NEW TECHNOLOGICAL LABORATORY FOR FISHERIES RESEARCH IN GLOUCESTER, MASSACHUSETTS

To meet the needs of the New England fishing industry and to form a center for long-range technological investigations of our marine resources, the U. S. Bureau of Commercial Fisheries opened a new Technological Laboratory in Gloucester, Mass., towards the latter part of 1959.

Back in 1945 a senior technologist was assigned to the New England area to find out what the fishing industry needed in the way of technological research. The result of his study was the establishment of a small laboratory on the Boston waterfront which directed the efforts of a few professional people to the development of a satisfactory method of freezing fish at sea.

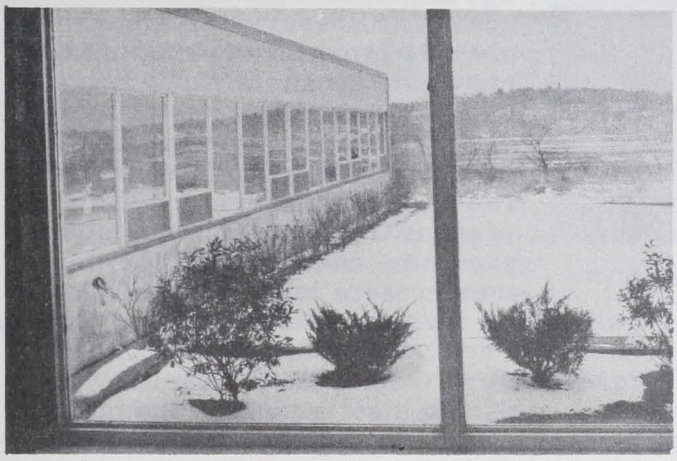

Fig. 1 - View of the office wing from the reception hall of the Gloucester Laboratory.

From this small beginning there was shaped the present staff of 14 professionals trained in chemistry, biochemistry, engineering, fishery technology, and related fields. This seasoned team has recently moved from the ramshackle building that housed the laboratory in East Boston to the new quarters in Gloucester.

The entire laboratory program is oriented toward providing the knowledge necessary for industry to attain its goal of producing fishery products of a quality as close to that of the freshly-caught fish as is possible. To accomplish this, the technological research program is divided into three major work areas dealing with: (1) the development of standards and specifications for fishery products, (2) preservation and engineering studies both on the vessel and ashore, and (3) chemical studies on the composition of fish and fishery byproducts, proteins, and flavors and odors.

Fig. 2 - Library section at the new laboratory.

A team of four chemists and a fishery aid are concentrating on the development of U. S. Standards for Grades and the preparation of Federal Specifications for fishery products. Surveys of current industry production practices and analyses of products form the basis for the development of standards for quality characteristics and effective testing methods. The resulting standards serve as a quality gauge in wholesale buying and selling and assurance to the consumer of an attractive high-grade product. Regular meetings with members of industry at various stages of this program's development have provided opportunity for partnership in the discussions and evaluation of standards as they are prepared.

The Federal Specifications which are developed under this program also assist industry and military and civil agencies by standardizing Federal purchases. This allows industry to compete for contracts on an even and fair basis, and at the same time assures Federal consumers of good quality fish at competitive market prices.

Fig. 3 - The conference room overlooking the Annisquam River.

Recognizing that improved quality results in increased sales and improved handling in decreased costs, the Preservation and Engineering group is working to improve the quality of fishery products through all phases of handling--from the time the fish is caught until the finished product reaches the consumer. At the present time preservation studies are being conducted on the time-temperature tolerance of frozen fishery products and on new methods of chilling and freezing fish at sea and ashore. The time-temperature-tolerance project is concerned with investigations of the effects of various combinations of temperature, storage time, relative humidity in the storage room, and other factors experienced during distribution on the quality of fishery products. In addition, frozen-storage studies are being conducted on new products from presently underutilized species of fish as a means of establishing new markets for such products. This group is also investigating methods of chilling groundfish in refrigerated sea water as a possible method for extending the edible shelf life of these fish, to provide more efficient handling, and to level out production.

Fig. 4 - Installation of furniture in the organic chemistry laboratory.

Engineering projects at the laboratory include the design of pilot-model refrigerated seawater installations for use at the processing plant or aboard a fishing vessel, studies on the freezing of fishery products, and on methods of improving plant and vessel sanitation. These investigations are designed to provide information that will better the economic position of both vessel and plant operators.

Chemical investigations into the fundamental quality factors of fishery products are the responsibility of the composition and utilization group. Problems under investigation include the composition of fish, the chemical constituents of the odor and flavor of fish, and the relation between protein denaturation and textural changes during the frozen storage of fish.

The objective of the composition studies is to provide a knowledge of the constituents in fish and of the factors, such as, season and areas which may affect

them. Information produced from these studies will permit the processor of fishery products to accurately calculate his yield and costs. It will also enable the nutritionist and dietician to make recommendations regarding the components of normal and special diets.

Studies of flavor and odor have as their immediate objectives the identification of those compounds that comprise the flavor and odor of fresh fish, and fish that has deteriorated during storage. The ultimate objective of the investigation is to gain an insight into the chemical processes involved during flavor and odor deterioration so that steps can be taken to prevent these reactions and thereby permit fish products to retain their attractive fresh flavor. Another undesirable change that occurs during frozen storage is an increase in toughness of the meat. This problem is under scrutiny in a study of the fundamental order of arrangement of the molecules comprising the protein of fresh and frozen fish. A solution to this problem will be an important contribution to the efforts of industry to increase the acceptability and demand for their frozen fish products.

Another responsibility of this laboratory is that of maintaining supervision of the U. S. D. I. Voluntary Inspection and Grading program in the New England Region. A team of some 14 highly-trained inspectors sample more than 50 million pounds of fishery products annually, thus assuring that the consumer obtains top quality merchandise. Just about every form of frozen, canned, fresh, raw, cooked, uncooked, breaded fish and/or shellfish is inspected at one time or another by this laboratory's inspectors.

Executing Bureau contract research projects and a special service-to-industry project for furnishing direct technological assistance to industry members rounds out a complete technological service.

CHANGE IN MOISTURE PERCENTAGE

Those unacquainted with the reduction of fish are sometimes surprised at the manner in which percentage of moisture varies during the process of evaporation. To illustrate the point, we might take two extreme examples.

For our first one, suppose that we have 100 pounds of a material containing 2 percent moisture, which means that it contains water in the amount of 2 pounds. Now let us evaporate exactly one half of the water, which would leave 1 pound of it. An analysis of the material then would show that it contains 1.0 percent moisture, about what we would expect.

For our second example, suppose that we start with 100 pounds of material containing 98 percent moisture. The material then would contain water in the amount of 98 pounds. Again let us evaporate one half of the water, which would leave 49 pounds of it. What amount of moisture does the material now contain? Reasoning from the first example, we might hazard 49 percent as a rough off-hand guess. Actually, it would contain 96.1 percent, as the following calculation shows:

$$\frac{(98-49)(100)}{100-49} = \frac{(49)(100)}{51} = 96.1 \text{ percent}$$

Thus care must be taken in mentally estimating changes in moisture content.