



## COMPOSITION OF FISH AND SHELLFISH

In the composition studies conducted in 1959 at the U. S. Bureau of Commercial Fisheries Technological Laboratory, Seattle, Wash., major attention was given to marine fish of the Pacific Coast. One study on meals was completed, and plans have been made to start the investigation of shellfish beginning with Dungeness crab.

Three investigations have been completed. The work on halibut showed it to be uniformly low in both oil and sodium and high in protein. A survey of the sodium content of fish meat indicates that salt-water fish in general are not significantly higher in sodium content than are fresh-water fish provided they have not been in contact with brine or other sources of sodium.

In a study of fish meals, it was found that the carbonate content was less than 2 percent and ranged as low as 0.5 percent. Shellfish meals on the other hand showed large variations, reaching 25 percent for shrimp and 75 percent for clams. The first two reports were presented at national meetings of scientific associations and all three have been submitted for publication.

Three projects are nearing completion. A long-term study of Pacific ocean perch and several other species of rockfish show a uniform composition regardless of species, season of capture, and area of capture. A similar study on sole, including 10 species, shows a wide variation in composition. They are much lower in protein and higher in sodium than are rockfish. Much of the analytical work for the Terminal Island project on a sampling method for tuna was done in this laboratory.

Three other projects are well under way or planned for the near future. The composition of tuna is being studied. Two series of albacore, one of skipjack, and several bluefin and yellowfin specimens have been analyzed. Of all fish tested, tuna meat is highest in protein and lowest in sodium, but it shows a large fluctuation in oil content. A proposed three-year program on the study of silver salmon has been started. Samples have been prepared from 4 series of specimens obtained during the 1959 fishing season. Plans have been made to start investigations on the composition of shellfish, beginning with Dungeness crab in January.



## CONTROL OF DRIP IN CHILLED AND FROZEN FISHERY PRODUCTS

Free liquid or juice that exudes from fishery products during refrigerated storage or during the defrosting of the frozen product may be (1) water native to the product, (2) water picked up during handling and processing, and/or (3) water added as a protective glaze. When present in excessive amounts, the free liquid may become a problem to the fish producer, buyer, and consumer. The general objectives

of this project are to investigate the factors that affect water retentivity of various frozen fishery products and to find means of determining the amount of native water in contrast to amounts of water picked up during processing or added as glaze.

The first phase consists of determining some of the constituents of thaw drip or juice that exudes from defrosted cod fillets that have been frozen and stored for various time intervals at 0° F. and +20° F. The constituents being determined include total solids, total nitrogen, protein nitrogen, ash, sodium, potassium, calcium, phosphorus, magnesium, and sulfate. Results are still insufficient to draw any conclusions at this time.



## FISH FLOUR RESEARCH

For research being conducted on fish flour at the Bureau's Technological Laboratory, College Park, Md., samples of whole fish, fillets, and the remaining fillet waste were obtained from a single lot of ocean perch. These samples were frozen separately and half of each was processed into fish flour by an acid precipitation technique. The remaining half of each of the samples was processed into fish flour by an azeotropic distillation technique by the VioBin Corporation at Monticello, Ill.

The ocean perch fillets first were ground while still frozen and then were processed into a coarse, dry form in the pilot plant. This material then was extracted three times with a patented solvent, dried thoroughly in an air stream, autoclaved, dried again, and milled. This process was repeated using the whole fish and then again using the fillet waste.

Samples of each of the flours were taken aseptically during the final drying stage for bacteriological analyses. Total plate counts and *E. coli* determinations will be conducted to aid in evaluating the "sanitary condition" of the product.

The fish flour pilot plant is only one of the installations of the VioBin Corporation at Monticello. There is a commercial-scale batch fat extractor for the final defatting of dried beef pancreas, beef liver, and fish meal. Each of the above products first is dried using the azeotropic processing technique either in the pilot plant at Monticello or in one of several other plants. The beef products are sold to pharmaceutical houses for the preparation of enzymes, etc., and the latter product is milled and sold as fish flour. Fish flour made from fish fillets is sold to pharmaceutical houses and all other fish flours are sold for export. Apparently there is at least a limited market for fish flour at the present time.

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## LOW STORAGE TEMPERATURES HELP MAINTAIN FILLET QUALITY

Frozen pollock fillets lose quality very rapidly at high storage temperatures, according to a preliminary report from the U. S. Bureau of Commercial Fisheries Technological Laboratory in Gloucester, Mass.

Temperatures of +10°, 0°, and -20° F. have been used in tests on one-pound packages of pollock fillets. The fillets became completely inedible in less than two

months when stored at 10° F. At 0° F. this product had a storage life of about six months, or more than three times that of the fillets stored at the higher temperature. At lower temperatures the keeping quality is increased even more significantly. For example, pollock fillets stored at -20° F. for six months showed no measurable change in quality.

The results of these tests, which are still in progress, emphasize again the importance of storing fish at temperatures of 0° F. or lower in order to insure the marketing of a high quality product. Also, the results show that the necessity for low-temperature storage increases as the length of the storage period is increased.



## PROPOSED STANDARDS FOR GRADES OF FROZEN RAW HEADLESS SHRIMP UNDER REVIEW

Two series of industry meetings were held during October 1959 with producers, users, and marketers of frozen raw headless shrimp, and scientists of the U. S. Bureau of Commercial Fisheries to discuss the first draft of the proposed standards for Federal grade of frozen raw headless shrimp. The first meetings were held in Brunswick, Ga., and Tampa, Fla. Two weeks later, meetings were held in New Orleans, La., and Corpus Christi, Tex. Approximately 40 industry members attended the four meetings.

The spirited discussion of the draft of the proposed standards provided the background needed for further revision. A new working draft, along with a draft copy of Instructions to the Inspector, was sent out to the 16 Bureau inspectors working in shrimp breeding plants. Through the cooperation of these inspectors and of the plants in which they are stationed, the standard can be given a thorough in-plant application and evaluation prior to the preparation of the final draft.

It was expected that the provisional draft would be ready for publication in the Federal Register during February 1960.



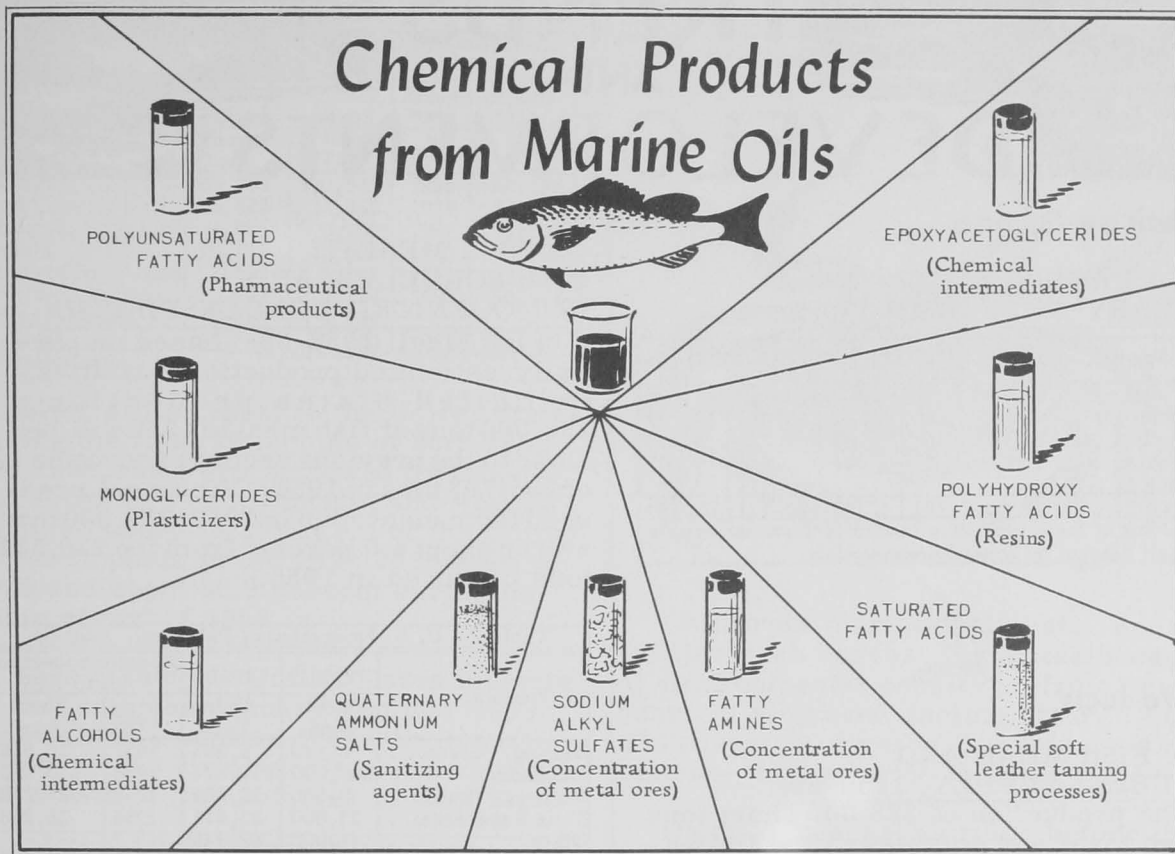
## PURIFIED FISH-OIL FRACTIONS TO BE MADE AVAILABLE FOR RESEARCH

Following up successful research findings by the U. S. Bureau of Commercial Fisheries on the usefulness of fish-oil fractions in reducing high blood-serum cholesterol levels in animals, Assistant Secretary of the Interior Ross Leffler announced on December 29, 1959, the details of a stepped-up research and technical assistance program.

He explained that the plans include making available to interested medical and pharmaceutical researchers relatively large samples of purified fish-oil fractions and the screening of 25 species of edible and industrial fish to determine whether the types of fatty acids present in those fishes are those useful in dietary and medical treatment of elevated cholesterol levels.

Other investigators are studying the effects of highly unsaturated oils on fat utilization by the body as well as the amount of dietary fish oil necessary to cause a useful reduction in serum-cholesterol levels. Nutritional advisory services by the Bureau on fish oils and edible fish products are being made freely available to dietitians and medical researchers engaged in formulation of special anticholesterol diets.

The Director of the Bureau stated that his staff has received many expressions of interest from researchers in utilizing fish oils and fishery products for human



feeding trials. Large quantities of these oil fractions have not been available. To remedy this situation, the Bureau is undertaking the preparation of such oil fractions utilizing a pilot-scale centrifugal molecular still and will make oil samples available, free of charge, to responsible researchers.

The key findings of recent research which the Bureau hopes will encourage full-scale clinical testing by responsible medical staffs are (1) the abundance of what are known as "unsaturated" fatty acids in the body oils of many species of fish, (2) proof that the feeding of these "unsaturated" fatty acids to test animals reduced the highly elevated content of cholesterol in their blood sera to "normal" levels, and (3) that the more "unsaturated" the fatty acid used, the more effective it was in normalizing levels of serum-cholesterol.

This latter finding was of most immediate interest to fishery researchers since fish-oil fatty acids contain up to six points of unsaturation as compared to two points of unsaturation in linoleic acid, the active cholesterol-depressant agent in vegetable oils. Use of a properly prepared concentrate of these highly unsaturated fatty acids from fish would permit effective anticholesterol treatment with a minimum of added fat intake.

Bureau technologists pointed out that these unique "soft fat" features of fish oils make fishery products especially valuable for inclusion in diets designed to bring about a better nutritional "balance" between the hard and soft fats in the American diet. Many medical authorities have pointed out the desirability of increasing soft fat consumption while reducing the consumption of hard fats as a possible means of controlling blood-cholesterol levels.