

POTENTIAL MARKETS FOR ALASKA SALMON CANNERY WASTE

By Norman B. Wigutoff*

INTRODUCTION

Since the beginning of salmon canning in Alaska late in the nineteenth century, waste disposal or utilization has been a problem. The canning process results in the use of only two-thirds of the whole fish. The other one-third--head, tail, fins, and viscera or entrails--is discarded.

Although reduction plants are successfully operated in areas of Alaska where large volumes of waste are available from several canneries, it has proved impractical with present costs to operate the usual type of reduction plant in areas where only one or two canneries are located. Inasmuch as many canneries are located in isolated places, the problem of waste utilization in these areas remains.

Between 100,000,000 and 125,000,000 pounds of salmon waste are discarded annually in Alaska.

The simplest way to dispose of this waste is to discharge it into deep water for the tides to carry it away. This is one reason why salmon canneries in Alaska are located on docks over deepwater whenever this is at all possible. Canneries located near shoal water must devise other means of disposal. This results in an expense, sometimes rather large, for chutes, bins, and scows, with which to collect and carry the waste to deep water and away from currents which might return the waste to the beach near the cannery.



FIG. 1 - HORSE SLAUGHTERING AND FOOD-MIXING PLANT OF A MINK FARMERS' COOPERATIVE NEAR SALT LAKE CITY, UTAH.

With the increase in population and commerce in Alaska, the disposal of the waste into tidal water also becomes a health hazard. Recently the Territorial legislature created a Water Pollution Control Board which has already issued orders prohibiting this type of fish-waste disposal in several specific places. But, more important, it is economic waste to throw away one-third of the salmon which does not go into the can. Therefore, the U. S. Fish and Wildlife Service and the Alaska Fisheries Experimental Commission have devoted considerable research into the economic possibilities for the use of this salmon waste.

Research on the utilization of Alaska salmon-cannery waste was conducted in 1947 by the Fishery Products Laboratory at Ketchikan, Alaska, and the Service's Fishery Technological Laboratory at Seattle, Washington. That research was made possible by a grant of funds to the Alaska Fisheries Experimental Commission from the Industrial Research and Development Division, Office of Technical Services, U. S. Department of Commerce. As a result of that work a series of articles was published in two reports issued by the Department of Commerce in 1947 and 1948.

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These reports discussed the production of biologicals, vitamin oils, industrial oils, salmon head oil for addition to canned salmon, and hatchery fish feeding from salmon waste. Research on the utilization of salmon cannery waste for hatchery fish feeding has been continued by the Fishery Technological Laboratory at Seattle. Several reports on various phases of this subject are now being prepared for publication. The most recent work (Landgraf, et al 1951, and Leekley, et al, unpublished data, 1952) was directed toward determining the suitability of salmon cannery waste as an ingredient in feeds for fur animals and hatchery fish. All of these researches have shown that salmon waste, particularly the soft visceral portions, is an excellent source of protein and vitamins. Much of the vitamins and the best protein are reported to be concentrated in the salmon eggs.

This part of the investigation was on the technical or manufacturing phase. Nothing was done on the marketing or distribution of fish food from salmon waste. Therefore, a study of potential markets for salmon was made in 1951.

POTENTIAL MARKETS

The potential market for salmon waste in the fur-farm and fish-hatchery industries in the western and midwestern United States is discussed in this report. To determine whether such a potential market exists, a field survey was made in the summer of 1951 in Washington, Oregon, Idaho, Utah, Colorado, Illinois, and Wisconsin. Fur farms, fish hatcheries (private, state, and federal), feed dealers, and feed cooperatives were visited. Feeding practices, costs, and individual preferences were observed and discussed.

Table 1 - Mink-Farm Populations in 17 States, 1948-50 Average^{1/}

State	Number of Mink Kits Raised	Number of Females on Farms
Wisconsin	712,000	203,144
Minnesota	224,467	70,304
Illinois	133,307	36,287
Michigan	125,000	40,802
Washington	87,442	29,360
Utah	72,414	25,886
Oregon	64,368	21,027
Iowa	58,352	18,319
Colorado	22,050	7,787
Idaho	19,266	6,359
California	14,384	5,467
South Dakota ...	13,716	4,107
Nebraska	9,176	3,079
Wyoming	7,424	2,912
Montana	7,251	2,282
Missouri	5,421	2,136
Kansas	4,333	1,767
Total	1,580,371	481,025
Subtotal (Kits and Females) ..		2,061,396
Males ^{2/}		137,500
Total, all mink		2,198,896

^{1/}CALCULATED FROM DATA OF THE NATIONAL BOARD OF FUR FARM ORGANIZATIONS.
^{2/}CALCULATED ON AVERAGE OF ONE BREEDING MALE PER 3.5 BREEDING FEMALES.

FUR FARMS: The number of mink and fur farms in 17 Western and Midwestern states is presented in table 1. In the Pacific Northwest it is common practice to supply an annual over-all average of about 60 percent fish in mink diets, while in the Midwestern states 15 to 20 percent fish in mink diets is considered high. If mink can be raised successfully in the Northwest on a large proportion of fish in the diet, there is reason to believe that the same average proportion of fish might be used for mink elsewhere. Mink ranchers are encountering greater difficulty in obtaining satisfactory and sufficient supplies of feeding materials at a price they can afford to pay. For the last several years, horse meat, the main feed ingredient, has become more expensive and less available. It is generally accepted in the fur-farming industry that some other material, cheaper and more abundant is needed. The greatest potential source of fur-animal feed is the fishing industries.

Mink ranchers report an annual average feed requirement of 100 to 125 pounds per animal. On the basis of the number of animals on mink farms as shown in table 1 and using the lower average of 100 pounds

of food per animal, the annual potential market was calculated and is shown in table 2.

Table 2 - Mink Feed Requirements in 17 States

	lbs.
Annual average number of mink on farms in 17 States	2,198,000
Total annual mink-feed requirements at 100 lbs. per animal	219,896,000
Potential fish requirements based on 60 percent fish in diets	131,934,000
Potential fish requirements based on 15 percent fish in diets	32,984,000

The total salmon-cannery waste per year in Alaska is estimated at from 100,000,000 to 125,000,000 pounds. In southeastern Alaska, the annual volume of salmon cannery waste is estimated to be between 25,000,000 and 30,000,000 pounds. On the basis of the requirements in table 2 it appears that the potential market for salmon-cannery waste in the 17 listed states would vary from 33,000,000 pounds to a maximum of over 131,000,000 pounds per year. The maximum potential exceeds the total waste available from all salmon canneries in Alaska. The lower figure (32,984,000 pounds) approximates or exceeds the amount of salmon waste which is produced annually in southeastern Alaska.

HATCHERIES: Fish food is reported to be one of the major items of expenditure in trout and salmon hatcheries. Fiedler and Samson (1935) reported a total of over 11,000,000 pounds of food used in 1934 in the fish hatcheries operated by 42 states, about two-thirds of the privately-owned hatcheries, and all the federal hatcheries.

In a later survey made by Tunison, et al (1949), a total of over 29,000,000 pounds of food was reported used by hatcheries of 38 states and the Federal Government. Privately-operated hatcheries were not included in that study. The increase is due to the tremendous growth of the industry. This growth is continuing at a steady pace.

The food used in fish hatcheries operated by 12 of the 17 states is shown in table 3. The total, over 16,000,000 pounds, does not include private or commercial hatcheries or those of the federal government in these states. Fiedler and Samson (1935) reported private hatcheries represented 29 percent of the industry. On the basis of this figure and adding a conservative estimate of 1,000,000 pounds for the federal hatcheries, the total food used in all hatcheries in the 17 states amounts to about 24,000,000 pounds per year. This total is actually low, for several reasons. No data are available for the states of Wisconsin, Illinois, Iowa, South Dakota, and Idaho. Idaho and Wisconsin have extensive fish-hatchery operations. Illinois and Iowa have less extensive but substantial hatchery operations. Supervisors of the U. S. Fish and Wildlife Service hatchery operations in Region 1, comprising the states of Washington, Oregon, California, Idaho, Montana, and Nevada, report annual requirements of salmon viscera alone at 1,000,000 to 1,500,000 pounds.

Table 3 - Food Used in State Fish Hatcheries of certain States^{1/}

State	Food Used lbs.
Wisconsin	2/
Minnesota	297,683
Illinois	2/
Michigan	2,191,778
Washington	2,929,300
Utah	4,140,500
Oregon	2,225,766
Iowa	2/
Colorado	1,000,000
Idaho	2/
California	2,353,342
South Dakota	2/
Nebraska	95,192
Wyoming	44,942
Montana	415,470
Missouri	338,000
Kansas	16,000
Total	16,047,973

^{1/} FROM TUNISON, ET AL (JANUARY AND OCTOBER, 1949). DATA ARE FOR CALENDER YEAR 1947 OR CLOSEST FISCAL YEAR.

^{2/} NOT REPORTED.

The Federal hatcheries are in the market for salmon viscera or soft portions only; heads, tails, fins and trimmings are not desired. Viscera are fed up to a ratio of 30 percent of the food used in these Federal hatcheries.



FIG. 2 - PORTION OF A TYPICAL WISCONSIN MINK RANCH.

The states of Oregon and Washington, on the other hand, use the entire waste and even include chopped whole salmon carcasses (spawned-out fish) in fish food fed in state-operated hatcheries. Fish comprise 75 to 90 percent of the foods used in the state-operated hatcheries of Oregon and

Washington. In one salmon hatchery in Washington where feeding experiments are conducted, successful results have been obtained on a diet of almost 100-percent salmon-cannery waste plus some small amounts of supplements.

As power, flood control, and irrigation dams are built on the river systems of the Northwest, the need for fish hatcheries increases. In addition, the present hatchery practice is to keep the fish in the hatcheries until they are of larger size to increase their ability to survive. It is estimated by research workers in this field that the projected fish hatcheries for the lower Columbia River will create a total annual demand of 25,000,000 pounds of fish food for that area alone.

COMPARATIVE COSTS AND FACILITIES

Methods used and the costs involved in the collection of salmon cannery waste were described by Landgraf, et al (1952). During the summer of 1951 over 100,000 pounds of frozen salmon viscera--soft portions of whole waste only--were collected at Petersburg, Alaska, for use in a Federal hatchery in the state of Washington. The costs of the collection and shipment to Seattle, Washington, are given in table 4. The total cost of the salmon viscera delivered at dockside in Seattle was 5.21¢

Table 4 - Cost for Collecting and Shipping 100,750 Pounds of Salmon Viscera from Petersburg, Alaska, to Seattle, Washington

Cost f.o.b. dock at Petersburg, Alaska ^{1/}	\$3,084.00
Freight, wharfage, and handling charges Petersburg, Alaska, to Seattle, Washington	\$2,167.39
Price per pound f.o.b. dock, Petersburg, Alaska ^{1/}	3.06¢
Shipping cost per pound--Petersburg, Alaska, to Seattle, Washington (includes wharfage and handling both places)	2.15¢
Price per pound f.o.b. dock, Seattle, Washington	5.21¢

^{1/}INCLUDES LABOR AND MATERIALS FOR COLLECTION OF WASTE, INSTALLATION OF COLLECTION FACILITIES, HAULING TO COLD STORAGE, FREEZING CHARGES, AND COST OF VISCERA AT 2¢ PER POUND, BUT DOES NOT INCLUDE THE PACKER'S PROFIT ON THIS OVER-ALL COLLECTION.

cents per pound. From the dock in Seattle, additional costs are involved in transporting the product to the fish hatcheries and mink ranches either by rail or by truck. The railroad freight rate for the commodity "Fish scraps, ground, frozen, having value only for animal feeding purposes, not prepared for human consumption, wrapped in waxed or Kraft paper" shipped in refrigerated cars is \$1.33 per 100 pounds from Seattle to Salt Lake City, points in Colorado, North Dakota, South

Dakota, Minnesota, Wisconsin, northern peninsula of Michigan, Illinois, Iowa, Nebraska, Kansas, Missouri, Oklahoma, Arkansas, Texas, and Louisiana. Carload minimums are 60,000 pounds in refrigerator cars of less than 2,200-cubic-foot loading capacity and 72,000 pounds in refrigerator cars of 2,200-cubic-foot or greater capacity. In addition, there are charges for ice and salt for cooling the refrigerator cars en route. The refrigerated truck rate for the commodity: "Scrapfish frozen in blocks, loose" is \$1.00 per 100 pounds, minimum 30,000 pounds, from Seattle to Salt Lake City and way points on the direct route. Delivered costs to Wisconsin points, for instance, would be between 6.54 and 7.00 cents per pound for frozen salmon viscera as collected in 1951 in Petersburg, Alaska.

These costs are considerably higher than the prices now being paid for fishery feed materials by the mink ranches in the Midwest. The costs of various fishery items now used range from a low of 3.60 to 5.05 cents per pound delivered to the users (table 5). Even considering the high nutritive quality of salmon-cannery waste, it is doubtful whether the difference in price would make it possible to develop an extensive market among the mink ranchers of the Midwestern States under the conditions prevailing in 1951 and 1952.

Table 5 - Prices of Frozen Fishery Items Used on Mink Ranches in Midwest, Fall 1951

Fishery Item	Source	Prices per 100 lbs. in Indiana, Michigan, Illinois, and Southeastern Wisconsin	Price per 100 lbs. in Iowa and Minnesota
Whiting, fillet carcasses, whole, in 25-lb. tins	Atlantic Coast	\$3.60 ¹ / ₂	\$3.80 ¹ / ₂
Haddock and flounder fillet carcasses, ground, in 35-lb. blocks	Atlantic Coast	\$3.85 ¹ / ₂	\$4.05 ¹ / ₂
Ocean Perch (rosefish), fillet carcasses, ground, in 50-lb. cartons ...	Atlantic Coast	\$4.30 ¹ / ₂	\$4.50 ¹ / ₂
Whiting, whole, in 35-lb. blocks	Atlantic Coast	\$4.35-4.85 ¹ / ₂	\$4.55-5.05 ¹ / ₂
Standard mink food, ground, in 50-lb. paper bags (consists of fish-fillet carcasses--80 percent cod and sole, 10 percent salmon, plus 5 percent salmon liver)	British Columbia, Canada	\$4.75 ² / ₂	\$4.75 ² / ₂

¹/FOR MINIMUM OF 30,000 POUNDS DELIVERED TO ONE RANCH OR DIVIDED AMONG SEVERAL RANCHES IN SAME AREA.
²/IN 60,000-LB. CARLOAD LOTS DELIVERED TO NEAREST RAIL TERMINAL.

In Utah most mink ranchers are organized into a cooperative. The cooperative has a membership of over 300 mink ranchers who annually feed over 9,000,000 pounds of food. This organization maintains two plants--one in Midvale (a suburb of Salt Lake City), and the other in Logan, Utah. At these plants fleets of trucks are maintained which make daily deliveries of mixed rations to members. Each plant maintains a horse slaughterhouse. The organization has so far succeeded in supplying horse meat to its members at a fraction of less than 6 cents per pound. Fishery items, primarily ground fillet waste frozen in blocks, are obtained from the Seattle area. The price for these delivered at Midvale is 3½ cents per pound.

In Denver, Colorado, about 225 mink ranchers maintain a cooperative. The plant butchers horses and supplies horse meat to ranchers at 7¼ cents f.o.b. plant. The manager reported that horse meat prices are expected to rise. In 1951 the cooperative was paying \$1.00 more per 100 pounds for live horses than was paid in 1950. Frozen fish, mostly ground bottom-fish fillet carcasses, in 50-lb. laminated paper bags, cost \$4.85 per 100 lbs. in 60,000-lb. carload lots shipped from Oregon and delivered at Denver railroad yards.

In Astoria, Oregon, 55 mink ranchers organized a cooperative and purchased a former fish-processing and cold-storage plant in 1951. Fish waste is obtained from local canneries, filleting plants, and cold storages for which the cooperative pays ½ cent per pound and uses its own trucks to pick up the fish waste at the plants. Ranchers in the Astoria area report paying 9 cents for horse meat in 1951.

In the vicinity of Seattle, Washington, mink ranchers also own a cooperative cold-storage plant. The cooperative contracts with fishery plants on the Seattle waterfront to collect their waste products. Member ranchers pay 3 cents per pound at the plant for the fish waste frozen in block. The membership rebate at the end of the year usually amounts to $\frac{1}{2}$ cent per pound, making the actual final price $2\frac{1}{2}$ cents per pound. The cooperative plant's fish-waste sales average about 12,000,000 pounds each year. Some of this fish waste is shipped to a Utah cooperative by refrigerated truck.

Feeds used in state and Federal hatcheries are usually obtained by contract purchasing on tendered bids. The problem of obtaining fish food is steadily becoming more difficult according to Tunison (1951). Competition from other users, such as dog and cat food plants, livestock feed manufacturers, and pharmaceutical plants, creates shortages and higher prices. In comparing fish food costs in Federal hatcheries between the years 1945 and 1949, Tunison (1951) found an increase of 57 percent in unit prices, from 5.6 to 8.8 cents per pound. Some of the foods used in the Federal hatcheries are condemned beef and pork livers, horse liver, horse meat, beef and pork packinghouse waste, and various types of fishery items.

FUTURE POSSIBILITIES

It is apparent from the prices which mink ranchers and fish-hatchery operators now pay for feeds that Alaska salmon-cannery waste cannot now profitably enter the market. However, a number of expected future developments might alter the marketing situation to a large extent.

SHORTAGES OF OTHER FEEDS: In most areas the prices of horse meat are approaching the level at which it will become unprofitable to use this product and it will be necessary to use other feeds. In the Midwest, one of the large feed dealers is already informing customers that: "The last quotation on horse meat we saw was $7\frac{1}{2}$ cents a pound. And the rapidity with which the horse population of this country is diminishing indicates that horse meat soon will disappear from the market. One large Midwest rancher who has fed western ocean fish for several years... feeds it at the level of 20 percent of the diet. If horse meat is very high in price or unobtainable, this level can be increased." It has already been pointed out that the diets of mink in the Pacific Northwest run as high as 60 percent fish.

After the many new dams with accompanying hatcheries now contemplated are built on the Columbia River, a severe shortage of hatchery feed is expected to

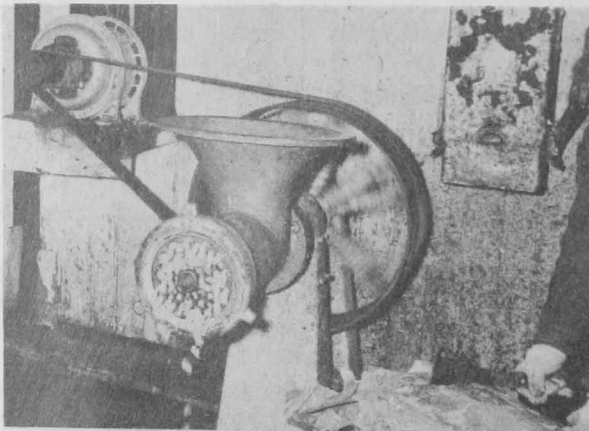


FIGURE 3

POWER GRINDER AND BATCH MIXER USED IN FOOD PREPARATION AND MIXING IN MINK RANCHES AND FISH HATCHERIES.

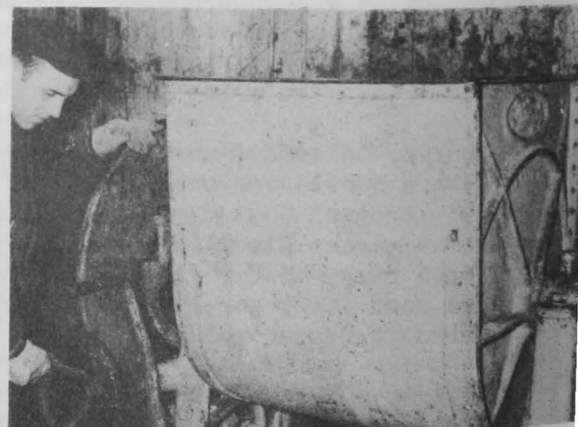


FIGURE 4

develop. At present, the fish waste from Washington and Oregon plants is being fully utilized either for fur-animal or hatchery feeding purposes or for reduction into oil and meal. As the demand for fish waste for feed continues to develop, Alaska is the largest potential source on the Pacific coast.

TO REDUCE COST OF PROCUREMENT: In the work done at Petersburg, Alaska, in 1951, only the visceral portions of the salmon waste were collected. This amounted to about 29 percent of the total waste. The other 71 percent--heads, tails, fins, and trimmings--was discarded. Additional costs were involved in setting up special equipment at their chink or butchering machine to separate these portions. It also required time to dispose of the unused parts. The volume which was collected per man hour was less than if all the waste were taken. This increased the unit cost of collection.

The collecting at Petersburg was discontinued ten days before the canning season ended. Had the collection continued over the entire season the final unit cost would have been lower, especially since the heaviest production of fish was during the last ten days of the season.



FIG. 5 - MIXED FOOD BEING FED TO MINK.

To assemble the bags used for packaging the collected material required a few hours each day, i.e., a polyethylene bag had to be inserted into a slightly smaller burlap bag. An already assembled, laminated, moistureproof paper bag would cost less to procure and would require no labor to assemble at the collection station.

TO REDUCE COST OF SHIPPING: The shipping costs of the viscera collected in Petersburg in 1951 were 2.15 cents per pound (table 4) from Petersburg to Seattle. Shipments to the midwest could be made through Prince Rupert, British Columbia, Canada, via the Canadian National Railroad whose rates are the same as those for shipments of the same commodity from Seattle. Prince Rupert is about 500 miles closer to the point of production than is Seattle. Fish dealers now charter a vessel to haul frozen fish to the railhead in Prince Rupert from southeastern Alaska points for from 85 cents to \$1.00 per 100 pounds, including unloading from the vessel and loading the freight cars in Prince Rupert. As much as 1 cent per pound saving could probably be realized by this routing of shipments.

With the announcement of the coming of a paper-pulp industry to southeastern Alaska, plans are being made for the establishment of a railroad car ferry system serving ports in southeastern Alaska, ports on the coast of British Columbia (Canada), Seattle, and Puget Sound points. It is expected that shipments from some ports in southeastern Alaska over this ferry system through Prince Rupert will enjoy terminal rates, that is the rates will be the same as those now applicable for

shipments originating at the railhead. This will result in the saving of the entire shipping cost of 2.15 cents per pound shown in table 4. This would reduce the cost per pound at the railhead to 3.06 cents, thus bringing the price range to what is now being paid by Midwestern mink farmers for other fish foods.

SUMMARY

The marketing of Alaska salmon waste to fur farms and fish hatcheries in the United States is not considered profitable at present, but it might be in the future if (1) there is a shortage of other feed materials, (2) the entire waste was used instead of only the viscera, and (3) lower freight rates from Alaska can be obtained.

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U. S. CANNED FISHERY PRODUCTS PRODUCTION

The pack of canned fishery products in the United States and Alaska in 1951 amounted to 800,514,576 pounds, valued at \$301,210,295 to the packers. This was a decrease of 17 percent in volume and 9 percent in value as compared with the 1950 production. These decreases resulted principally from smaller packs of tuna and California sardines (pilchards). Canned fishery products were packed in 473 plants in 21 States and Alaska during 1951.

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