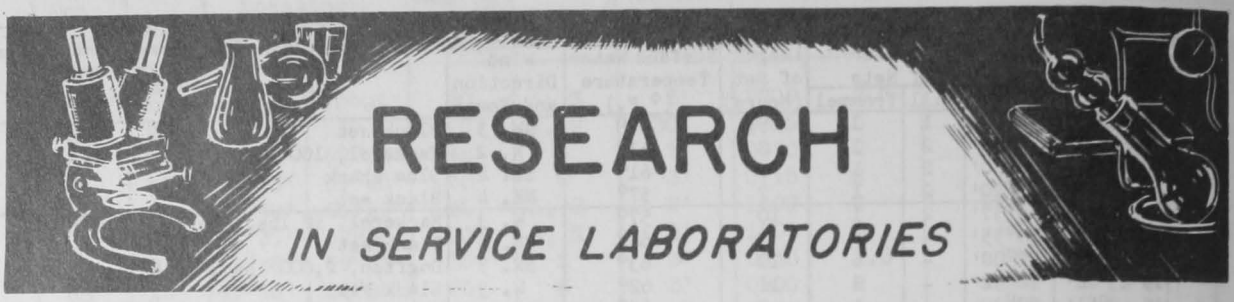


Progress on Projects, June 1953

REFRIGERATION: Freezing Fish at Sea, Defrosting, Filleting, and Refreezing the Fillets: LABORATORY STUDIES: Tables 1 and 2 contain data on the effect of extended brine immersion periods on scrod haddock fillets.

Table 1 - Effect of Variation in Immersion Time on Scrod Haddock Fillets Dipped in Brine (10 percent salt, by weight)

Time Fillets Immersed in Brine	Characteristics of the Dipped Fillets				
	Weight Increase	Salt (NaCl) Content	Free Drip	Press Drip	Tenderometer Reading
Seconds	Percent	Percent	Percent	Percent	Pounds
5	2.8	0.73	4.6	24.1	15
10	3.0	0.85	3.0	28.9	22
20a/	3.8	0.91	1.7	24.2	25
30	4.2	1.21	2.2	31.8	26
60	6.1	1.44	2.8	31.0	19
120	7.3	1.62	2.1	36.0	21

a/ DATA FROM A PREVIOUS TEST.

Table 2 - Effect of Variation in Immersion Time and Brine Concentration on Salt Content of Scrod Haddock Fillets

Salt (NaCl) in Brine, by weight	Time Fillets Immersed in Brine	Salt Content of Fillets
Percent	Seconds	Percent
5	5	0.42
	10	0.49
	30	0.59
	60	0.67
	120	0.98
10	5	0.73
	10	0.85
	30	1.21
	60	1.44
	120	1.62
15	5	0.99
	110	1.11
	30	1.56
	60	2.25
	120	2.41

Further data were obtained on the changes occurring in round scrod haddock immersed in refrigerated brine for extended periods. The effect on salt and moisture content of the surface layers of the fish are shown in table 3.

Table 3 - Moisture and Salt Content of the Surface Layers of Round Scrod Haddock Immersed in Cold Brine. (Brine temperature: 5° F.; salt content of brine: 23 percent sodium chloride, by weight.)

Time Whole Scrod Haddock Immersed in Brine	Characteristics of the Surface Layers of the Haddock Flesh			
	First 1/4 inch		Second 1/4 inch	
	Moisture	Salt (NaCl)	Moisture	Salt (NaCl)
Hours	Percent	Percent	Percent	Percent
48	76.8	4.48	80.6	1.39
96	74.5	5.81	77.7	3.57
144	73.6	7.51	75.5	5.64
240	71.8	10.3	70.8	8.98
288	69.4	12.3	69.7	10.7

VESSEL OPERATION: The research trawler Delaware was readied for fishing operations. The first cruise is under way, at which time the new brine-freezer mechanism will be tested.

(Boston)

* * * * *

Freezing, Glazing, and Thawing Salmon to be Canned: Analysis for salt content of the various experimental and commercial samples was completed. The data follow:

Salt Content of Canned Alaska Red Salmon Prepared from Brine-Frozen Fish

Species of Canned Salmon	Treatment of Raw Material	Can Size	Amount of Salt Added to Each Can	Number of Cans Sampled	Salt (NaCl) Content of the Canned Salmon (Average)
			Grams		Percent
Alaska Red (sockeye)	Brine-frozen; thawed in running tap water	½-lb. Flat	2.59	9	1.66
	Brine-frozen; thawed in still water	½-lb. Flat	1.94	9	1.64
	Brine-frozen; thawed in air	½-lb. Flat	1.94	9	1.71
	Brine-frozen; thawed in saturated brine (NaCl)	½-lb. Flat	0.65	9	1.40
	Brine-frozen; thawed in running tap water	½-lb. Flat	2.83 (dissolved in 18 ml. of water)	9	1.75
	Packed commercially from fresh (not frozen) fish	½-lb. Flat	a/	6	1.54
Chum	Brine-frozen; held in dry storage until packed commercially	4-lb.	b/	6	1.32
	Brine-frozen; held in the refrigerated brine for 2 weeks before packed commercially	1-lb. Tall	b/	9	1.06
	Brine-frozen; held in the refrigerated brine for 2 weeks before packed	½-lb. Flat	1.94	9	1.10
	Brine-frozen, held in the refrigerated brine for 2 weeks before packed	½-lb. Flat	None	6	0.47

A/COMMERCIAL PACKING INCLUDES ABOUT 1/8 OUNCE (3.54 GRAMS) OF SALT PER 1/2-LB. FLAT CAN.
B/AMOUNT OF SALT ADDED WAS NOT KNOWN.

PRESERVED WHALE WILL NOT BE EXHIBITED IN UNITED STATES

The famous "Mrs. Haroy," an embalmed 70-ton fin whale, which arrived in the United States in April for an extended tour, will not be exhibited as planned. The Danish owner has announced that since he was not successful in making arrangements to exhibit the whale in the United States, he has decided to return to Denmark with the whale.

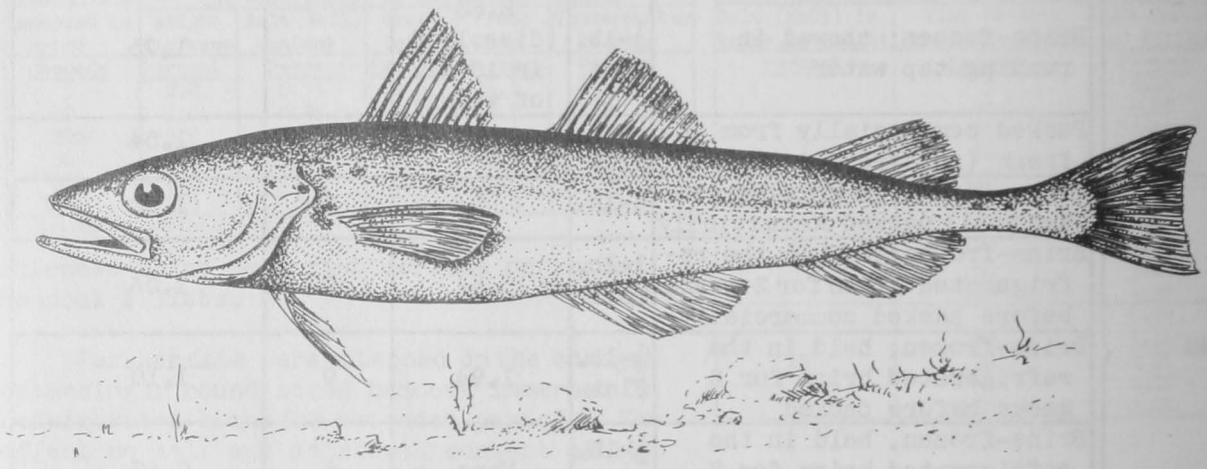
Loaded on a specially built railroad flatcar, the whale was waiting at Weehawkin, N. J., to start her tour. The owner states that the specially-preserved whale prior to its shipment to the United States had been shown to 3,500,000 Europeans.

NOTE: SEE COMMERCIAL FISHERIES REVIEW, JUNE 1953, P. 40.

TECHNICAL NOTE NO. 27--ALASKA POLLOCK: PROXIMATE COMPOSITION; AMINO ACID, THIAMINE, AND RIBOFLAVIN CONTENT; USE AS MINK FEED

With the scarcity of flounder (Pleuronectidae) in the vicinity of Petersburg, Alaska, during the fall and spring of 1952, the commercial fur farmers of that area resorted to the use of Alaska pollock[1/] (Theragra chalcogramma) for mink feed. Since pollock had never been fed in large quantities previously in the Petersburg area, the Fishery Products Laboratory was requested to determine the composition of representative samples of this species of fish and of typical mink feeding rations prepared from this fish.

The proximate composition and "essential" amino acid, thiamine, and riboflavin content of Alaska pollock were determined. Data for flounder are given for com-



ALASKA POLLOCK (THERAGRA CHALCOGRAMMA)

parison since this species of fish is considered to be suitable for mink feed by most Alaska fur farmers. The proximate composition of various pollock mink rations and a typical flounder ration is also reported. Data on the "essential" amino acid content of beef liver, an accepted animal feed, and of salmon eggs are given as a comparative index to the quality of the fish protein.

EXPERIMENTAL PROCEDURES: Two 50-pound blocks of frozen whole (round) pollock, representative of that being fed at Petersburg during the spring and fall of 1952, were sent to the Laboratory for analysis. The fish were from 15 to 23 inches in over-all length and averaged 1-3/4 pounds in weight.

Samples of the frozen whole pollock were prepared as follows: Each whole fish was cut into 8 or 10 pieces. The pieces were passed twice through an electric grinder having a 3/16-inch plate. Representative samples of the ground material were sealed in 1/2-pound cans, frozen, and stored at 0° F. until needed for analysis. Samples of eviscerated pollock, pollock fillets, and pollock fillet-waste were prepared in a similar manner.

Analyses for ash, moisture, and protein were made according to modified Method of Analysis of the Association of Official Agricultural Chemists.(1950). Oil content was determined by the acetone extraction method of Stansby and Lemon (1937) a

1/ALSO CALLED WALLEYE POLLOCK OR WHITING. LOCAL FISHERMEN OFTEN CALL THIS SPECIES HAKE.

modified by Voth (1946). Assays for the "essential" amino acids were made according to the microbiological procedure of Henderson and Snell (1948). Thiamine (vitamin B_1) and riboflavin (vitamin B_2) were determined by fluorometric methods given in Methods of Vitamin Assay (1947).

DISCUSSION OF RESULTS: The results are given in the following tables:

Table 1 - Proximate Composition of Alaska Pollock[1]

Sample Description	Moisture	Protein	Oil	Ash
	(Percent)			
Pollock, whole	79.1	15.3	2.9	3.3
Pollock, eviscerated	79.2	17.2	1.2	3.5
Pollock, fillets	82.5	16.8	0.7	1.1
Pollock, fillet waste	79.7	14.1	2.6	4.3
Flounder, eviscerated[2]	77.5	16.0	3.7	3.2

1/ THE PROXIMATE COMPOSITION DATA ARE TYPICAL FOR THE SIZES OF FISH CAUGHT DURING THE SPRING AND FALL OF 1952 AT PETERSBURG, ALASKA, AND MAY NOT BE APPLICABLE TO LARGER FISH OR FISH FROM OTHER AREAS.

2/THE PROXIMATE COMPOSITION OF FLOUNDER IS GIVEN FOR COMPARISON. THE DATA ARE FROM THE ANALYSIS OF A REPRESENTATIVE SAMPLE OF FLOUNDER FED AT THE U. S. D. A. EXPERIMENTAL FUR STATION, PETERSBURG, ALASKA, DURING MAY 1951.

Table 2 - Proximate Composition of Pollock Mink Rations

Sample Description[1]	Moisture	Protein	Oil	Ash	Carbohydrate[2]
	(Percent)				
Pollock Mink Ration, A[3]	73.7	14.6	4.3	2.1	5.3
Pollock Mink Ration, B[3]	76.8	15.0	1.6	4.1	2.5
Pollock Mink Ration, C[3]	78.3	15.5	1.3	3.4	1.5
Pollock Mink Ration, D[3]	72.1	14.1	4.6	2.4	6.8
Flounder Mink Ration[4]	70.3	13.9	3.5	3.4	9.0

1/ALL FISH WERE EVISCERATED FOR PREPARATION OF POLLOCK AND FLOUNDER RATIONS. THE SAMPLES WERE TAKEN BY THE FUR FARMER. A ONE-POUND SAMPLE WAS TAKEN EACH DAY FOR ONE WEEK AS THE FEED WAS MIXED. THE SEVEN SAMPLES OF EACH RATION RECEIVED BY THE LABORATORY WERE GROUND TOGETHER, REPRESENTATIVE SAMPLES WERE THEN TAKEN, SEALED IN 1/2-POUND CANS, FROZEN, STORED AT 0^0 F. UNTIL NEEDED FOR ANALYSIS.

2/CARBOHYDRATE BY DIFFERENCE.

3/POLLOCK RATIONS A, B, C, AND D ARE THE WHOLE RATIONS AS FED BY DIFFERENT FUR FARMERS IN THE PETERSBURG AREA AND SHOW THE VARIATION IN RATIONS FROM FARM TO FARM. THE DATA ARE TYPICAL FOR RATIONS IN WHICH POLLOCK OF THE SIZE CAUGHT DURING THE SPRING AND FALL OF 1952 AT PETERSBURG ARE FED.

4/THE FLOUNDER RATION IS GIVEN FOR COMPARISON. IT WAS USED AT THE U. S. D. A. EXPERIMENTAL FUR STATION, PETERSBURG, ALASKA, DURING THE 1951 SPRING WHELPING EXPERIMENTS.

Table 3 - Amino Acid Content of Alaska Pollock, Flounder, Salmon Eggs, and Animal Liver

Material	Amino Acid Content of the Protein (N x 6.25)									
	Argi-nine	Histi-dine	Isoleu-cine	Leu-cine	Ly-sine	Methio-nine	Phenyl-alanine	Threo-nine	Trypto-phane	Va-line
	(Percent)									
Pollock[1] (eviscerated)	7.4	2.2	5.2	7.4	8.7	3.0	3.1	5.6	0.9	4.8
Flounder[1] (eviscerated)	7.6	2.0	4.8	7.0	8.1	2.9	3.0	5.4	0.8	4.6
Salmon eggs[2]	7.3	2.6	7.4	9.9	8.8	3.0	4.8	5.7	0.9	7.2
Animal liver[3]	6.6	2.5	4.8	8.4	7.0	3.2	6.1	5.3	1.5	6.0

1/ANALYSES RUN ON SAMPLES OF ALASKA POLLOCK AND FLOUNDER CAUGHT NEAR PETERSBURG, ALASKA, DURING THE FALL OF 1952. DETERMINATIONS MADE BY H. L. SEAGRAN AND D. E. MOREY, FISHERY PRODUCTS LABORATORY, KETCHIKAN, ALASKA.

2/AVERAGE VALUES OF THE AMINO ACID CONTENT OF MATURE ROES FROM THE FIVE SPECIES OF SALMON. (SEAGRAN, H. L., AMINO ACID CONTENT OF SALMON ROE, COMMERCIAL FISHERIES REVIEW, VOL. 15, NO. 3, MARCH 1953, PP. 31-34.)

3/BLOCK, R. J. AND BOLLING, D.: THE AMINO ACID COMPOSITION OF PROTEINS AND FOODS, CHARLES C. THOMAS, SPRINGFIELD, ILLINOIS, 2ND ED. (1951).

Alaska pollock compares favorably with flounder in proximate composition and amino acid content (tables 1 and 3). The "essential" amino acid content of Alaska pollock (table 3) is quite similar to that of beef liver and salmon eggs, both of which are considered to contain good quality protein for animal-feeding purposes.

Comparison of the thiamine and riboflavin content of Alaska pollock (table 4) with data of Sautier (1946) for the edible portion of flounder (Pleuronectidae) and gray cod (Gadus macrocephalus) indicate that the pollock have a similar or slightly higher thiamine and riboflavin content than other bottom fish.

Table 4 - Thiamine and Riboflavin Content of Pollock, Flounder, and Gray Cod

Material	Thiamine	Riboflavin
	(Micrograms Per Gram)	
Whole pollock	1.8	2.4
Eviscerated pollock	1.7	1.7
Flounder, edible portion[1]/.	0.4 to 0.7	0.4 to 0.6
Gray cod, edible portion[1]/.	0.9	1.6

1/SAUTIER, PHILIP M.,"THIAMINE ASSAYS OF FISHERY PRODUCTS," COMMERCIAL FISHERIES REVIEW, VOL. 8, NO. 2 (FEBRUARY 1946), PP. 17-19. RIBOFLAVIN ASSAYS OF FISHERY PRODUCTS," COMMERCIAL FISHERIES REVIEW, VOL. 8, NO. 3 (MARCH 1946), PP. 19-21.

The proximate composition of various pollock mink rations is given in table 2. In two of these rations the carbohydrate content was extremely low, which indicated that the pollock was fed at a very high level in the diet (in other words, very low percentages of cereal mixtures were used as a supplement).

On the basis of these data on composition alone, it appears that Alaska pollock can be successfully used as feed for mink. However, in determining the suitability of any animal feed, there are other factors involved that were not considered here. To determine the true suitability of Alaska pollock as a food source for mink, feeding tests should be made using high percentages of pollock in properly supplemented rations.

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--R. G. Landgraf, Jr., Chemist
Fishery Products Laboratory[1]/,
Branch of Commercial Fisheries,
U. S. Fish and Wildlife Service,
Ketchikan, Alaska.

1/THE FISHERY PRODUCTS LABORATORY IS OPERATED JOINTLY BY THE ALASKA FISHERIES EXPERIMENTAL COMMISSION AND THE U. S. FISH AND WILDLIFE SERVICE.