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# NEW FOODS from SALMON CANNERY WASTE

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**PRODUCTION** of canned food from edible material now being discarded by salmon canneries has been studied by the staff of the Ketchikan fish products laboratory of the United States Fish and Wildlife Service, with results first discussed in this paper.

Although the yields vary with species, sex, season, and fishing grounds, an average of about 65-70% of the salmon received by the cannery enters the can. The remaining 30-35% is generally wasted. (The accompanying sketch shows approximate distribution by weight of the different portions of the fish.) Of the currently wasted material, the major portion, consisting of the head and collar (without the gills), the flesh of the tailpiece, the liver, and the roe or milt, is entirely edible and has valuable nutritive properties.

The salmon packers of North America are expected to produce an estimated 350,000,000 pounds of canned product during the coming season. The trimmings from the cannery operations will amount to approximately 175,000,000 pounds. A portion of this amount, consisting of fins, gills, stomachs, etc., is not considered edible. However, if the remaining edible portions were utilized to their fullest extent, at least 125,000,000 lbs. of nutritious foodstuffs would be added to the salmon pack.

Obviously, this theoretical production figure is impossible to attain in practice; however, if only a small part of the whole were utilized in 1944, progress would have been made toward more efficient use of the nation's available food resources.

Two canned products are proposed, one using essentially the entire quantity of edible trimmings and the second including approximately three-fifths of these materials. The names "Cannery Loaf" and "Cannery Tips" have been arbitrarily assigned in order to provide a concise method of reference to them.

The two trial products prepared from salmon trimmings employed the following proportions of each raw material:

	Cannery Loaf Per cent	Cannery Tips Per cent
Salmon heads .....	33	50
Collars .....	25	35
Tailpieces .....	10	15
Milt .....	8	.....
Eggs .....	16	.....
Liver .....	8	.....
Total .....	100	100

These proportions were obtained by using the trimmings as received from the cannery, except that only half of the eggs were included. Possibly the taste or texture of the final product could be improved by other proportions. However, it was considered that economy of operation would be served by keeping as possible to natural "run of the mill" material. A small amount of salt and a trace of pepper were added for seasoning.

Both products were ground to a fine paste in a hammer mill, but they still had a suggestion of graininess throughout. They were packed raw, vacuum-sealed and then retorted. The difficulty experienced in milling the eggs was eliminated by preliminary grinding of the entire mixture of raw materials in

a coarse food chopper. This operation also assisted in assuring a uniform mixing of the constituents.

It is to be noted that the gills were not included in either product. The gills contain such a large area of moist, bloody tissue, lying in a protected place, that they are subject to rapid putrefaction. Even if the fish is but a few hours old, the gills are not considered wholesome. They can be easily removed by an experienced person with a single simple tearing motion. Experimentation showed that there was no need to remove the teeth, for in the final product they are no more objectionable than the bones, being softened by heat.

The "Cannery Tips" closely resemble minced standard pack salmon. The "Cannery Loaf" has a taste peculiar to itself. The salmon liver is the principal contributor to this singular flavor, although the eggs also add somewhat. Both new products have good texture and are quite appetizing.

These products can be used with excellent results in many recipes calling for fish. Delicious oven loaves, croquettes, and fish balls are easily prepared. The canned trimmings are suitable for use in fish soup, chowders, and porridge, the latter especially as made in Puerto Rico, Hawaii and China. Both of the products, but especially the

Proximate Analysis of New Salmon Products\* and Standard Pack†

	Pink Salmon			Chum Salmon		
	Tips	Loaf	Standard Pack†	Tips	Loaf	Standard Pack†
Protein .....	16.6	17.5	20.56	18.1	20.6	21.48
Fat .....	11.9	11.5	6.20	7.4	8.5‡	5.15
Moisture .....	67.2	67.6	70.05	69.8	66.6	70.85
Ash .....	4.3	3.3	1.31	4.7	4.2	1.28
Calories .....	810	810	644	650	740	615

\* Samples prepared from a dozen or more August fish in Ketchikan.

† Summary data of Shostrom, Clough and Clark, Ind. Eng. Chem. 16 283 (1924).

‡ Different lot of fish than that from which Tips were made.

\* Studies reported upon by the authors in this paper were conducted with laboratory assistance by Kathleen Noland.

"Cannery Loaf," are excellent as sandwich fillings, hors d'oeuvre and canape ingredients, and as substitutes for fish pastes and butters. Which of the two products will be most readily accepted by the consumers will depend to a great extent upon the normal food habits of the people in the section of the world or country to which the products are shipped.

The composition of the preparation varies somewhat from standard canned salmon, as shown in the table above.

It is seen that these products have more oil and ash and slightly less water and protein than the standard pack salmon. The calorific values were calculated from the oil and protein contents according to Rubner's method. It is seen that in this respect all products made from trimmings rank above the standard pack.

There are other nourishing ingredients in the trimmings besides oil and protein, however. A thorough investigation to obtain complete data on the nutritive constituents of the "Cannery Loaf" and "Cannery Tips" is nearing completion. The results of this study will appear as a separate report at an early date.

The following table shows approximately the amounts of vitamins and minerals present. The data for vitamin B<sub>1</sub> have been calculated from that of R. L. Lane, et al., J. Nutrition 23, 613 (1942); the estimated vitamin D content was computed from data in Pacific Salmon Oils, by Harrison, Anderson, Pottinger and Lee, U. S. Bur. Fish., Investigational Report No. 40, 1939. The Heinz Nutritional Charts were used as bases for the estimated daily requirements.

Vitamin A—Fourteen times daily requirements per pound.

Vitamin B<sub>1</sub>—One-half times daily requirements per pound.

Vitamin B<sub>2</sub>—One and one-half times daily requirement per pound.

Vitamin D—Four times daily requirement per pound.

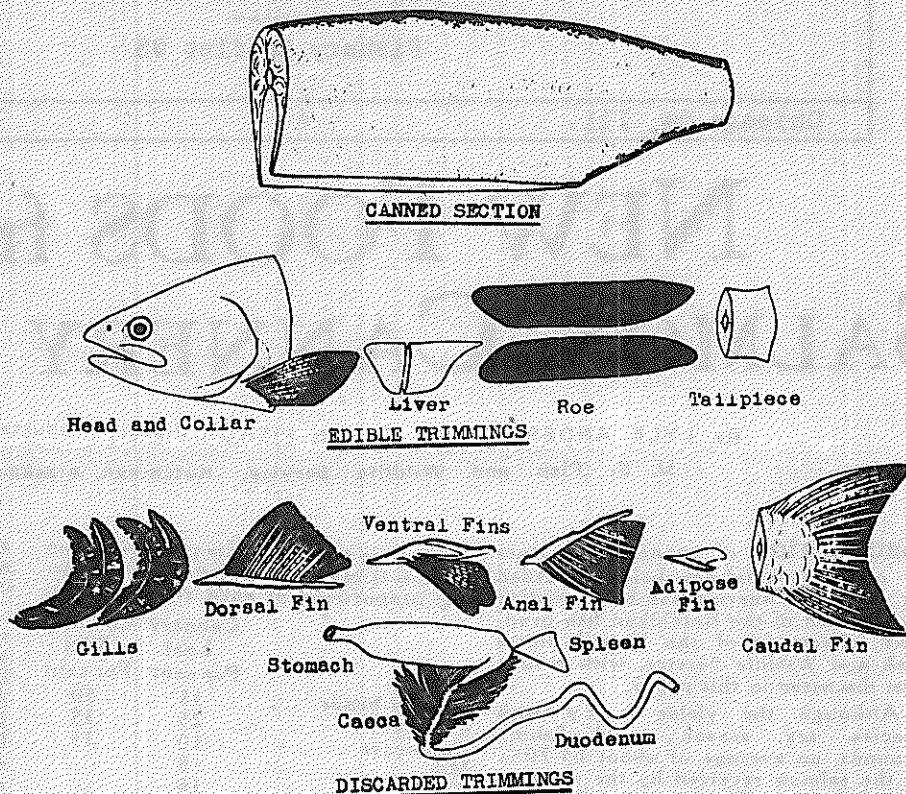
Calcium—Four times daily requirement per pound.

Iron, Magnesium & Iodine — More than trace amounts.

All of these values are higher than the corresponding value for standard pack salmon.

From information at present available it is clearly evident that the products made from cannery trimmings surpass the standard pack in every nutritional aspect, except that the protein content is slightly less. The protein content, however, is still comparable to that of fish generally, since salmon is unusually high in this factor.

SKETCH SHOWING THE CUTS OF SALMON



### Machinery and Equipment Involved

The first operation is the transport of the fish heads and other trimmings from the "iron chink" to the gilling and sorting tables. This can be accomplished by two drag chain elevators. For efficient operation the sorting table and the table on which the gills are removed should be equipped with broad conveyor belts at table-top level. From these tables the edible trimmings would go directly into the washing equipment, which could consist of a rotating perforated cylinder. Water would be sprayed from holes in a co-axial pipe, and the product conveyed by inclining the cylinder.

Probably a hammer mill could be given enough power to handle the trimmings in one operation. However, more uniform composition of material entering the hammer mill would result from pre-grinding the trimmings in a common meat chopper—with blades and perforated plate. The finely minc-

ed material from the hammer mill can be most economically packed by using a filling machine for pastes. These are capable of measuring the ground material with sufficient accuracy to make any subsequent weighing operation unnecessary.

The remainder of the equipment needed is the same as that in a standard salmon cannery line.

At some points it may be necessary to install storage bins or surge tanks, but it is preferable, if the equipment is adequate and the labor available, to handle continuously the entire volume of trimmings from the cannery.

Any of the reduction equipment manufacturers listed in Pacific Fisherman can offer quotations on the necessary grinder and hammer mill. Data on automatic paste filling machines can be obtained from several manufacturers listed in "Thomas' Register of American Manufacturers." The cost of these latter machines ranges from \$1,000 to \$2,500, depending upon the features included. With priority they are available at this time, even with stainless parts.

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