



RESEARCH

IN SERVICE LABORATORIES

Progress on Projects, August 1953

REFRIGERATION: Freezing Fish at Sea, Defrosting, Filleting, and Refreezing the Fillets: **LABORATORY:** Further studies were carried out on the penetration of salt into the meat of brine-frozen haddock prepared under commercial operating conditions and on the removal of the absorbed salt during the thawing process. Haddock were frozen at sea aboard the Delaware in a 22-to 23-percent salt (sodium chloride) solution at temperatures of 6° F. to 8° F. The large haddock remained in the refrigerated brine for 3 hours; the scrod haddock for 1½ hours. The thawed samples were prepared by immersing the fish in running freshwater held at 60° F. ($\pm 5^\circ$). The large haddock were held in the thawing water for 3½ hours; the scrod haddock for 2 hours. The results are shown in the following table:

Salt Content of Unthawed and Thawed Brine-Frozen Haddock					
Sample		Salt Content ^{2/}			
		First ¼-inch of Meat		Second ¼-inch of Meat	
Fish	Condition	Range	Average	Range	Average
		Percent	Percent	Percent	Percent
Brine-Frozen Large Haddock ^{1/}	Unthawed	1.19-1.67	1.4	0.18-0.27	0.22
	Thawed ^{2/}	0.35-0.68	0.43	0.17-0.25	0.19
Brine-Frozen Scrod Haddock ^{3/}	Unthawed	1.02-1.15	1.1	0.17-0.24	0.21
	Thawed ^{4/}	0.25-0.36	0.32	0.18-0.24	0.21

^{1/} HELD IN 22-23 PERCENT SALT SOLUTION AT 6° F. TO 8° F. FOR 3 HOURS.
^{2/} IMMERSED IN RUNNING FRESH WATER AT 60° F. ($\pm 5^\circ$) FOR 3½ HOURS.
^{3/} HELD IN 22-23 PERCENT SALT SOLUTION AT 6° F. TO 8° F. FOR 1½ HOURS.
^{4/} IMMERSED IN RUNNING FRESH WATER AT 60° F. ($\pm 5^\circ$) FOR 2 HOURS.
^{5/} RESULTS OF ANALYSES OF SIX GROUPS FROM EACH SAMPLE. EACH GROUP CONSISTED OF THREE FISH.

VESSEL: Experimental lots of frozen fish were prepared and the modified brine-freezing mechanism was tested under operating conditions at sea during the Delaware's five-day cruise (July 23-25). Fishing operations were carried out by the Service's technological research vessel on the southeast part of Georges Bank. On this cruise (Technological Cruise No. 21) all freezing was done in a mixed magnesium-chloride and sodium-chloride brine, permitting the use of a freezing temperature of about -5° F. This is about 10 degrees lower than can be safely attained with the refrigeration equipment using a straight sodium-chloride brine. A substantial decrease in freezing time for both scrod and large haddock was possible at this low temperature. Approximately 14,000 pounds of scrod and large haddock were frozen in-the-round in this mixed brine. Half of the total was glazed in sea water and the remainder left unglazed. The frozen fish were then stored at 0° F. in the vessel's hold. When the vessel docked, these fish were placed in commercial cold storage to determine the effect of the mixed brine on storage characteristics of the fish. Small lots of several other varieties of fish were also frozen in this brine.

(Boston)

COMPOSITION OF FISH: Abalone: During the Southeastern Alaska abalone investigation in September 1951, representative samples of abalone (Haliotes kamtschaticana) from three fishing grounds off the west coast of Prince of Wales Island were collected. These were packed in cans, frozen, and stored at 0° F. for storage tests and for later chemical analysis. Results of the proximate analyses are given in the following table:

Source of Abalone	Proximate Composition of Abalone Meat				
	Moisture	Protein	Oil	Ash	Carbohydrate ^{1/}
	Percent	Percent	Percent	Percent	Percent
Kelly Cove.....	77.5	17.5	0.7	1.7	2.6
Lulu Island.....	76.8	17.4	0.7	1.7	3.4
Blanquigal Point..	76.6	16.3	0.6	1.8	4.7

1/ BY DIFFERENCE.

(Ketchikan)



FALL BRINGS OVEN DINNERS

The first crisp, cool days of autumn signal the time for oven dinners--when you can pop your whole dinner into the oven and have a hearty, savory meal for your family.

One of the best tasting and least expensive combinations of food is baked cod fillets and baked potatoes. Tender flaky fish and hot buttered baked potatoes just naturally go together. Perhaps you would like to bake your dessert at the same time. Deep-dish apple pie or peach cobbler are two suggestions. To complete your meal, add a tossed salad and your family's favorite beverage.

Allow 45 minutes to an hour for baking your potatoes and dessert. Half an hour before the potatoes and dessert are done, put your cod fillets into the oven.

As a suggestion for your oven dinner, the home economists of the U. S. Fish and Wildlife Service recommend Cod Fillets Baked in Spanish Sauce.

COD FILLETS BAKED IN SPANISH SAUCE

2 POUNDS COD FILLETS	1 TEASPOON SALT
1/4 CUP ONION, CHOPPED	1/2 TEASPOON SUGAR
3 TABLESPOONS BUTTER OR OTHER FAT, MELTED	DASH OF PEPPER
2 TABLESPOONS FLOUR	1 BAY LEAF
1/4 CUP GREEN PEPPER, CHOPPED	1 WHOLE CLOVE
2 CUPS CANNED TOMATOES	

Cook onion in fat until tender. Blend in flour. Add all remaining ingredients except fish and cook until thick, stirring constantly. Remove bay leaf and clove. Arrange fillets in a shallow well-greased baking dish and cover with sauce. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until fish flakes easily when tested with a fork. Garnish and serve hot. Serves 6.