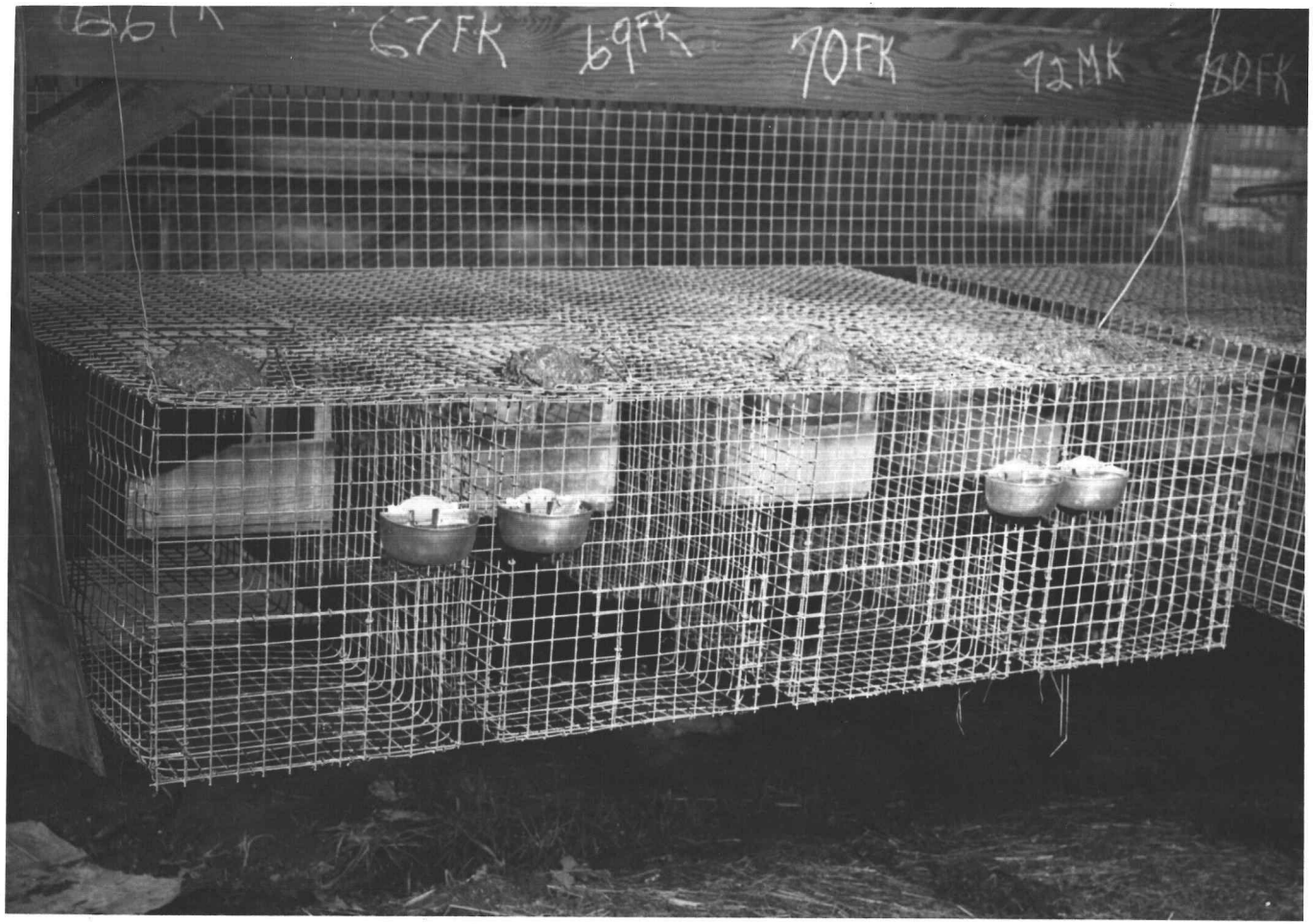

Figure 12. Section of four pelter pens showing type of pen used for experimental animals

than did the two immediately preceding diets, due, perhaps, to the inclusion of sole, as has been similarly noted of Group X.

Group VIII (66.9% black rockfish) is comparable to the basic Group I in rate of consumption at 6.45 ounces.

Group IX (50.3% black rockfish) had a comparatively low food consumption rate by averaging 5.80 ounces consumed per mink per day.

Group X (33.7% black rockfish), as noted above, had a higher rate at 6.57 ounces.

The Groups XI, XII and XIII, since they are not compared with others, will be listed as indicators and will be compared with one another.

Group XI (22.3% hake) averaged 5.82 ounces per mink per day as compared with 5.11 ounces for Group XII (22.3% arrowtoothed halibut) and 5.64 ounces for Group XIII (22.3% black rockfish).

The relationship of food consumption to growth has been presented, in reference to individual experimental diet groups, under the heading of Discussion.

APPEARANCE AND GENERAL CONDITION

Since an adequate diet is generally believed to be

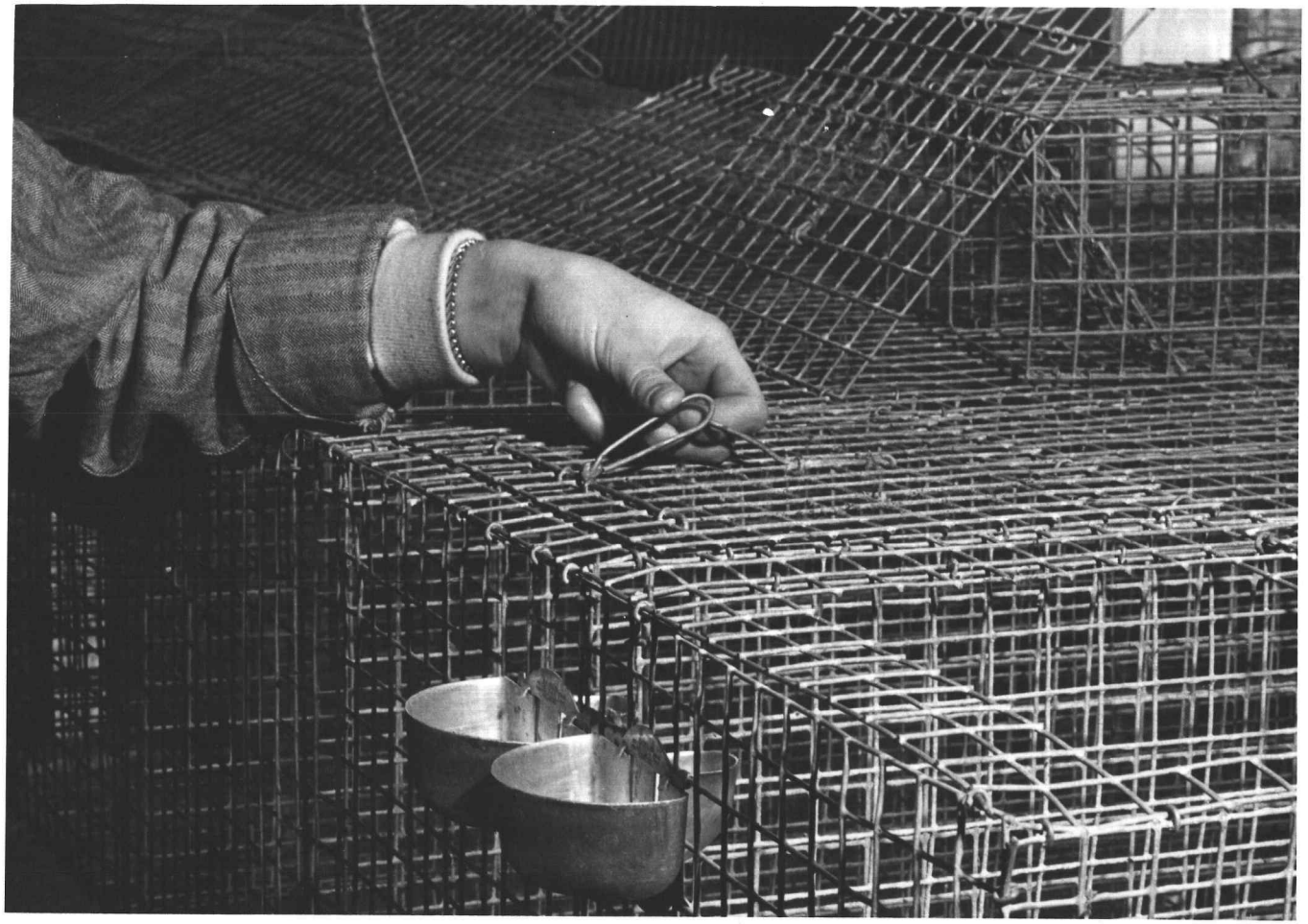

Figure 13. Closeup of catch used on pelter pen door, patterned after those seen on the Robert Watt ranch, Bay City, Oregon

one of the important factors in effecting desirable fur appearance and the physical well-being of mink, the following paragraphs evaluate these aspects in reference to the experimental diet groups.

The animals on diet Group I (Basic) were considered normal; they produced sleek heavy fur and were healthy in appearance. They exhibited no more than the usual aggressiveness.

Mink of Group II (66.9% hake), from appearance, would be called deficient since their fur was sparse, ruffled and undesirably brownish in color. The mink were extremely nervous and hard to handle because they were vicious.

Group III (50.3% hake) produced mink with fur which was not as sparse as those of Group II, although it was similarly brownish and ruffled. These mink, too, were nervous and abnormally aggressive.

Group IV (33.7% hake) produced mink whose fur and temperament compared closely with that of Group II.

Group V (66.9% arrowtoothed halibut) contained mink which appeared much larger than those of Groups II, III and IV. This size difference was due, in part, to the long fur produced on mink of this group. This fur was brownish but dense. The temperament of these animals was comparable to those of Group I.

The mink of Groups VI (50.3% arrowtoothed halibut) and VII (33.7% arrowtoothed halibut) were comparable in aggressiveness with those of Group V. The fur of these mink was also dense and long, with the guard hair providing good coverage to the underfur. But as the percentage of arrowtoothed halibut in the diet decreased, the undesirable brownish color decreased.

Groups VIII (66.9% black rockfish), IX (50.3% black rockfish) and X (33.7% black rockfish) contained mink of normal temperament and of exceptional fur quality. The fur texture was excellent, accompanied by a desirable dark color. This was especially noted of the mink in diet Group IX.

Mink of Groups XI (22.3% hake), XII (22.3% arrowtoothed halibut) and XIII (22.3% black rockfish) were of normal temperament but were of generally poorer fur quality than those mink in diet Group I.

WEIGHT STUDIES

The weights of the experimental animals taken biweekly from July 28 to November 18 have been averaged and appear in table V. Growth rates of each group, as computed from these averages, can be found in the growth graphs, figures 15 through 27. The most pertinent points

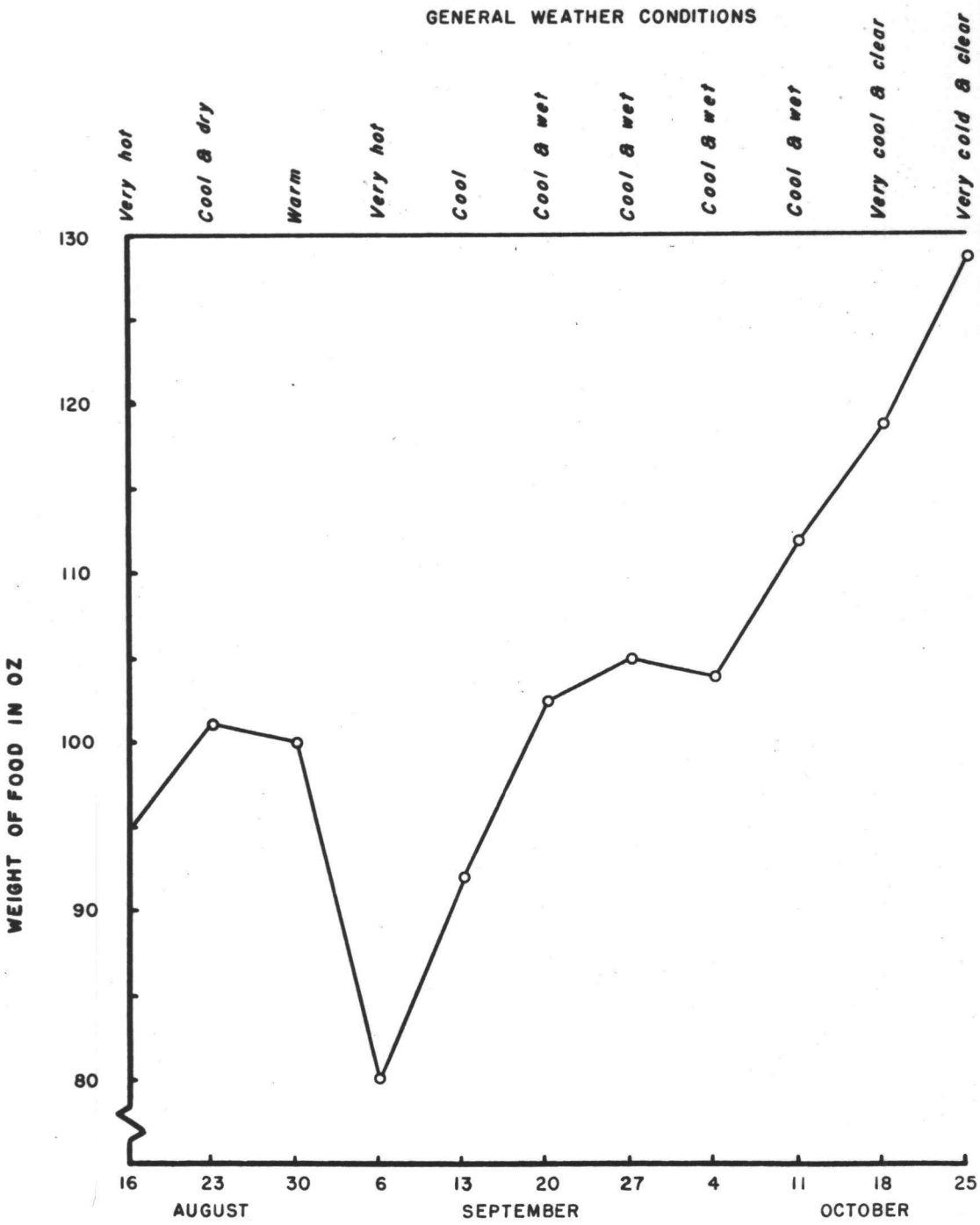

FIGURE 14

FOOD CONSUMPTION CURVE

Amount of food consumed by 14 mink in Group III showing effect of weather on food consumption

of the weight portion of the study have been noted below by group diets.

Group I (Basic)

From July 28, when the average weight of the females was 1 pound 10 ounces, to November 18, when the average weight was 2 lb. 1 oz., the weight increase for the females averaged 7 ounces. Weights taken on November 18 ranged from 1 lb. 10 oz. to 2 lb. 6 oz.

For the males the initial average weight was 2 lb. 5 oz. and the final average was 3 lb. 7 oz. The increase for this period was 1 lb. 2 oz., on the average. Weights of the males ranged from 3 lb. 3 oz. to 3 lb. 12 oz. on November 18.

The final weighing of both sexes showed the highest average weight reached during the course of the experiment.

Group II (66.9% hake)

Initial weight of the females averaged 1 lb. 9 oz. as compared to 1 lb. 8 oz. average of November 18, to make, on the average, a 1 ounce loss per female. At the last weighing, weights ranged from 1 lb. 3 oz. to 1 lb. 13 oz. On October 7, the average weight reached the optimum at 1 lb. 10 oz.

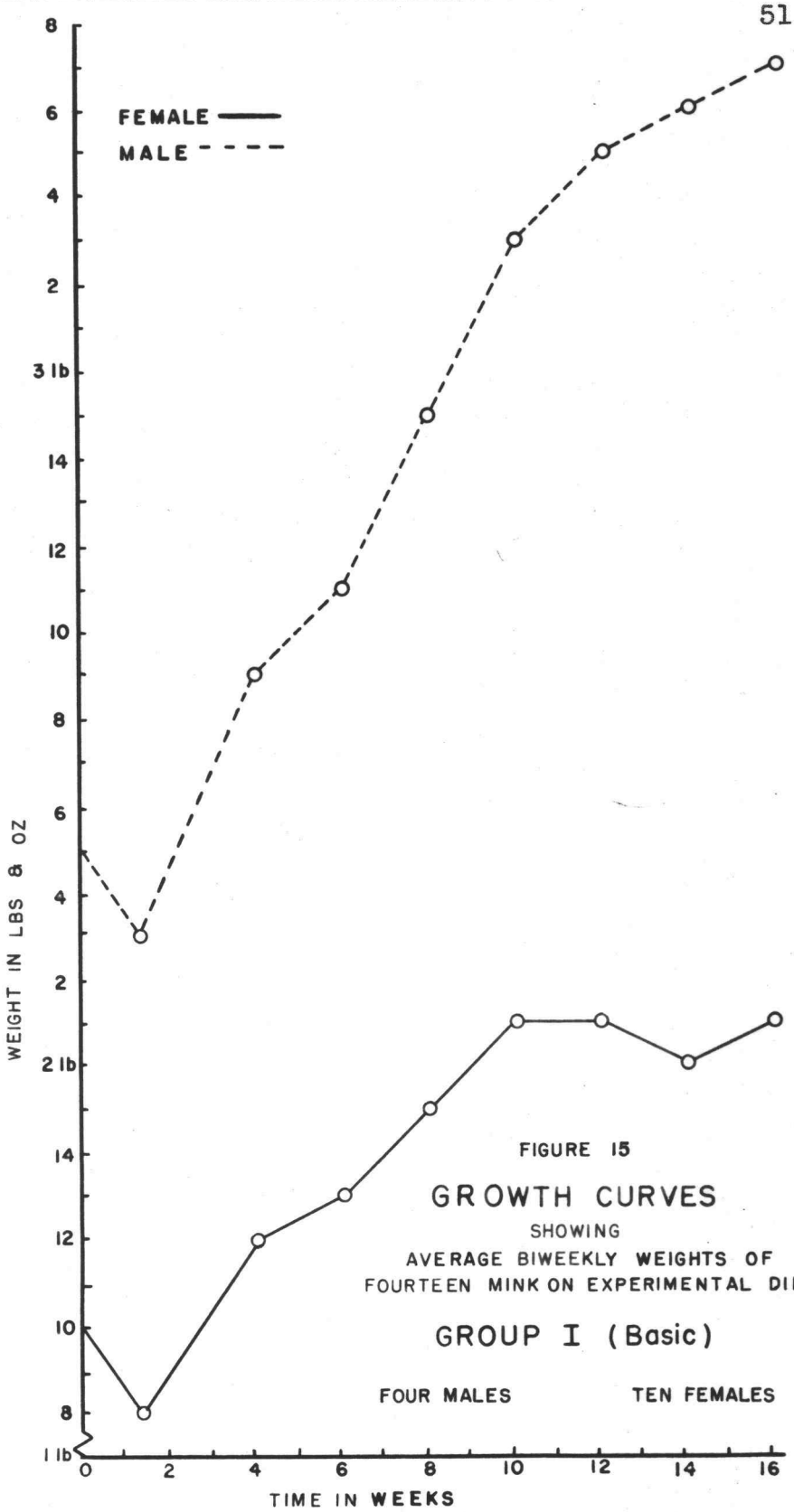

FIGURE 15

GROWTH CURVES

SHOWING

AVERAGE BIWEEKLY WEIGHTS OF

FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP I (Basic)

FOUR MALES TEN FEMALES

On July 28, the males averaged 2 lb. 5 oz. and at the close of the tests weighed the same average to register no gain. November 18 weights ranged from 1 lb. 10 oz. to 3 lb. On September 23, the average weight of the males reached 2 lb. 7 oz.

Group III (50.3% hake)

On July 28, the female average weight was 1 lb. 11 oz. and on November 18 it was 1 lb. 15 oz. for an average weight gain of 4 oz. per female mink. The range of weights taken on November 18 was 1 lb. 10 oz. to 2 lb. 8 oz.

For the males the first average weight taken was 2 lb. 2 oz. as compared to 2 lb. 15 oz. for the final weighing to average the weight increase at 13 oz. The weight range of this sex group was 1 lb. 15 oz. to 3 lb. 11 oz. The November 18 weights were the highest average reached by the animals on this ration.

Group IV (33.7% hake)

Average weight taken of females on July 28 was 1 lb. 8 oz. November 18 weight average was 1 lb. 13 oz., which showed an average gain of 4 oz. Final weights of females varied from 1 lb. 6 oz. to 2 lb.3 oz. Highest average weight reached was 1 lb. 15 oz. on October 7.

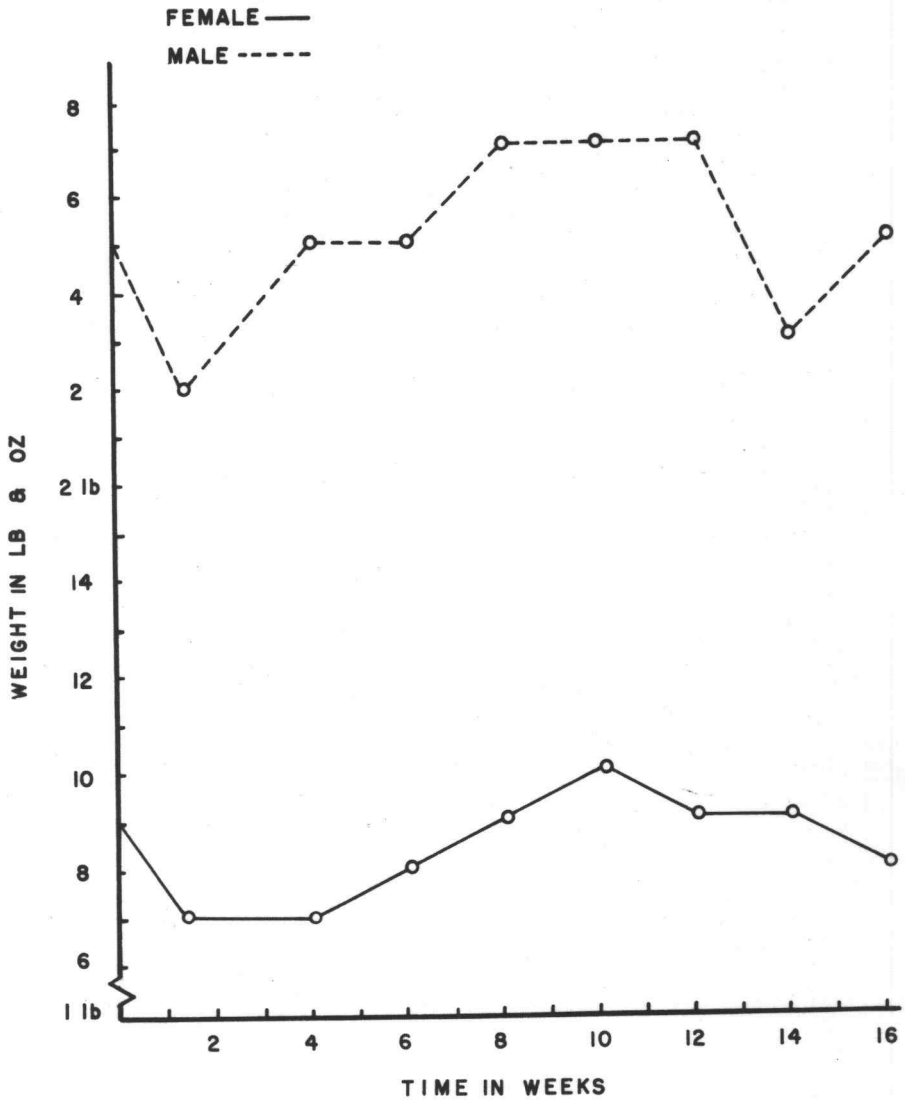

FIGURE 16

GROWTH CURVES
SHOWING
AVERAGE BIWEEKLY WEIGHTS OF
FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP II (66.9 % Hake)

SEVEN MALES SEVEN FEMALES

The males of this group weighed 2 lb. 3 oz. at first weighing and 3 lb. 1 oz. on November 18. This made the average weight gain 14 oz. Weights ranged from 2 lb. 10 oz. to 3 lb. 7 oz. on November 18 when the highest weight average of the group was reached.

Group V (66.9% arrowtoothed halibut)

Weight of the females on July 28 was an average of 1 lb. 10 oz. as compared to the November 18 weighing of 1 lb. 13 oz. for an average gain of 3 oz. per mink. On October 7 the highest average weight was reached at 2 lb. November 18 weighings varied from 1 lb. 8 oz. to 2 lb. 6 oz.

On July 28, the males weighed 2 lb. 4 oz. and finished the experiment at 3 lb. 3 oz. to show an average weight gain of 15 oz. per mink. November 18 weights ranged from 2 lb. 11 oz. to 4 lb. The optimum weight average for this diet was reached on November 4 at 3 lb. 4 oz.

Group VI (50.3% arrowtoothed halibut)

The first average weight taken for females on this diet was 1 lb. 11 oz. in comparison with 1 lb. 15 oz. on November 18. An average gain of 4 oz. per mink with a range of from 1 lb. 9 oz. to 2 lb. 3 oz. at final

TABLE V

AVERAGE BIWEEKLY WEIGHTS OF MINK IN EXPERIMENTAL DIET GROUPS

Group No.	Sex	Diet	Weights in Pounds and Ounces								
			July 28	Aug. 9	Aug. 26	Sept. 9	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
I	F	Basic	1-10	1-8	1-12	1-13	1-15	2-1	2-1	2-0	2-1
I	M	Basic	2-5	2-3	2-9	2-11	2-15	3-3	3-5	3-6	3-7
II	F	66.9% hake	1-9	1-7	1-7	1-8	1-9	1-10	1-9	1-9	1-8
II	M	66.9% hake	2-5	2-2	2-5	2-5	2-7	2-7	2-7	2-3	2-5
III	F	50.3% hake	1-11	1-8	1-10	1-11	1-11	1-14	1-14	1-14	1-15
III	M	50.3% hake	2-2	2-0	2-3	2-7	2-9	2-13	2-12	2-13	2-15
IV	F	33.7% hake	1-8	1-7	1-10	1-12	1-13	1-15	1-13	1-13	1-13
IV	M	33.7% hake	2-3	2-1	2-5	2-8	2-11	2-14	2-14	3-0	3-1
V	F	66.9% arrowtoothed halibut	1-10	1-8	1-11	1-12	1-12	2-0	1-14	1-13	1-13
V	M	66.9% arrowtoothed halibut	2-4	2-0	2-8	2-11	2-14	3-3	3-2	3-4	3-3
VI	F	50.3% arrowtoothed halibut	1-11	1-10	1-13	1-15	1-15	2-0	2-1	1-15	1-15
VI	M	50.3% arrowtoothed halibut	2-5	2-1	2-8	2-11	2-14	3-3	3-5	3-5	3-4
VII	F	33.7% arrowtoothed halibut	1-9	1-8	1-10	1-10	1-11	1-14	1-15	1-14	1-13
VII	M	33.7% arrowtoothed halibut	2-5	2-2	2-7	2-11	2-14	3-2	3-3	3-5	3-3
VIII	F	66.9% black rockfish	1-10	1-7	1-10	1-12	1-11	1-13	1-14	1-13	1-12
VIII	M	66.9% black rockfish	2-5	1-15	2-5	2-8	2-11	2-13	2-15	3-0	3-0

TABLE V--continued

Group No.	Sex	Diet	Weights in Pounds and Ounces								
			July 28	Aug. 9	Aug. 26	Sept. 9	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
IX	F	50.3% black rockfish	1-8	1-7	1-11	1-14	1-13	2-0	2-2	2-0	1-15
IX	M	50.3% black rockfish	2-2	2-0	2-3	2-7	2-8	2-10	2-12	2-12	2-14
X	F	33.7% black rockfish	1-9	1-8	1-10	1-12	1-12	1-13	1-15	1-15	1-13
X	M	33.7% black rockfish	2-2	2-1	2-5	2-7	2-9	2-13	2-14	3-1	3-0
XI	F	22.3% hake		1-9	1-9	1-10	1-10	1-12	1-13	1-14	1-12
XI	M	22.3% hake		2-2	2-3	2-4	2-2	2-3	2-5	2-7	
XII	F	22.3% arrowtoothed halibut		1-11	1-11	1-11	1-12	1-14	1-15	2-0	
XII	M	22.3% arrowtoothed halibut		2-7	2-10	2-12	2-13	3-0	3-5	3-3	
XIII	F	22.3% black rockfish		1-10	1-11	1-13	1-14	1-14	2-0	1-13	
XIII	M	22.3% black rockfish		2-4	2-9	2-14	3-1	3-4	3-8	3-5	

weighing was noted. An optimum average of 2 lb. 1 oz. was reached on October 21.

Average weight of the males on July 28 was 2 lb. 2 oz. and the final weighing averaged 3 lb. 4 oz. to constitute an average gain of 15 oz. The highest weight of the group was averaged on October 21 at 3 lb. 5 oz. November 18 weights ranged from 2 lb. 3 oz. to 3 lb. 15 oz.

Group VII (33.7% arrowtoothed halibut)

These females showed an average weight gain of 4 oz. by comparing the first weighing of 1 lb. 9 oz. to that of 1 lb. 13 oz., the average on November 18. Range of weights on November 18 was from 1 lb. 8 oz. to 2 lb. The highest average weight of this sex group occurred on October 21 at 1 lb. 15 oz.

Average weights of males within this group progressed from 2 lb. 5 oz. on July 28 to 3 lb. 3 oz., after an optimum had been reached of 3 lb. 5 oz. on November 4. An average gain of 14 oz. was noted. Weights taken on November 18 varied from 2 lb. 7 oz. to 4 lb. 1 oz.

Group VIII (66.9% black rockfish)

Weights of July 28 for these females were averaged at 1 lb. 11 oz. After final weighings of 1 lb. 12 oz.

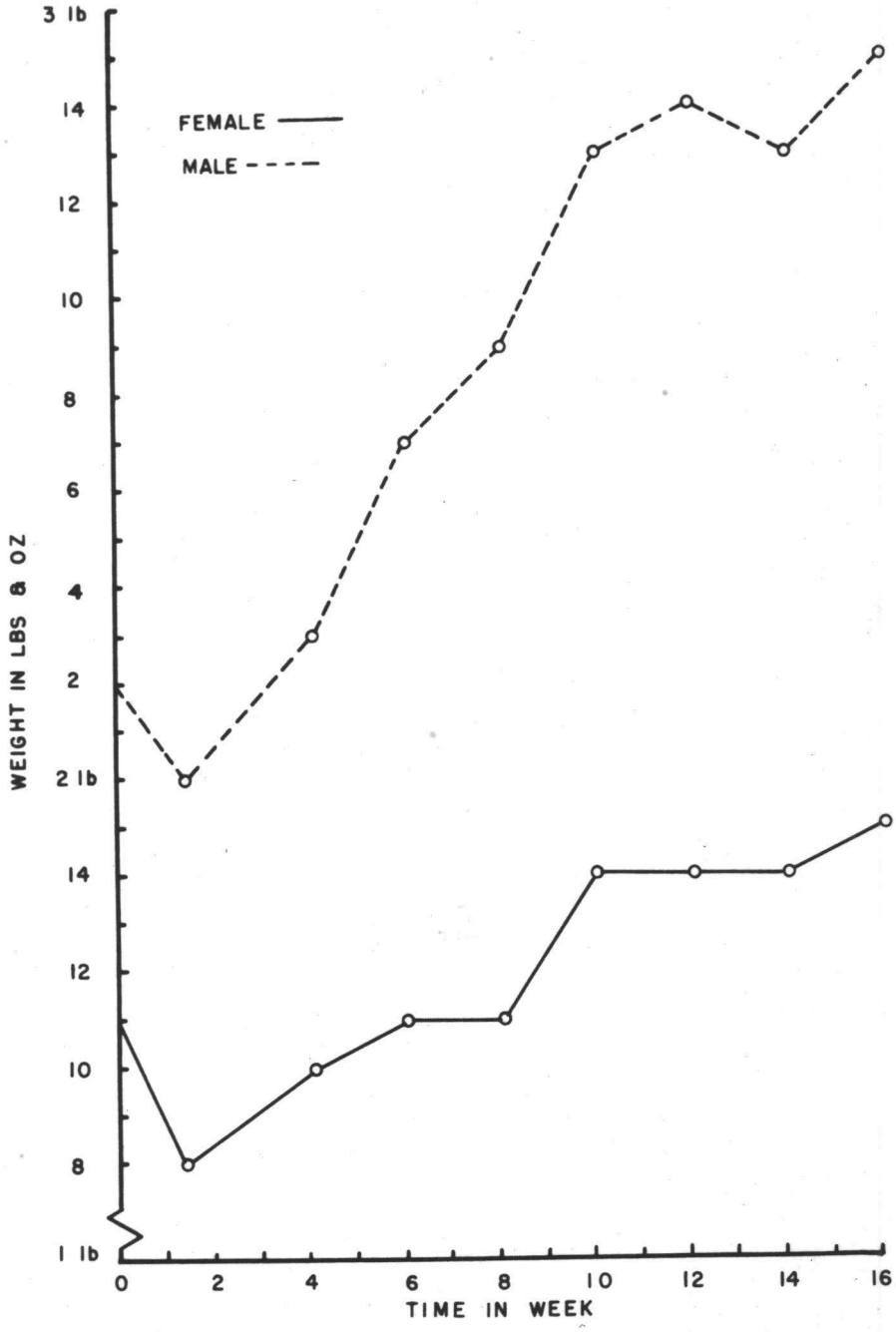

FIGURE 17

GROWTH CURVES

SHOWING

AVERAGE BIWEEKLY WEIGHTS OF
FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP III (50.3 % Hake)

SEVEN MALES SEVEN FEMALES

average, a 2 oz. average gain was shown. November 18 weighings ranged from 1 lb. 10 oz. to 1 lb. 15 oz. The highest weight average for this sex group was reached on October 21 at 1 lb. 14 oz.

Males gained 11 oz. each, on the average, after having registered an initial 2 lb. 5 oz. and a final 3 lb. Weighings on November 18 ranged from 2 lb. 1 oz. to 4 lb. 1 oz. The final weighing was the highest, when averaged, of the biweekly weights.

Group IX (50.3% black rockfish)

Females averaged 1 lb. 8 oz. on July 28 in comparison with 1 lb. 15 oz. on November 18 to make an average gain of 7 oz. On the latter date the weights ranged from 1 lb. 8 oz. to 2 lb. 12 oz. The group averaged 2 lb. 2 oz. on October 21.

Males weighed 2 lb. 2 oz. average on July 28 and 2 lb. 14 oz. on November 18 to average a gain of 12 oz. per mink. Weights ranged from 2 lb. 11 oz. to 3 lb. on November 18. These November 18 weights were the highest reached in this sex group during the run of the tests.

Group X (33.7% black rockfish)

This group of females ranged from 1 lb. 7 oz. on July 28, to 1 lb. 13 oz. on November 18, to average a

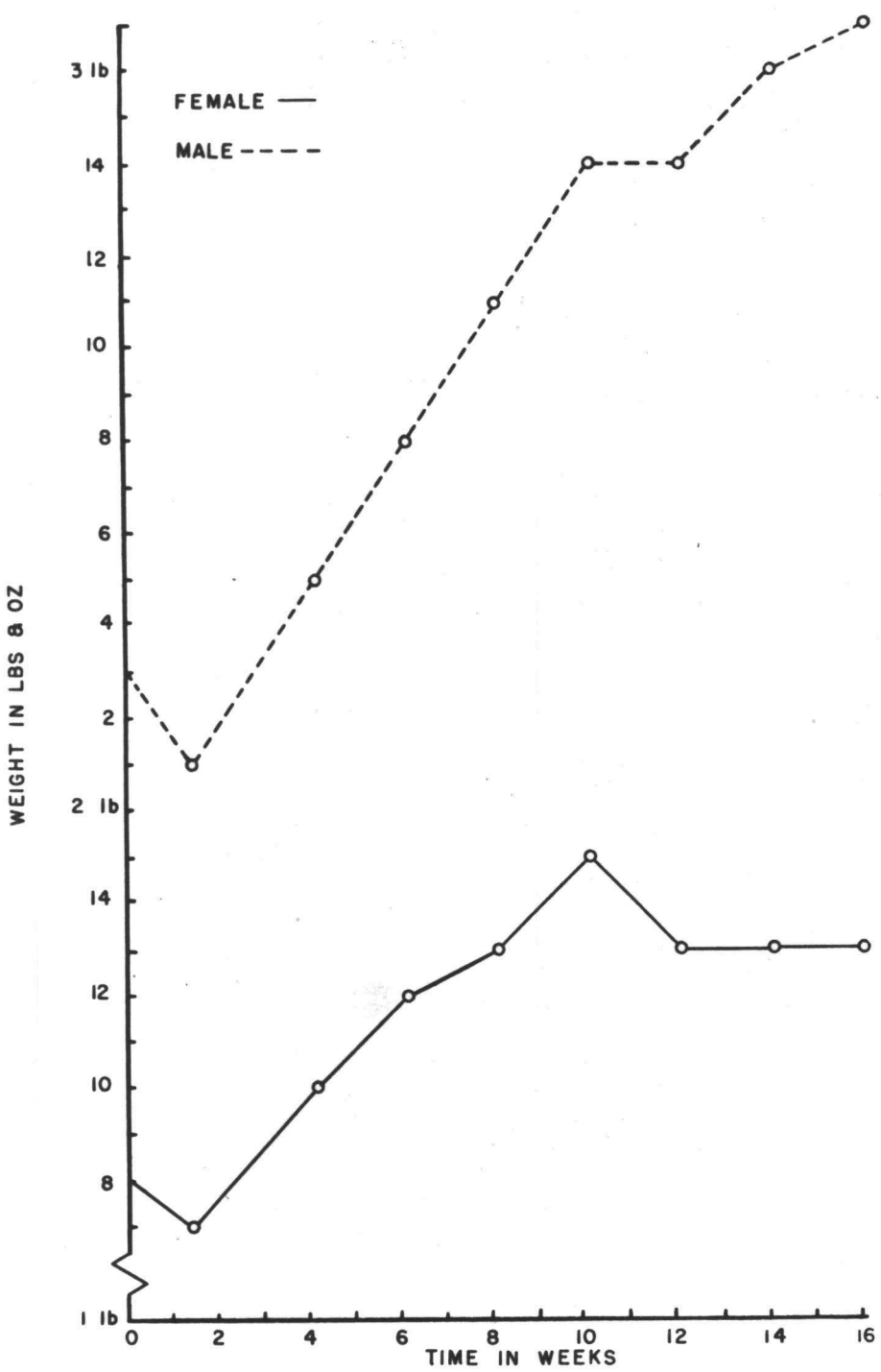

FIGURE 18

GROWTH CURVES

SHOWING
AVERAGE BIWEEKLY WEIGHTS OF
FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP IV (33.7% Hake)

SEVEN MALES SEVEN FEMALES

gain of 6 oz. per mink. On October 21, these females averaged 1 lb. 15 oz. November 18 the weights varied from 1 lb. 9 oz. to 2 lb. 1 oz.

Males averaged 2 lb. 2 oz. on July 28 and weighed e lb. on November 18 when the weights ranged from 2 lb. 6 oz. to 3 lb. 13 oz. The average weight gain was 14 oz. Optimum weight average of this group was reached on November 4 at 3 lb. 1 oz.

The three experimental groups containing some adult mink, Groups XI, XII and XIII, should not be compared with the above ten groups, so they will be considered after a number of general observations have been recorded on the above groups.

Since in many species of mammals, females reach maturity before the males, and as may be seen in the growth graphs, it would appear that the females on the above diets were more near maturity than were the males when placed in the diet groups. They did not show extensive weight losses and gains, and were, therefore, not affected to such a degree as were the males, which were still in fast-growing period.

The drop in weights, of the majority of groups, toward the end of the experiments is attributed, in part, to the maturing of the animals.

The point when an animal on a deficient diet such

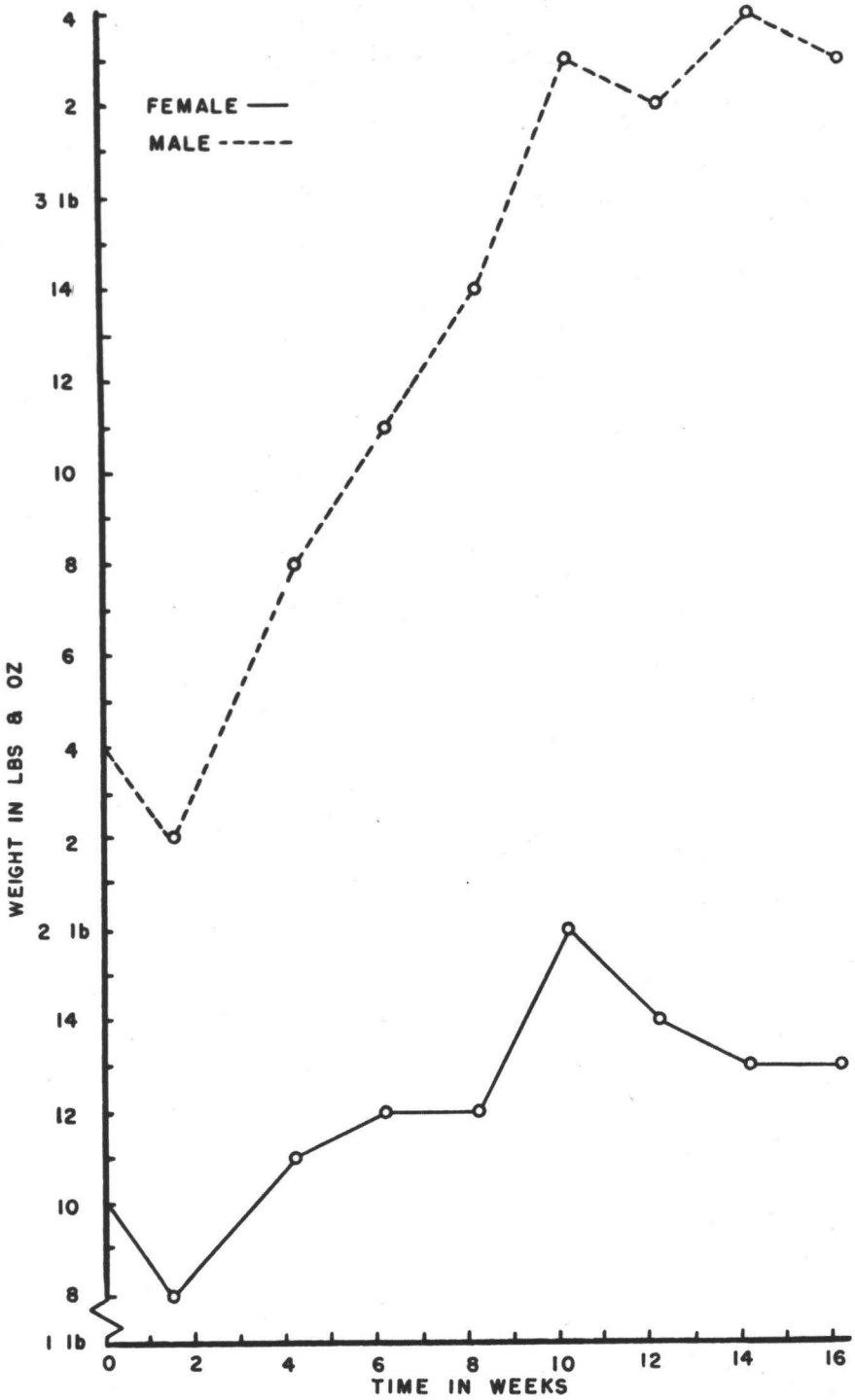

FIGURE 19

GROWTH CURVES

SHOWING

AVERAGE BIWEEKLY WEIGHTS OF
FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP V (66.9% Arrowtoothed Halibut)

SEVEN MALES SEVEN FEMALES

as those including above 33.7% hake had used all its stored potentials such as vitamins and/or minerals was not apparent so much in weight loss as in general condition. Fur became ruffled and the mink appeared not normal.

Groups XI, XII and XIII contained fewer mink than above groups and also contained adults. These groups were used only as indicators and were not regarded as having given definite facts. Only average weight gains will be given for the following groups:

Group XI (22.3% hake)

For females in this group the average weight gain was 3 oz. and for the males, 5 oz. for the period from August 9 to November 4.

Group XII (22.3% arrowtoothed halibut)

For the same period in this group, the average weight gain per female was 5 oz. The males gained 12 oz. on the average.

Group XIII (22.3% black rockfish)

An average of 3 oz. and 1 lb. 1 oz. gain was registered by the females and males respectively of this group for the period between August 9 and November 4.

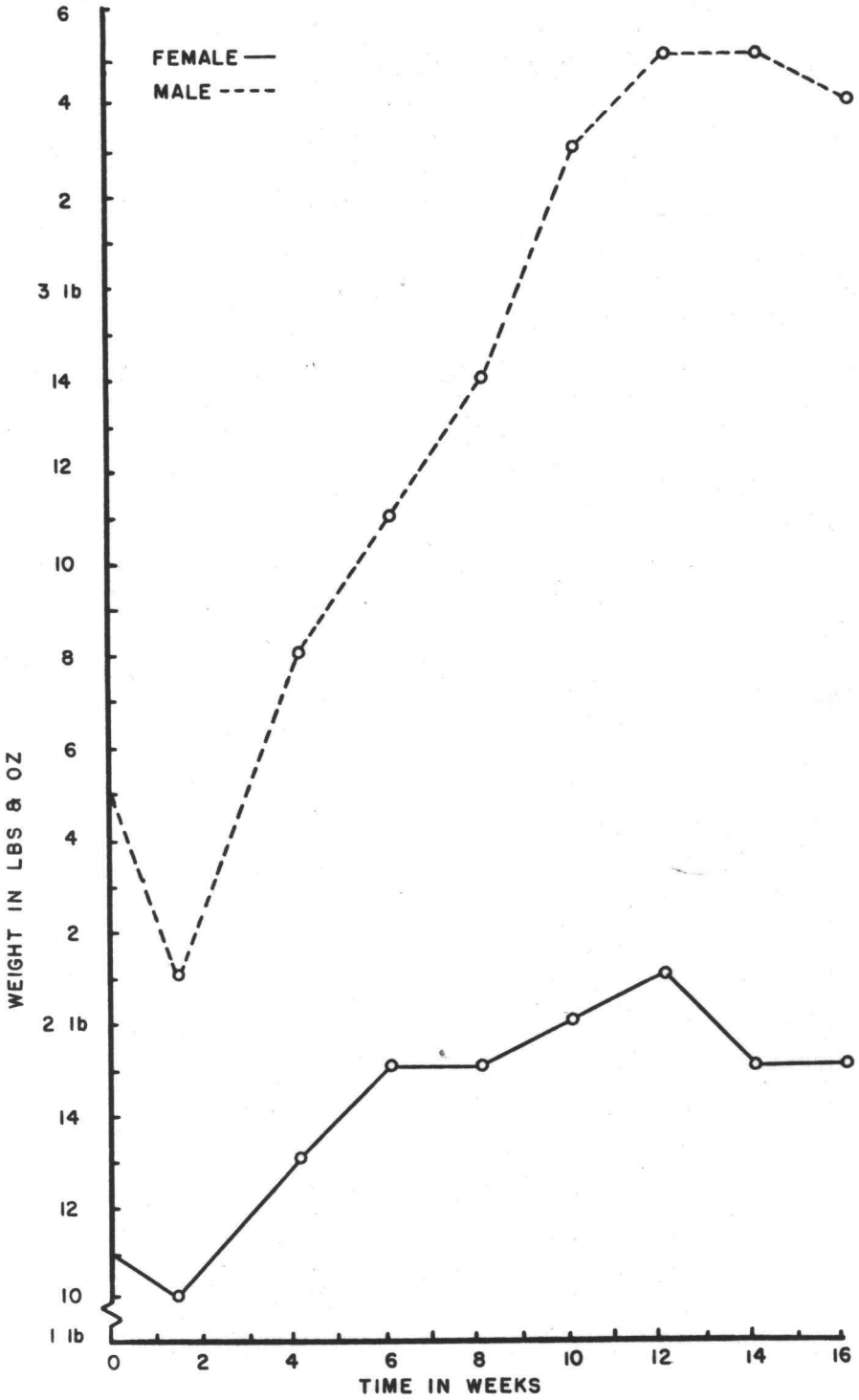

FIGURE 20

GROWTH CURVES

SHOWING

AVERAGE BIWEEKLY WEIGHTS OF

FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP VI (50.3% Arrowtoothed Halibut)

SEVEN MALES SEVEN FEMALES

THE BIOCHEMICAL ANALYSES

When considering the diet analyses by Dr. Haag and Howard Griffin it became evident that the diet constituents had played a large part in guiding growth and fur quality. Table VI contains the analyses of the various experimental diets.

Diets containing arrowtoothed halibut had very high fat contents which decreased when flatfish were added. The diet of Group V, which contained only arrowtoothed halibut as the fish portion of the diet, had a much lower protein content than when red rockfish and red rockfish and flatfish were added, as in Groups VI and VII.

Hake diets had the lowest fat contents except when red rockfish was added. These same diets, Groups II, III and IV, had high protein, especially Group II, containing 66.9% hake.

Black rockfish diets had relatively high protein contents and, when red rockfish was added, had also a high fat content. Also, diets fed to Groups VIII and IX were high in ash content.

In diet Groups XI, XII and XIII, all constituents seemed to be comparable except the high fat content of diet XII, an arrowtoothed halibut-containing diet, and the high ash content of diet XI, a hake-containing diet.

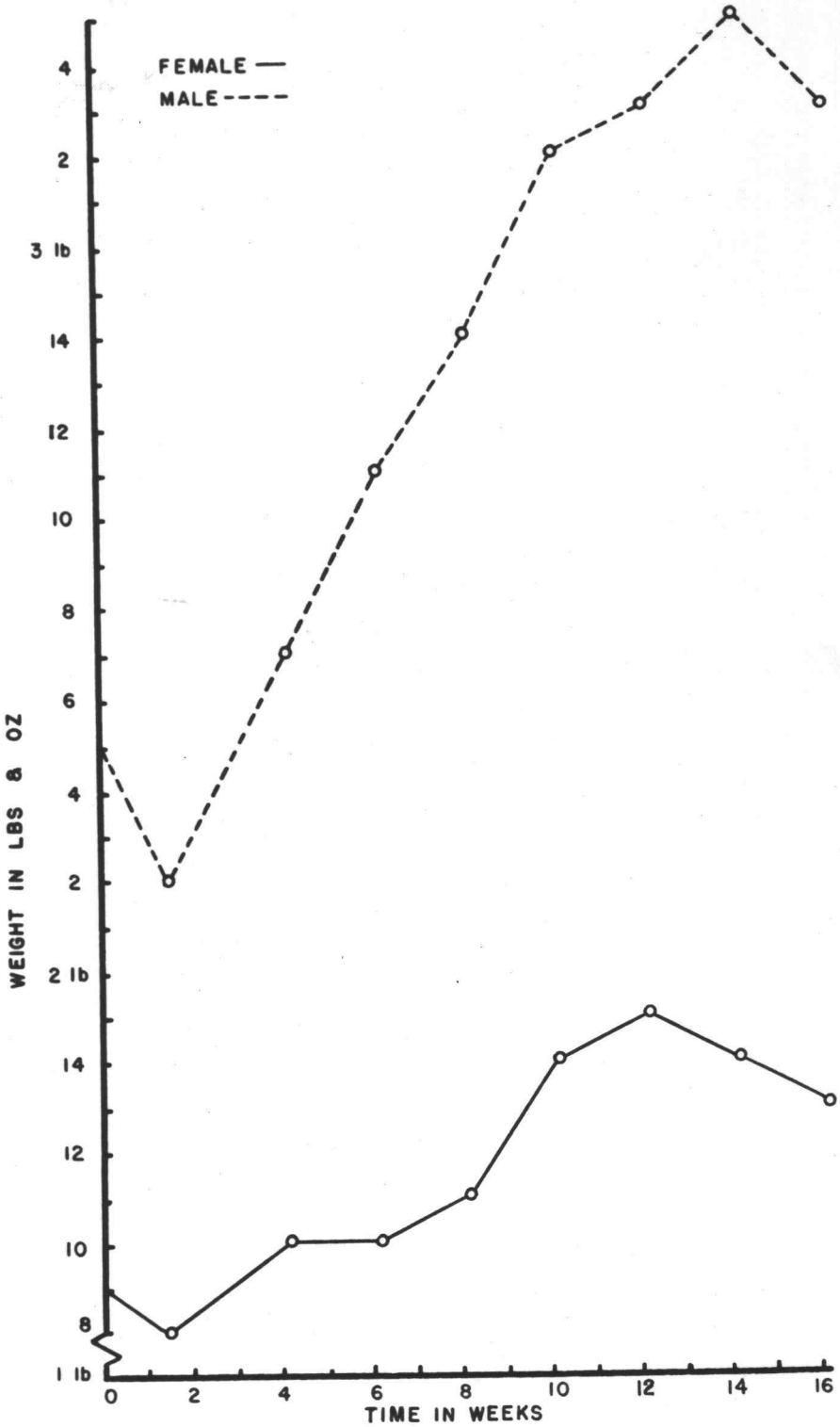

FIGURE 21

GROWTH CURVES

SHOWING AVERAGE BIWEEKLY WEIGHTS OF FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP VII (33.7 % Arrowtoothed Halibut)

SEVEN MALES SEVEN FEMALES

TABLE VI

BIOCHEMICAL ANALYSES OF EXPERIMENTAL DIETS

MINK FOOD SAMPLES*

Group Number and Diet	% Dry Matter	Dry Basis % Protein	% Ash	% Fat
Group I (Basic) Basic meat**--28% Red rockfish--26% Mixed flatfish--46%	22.9	46.35	12.88	26.85
Group II Basic meat--28% Hake--72%	19.8	64.25	10.11	20.19
Group III Basic meat--28% Hake--54% Red rockfish--18%	23.6	56.10	11.31	28.07
Group IV Basic meat--28% Hake--36% Red rockfish--18% Mixed flatfish--18%	22.2	54.35	11.24	22.20
Group V Basic meat--28% Arrowtoothed halibut--72%	24.1	49.55	9.91	36.44
Group VI Basic meat--28% Arrowtoothed halibut--54% Red rockfish--18%	26.3	48.45	10.84	37.95
Group VII Basic meat--28% Arrowtoothed halibut--36% Red rockfish--18% Mixed flatfish--18%	24.6	57.75	10.97	33.70
Group VIII Basic meat--28% Black rockfish--72%	22.9	59.75	13.05	21.13

TABLE VI--continued

Group Number and Diet	% Dry Matter	Dry Basis % Protein	% Ash	% Fat
Group IX Basic meat--28% Black rockfish--54% Red rockfish--18%	22.9	57.35	12.43	28.86
Group X Basic meat--28% Black rockfish--36% Red rockfish--18% Mixed flatfish--18%	24.2	56.55	11.35	23.30
Group XI Basic meat--28% Hake--24% Red rockfish--24% Mixed flatfish--24%	23.1	55.10	13.17	23.30
Group XII Basic meat--28% Arrowtoothed halibut--24% Red rockfish--24% Mixed flatfish--24%	23.8	55.70	11.73	32.87
Group XIII Basic meat--28% Black rockfish--24% Red rockfish--24% Mixed flatfish--24%	22.4	55.10	11.73	26.66
Basic cereal*** (not included in above analyses)	92.1	26.40	14.68	7.17

* Percentages of the constituents of the diets differ from those in table I because herein cereal percentages are not contained in the 100% total.

** Basic meat contains 15% tripe, 8% horsemeat, 5% liver.

*** Basic cereal contains 2% wheat germ, 1½% yeast, 1½% alfalfa meal, 2% Cerl-meal, 1% bone meal.

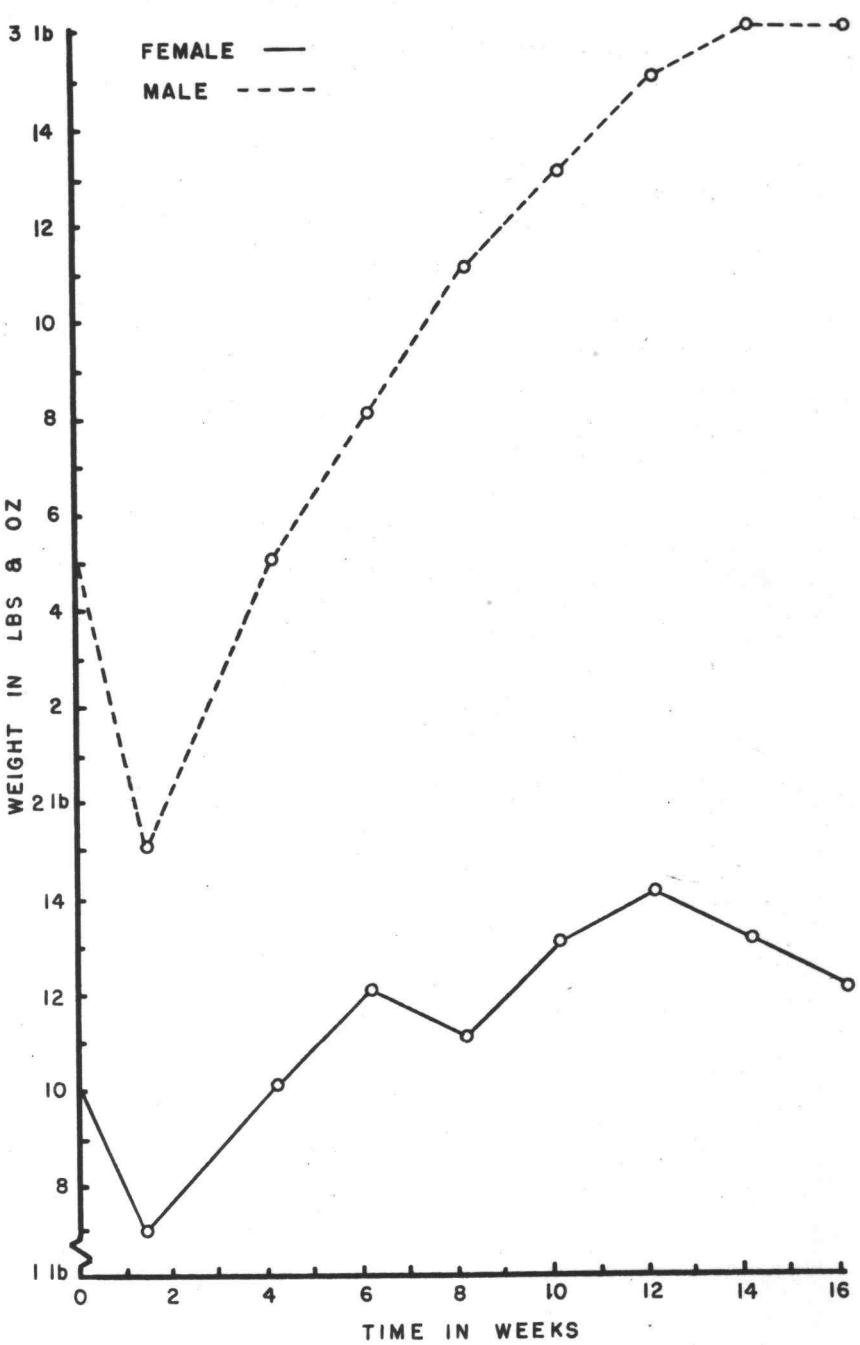

FIGURE 22

GROWTH CURVES

SHOWING

AVERAGE BIWEEKLY WEIGHTS OF
FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP VIII (66.9 % Black Rockfish)

SEVEN MALES SEVEN FEMALES

SUGGESTIONS FOR FURTHER RESEARCH

On the basis of these studies, suggestions for further research have been made. Experimental diets containing mixtures of hake and arrowtoothed halibut might prove to be valuable. An experimental diet in which arrowtoothed halibut would be the main constituent could be fed to growing mink while a diet in which black rockfish was the principal fish might be fed these same mink while their fur became prime. Diets containing percentages, other than those used in these experiments, of these same fish might prove to be of some value. Perhaps diets containing principally hake could be supplemented, to great advantage, with some of the growth stimulating factors, such as vitamin B_{12}.

DISCUSSION

Below is listed a summary of the observations by groups and any conclusions which have been drawn from those observations by group diets.

GROUP I

Group I, considered a reliable average of the adequate diets fed on Oregon fur farms today, provided a standard with which to compare the other experimental

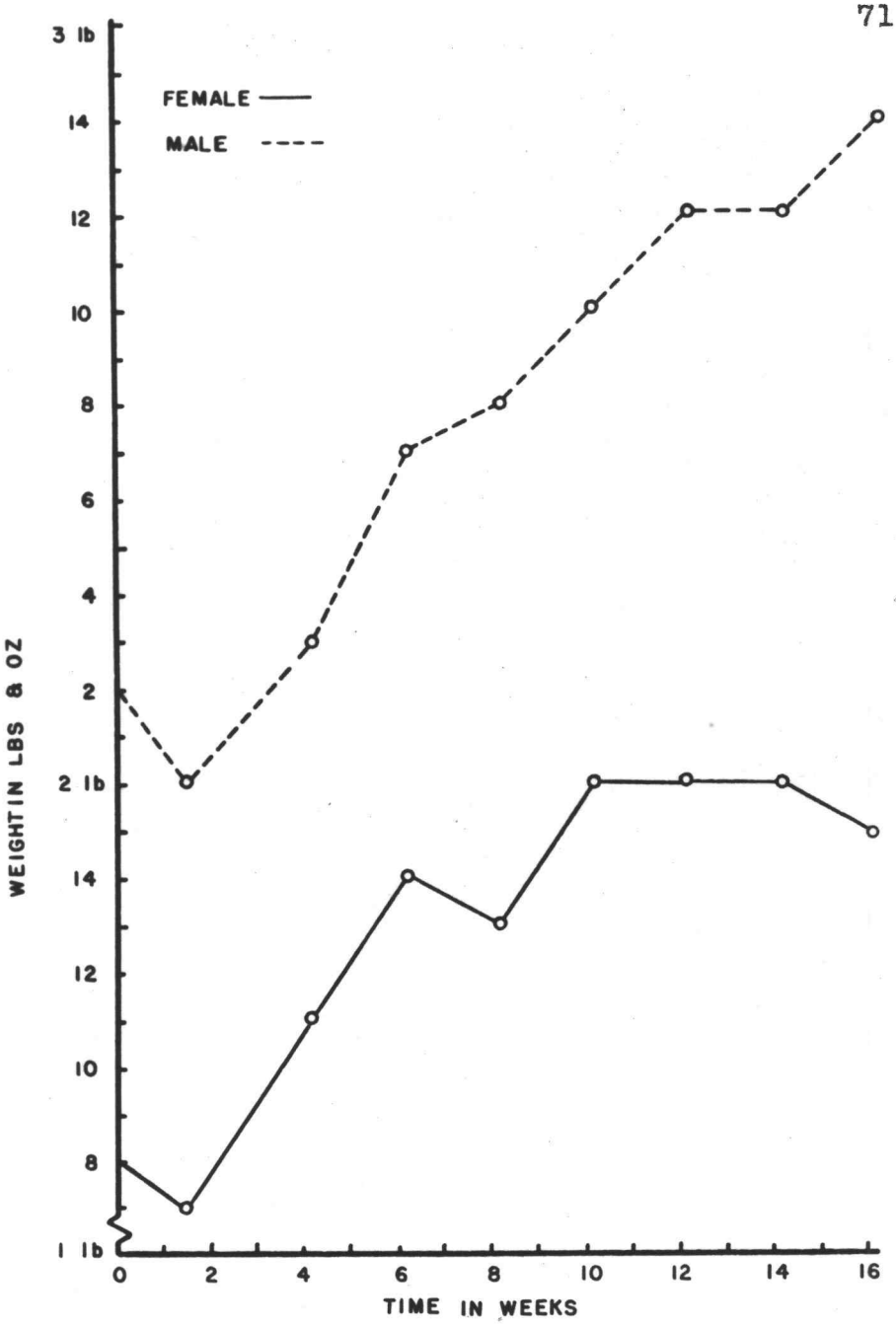

FIGURE 23

GROWTH CURVES

SHOWING
AVERAGE BIWEEKLY WEIGHTS OF
FOUTEEN MINK ON EXPERIMENTAL DIET

GROUP IX (50.3% Black Rockfish)

SEVEN MALES SEVEN FEMALES

group diets.

This diet consisted of the following ingredients:

Basic meat	25.7%
Basic cereal	7.4%
Red rockfish	24.7%
Mixed flatfish	42.2%
2,000 I. U. Vitamin A/mink	

The Group I diet was analyzed and found to contain 22.9% dry matter and, on a dry basis, 46.35% protein, 12.88% ash and 26.85% fat. These figures might be considered a basis with which to compare the analyses of the other experimental diet groups.

The average weight gain per mink from July 28 to November 18 for Group I was 7 oz. for the females and 1 lb. 2 oz. for the males. This weight gain was the highest averaged during the period in which weights were taken, of any experimental group.

This group averaged a food consumption rate of 6.38 oz. per mink per day from August 14 to November 10, which was considered as normal.

Pelt average for all of Group I was $23.04, for the females, $18.15 per pelt, and for the males, $27.93. The fur color rating score was 88 points.

The mink in this group, it was concluded, received an adequate diet so that all of their basic requirements were met, as far as could be ascertained from the knowledge at the disposal of the experimental workers. The

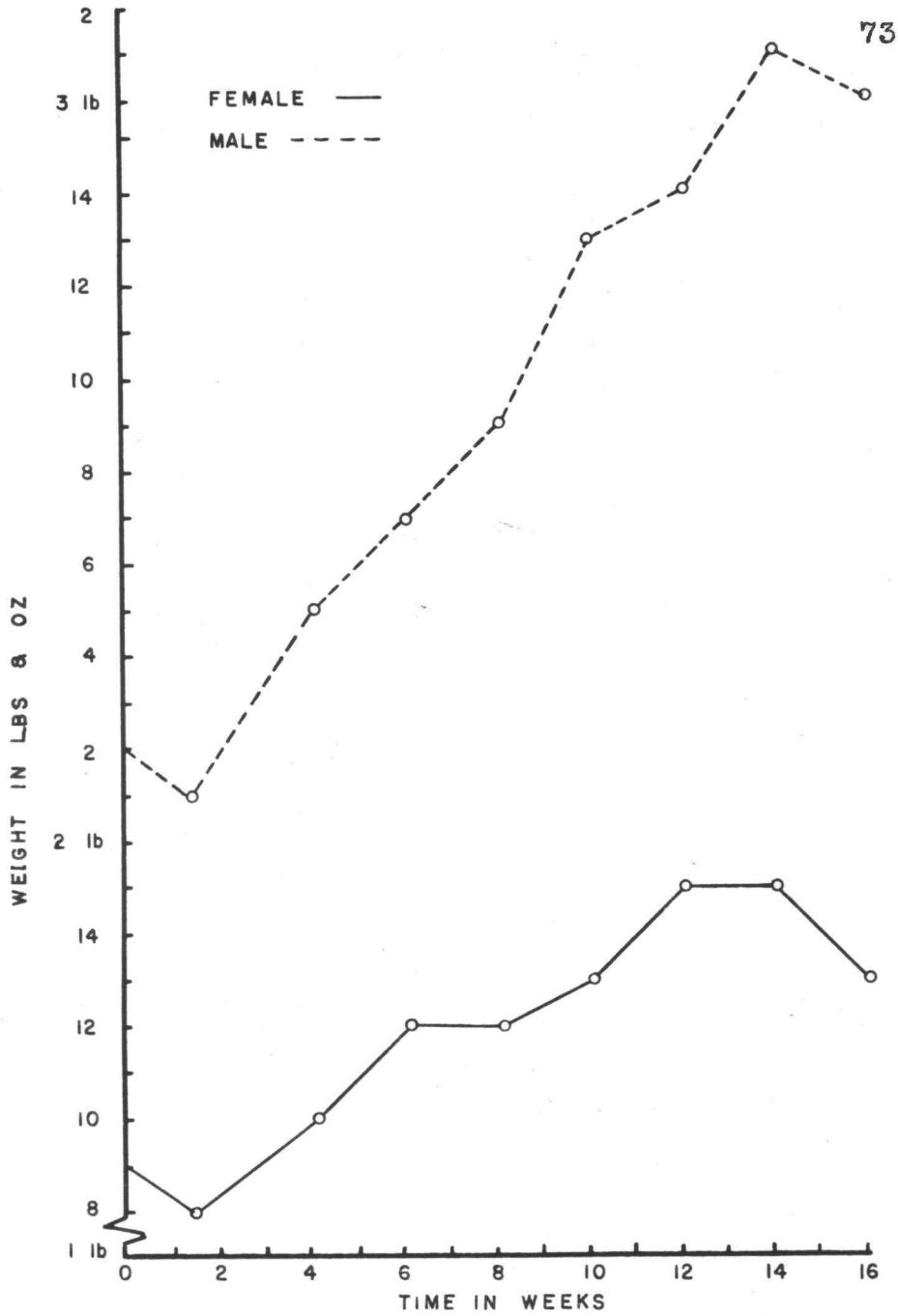

FIGURE 24

GROWTH CURVES

SHOWING
AVERAGE BIWEEKLY WEIGHTS OF
FOURTEEN MINK ON EXPERIMENTAL DIET

GROUP X (33.7 % Black Rockfish)

SEVEN MALES SEVEN FEMALES

pelts priced well and were rated as being of high value on a fur color basis.

The purpose of the experiment was not to prove that this basic diet was superior to all other experimental diets fed, but to ascertain if the designated marine fishes, Pacific hake, arrowtoothed halibut and black rockfish, could be used in diets as adequate substitutes for the fish commonly used on fur farms today and included in the basic group diet.

With this in mind, the following groups will be discussed. Ash content will hereafter not be mentioned in the summarization and conclusion as it was not considered to be a controlling factor herein.

GROUP II

The diet included the following constituents:

Basic meat	25.7%
Basic cereal	7.4%
Hake	66.9%
2,000 I. U. Vitamin A/mink	

The biochemical analysis showed this diet as having the lowest fat content on the dry basis, and the highest protein content, dry basis, of all diets considered. Percentage of the fat was 20.19 while that of protein was 64.25. The ash content was comparable to the other diets.

When considering weight gain, Group II diet proved

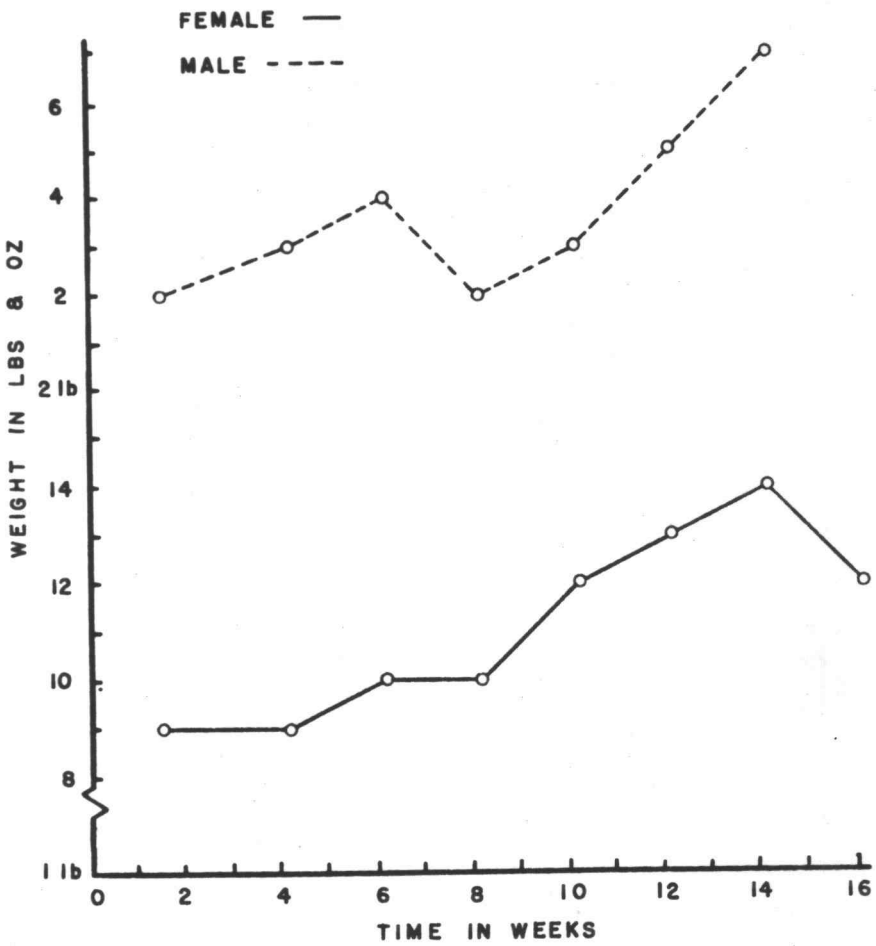

FIGURE 25

GROWTH CURVES
SHOWING
AVERAGE BIWEEKLY WEIGHTS OF
NINE MINK ON EXPERIMENTAL DIET

GROUP XI (22.3 % Hake)

THREE MALES SIX FEMALES

inadequate by registering a 2 oz. average loss for the females and no gain for the males for the period of July 28 to November 18. In comparison with this weight loss the mink on this diet consumed more than the mink on any other diet with an intake of 7.33 oz. per mink per day, on the average.

After being given the rating of 80 points, color basis, these mink brought an average price of $16.25 per mink pelt. The females brought $13.14 per pelt while the males were priced at $19.36 per pelt, on the average. This group was late in priming in comparison with the basic group.

Conclusions drawn from these observations were:

1. This diet was not adequate and was not recommended for use either as a growth ration or as a furring-out feed.

2. When considering the constituent analysis, it seemed evident that high protein content did not necessarily promote growth and proper priming.

3. The general conclusion was that this diet was deficient, in that consumption was high and yet there was no growth, and some weight loss, of mink on this diet.

4. As may be observed in the following conclusions, the low fat content was presumed to have been correlated with the lack of growth of mink on this diet.

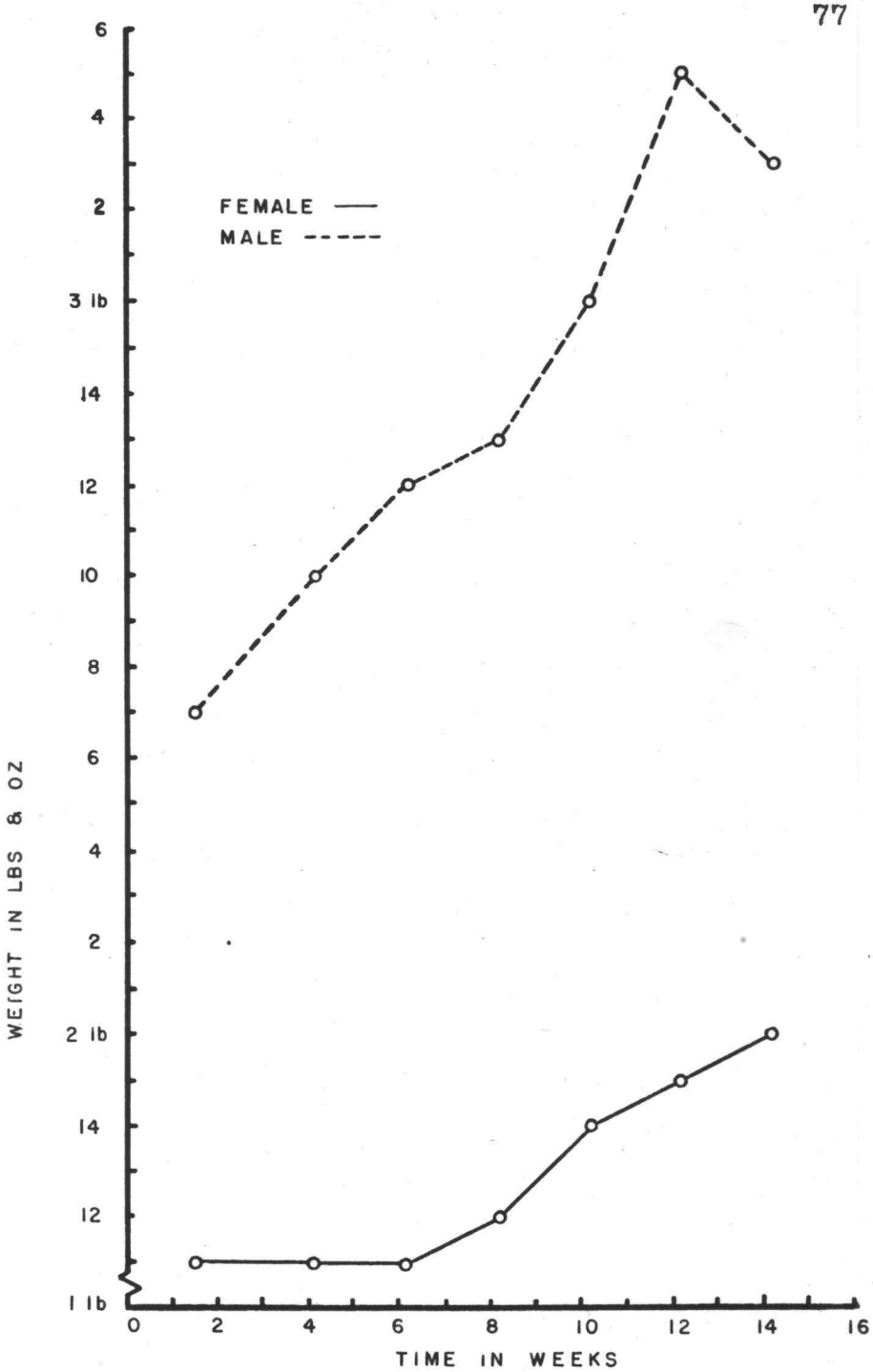

FIGURE 26

GROWTH CURVES

SHOWING

AVERAGE BIWEEKLY WEIGHTS OF
NINE MINK ON EXPERIMENTAL DIET

GROUP XII (22.3 % Arrowtoothed Halibut)

THREE MALES SIX FEMALES

GROUP III

This diet included:

Basic meat	25.7%
Basic cereal	7.4%
Hake	50.3%
Red rockfish	16.6%

With the addition of red rockfish to the hake portion of the diet, the fat content was increased from 20.19%, as in Group II, to 28.07%, dry basis. The protein content was 56.10%, dry basis, and was not considered a controlling factor.

Mink fed this diet gained 3 oz. average per female and 13 oz. average per male during the aforementioned period during which the mink were weighed. These mink consumed 7.28 oz. per mink per day, a high amount in comparison with most other groups.

Pelt price average for the whole group was $18.36, $13.66 for the female pelts and $23.06 for the male pelts. The color rating was 82 points.

Conclusions regarding these observations were:

1. As indicated by the observations, although growth was promoted by the addition of red rockfish to the hake diet, this ration was not considered adequate. The animals were "high-strung", nervous and appeared to be deficient in certain basic food requirement and fur development needs.

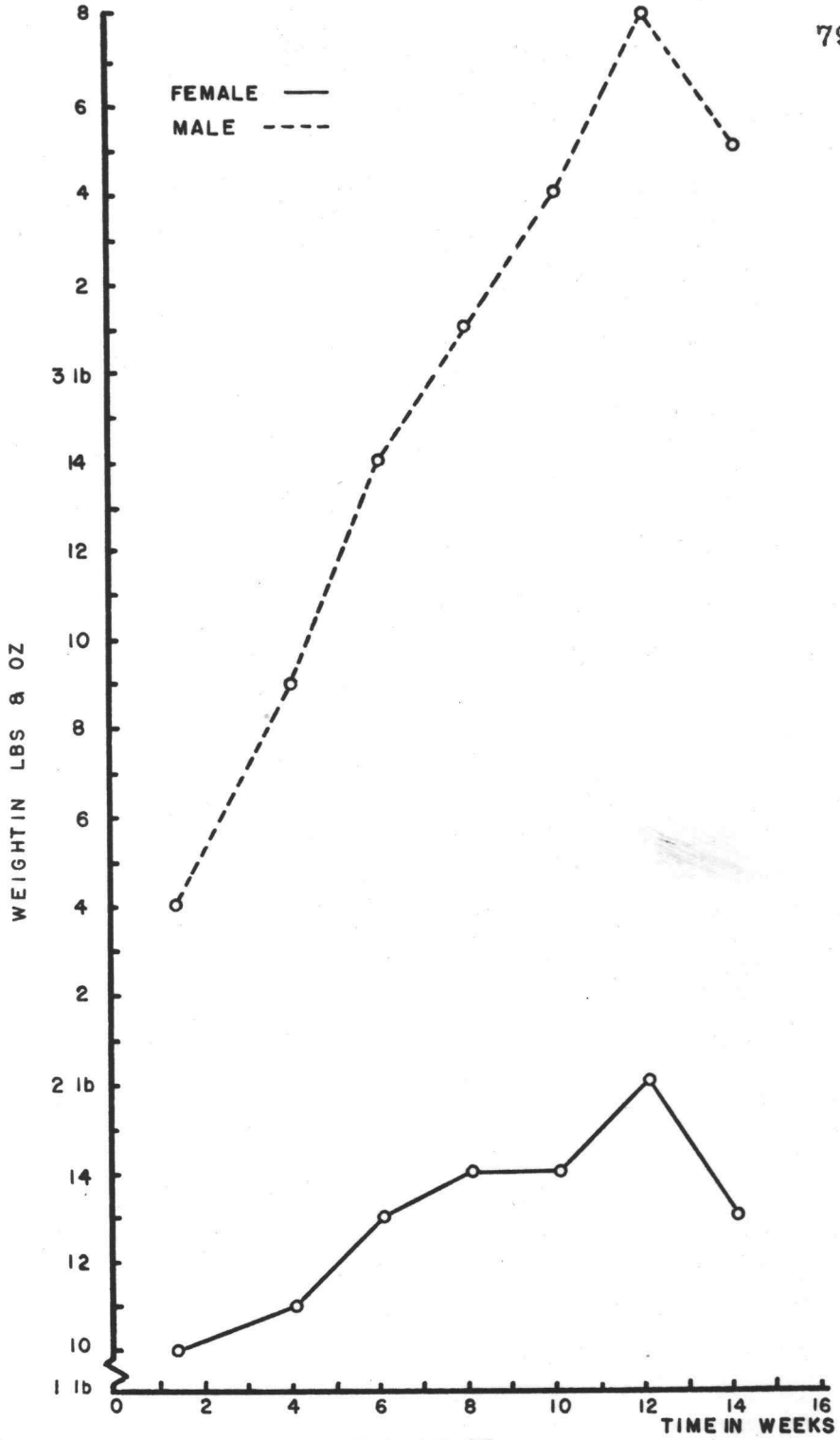

FIGURE 27
GROWTH CURVES
SHOWING AVERAGE BIWEEKLY WEIGHTS OF
NINE MINK ON EXPERIMENTAL DIET
GROUP XIII (22.3 % Black Rockfish)
THREE MALES SIX FEMALES

2. This ration would not be recommended for feed during the pre-pelting period. As evidenced by the prices received from the sale of pelts from this group, the pelts were unsatisfactorily below average.

3. The addition of red rockfish, high in fat content, proved enough of a stimulus to cause 5 oz. more gain per female and 13 oz. more gain per male mink than was observed in Group II, where the diet contained 66.9% hake.

GROUP IV

This diet included:

Basic cereal	7.4%
Basic meat	25.7%
Flatfish	16.6%
Hake	33.7%
Red rockfish	16.6%

The fat content was 22.2%, dry basis, and the protein 54.34%, dry basis.

As observed, the females gained an average of 4 oz. and the males, 14 oz. average, during the period from July 28 to November 10. Color rating for the group was 80 points and the pelt value for both males and females was $18.32. For the females it was $13.43 and for the males, $23.21.

The appearance and temperament of these mink was not normal and was considered undesirable. These mink consumed 7.23 oz. per mink per day, average.

Conclusions drawn from the above summary were:

1. On a diet containing 33.7% hake, the mink did not respond either in regard to growth or pelt value. This diet would not be recommended, therefore, for either purpose.

2. Food consumption was high, indicating that while the diet was not considered deficient entirely in growth-promoting factors, it was assumed to be lower in them than the level found in the basic diet.

GROUP V

This diet included:

Basic meat	25.7%
Basic cereal	7.4%
Arrowtoothed halibut	66.9%
2,000 I. U. Vitamin A/mink	

This ration, high in fat content, with 36.44%, dry basis, promoted growth averages of 3 oz. per female mink and 15 oz. per male during the weighing period.

The pelts averaged $13.50 per female and $24.50 for the males to make a group average of $19.00. The mink had a color rating of 82 points on November 1. The food consumption rate was low at 5.47 oz. per mink per day. A protein content of 49.55%, dry food, was observed from the analyses.

Conclusions were:

1. The food consumption rate of this group was low,

Figure 28. Exterior of breeder building recently completed, as patterned after those seen on the Andrew Wari s ranch, Clatskanie, Oregon

while the diet still supported good growth.

2. The diet was unsatisfactory as a furring-out diet because of the tendency toward a definite brownish cast to the fur, considered undesirable in natural ranch mink.

3. Animals on this diet produced heavy fur, indicating a more nearly adequate diet than those containing hake, although it still was not on the level of the basic Group I.

GROUP VI

This diet included:

Arrowtoothed halibut	50.3%
Red rockfish	16.6%
Basic cereal	7.4%
Basic meat	25.7%
2,000 I. U. Vitamin A/mink	

A combination of two fatty fishes, arrowtoothed halibut and red rockfish, contributed toward the highest fat content of all diets, 37.95%, dry basis. The protein was not considered to have been a controlling factor.

Conclusions drawn from these observations are:

1. From a growth standpoint this diet would be recommended, since good growth was promoted despite low food consumption. Heavily-furred, large mink indicated that this was an adequate diet for growing animals.

2. This diet would not be recommended for color

production or as a diet for mink whose fur was becoming prime, as indicated by the 83 points color rating. These furs were undesirably brown, as was the case of all mink on the diets containing arrowtoothed halibut.

GROUP VII

This diet included:

Arrowtoothed halibut	33.7%
Mixed flatfish	16.6%
Red rockfish	16.6%
Basic meat	25.7%
Basic cereal	7.4%
2,000 I. U. Vitamin A/mink	

The fat content of this diet, dry basis, was 33.7% while the protein percentage, dry basis, was 57.75, the highest protein content of the arrowtoothed halibut groups.

The average gain of females during the period of July 28 to November 18 was 4 oz. and for the males, 14 oz. The fur color for this group rated 84 points. Consumption rate was comparable with the basic group at 6.15 oz.

Female pelt value was $17.07 per pelt and the male, $24.50, to make a total group average of $20.79 per pelt.

Conclusions which were drawn from these results were:

1. These mink were not as brownish, when pelted, as were those in Groups V and VI. However, they were not as large as the mink in Group VI.

2. The food consumption rate was higher than in the above Groups V and VI, giving evidence to the assumption that as mixed flatfish was added to the arrowtoothed halibut diet, the diet became less concentrated.

3. This diet might be recommended as a substitute for the diet fed Group I for a growth diet for young mink, although it did not bear as much merit on this basis as did the diet fed to Group VI.

GROUP VIII

The constituents of this diet were:

Black rockfish	66.9%
Basic cereal	7.4%
Basic meat	25.7%
2,000 I. U. Vitamin A/ mink	

A comparatively low fat content, 21.13%, dry basis, was observed along with a high protein content of 57.75%.

The mink on this diet made moderate gains, averaging 2 oz. per female and 11 oz. per male for the period from July 28 to November 18.

The rate of food consumption may be compared with that of Group I (Basic) at 6.43 oz. per mink per day average. The female pelts averaged $16.71 and the males $22.43, the combination of which made a total group average of $19.57. This group rated 90 points on color, 2 points higher than the animals on the basic diet.

Conclusions advanced on the above observations were:

1. Although the weight gain and, therefore, the pelt size was not as large as was desirable, the mink on this diet were of exceptionally fine color. The fur was very dark and evenly colored throughout the group.

2. This diet might not be recommended for a growth diet, but might be valuable for use as a furring-out diet. It does not, however, gain the merit of the diet of Group IX, following.

3. The low fat content of the diet, 21.13% dry basis, may be said to have been responsible for the lack of growth of the mink on this diet.

GROUP IX

This diet included:

Black rockfish	50.3%
Red rockfish	16.6%
Basic cereal	7.4%
Basic meat	25.7%
2,000 I. U. Vitamin A/mink	

Seven ounces per female and 12 ounces per male were the average weight gains of the mink on this diet. Food consumption rate was low at 5.80 oz. per mink per day.

The fat content of the diet was comparable with that of the basic diet at 28.86% dry basis. A high protein content of 57.35% was observed.

These mink rated 88 points on color and brought an average of $21.28 per pelt. The males were averaged at

Figure 29. Interior of breeder building recently completed

$26.42 and the females at $16.14.

Conclusions drawn from these observations were:

1. This diet is the most highly recommended for feeding to mink becoming prime of those fed. The mink on this diet merited the high prices they received, not for size of pelt as the mink in Group VI, but for fine color. The group was evenly dark in color throughout.

2. The low food consumption rate was a desirable factor when considering cost of diet.

3. Again, it was observed that with an increase in fat content, that is, with the addition of red rockfish, the growth was increased, and when combined with the black rockfish, the previously observed brownish cast of prime fur of mink on high fat diets, such as those of Groups V and VI, was not seen.

GROUP X

This diet consisted of:

Flatfish	16.6%
Red rockfish	16.6%
Black rockfish	33.7%
Basic cereal	7.4%
Basic meat	25.7%
2,000 I. U. Vitamin A/mink	

The fat and protein contents were not considered as controlling factors in this diet.

These mink consumed 6.57 oz. per mink per day during

the August 14 to November 10 period and registered an average weight gain of 6 oz. per female and 14 oz. per male during the July 28 to August 18 period.

Pelt values were $16.07 average for females and $23.29 for males to make a group average of $19.68 per mink. The color rating given on November 1 was 85 points.

Conclusions were:

1. These mink were undesirably browner than those animals making up Groups VIII and IX. the males showed a slightly higher weight gain than did those in Group IX but this was offset by a lower pelt value because of poorer color.

2. Food consumption was comparable with the basic group although slightly higher, but this diet would not be recommended because of the lower pelt value.

3. The brownish color here cannot be attributed to high fat content and would suggest an inbalance of some other factors rather than high fat content.

GROUP XI

Constituents of this diet were:

Basic meat	25.7%
Pacific hake	22.3%
Red rockfish	22.3%
Mixed flatfish	22.3%
Basic cereal	7.4%

The average weight gain for these females was 3 oz.

and for males, 5 oz., for the period from August 16 to November 4.

The fat content was low at 23.3%, dry basis and the protein content was 55.1%.

The food consumption was 5.82 oz. The color rating was 87 points, with the pelt group average $19.67, which included a $15.50 average per female pelt and a $23.83 per male pelt.

Indications were:

1. Food consumption at 5.82 oz. was not considered low because of the usually lower rate of consumption by adults than by young mink.

2. Of diets XI, XII and XIII, this diet was second, in desirability, to that containing arrowtoothed halibut, diet Group XII, in general.

3. This diet would not be recommended for either growth promotion or for furring out. It had the typical low fat content of all hake-containing diets.

GROUP XII

This diet included:

Basic meat	25.7%
Arrowtoothed halibut	22.3%
Red rockfish	22.3%
Mixed flatfish	22.3%
Basic cereal	7.4%

Typically, this arrowtoothed halibut-containing

diet had a high fat content, 32.87%. The protein content was not considered to be a controlling factor.

The color rating of 88 points was given this group and a pelt value of $20.70 was received for the whole group which included a $24.00 per male average and a $17.50 per female average. The weight gain for females and males respectively was 5 oz. and 12 oz. for the weight-taking period. Food consumption was 5.11 oz. per mink per day.

Indications were:

1. Even though the fat content was high, the brownish cast of the fur, as observed on mink of other arrow-toothed halibut diets was not so apparent in mink fed it in these proportions.

2. This diet might be recommended for general use as a partial substitute for a diet similar to the basic. A large enough group was not carried to give conclusive evidence. Indications were that it did fulfill growth requirements and, to a certain extent, needs of mink producing new fur.

GROUP XIII

Basic meat	25.7%
Red rockfish	22.3%
Black rockfish	22.3%
Mixed flatfish	22.3%
Basic cereal	7.4%

The fat content may be compared to that of the basic

diet at 26.66%. Protein content was not considered as a controlling factor at 55.10%.

An average weight gain of 3 oz. per female and 1 lb. 1 oz. per male for the period from August 16 to November 4 was registered by this group. Consumption was comparable to Group XI at 5.64 oz. per mink per day.

Pelt value of $18.63 was given the group with females receiving average values of $14.92 and the males, $22.33. Color rating was 82 points.

Indications were:

1. Black rockfish in small concentrations did not affect the color of the pelt as was indicated in diets VIII and IX.

2. It was indicated that this diet was not adequate for feeding to pelter mink and, although a large average weight gain was registered, it was misleading because of one extremely large male mink; therefore, this diet was considered particularly conducive to growth.

CONCLUSIONS

On the basis of the observations made during the course of the experiments, hake, when included in the diet from 22.3% to 66.9% of the total diet, by weight, did not meet the basic requirements of the mink and was not considered adequate for use in a growth diet.

Diets containing hake were not sufficient to promote proper furring of the mink prior to pelting.

The experimental diets containing arrowtoothed halibut in amounts up to 50.3% of the total diet, by weight, were satisfactory in promoting growth of young mink, but were not considered desirable for feeding to mink whose fur was becoming prime, prior to taking the pelt. The mink on these diets tended to have a brownish fur which was undesirable.

Diets containing from 33.7% to 66.9% black rockfish of the total diet, by weight, were not considered adequate when fed to growing mink but they were considered as of exceptional value when fed to mink which were producing new fur. The pelts of these group diets were dark and even in color.

On the basis of the experiments conducted, it was indicated that diets containing varied amounts of arrowtoothed halibut and black rockfish might serve as substitutes for diets now fed to mink on Oregon fur farms.

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APPENDIX I

DISTINGUISHING TAXONOMICAL FEATURES OF THE FISH USED IN THE EXPERIMENTAL DIETS

PACIFIC HAKE. Merluccius productus (Ayres)

Distinguished by the two dorsal fins, the first short, the second long and deeply notched; the large mouth with the protruding lower jaw; the large eyes and the ridges on the top of the head. (3, p.129)

BLACK ROCKFISH. Sebastodes melanops (Girard)

Distinguished by the highly convex interorbital space without spines, the moderately large eyes, the black coloration sometimes blotched with carmen red and the white peritoneum. (3, p.208)

RED ROCKFISH. Sebastodes ruberimmus (Cramer)

Distinguished by the multifid points on the third preopercular spine, the broken up spiny cranial ridges and the red coloration. (3, p.220)

PRIEST FISH. Sebastodes mystinus (Jordan and Gilbert)

Distinguished by the highly convex interorbital space without spines, the small prefrontal spines, the lower spinous portion of the dorsal fin, the small eyes and the

grayish-black coloration on the body and the peritoneum. (3, p.210)

ARROWTOOTHED HALIBUT. Atheresthes stomias (Jordan)

Distinguished by the very large jaws extending behind the eyes, the arrow-shaped teeth and the left eye on the upper margin of the head. (3, pp.310-311)

ROUNDNOSE FLOUNDER. Eopsetti jordani (Lockington)

Distinguished by the small scales with about 30 in a diagonal row between the dorsal fin and the lateral line at the widest part of the body, the smooth scales completely covering the blind side of the body and the teeth in 2 rows on each side of the upper jaw. (3, p.316)

LEMON FLOUNDER. Parophrys vetulus (Girard)

Distinguished by the pointed head, the accessory dorsal branch of the lateral line and the scales on the body smooth anteriorly, rough posteriorly. (3, pp.321-322)

LONGFINNED FLOUNDER. Glyptocephalus zachirus (Lockington)

Distinguished by the long pectoral fin on the eyed side of the body, the nearly straight lateral line without

an accessory branch and the gill openings extending above the bases of the pectoral fins. (3, p.326)

SLIPPERY FLOUNDER. Microstomus pacificus (Lockington)

Distinguished by the abundance of slime, the nearly straight and indistinct lateral line without an accessory branch and the gill openings not extending above the bases of the uppermost pectoral fin rays. (3, p.327)

APPENDIX II

TABULATED HISTORY OF INDIVIDUAL MINK IN EXPERIMENTAL DIET GROUPS

Group No.	Serial Number	Sex	Litter Number	Pelter or Breeder	Live Fur Rate	Pelt Value	Date of Pelting
I*	51	F	2	B	2	18.00**	
I*	52	F	1	B	2	18.00**	
I*	53	F	17	B	1	20.00**	
I*	54	F	21	B	2	18.00**	
I*	55	F	23	P	3	17.00	Nov.21
I*	56	F	38	B	2	17.50**	
I*	57	F	34	B	1	19.50**	
I*	58	F	33	B	2	17.50**	
I*	59	F	30	B	2	18.00**	
I*	60	F	4	B	2	18.00**	
I*	61	M	2	B	1	28.00**	
I*	62	M	38	B	1	29.50**	
I*	63	M	22	P	2	26.00	Nov.21
I*	64	M	44	B	1	29.00**	
II	65	F	23	P	3	10.00	Dec.3
II	66	F	22	B	2	13.00**	
II	67	F	49	B	2	14.00**	
II	68	F	14	P	2	13.00	Nov.21
II	69	F	19	B	2	14.00**	
II	70	F	18	B	1	15.00**	
II	71	F	15	P	3	13.00	Nov.21
II	72	M	2	B	1	26.00**	
II	73	M	6	P	2	26.50	Dec.3
II	74	M	7	P	2	22.00	Nov.21
II	75	M	8	P	3	18.00	Dec.3
II	76	M	42	P	4	6.00	Dec.3
II	77	M	41	P	2	21.00	Nov.21
II	78	M	34	P	3	16.00	Dec.3
III	79	F	29	P	3	13.00	Nov.21
III	80	F	44	B	2	14.00**	
III	81	F	42	P	3	12.50	Dec.3

* Basic group
** Estimated

APPENDIX II--continued

Group No.	Serial Number	Sex	Litter Number	Pelter or Breeder	Live Fur Rate	Pelt Value	Date of Pelting
III	82	F	50	P	3	23.00***	Dec. 3
III	83	F	17	B	1	15.00**	
III	84	F	3	P	3	13.00	Nov. 21
III	85	F	7	B	1	14.50**	
III	86	M	19	P	2	23.00	Dec. 3
III	87	M	15	P	2	23.00	Nov. 21
III	88	M	1	P	3	17.50	Dec. 3
III	89	M	36	P	2	24.00	Nov. 21
III	90	M	40	P	2	24.00	Dec. 3
III	91	M	30	P	2	24.00	Dec. 3
III	92	M	33	B	1	26.00**	
IV	93	F	46	B	2	14.00**	
IV	94	F	42	P	3	12.50	Nov. 21
IV	95	F	38	P	3	13.00	Nov. 21
IV	96	F	2	B	2	14.00**	
IV	97	F	23	P	3	12.50	Nov. 21
IV	98	F	15	P	3	13.00	Dec. 3
IV	99	F	9	B	1	15.00**	
IV	100	M	28	P	3	22.00	Nov. 21
IV	101	M	33	P	3	17.50	Dec. 3
IV	102	M	30	P	3	22.00	Dec. 3
IV	103	M	21	P	1	26.50	Nov. 21
IV	104	M	50	P	2	24.00	Dec. 3
IV	105	M	9	B	1	27.50**	
IV	106	M	3	P	2	23.00	Dec. 3
V	107	F	4	B	1	15.00**	
V	108	F	50	P	3	12.50	Nov. 28
V	109	F	3	B	1	15.00**	
V	110	F	8	P	3	12.50	Nov. 21
V	111	F	36	B	2	14.00**	
V	112	F	42	P	3	12.50	Nov. 21
V	113	F	34	B	2	13.00**	
V	114	M	19	B	1	28.00**	
V	115	M	22	P	2	26.00	Nov. 21
V	116	M	2	P	1	26.50	Dec. 3
V	117	M	38	P	2	22.00	Dec. 3
V	118	M	30	P	3	23.00	Dec. 3

** Estimated
*** Estimated (not shed on Nov. 1)

APPENDIX II--continued

Group No.	Serial Number	Sex	Litter Number	Pelter or Breeder	Live Fur Rate	Pelt Value	Date of Pelting
V	119	M	42	P	3	22.00	Nov. 21
V	120	M	46	P	3	24.00	Dec. 3
VI	121	F	33	P	3	10.00	Dec. 3
VI	122	F	29	B	2	16.00**	
VI	123	F	38	P	2	17.00	Dec. 3
VI	124	F	1	B	1	18.00**	
VI	125	F	23	P	3	12.50	Nov. 21
VI	126	F	7	B	2	16.00**	
VI	127	F	49	B	1	17.00**	
VI	128	M	45	P	3	24.00	Nov. 21
VI	129	M	30	P	2	28.00	Dec. 3
VI	130	M	38	P	3	24.00	Nov. 21
VI	131	M	6	B	1	28.00**	
VI	132	M	22	P	2	26.00	Nov. 28
VI	133	M	17	P	2	26.50	Nov. 28
VI	134	M	15	P	2	19.00	Nov. 21
VII	135	F	9	P	3	12.00	Nov. 21
VII	136	F	18	B	2	18.00**	
VII	137	F	2	B	2	18.00**	
VII	138	F	21	P	3	17.00	Nov. 21
VII	139	F	42	B	1	19.00**	
VII	140	F	44	B	2	17.50**	
VII	141	F	40	P	2	18.00	Nov. 28
VII	142	M	1	P	2	21.00	Nov. 28
VII	143	M	21	P	2	22.00	Nov. 19
VII	144	M	18	B	1	30.00**	
VII	145	M	4	P	2	26.50	Nov. 19
VII	146	M	46	P	2	28.00	Nov. 28
VII	147	M	33	P	2	22.00	Nov. 28
VII	148	M	38	P	2	22.00	Nov. 28
VIII	149	F	41	P	1	17.00	Nov. 28
VIII	150	F	34	B	1	18.00**	
VIII	151	F	3	B	2	15.00**	
VIII	152	F	4	P	2	14.00	Nov. 28
VIII	153	F	49	B	1	18.00**	
VIII	154	F	23	P	2	17.00	Nov. 11
VIII	155	F	17	B	1	18.00**	
VIII	156	M	9	B	1	25.00**	
VIII	157	M	6	P	1	23.00	Nov. 19

** Estimated

APPENDIX II--continued

Group No.	Serial Number	Sex	Litter Number	Pelter or Breeder	Live Fur Rate	Pelt Value	Date of Pelting
VIII	158	M	22	P	2	20.00	Nov. 28
VIII	159	M	2	P	2***	24.00	Dec. 3
VIII	160	M	45	P	2	23.00	Nov. 19
VIII	161	M	40	P	2	20.00	Nov. 28
VIII	162	M	42	P	2	22.00	Nov. 19
IX	163	F	36	P	2	15.00	Nov. 19
IX	164	F	33	P	3	14.00	Nov. 28
IX	165	F	38	P	2	14.00	Nov. 19
IX	166	F	50	B	1	18.00**	
IX	167	F	22	B	2	17.00**	
IX	168	F	1	P	2	17.00	Nov. 28
IX	169	F	9	B	1	18.00**	
IX	170	M	44	P	1	26.00	Nov. 19
IX	171****	M	46	P			
IX	172	M	4	P	2	23.00	Nov. 12
IX	173	M	7	P	2	26.50	Nov. 28
IX	174	M	21	B	1	28.00**	
IX	175	M	17	B	1	28.50**	
IX	176	M	19	P	2	26.50	Nov. 28
X	177	F	1	P	2	14.00	Nov. 28
X	178	F	8	B	2	17.00**	
X	179	F	23	P	2	16.00	Nov. 12
X	180	F	17	B	1	18.50**	
X	181	F	29	P	3	12.00	Nov. 12
X	182	F	33	P	2	17.00	Nov. 21
X	183	F	34	B	1	18.00**	
X	184	M	7	P	2	23.00	Nov. 28
X	185	M	15	P	2	22.00	Nov. 28
X	186	M	3	P	2	18.00	Nov. 28
X	187	M	2	P	3	24.00	Nov. 28
X	188	M	42	P	2	20.00	Nov. 28
X	189	M	44	P	2	28.00	Nov. 28
X	190	M	19	B	1	28.00**	
XI	191	F	2	P	3	13.00	Dec. 3
XI	192	F	33	P	2	14.00	Nov. 28
XI	193	F	8	P	2	17.00	Nov. 28

** Estimated
*** Estimated (not shed on Nov. 1)
**** Died August 20

APPENDIX II--continued

Group No.	Serial Number	Sex	Litter Number	Pelter or Breeder	Live Fur Rate	Pelt Value	Date of Pelting
XI	194	F	Ad 12	P	1	17.00	Nov. 28
XI	195	F	Ad 25	P	1	16.00	Nov. 28
XI	196	F	Ad 32	P	2	16.00	Nov. 28
XI	197	M	3	P	2	22.00	Nov. 28
XI	198	M	1	P	1	23.00	Nov. 12
XI	199	M	23	P	3	26.50	Nov. 28
XII	200	F	17	P	2	18.00	Nov. 28
XII	201	F	34	P	2	17.00	Nov. 28
XII	202	F	Ad 37	P	2	18.00	Nov. 28
XII	203	F	Ad 13	P	1	19.00	Nov. 28
XII	204	F	Ad 26	P	2	18.00	Nov. 12
XII	205	F	Ad 47	P	2	15.00	Dec. 3
XII	206	M	4	P	2	17.50	Nov. 12
XII	207	M	21	P	2	26.50	Dec. 3
XII	208	M	Ad 35	P	1	28.00	Dec. 3
XIII	209	F	18	P	2	17.00	Nov. 12
XIII	210	F	6	P	1	17.00	Nov. 12
XIII	211	F	Ad 11	P	1	17.00	Dec. 3
XIII	212	F	Ad 14	P	2	13.00	Nov. 12
XIII	213	F	Ad 28	P	3	13.00	Nov. 28
XIII	214	F	Ad 48	P	4	12.50	Dec. 3
XIII	215	M	4	P	2	23.00	Nov. 12
XIII	216	M	22	P	4	17.50	Dec. 3
XIII	217	M	Ad 43	P	2***	26.50	Dec. 3

*** Estimated (not shed on Nov. 1)

APPENDIX III

A COMPARISON OF INDIVIDUAL BIWEEKLY WEIGHTS OF MALE AND FEMALE MINK INCLUDED IN EXPERIMENTAL DIET GROUPS

Group No.	Serial Number	Sex	Biweekly Weights in Pounds and Ounces								
			July 28	Aug. 9	Aug. 26	Sept. 9	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
I*	51	F		1-6	1-9	1-11	1-13	1-15	2-0	2-0	2-0
I*	52	F		1-8	1-14	2-0	2-2	2-3	2-3	2-4	2-4
I*	53	F		1-8	1-13	1-15	2-3	2-5	2-6	2-4	2-6
I*	54	F		1-9	1-12	1-12	1-13	1-15	2-2	2-0	2-0
I*	55	F		1-7	1-10	1-11	1-12	1-12	1-11	1-7	1-10
I*	56	F		1-8	1-12	1-11	1-12	2-0	2-0	2-0	2-1
I*	57	F		1-10	1-11	1-12	1-14	2-0	2-1	1-15	2-1
I*	58	F		1-6	1-11	1-13	1-15	2-3	2-2	2-1	2-2
I*	59	F		1-9	1-13	2-0	2-1	2-3	2-3	1-14	2-0
I*	60	F		1-8	1-11	1-11	1-13	2-0	1-15	1-12	1-15
I*	61	M		2-2	2-7	2-12	3-1	3-4	3-5	3-5	3-3
I*	62	M		1-15	2-5	2-6	2-9	2-14	2-15	3-2	3-4
I*	63	M		2-2	2-10	2-13	3-1	3-8	3-8	3-9	3-12
I*	64	M		2-7	2-14	2-14	2-15	3-3	3-8	3-6	3-8
II	65	F	1-11	1-8	1-7	1-8	1-13	1-10	1-11	1-8	1-7
II	66	F	1-5	1-3	1-2	1-3	1-4	1-6	1-6	1-6	1-5
II	67	F	1-9	1-8	1-7	1-7	1-9	1-9	1-9	1-9	1-10
II	68	F	1-12	1-13	1-12	1-12	1-13	2-0	1-15	1-15	1-13
II	69	F	1-12	1-9	1-8	1-9	1-8	1-12	1-11	1-10	1-9
II	70	F	1-10	1-7	1-7	1-7	1-9	1-10	1-8	1-8	1-9
II	71	F	1-4	1-5	1-5	1-6	1-7	1-5	1-4	1-4	1-3

* Basic group

APPENDIX III--continued

Group No.	Serial Number	Sex	Biweekly Weights in Pounds and Ounces								
			July 28	Aug. 9	Aug. 26	Sept. 9	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
II	72	M	2-0	2-0	2-3	2-3	2-4	2-5	2-6	2-5	2-4
II	73	M	2-3	2-2	2-4	2-5	2-6	2-8	2-7	2-6	2-12
II	74	M	2-10	2-6	2-11	2-9	3-0	3-3	3-3	3-0	3-0
II	75	M	2-11	2-6	2-8	2-8	2-8	2-7	2-4	1-15	1-13
II	76	M	1-12	1-9	1-14	1-15	2-1	2-3	2-3	1-12	1-10
II	77	M	2-9	2-3	2-5	2-7	2-7	2-8	2-6	2-6	2-10
II	78	M	2-4	2-3	2-4	2-3	2-5	2-2	2-3	2-3	2-4
III	79	F	1-15	1-10	1-13	1-15	2-2	2-5	2-6	2-7	2-8
III	80	F	1-11	1-10	1-12	1-13	1-14	2-1	1-14	1-14	2-0
III	81	F	1-7	1-6	1-7	1-8	1-9	1-8	1-8	1-8	1-10
III	82	F	1-10	1-8	1-10	1-9	1-8	1-11	1-11	1-12	1-12
III	83	F	1-9	1-6	1-5	1-6	1-6	1-11	1-11	1-12	1-13
III	84	F	1-10	1-8	1-9	1-11	1-11	1-14	1-15	1-14	1-13
III	85	F	1-13	1-11	1-13	1-14	1-13	1-15	1-15	1-13	2-3
III	86	M	2-3	2-1	2-1	2-2	2-2	2-5	2-3	2-0	1-15
III	87	M	2-0	1-15	2-1	1-15	2-6	2-9	2-9	2-10	1-15
III	88	M	1-11	1-11	1-14	1-15	2-1	2-3	2-2	2-2	2-5
III	89	M	2-1	2-0	2-6	2-12	2-14	3-5	3-4	3-8	3-11
III	90	M	2-4	2-0	2-3	2-7	2-9	2-13	2-15	3-0	3-2
III	91	M	2-5	2-2	2-4	2-9	2-13	3-3	3-3	3-5	3-3
III	92	M	2-4	2-2	2-10	2-14	3-2	3-5	3-3	3-4	3-8
IV	93	F	1-9	1-7	1-10	1-13	1-15	2-0	2-1	2-2	2-3
IV	94	F	1-9	1-6	1-11	1-14	1-15	2-1	2-1	2-0	2-0
IV	95	F	1-6	1-8	1-10	1-12	1-12	2-0	1-14	1-14	1-15
IV	96	F	1-7	1-6	1-10	1-12	1-13	1-15	1-13	1-14	1-11

APPENDIX III--continued

Group No.	Serial Number	Sex	Biweekly Weights in Pounds and Ounces								
			July 28	Aug. 9	Aug. 26	Sept. 9	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
IV	97	F	1-10	1-8	1-11	1-14	1-15	2-0	1-12	1-10	1-11
IV	98	F	1-6	1-4	1-6	1-7	1-5	1-10	1-8	1-7	1-6
IV	99	F	1-11	1-8	1-9	1-12	1-14	1-13	1-10	1-15	2-0
IV	100	M	2-5	2-3	2-10	2-12	3-1	3-4	3-4	3-10	3-7
IV	101	M	2-6	2-3	2-7	2-13	2-15	3-4	3-5	3-7	3-7
IV	102	M	2-3	2-1	2-5	2-4	2-8	2-12	2-15	3-0	3-1
IV	103	M	2-4	1-14	2-3	2-7	2-8	2-10	2-7	2-12	3-0
IV	104	M	1-14	1-14	2-2	2-5	2-5	2-10	2-10	2-11	2-10
IV	105	M	2-0	1-14	2-7	2-12	2-15	2-15	2-15	3-2	3-2
IV	106	M	2-3	1-12	2-1	2-4	2-6	2-9	2-7	2-9	2-10
V	107	F	1-12	1-8	1-10	1-11	1-13	1-15	1-12	1-12	1-12
V	108	F	1-9	1-7	1-12	1-12	1-13	1-15	1-12	1-12	1-11
V	109	F	1-9	1-6	1-6	1-7	1-8	1-12	1-9	1-8	1-9
V	110	F	1-12	1-8	1-10	1-12	1-13	1-15	2-0	1-14	1-12
V	111	F	1-13	1-10	1-15	2-2	2-2	2-6	2-7	2-5	2-6
V	112	F	1-7	1-6	1-11	1-12	1-14	2-4	2-1	1-15	1-15
V	113	F	1-10	1-8	1-10	1-10	1-8	1-11	1-9	1-9	1-8
V	114	M	2-2	1-15	2-5	2-6	2-7	2-12	2-10	2-9	2-12
V	115	M	2-2	2-4	2-13	3-1	3-6	3-9	3-12	3-13	3-9
V	116	M	1-14	1-13	2-1	2-6	2-8	2-12	2-15	2-14	2-14
V	117	M	2-1	1-12	2-4	2-6	2-8	2-11	2-14	2-13	2-11
V	118	M	2-12	2-8	3-2	3-7	3-10	3-15	3-13	4-1	4-0
V	119	M	2-1	1-12	2-5	2-7	2-11	3-1	3-2	3-1	2-14
V	120	M	2-12	2-2	2-10	2-14	3-2	3-8	3-9	3-7	3-6
VI	121	F	1-6	1-7	1-13	2-1	2-1	2-2	2-3	2-8	2-2
VI	122	F	2-0	1-12	2-2	2-4	2-3	2-3	2-3	2-1	2-3

APPENDIX III--continued

Group No.	Serial Number	Sex	Biweekly Weights in Pounds and Ounces								
			July 28	Aug. 9	Aug. 26	Sept. 9	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
VI	123	F	1-9	1-6	1-10	1-13	1-14	2-0	2-1	2-0	2-1
VI	124	F	1-6	1-4	1-6	1-4	1-7	1-10	1-11	1-9	1-9
VI	125	F	1-10	1-8	1-14	2-1	2-1	2-1	2-1	1-14	2-0
VI	126	F	1-14	1-14	2-3	2-2	2-1	2-3	2-1	1-14	1-15
VI	127	F	1-13	1-10	1-12	1-13	1-13	2-0	2-1	1-14	1-11
VI	128	M	2-10	2-7	2-14	3-4	3-9	4-0	4-4	4-2	3-15
VI	129	M	2-9	2-4	2-8	2-12	2-15	3-5	3-5	3-4	3-0
VI	130	M	2-6	2-0	2-14	3-1	3-6	3-0	3-5	3-8	3-4
VI	131	M	2-4	1-14	2-4	2-6	2-9	2-11	3-0	2-14	2-13
VI	132	M	2-5	2-2	2-12	2-14	3-0	3-5	3-7	3-12	3-15
VI	133	M	2-3	2-0	2-2	2-5	2-9	2-15	3-2	3-2	3-4
VI	134	M	1-14	1-12	2-0	2-3	2-6	2-9	2-11	2-8	2-9
VII	135	F	1-11	1-8	1-10	1-12	1-13	2-0	2-1	2-0	2-0
VII	136	F	1-11	1-10	1-13	1-13	1-14	2-0	2-1	1-15	1-15
VII	137	F	1-9	1-6	1-10	1-11	1-10	1-14	1-15	1-14	1-13
VII	138	F	1-8	1-6	1-8	1-10	1-12	1-13	1-14	1-14	2-0
VII	139	F	1-10	1-8	1-10	1-11	1-12	1-15	2-0	1-15	1-14
VII	140	F	1-11	1-12	1-11	1-10	1-12	1-15	1-14	1-15	1-12
VII	141	F	1-6	1-5	1-7	1-6	1-5	1-9	1-10	1-10	1-8
VII	142	M	2-0	1-13	2-2	2-6	2-8	2-12	2-13	3-0	2-7
VII	143	M	2-5	2-2	2-6	2-8	2-10	2-14	2-13	2-11	2-11
VII	144	M	2-9	2-6	2-12	2-14	3-1	3-4	3-3	3-8	3-9
VII	145	M	2-3	2-3	2-8	2-10	2-13	2-14	2-15	2-13	2-14
VII	146	M	2-2	2-2	2-11	3-0	3-5	3-10	3-12	4-0	4-1
VII	147	M	2-6	2-0	2-12	3-1	3-6	3-11	4-0	4-0	3-11
VII	148	M	2-11	1-12	2-1	2-6	2-8	2-11	2-13	3-0	2-14

APPENDIX III--continued

Group No.	Serial Number	Sex	Biweekly Weights in Pounds and Ounces								
			July 28	Aug. 9	Aug. 26	Sept. 9	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
VIII	149	F	1-12	1-7	1-12	1-14	1-13	2-0	2-2	2-1	1-11
VIII	150	F	1-10	1-10	1-12	1-13	1-12	1-15	2-0	2-0	1-14
VIII	151	F	1-10	1-8	1-11	1-12	1-11	1-12	1-13	1-14	1-12
VIII	152	F	1-8	1-5	1-6	1-8	1-8	1-10	1-10	1-12	1-10
VIII	153	F	1-12	1-7	1-9	1-11	1-12	1-12	1-12	1-10	1-10
VIII	154	F	1-9	1-8	1-8	1-10	1-10	1-12	1-12	1-8	*
VIII	155	F	1-9	1-5	1-11	1-13	1-13	1-15	2-0	2-0	1-15
VIII	156	M	2-11	1-14	2-2	2-9	2-13	2-14	2-15	2-14	2-13
VIII	157	M	1-14	1-8	1-14	2-1	2-1	2-4	2-5	2-3	2-1
VIII	158	M	2-8	1-14	2-4	2-7	2-12	2-14	3-2	3-2	3-2
VIII	159	M	2-9	2-1	2-6	2-9	2-5	2-6	2-9	2-12	3-2
VIII	160	M	2-6	2-8	2-13	3-2	3-6	3-7	3-8	3-13	4-1
VIII	161	M	2-0	1-14	2-5	2-7	2-10	2-13	3-0	3-2	2-12
VIII	162	M	2-4	2-1	2-5	2-8	2-11	3-1	3-2	3-1	2-14
IX	163	F	1-11	1-11	2-2	2-5	2-5	2-7	2-8	2-8	2-6
IX	164	F	1-7	1-7	1-10	1-13	1-11	1-14	2-1	1-13	1-13
IX	165	F	1-4	1-4	1-8	1-10	1-9	1-11	1-12	1-12	1-11
IX	166	F	1-10	1-8	1-10	1-13	1-13	1-15	2-1	1-14	1-12
IX	167	F	1-9	1-7	1-9	1-9	1-11	1-13	1-14	1-12	1-8
IX	168	F	1-7	1-6	1-9	1-13	1-13	1-15	2-3	2-0	1-14
IX	169	F	1-6	1-9	1-15	2-1	2-0	2-3	2-4	2-2	2-12
IX	170	M	2-3	2-1	2-4	2-7	2-7	2-6	2-8	2-11	2-11
IX	171	M	2-2	2-0	(Died August 20 at 2 lb. 3 oz.)						
IX	172	M	1-11	1-12	1-15	2-1	2-2	2-4	2-6	2-3	*

* Pelted before indicated date.

APPENDIX III--continued

Group No.	Serial Number	Sex	Biweekly weights in Pounds and Ounces								
			July 28	Aug. 9	Aug. 26	Sept. 9	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
IX	173	M	2-4	2-0	2-4	2-8	2-9	2-14	3-2	3-2	3-0
IX	174	M	2-1	1-15	2-1	2-3	2-5	2-7	2-12	2-13	2-12
IX	175	M	2-0	1-14	2-3	2-9	2-11	2-13	2-14	2-15	2-15
IX	176	M	2-6	2-3	2-8	2-12	2-12	2-13	2-14	2-13	2-15
X	177	F	1-7	1-5	1-6	1-7	1-6	1-8	1-9	1-8	1-9
X	178	F	1-13	1-10	1-10	1-11	1-13	1-14	2-0	1-14	2-0
X	179	F	1-7	1-4	1-6	1-9	1-9	1-9	1-11	1-10	*
X	180	F	1-5	1-6	1-8	1-9	1-9	1-11	1-12	1-12	1-12
X	181	F	1-15	1-15	2-4	2-7	2-7	2-6	2-10	2-10	*
X	182	F	1-5	1-6	1-8	1-11	1-12	1-14	2-2	2-4	2-1
X	183	F	1-11	1-10	1-12	1-12	1-10	1-12	1-13	1-12	1-12
X	184	M	2-9	2-7	2-13	3-0	3-5	3-5	3-7	3-8	3-13
X	185	M	1-14	2-0	2-0	2-3	2-4	2-5	2-8	2-12	2-7
X	186	M	1-13	1-11	2-0	1-15	1-13**	2-1	2-2	2-5	2-7
X	187	M	2-3	2-1	2-10	2-14	3-1	3-4	3-6	3-10	3-7
X	188	M	2-0	2-1	2-4	2-5	2-8	2-11	2-12	2-15	2-14
X	189	M	2-10	2-8	2-10	2-12	2-12	2-14	3-3	3-11	3-9
X	190	M	2-0	1-12	2-0	2-0	2-2	2-8	2-9	2-7	2-6

* Pelted before indicated date.
** Sick from unknown cause.

APPENDIX III--continued

Group No.	Serial Number	Sex	Biweekly Weights in Pounds and Ounces							
			Aug. 15	Aug. 26	Sept. 4	Sept. 23	Oct. 7	Oct. 21	Nov. 4	Nov. 18
XI	191	F	1-9	1-8	1-10	1-7	1-7	1-10	1-9	1-4
XI	192	F	1-7	1-8	1-12	1-12	1-14	2-0	2-0	1-15
XI	193	F	1-11	1-12	1-13	1-12	1-14	2-0	2-0	1-14
XI	194	F	1-10	1-9	1-10	1-10	1-14	1-13	2-0	1-15
XI	195	F	1-9	1-7	1-7	1-8	1-10	1-11	1-12	1-10
XI	196	F	1-7	1-7	1-8	1-9	1-11	1-11	1-12	1-11
XI	197	M	1-12	1-11	1-12	1-12	1-12	2-1	2-2	
XI	198	M	2-5	2-7	2-8	2-3	2-4	2-4	2-12	
XI	199	M	2-4	2-7	2-8	2-6	2-8	2-9	2-8	2-0
XII	200	F	1-10	1-9	1-11	1-12	1-15	1-13	2-1	2-1
XII	201	F	1-11	1-13	1-10	1-8	1-10	1-12	1-13	1-13
XII	202	F	1-14	1-14	2-0	2-1	2-5	2-5	2-5	2-2
XII	203	F	1-10	1-10	1-11	1-11	1-13	2-0	2-0	2-0
XII	204	F	1-13	1-10	1-12	1-13	1-14	2-0	1-15	
XII	205	F	1-9	1-8	1-8	1-8	1-9	1-9	1-12	1-11
XII	206	M	2-3	2-4	2-7	2-7	2-9	2-11	2-11	
XII	207	M	2-4	2-6	2-9	2-9	2-11	3-3	2-15	3-2
XII	208	M	2-15	3-4	3-5	3-8	3-13	4-0	3-15	4-1
XIII	209	F	1-10	1-9	1-10	1-10	1-11	1-14	1-8	
XIII	210	F	1-8	1-10	1-12	1-13	1-14	1-14	1-11	
XIII	211	F	1-11	1-12	2-0	2-1	2-4	2-3	2-3	2-4
XIII	212	F	2-2	2-2	2-4	2-5	2-7	2-7	2-5	
XIII	213	F	1-8	1-10	1-10	1-11	1-13	1-14	1-13	1-15
XIII	214	F	1-7	1-7	1-9	1-9	1-10	1-10	1-7	1-12
XIII	215	M	1-14	2-2	2-4	2-5	2-8	2-9	2-5	
XIII	216	M	1-9	2-0	2-9	2-13	3-0	3-4	3-2	3-6
XIII	217	M	3-6	3-10	3-12	4-0	4-4	4-12	4-8	4-12

APPENDIX IV

BIOCHEMICAL ANALYSES OF CERTAIN OREGON MARINE FISH

Description	Fresh Basis					Dry Basis		
	Water	Dry Matter	Crude Protein	Fat	Ash	Crude Protein	Fat	Ash
	%	%	%	%	%	%	%	%
Longfinned flounder, whole	80.8	19.2	14.7	1.26	3.2	76.5	6.6	16.4
Roundnose flounder, whole	77.1	22.9	16.5	2.61	3.6	71.8	11.4	15.5
Roundnose flounder, intestines out	76.7	23.3	16.5	2.49	3.9	70.8	10.7	16.8
Roundnose flounder, cleaned carcass	75.7	24.3	15.11	5.43	3.5	62.3	22.4	14.4
Roundnose flounder, fillet	78.9	21.1	18.0	1.06	1.4	85.4	5.0	6.4
Lemon flounder, whole	76.7	23.3	15.2	3.41	3.9	65.1	14.6	16.8
Lemon flounder, carcass	75.5		13.76					
Lemon flounder, intestines out	76.8	23.2	15.4	3.72	3.2	66.3	16.0	13.8
Sand flounder, whole	78.9	21.1	15.1	1.95	3.6	71.7	9.2	17.0
Sand flounder, intestines out	79.3	20.7	16.0	1.37	3.1	77.0	6.6	15.2
Arrowtoothed halibut, whole	77.2	22.8	15.4	4.08	2.7	67.7	17.9	11.9
Arrowtoothed halibut, intestines out	75.4	24.6	15.5	5.37	2.9	63.2	21.8	11.9
Chimera, whole	70.8	29.2	16.2	12.53	2.1	55.6	42.3	7.1
Chimera, intestines out	81.6	18.4	17.4	1.36	1.7	94.7	7.4	9.3
Pacific hake, cleaned whole	81.0	19.0	15.9	0.80	2.65	83.6	4.2	13.9
Slippery flounder, cleaned carcass	81.9	18.1	10.94	2.65	3.75	60.4	14.7	20.7
Red rockfish (1, p.1)	70.9		15.67					
Black rockfish, whole (1, p.1)	73.6		16.89					
Black rockfish, carcass (1, p.1)	73.7		15.63					
Whole mixed flatfish (4, p.2)	78.4		15.69					