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THE CANNING OF MAINE SEA HERRING ^{1/}

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The war reduced the supply of canned fish at the same time it increased the demand. This made it necessary to develop new canned fish products and to see that the available sources of supply were utilized as fully as possible. Large sea herring have been packed commercially for some time on the Pacific coast in British Columbia, but until 1942 none were canned on the Atlantic coast, although small ones have been canned as Maine sardines.

In 1942, the Agricultural Marketing Administration urged the Maine fish-canning industry to can large sea herring and a number of firms did so. The method first adopted did not prove entirely satisfactory as there was some breakage in shipping, difficulties in fill, and complaints of insufficient vacuum. These difficulties may be ascribed to lack of preliminary experiment and acquaintance with methods used in canning other fishery products which might have a bearing on the problem.

The Agricultural Marketing Administration then called on the National Cannery Association and the can-making industry to develop a better method. It was decided that a study would be made of the problem and as the Fish and Wildlife Service had collected information on fish canning, and had conducted recent experimental work in this field, its collaboration should be requested.

SUMMARY OF FINDINGS

1. Brining both large and medium fish in a 100° brine for 90 minutes was found to give the most satisfactory results.
2. Brining from 90 minutes to 6 hours does not seem to give the fish an excessive salt flavor, but those brined for longer periods were both fibrous and salty.
3. Fish brined for periods shorter than 90 minutes, or in 70° brines, had a fresh or flat flavor and seemed slightly softer in texture.
4. Packs given some type of extensive precooking were found to have a firmer texture with less breakage than those canned with the steam-flow closing machine.
5. Fish given the standard steaming and drying treatment, used in canning sardines, had the firmest texture of the experimental packs, but the method presents difficulties in handling and filling, and would be more expensive.
6. Herring precooked and packed with tomato puree seemed to have a somewhat firmer texture than corresponding packs prepared without tomato puree. The herring with tomato puree was not satisfactory however, when the "steam-flow" method was used.

7. Fish butchered without trimming were not so well cleaned, showed more breakage in the can, and did not make so good a fill as herring trimmed with a deep belly cut.

8. Bones of herring canned in No. 300 cans processed less than 75 minutes at 240° F. were still hard after canning.

9. Shipping tests gave unsatisfactory results. Apparently, individual samples were too small and the amount of shipping insufficient.

10. If the fish are of such size that more than seven are needed to fill a No. 300 can, trimming and filling are unsatisfactory.

11. Medium-sized fish were generally firmer than large ones in the same series.

12. Precooked fish were found to require a $4\frac{1}{2}$ -inch, and steam flow fish a 4-1/8-inch, length of cut when packed in a No. 300 can.

13. Loss of weight in butchering was found to average 60 percent.

METHOD GENERALLY RECOMMENDED

Butcher the herring as soon as possible after landing, trimming away the thin under part with a deep belly cut and scraping away all intestinal material and blood. Cut the fish to a length of $4\frac{1}{2}$ inches for the No. 300 can. After washing the cleaned fish thoroughly in fresh water, hold for not less than 90 minutes in a 100° salinometer brine. Drain surplus moisture from the brined fish and pack in No. 300 cans to an average fill-in weight of 16.0 oz. Precook the cans for 30 minutes at 212° F. or 15 minutes at 230° F. Then invert the cans and drain for one minute. Place the drained cans on the closing machine conveyor, adding $\frac{1}{2}$ ounces of tomato puree, for that type of pack. Fill the cans with hot water for "brine" or "natural" packs. Seal the cans immediately and process 75 minutes at 240° F. Water-cool after processing.

This method is recommended as the most practical procedure resulting in the best product obtainable at the lowest cost. Brining has some effect in making the texture firmer and it also improves the color and makes it possible to hold the fish in good condition before canning. Fish given a precooking but no brining seem somewhat softer, are darker in color, and have a "fresh" or "flat" taste.

There is only a slight difference between the steam-flow and precook packs in percentage of shrinkage--21.4 percent for the first as against 21.1 percent for the second. But in the precook pack it is possible to use a heavier fill-in weight so there is less headspace in the can and, therefore, less likelihood of the center shaking about during shipping and handling. The precook packs also have a higher vacuum than the steam-flow packs.

The standard Maine procedure of steaming and drying the fish is not recommended for large and medium herring, since there is more breakage in filling, round cans are more difficult to fill, and it is not possible to get as heavy a fill.

Draining the cans after precooking is necessary to remove excess moisture, and where tomato sauce is used, so that the sauce will not be diluted. The cans should be sealed as rapidly as possible after precooking to maintain a high initial temperature in processing, and to prevent loss of vacuum. This processing is regarded as the minimum necessary for safety. Regulations of the California State Board of Health require much longer processing for this type of pack and size of container; namely, 90 minutes at 240° F.