



## FISH-QUALITY DETERIORATION STUDY

As part of a large-scale study on objective tests for quality of fish, work at the Seattle Technological Laboratory of the U. S. Fish and Wildlife Service has been concentrated on compounds formed in the meat of fish while deterioration in quality is occurring. Fish of varying degrees of freshness are being analyzed to learn what these compounds are, and how they may be evaluated in terms of the level of quality of the fish. The first group of compounds being studied are the free amino acids, liberated from the protein of the meat by enzymatic action. Results to date indicate that certain reactive compounds are freed only after definite spoilage has occurred. Changes in fish muscle constituents during earlier stages of spoilage are now being studied.



## STUDY OF DRIP IN FROZEN FISH

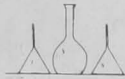
The loss of tissue fluid from fish frozen, then thawed, has for years been a vexing problem of fish processors and users. For example, the homemaker may think she is being sold water at the price of fish when the exuded fluid appears around the thawed portion. Studies now under way at the Ketchikan laboratory are aimed at a better understanding of the chemistry involved when the meat of fish loses these fluids.

In preliminary studies designed to characterize the proteins occurring in drip, frozen fish were thawed, minced and subjected to centrifugation. The fluid separated from the meat by this process was again centrifuged, this time at very high speeds. No solid particles were precipitated from the fluid during the centrifugation. No structural (fibrous) proteins from the musculature of the fish were observed to be precipitated following a ten-fold dilution of the drip with distilled water. Continued dilution caused the precipitation of a protein fraction, and subsequently, treatment of the remaining liquid with trichloroacetic acid precipitated a second fraction.

Protein characterization studies on the drip were also made using electrophoresis, the technique whereby protein fractions are separated by their different rates of movement under electrical impulse along a strip of porous paper. Three major fractions were observed which were soluble in dilute salt solutions.

Work to date indicates: (1) no solid proteinaceous particles or fibrous proteins can be found in the drip fluid from the meat of fish; (2) two major fractions of proteins, soluble in very dilute salt solutions, but differing in their solubilities in distilled water, were found to be present in the drip; (3) separation of the protein components of drip into three major groups was accomplished by taking advantage of the relative mobilities of the fractions during electrically-assisted diffusion along a strip of porous paper.

The apparent significance of the studies lies in the fact that the only protein components of drip found thus far are all soluble in dilute saline solutions corresponding to the salinity levels of the meat of the fish. As a preliminary hypothesis, it may be stated that drip from frozen and thawed fish meat contains only those proteins normally found in suspended form in the meat.



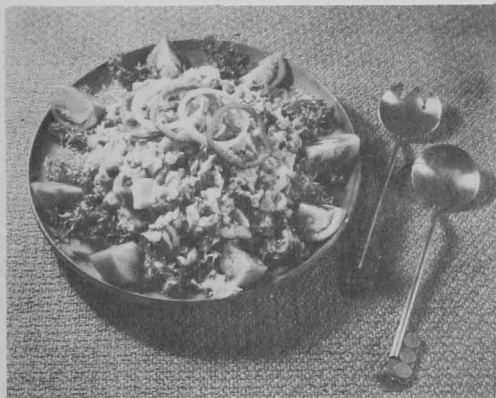
## ANTIOXIDANT MIXTURES FOR PRESERVING FISHERY PRODUCTS

The possibility of increased preservation of fatty fish by the use of antioxidants is a matter of great importance to the fishing industry. Research contracted by the U. S. Fish and Wildlife Service to the University of California at Davis, Calif., has shown that mixtures of antioxidants are much more effective in preventing oxidative deterioration of food products than are any of the compounds alone. This synergistic action of antioxidant mixtures is now being tested under commercial conditions at the Fish and Wildlife Service's Seattle laboratory. Further information will be available when the tests are completed. The research is being financed with funds provided by the Saltonstall-Kennedy Act of 1954.



### TUNA IDEAL FOR SUMMER PICNICS

If your family responds to your dinner call with mild enthusiasm, it is time for a change. Summertime is tuna time and also picnic time. So, why not change the family eating routine and treat them to a picnic supper either in your backyard or a nearby park? Picnics are the occasions when you can don sports clothes and serve simple but tasty food in a relaxed and enjoyable fashion.



Of course, it's the food that makes a picnic enjoyable and the enterprising planner will give the main course extra-special attention. Canned tuna packed with energy-giving protein is a flavorful basis for main-course salads or sandwiches. It is a natural ingredient, too, as there is little or no preparation. Just open a can and it is ready to use. And, it is economical, too, as there is no waste.

The home economists of the U. S. Fish and Wildlife Service suggest that you join the summertime outdoor parade and serve "Tuna Salad" at your next picnic supper.

#### TUNA SALAD

2 CANS (6½ OR 7 OUNCES EACH) TUNA  
 ½ CUP MAYONNAISE OR SALAD DRESSING  
 1 CUP DICED CELERY  
 2 TABLESPOONS CHOPPED SWEET PICKLE  
 2 TABLESPOONS CHOPPED ONION

2 HARD-COOKED EGGS, DICED  
 DASH PEPPER  
 LETTUCE  
 TOMATO WEDGES

Drain tuna and flake. Combine next six ingredients. Serve on lettuce and garnish with tomato wedges. Serves six.