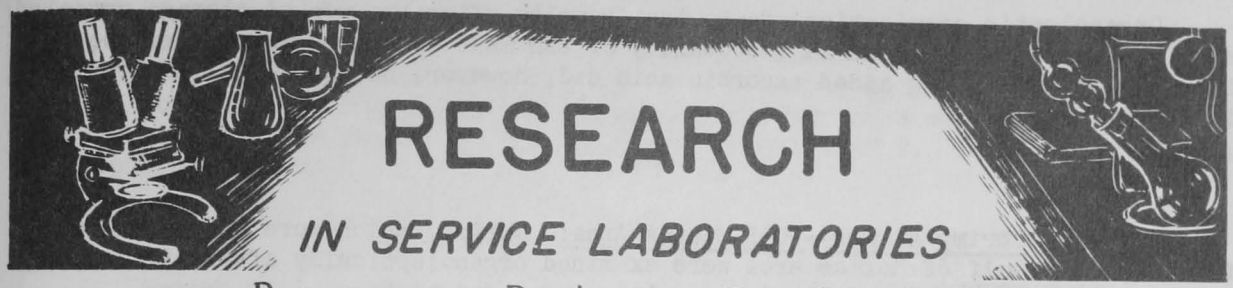

Progress on Projects, November 1952

REFRIGERATION: Freezing Fish at Sea, Defrosting, Filleting, and Refreezing the Fillets: Several generalizations on salt penetration in brine-frozen fish have been made on the results of this month's and earlier work:

1. Using the freezing process employed on the research trawler Delaware, the penetration of salt into the meat of brine-frozen (23-percent salt solution) whole fish increases directly with the brine temperature and immersion time. Penetration of salt into the meat, however, is not a serious factor provided the fish are not held in the brine longer than four hours and the brine temperature does not exceed 10° F.

2. Salt penetration continues after the fish have been frozen and are left in the refrigerated brine.

3. Whole fish frozen in brine containing slush ice showed some penetration of salt into the meat. This test was carried out to determine whether or not salt will penetrate into the meat of whole fish frozen in a brine which is held at its freezing point. Apparently, penetration of salt occurred because the brine in contact with the warm fish was momentarily raised above the freezing point.

4. Coating the fish with a marine-plant gel reduced penetration of salt during the brine-freezing process. This practice is not recommended, however, since large-scale use of such preparations would dilute and contaminate the refrigerated brine.

(Boston)

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Freezing and Storing Alaska Shrimp and Dungeness Crab: Seven experimental packs of frozen Dungeness crab meat were prepared to study the effect of low storage temperatures (-20° F.) and improved packaging methods. Approximately 65 pounds of crab meat were obtained from a local packer to prepare the packs. The Dungeness crabs were caught outside the three-mile limit in Hecate Straits and transported to the Ketchikan cannery by the fishing boat. The crabs were kept alive aboardship by holding in circulating sea water. At the processing plant, the crabs were butchered and the sections containing the edible portion were cooked in boiling fresh water for about 20 minutes. The cooked sections were cooled in cold running water. The meat was removed, air-cooled, washed in brine to remove any shell, washed in fresh water to remove salt, then allowed to drain. At this point, crab meat was taken and prepared as experimental lots. Samples were packed in cans and in polyethylene containers. Some samples in cans were packed under vacuum; other samples were flooded with 2-percent brine; and others were treated with ascorbic acid.

Organoleptic examination of the test samples after two weeks' storage revealed no significant differences in the quality of the meat--all were rated very good. The samples containing added ascorbic acid did, however, seem to be a little flat in flavor.

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Freezing Shrimp at Sea--Gulf States Area: Shrimp, which were brine- and air-frozen in the Gulf of Mexico area were examined organoleptically after six months of storage at 0° F. The following samples were under test:

Air-frozen Shrimp: Shrimp tails were packed in 1- and 5-pound waxed cartons and frozen at -20° F. Shrimp were glazed after freezing and stored at 0° F. Samples were prepared aboardship and ashore.

Brine-frozen Shrimp: Shrimp tails were frozen aboard the vessel by immersing them in 85-degree brine (sodium-chloride solution) at 5° F. for 15 minutes. Frozen shrimp were then drained, packed in 1- and 5-pound cartons, and the cartons stored at 0° F.

Refrozen Shrimp: Whole shrimp were brine-frozen aboardship as indicated above. Frozen shrimp were thawed ashore by immersing in fresh water at 60° F. for 15 minutes. The heads were removed from the defrosted whole shrimp and the tails packaged and refrozen in the same manner as the air-frozen shrimp.

In all samples some dehydration of the meats occurred in those shrimp located near the corners and edges of the carton. Those shrimp located in other portions of the carton and in the center of the package seemed to be well protected from dehydration and were of good color, texture, and flavor after thawing and cooking. Those shrimp which showed dehydration were discolored, tough, and off-flavored. In the brine-frozen shrimp these adverse changes, which accompanied dehydration, were noticeably greater than in the air-frozen shrimp, presumably due to the salt absorbed by or adhering to the shrimp. The taste panel found no evidence of excessive saltiness of the brine-frozen shrimp.

Apparently the method of packaging is an important factor in the keeping quality of frozen shrimp. The refreezing process seemed to be quite satisfactory since the thawed shrimp tails could be packaged compactly in the cartons. The refrozen shrimp were actually slightly superior in quality to the plain brine-frozen shrimp because of this fact. There was no evidence that refreezing the shrimp, in accordance with the process described above, caused any change in the normal texture of the shrimp.

Refrozen shrimp (prepared from shrimp brine-frozen at sea) retained the fresh sea flavor to a greater extent than did the shrimp samples prepared from commercially-caught and iced shrimp. The appearance of the refrozen shrimp in the package was far superior to the commercial shrimp because of the complete absence of black-spot discoloration in shrimp frozen at sea.

(Ketchikan)

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NUTRITION: Chemical and Physical Properties of Fish and Shellfish Proteins: An examination was made of the samples of fast- and slow-frozen rockfish fillets after 12 weeks of storage at 0° F. The rockfish were filleted about 48 hours after they were caught. The fillets were cut into about 80-gram pieces, which were then packed

in half-pound cans and sealed at atmospheric pressure. The lot was divided into two groups. The first group was fast frozen by immersing the cans in an ethyl alcohol-dry ice bath. The second group was slow frozen by placing the cans in an insulated box which was held at 0° F. (approximately 104 hours were required to hard freeze the pieces of fish). Both groups were stored at 0° F. The results of tests on drip are as follows:

	FISH	
	Fast-Frozen	Slow-Frozen
Amount of drip (percent)	2.8	3.8
Solids in drip (")	10.9	10.8
Nitrogen in drip (mg. per gm. of drip) ..	15.9	15.3

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BYPRODUCTS: Vitamin Content and Nutritive Value of Fishery Byproducts: Vitamin B_{12} assays were completed on 23 samples of menhaden meal and one of blue-crab meal. The vitamin B_{12} content of the samples of menhaden meal ranged from 0.064 to 0.26 micrograms per gram of meal, as received. The average was 0.15.

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ANALYSIS AND COMPOSITION: Composition and Cold-Storage Life of Fresh-Water Fish: The proximate composition of 10 additional individual samples of bullhead (Ameiurus melas) was determined. These fish were caught in August 1952 in Lake Benton, Minn. The data are presented in the following table:

Composition of Edible Portion of Bullhead

Sample Number	Length	Weight	Fillet Yield	Proximate Composition of Edible Portion			
				Moisture	Fat	Protein	Ash
	Centimeters	Grams	Percent	Percent	Percent	Percent	Percent
7	25.5	217	24.4	80.9	1.2	16.6	1.0
8	25.0	285	15.8	81.2	1.6	16.4	1.0
9	26.5	300	18.3	83.1	0.85	15.8	1.0
10	25.5	300	16.7	81.4	0.87	16.6	1.1
11	25.5	270	18.9	82.3	1.0	16.5	1.0
12	26.0	277	14.4	82.9	1.2	16.1	1.0
13	27.0	310	20.0	81.5	1.5	16.6	1.0
14	25.0	283	23.0	81.0	1.6	16.4	1.0
15	25.5	285	12.3	81.5	1.2	16.5	1.1
16	26.5	323	18.6	81.9	0.94	15.8	1.0

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PROCESSING AND PRESERVATION: Tuna Survey--Technological Phase: Packing operations of tuna canning plants on the West Coast were surveyed. The survey is being continued on the East Coast. Sample packs of tuna in oil and in brine were prepared. A technologist from the Ketchikan Laboratory was detailed to Seattle to conduct special tests on texture of canned domestic and imported canned tuna.

(Seattle)