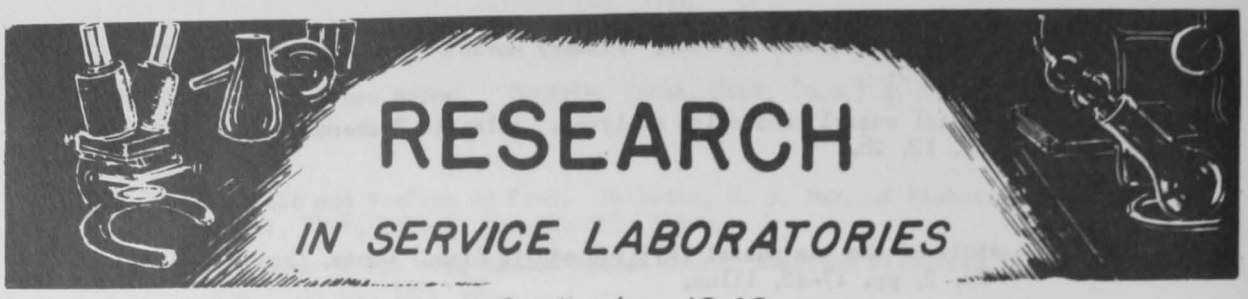


September 1949

NUTRITION: Work is being continued on the vitamin B_{12} assay using purified vitamin B_{12}. In the present method being tested, an excessively long incubation period was required and, furthermore, the bacteriological media was exceedingly expensive. Attempts are being made to use a lower-priced media and also to reduce the incubation period.

PROCESSING: Work was initiated on the processing of fish eggs and fish viscera for use as hatchery food. Several preliminary canned packs were made to determine the optimum processing conditions necessary for canning these materials in large sized cans.

ANALYTICAL METHODS: Studies were initiated by a student fellow on the extraction of oil and vitamin A from fish livers of low oil content. Attempts will be made to correlate the vitamin A recovery with the amount of oil extracted from the livers.

REFRIGERATION: At the end of 10 months of storage, the palatability scores for the striped bass fillets fell below the figure for an acceptable product. Nearly equal scores were obtained for the samples held at a constant temperature of -10° F. and at temperatures fluctuating between -10° and 0° F. A slightly lower score was obtained for the lot held at a constant temperature of 0° F. All lots showed surface desiccation, and a definite fishy odor was apparent upon thawing the samples. The color of the samples held at these temperatures had remained reasonably satisfactory.

Volatile acid numbers have followed very much the same trend as shown by the palatability scores. The quantity of "drip" occurring upon thawing the fillets has shown very little change. No appreciable effect due to fluctuating temperatures is apparent.

* * *

In the tests with wrapping and glazing combinations, the fish that were first wrapped in vegetable parchment and dipped in water, then wrapped in cellophane showed localized desiccation.

PRESERVATION: Twenty experimental lots of salmon cannery waste were prepared for studies of possible procedures for preserving and storing the material for periods of 5 to 20 weeks. The waste was coarsely ground and treated with various proportions of a preservative. Some lots were cooked and others were adjusted to pH 4.7.

Fisheries Technological Research Program, 1949-50

Heads of the laboratories of the Technological Section of the Branch of Commercial Fisheries conferred with Washington officials in July for the purpose of reviewing the laboratory program for the preceding year and setting up a fisheries research program for fiscal year 1950. In accordance with the policy set up last year (Commercial Fisheries Review, August 1948, p. 31), representatives of industry and labor were invited to the conference by the Service to discuss the tentative program and to offer any suggestions that would aid the Section in directing the research program toward the most efficient use of funds available for solving problems of greatest urgency to the fishermen and the fishing industry.

Because of their importance and because of the need for more data, some of the projects of the preceding year are to be continued. Others have been completed and results will be reported in the near future. Several new projects have been added in view of newer developments and the increasing needs of the industry.

The program for the present fiscal year, ending June 30, 1950, is outlined below according to subject, without reference to the laboratory to which each subproject is assigned. The laboratories in which the various phases of the program will be conducted are located at Boston, Massachusetts; College Park, Maryland; Ketchikan, Alaska; and Seattle, Washington.

NUTRITION:

1. Determination of food values of fishery products as prepared for serving. Information on the nutritive value of cooked fishery products as served is required by nutritionists, dietitians and members of industry. Data on the nutritive value as prepared for serving is the only accurate method of determining the ultimate food value. Practically no data has been available on cooked products. To date, approximately 250 fish dishes have been analyzed for dry matter, protein, fat, and carbohydrate and for calorific values. This project is being carried over from last year.

FISHERIES LABORATORY IN SEATTLE, WASHINGTON, WHERE BOTH TECHNOLOGICAL AND BIOLOGICAL FISHERIES RESEARCH ARE CONDUCTED. THE PILOT PLANT OF THE FISHERY TECHNOLOGICAL LABORATORY IS SHOWN IN THE LOWER LEFT.

2. Determination of rate of digestion of certain fishery products. Rate of digestion may be closely associated with the satiation value of fishery products and is a factor bearing upon the nutritive value of the product. Lack of personnel and equipment delayed progress on this project. Development of a suitable method of evaluation was a necessary prerequisite. Rats were fed known quantities of radioactive phosphorus and the rate of passage through the gastro-intestinal tract was followed by electric counter. Other methods were also tested. Gastric evacuation time for baked haddock, broiled mackerel and roast beef is about equal. There was no significant correlation between fat content and rate of gastric evacuation as measured with haddock and mackerel. A method was developed that satisfactorily accounted for the ingested radio-phosphate in the body, however, P^{32} did not prove to be a suitable marker for studying the rate of evacuation since it passed through the walls of the stomach and small intestine much more rapidly than expected. Several new approaches are being considered which have theoretical possibilities of solving the problem. This project is being carried over from last year.

FISHERY TECHNOLOGICAL LABORATORY IN COLLEGE PARK, MARYLAND, IS LOCATED ON THE CAMPUS OF THE UNIVERSITY OF MARYLAND. (THE LABORATORY SERVING THE NEW ENGLAND AREA IS LOCATED IN THE APPRAISERS STORES BUILDING IN BOSTON, MASS.)

3. Chemistry of fish proteins. Investigation of the chemical cause of curd in canned fish, browning of fish during canning, toughening of crab meat and other results caused by changes in fish protein. It would also include investigation of the chemical nature of fish protein which might be of value in obtaining purified fish proteins for industrial use. Study of this problem will entail a thorough search of the literature which will be undertaken as time and personnel are available, but no other work is contemplated for the first year.

4. Utilization of salmon cannery waste for hatchery food. Preliminary tests indicate that salmon cannery waste can serve to replace some of the more expensive and decreasing supply of meat products usually included in the diet of hatchery fish. Tests were initiated to show which parts of salmon waste are most effectively utilized by young fish and how these parts can be processed without loss of nutritional elements. Feeding tests so far indicate: (1) Salmon viscera meal added to the diet at the 10 percent level produces much better growth than does total offal meal. (2) Drying temperature of 100° F. produces a meal of greater growth potential than does 145° F. or higher temperatures. (3) Dried fish meal should not be added to the diet of young salmon before they have reached an age of six weeks nor at a water temperature below 50° F. The present work will be confined to:

(a) Collection and processing of hatchery food;

(b) Analyses of hatchery materials. Particular attention will be paid to assay of vitamin B_{12} in fish waste materials.

5. Clam processing methods and clam toxicity survey. With a view towards reactivating the Alaskan butter clam industry, studies were conducted to develop suitable processing methods for canning butter clams which would result in good quality packs of low or no toxicity. The results of laboratory tests indicate that it is possible to prepare a pack of canned minced butter clams one-tenth as toxic as the original whole clams. On the basis of recommendations from the Ketchikan laboratory, one canner is preparing a small pack of butter clams. Tests on his product indicate that it is safe and suitable for market. This was the first attempt by a commercial packer to reactivate the industry in southeastern Alaska since 1946 when operations had ceased after several shipments of clams had been seized because of the reported presence therein of a toxic substance. The present work will be confined to:

(a) Processing methods including the variations of the pH prior to canning;

(b) Survey of toxic clam areas in order to keep informed as to the possible beds which may become more highly toxic from time to time;

(c) Sampling and testing methods. The results which are at hand will be written up for publication and this portion of the project will be discontinued within the next three months.

6. Preservation of salmon waste. Salmon cannery waste collects at the canneries so rapidly during the height of the season in Alaska that it is impractical to try to handle it immediately. The only hope of complete utilization of this waste is if some way can be developed to preserve it so that processing can be completed over a longer period of time. It is proposed to carry out experiments using different chemical preservatives on salmon cannery waste.

REFRIGERATION AND PRESERVATION:

1. Freezing fish at sea, defrosting, filleting, and refreezing fish. In order to (1) utilize large reserves of food fish existing in northern Pacific and Alaskan waters and (2) to provide methods for improving the quality of North Atlantic fish to make possible the marketing of quality fish as well as to meet the competition of foreign imports of high quality fish fillets, tests were conducted in freezing fish at sea. It was shown that excellent quality fish fillets can be obtained by freezing whole fish at sea, bringing the frozen fish to port where they are stored, thawed, filleted, and refrozen for marketing.

2. Effect of fluctuating temperatures on quality of frozen fish in storage and in transit. With a view toward development of optimum storage temperatures and conditions for frozen fish, studies were conducted to determine the effect of fluctuating temperatures on the quality of frozen fish. Tests indicate that fluctuating temperatures, in themselves, do not have an appreciable effect on the quality. Instead, the average storage temperature encountered during the fluctuations seemed more likely to be the determining factor.

3. Study of Frozen Oysters. This project was initiated with a view toward developing and improving methods of freezing, packaging, and storing of frozen oysters. These studies will consist of:

(a) Use of ascorbic acid and possibly other organic acids to prevent discoloration and oxidation;

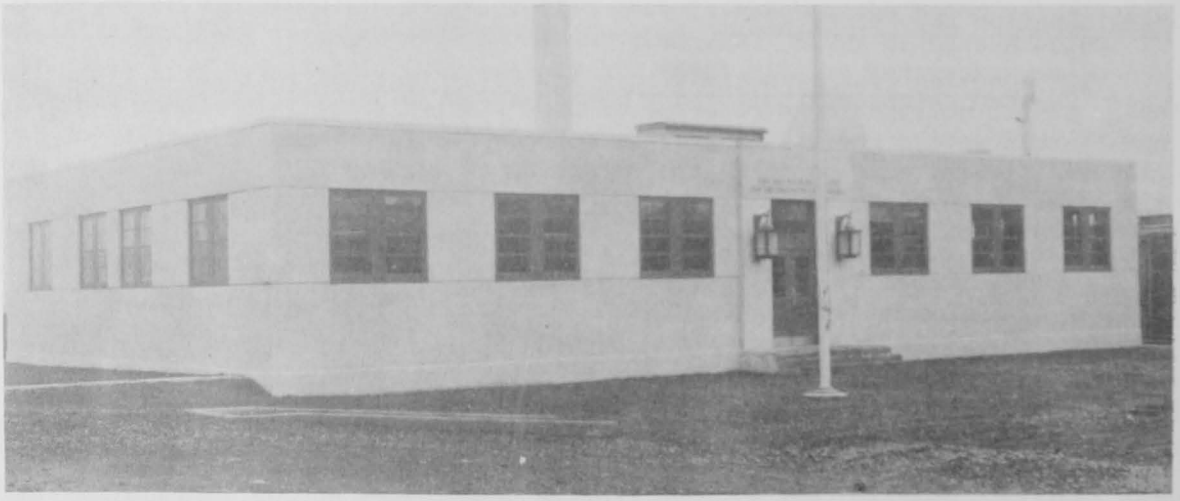
(b) Use of some of the new postwar packaging materials to determine their adaptability in the oyster industry;

(c) Making pH determinations on the oysters prior to processing.

4. Frozen storage life of certain Pacific fish. Several species of Pacific Coast fish, such as rockfish, Dungeness crab, king crab, pink salmon, and Alaskan flounders and pollock, need additional study on the storage life at low temperatures and on the methods of preparation and packaging for freezing. New techniques of packaging, including the use of antioxidants, should be applied to species which deteriorate rapidly during storage to determine the most effective methods of retaining the fresh fish characteristics. The studies will be directed towards determining the palatibility characteristics of the various species during frozen storage and to determine the most effective methods of packaging and storing those species which have a limited storage life. Considerable data have already been collected on king crab and a report has been published on rockfish (Commercial Fisheries Review, July 1949, p.1).

5. Studies of methods of handling frozen salmon to be used for canning. Much salmon is being frozen in remote areas of Alaska for canning at existing canneries elsewhere. Last year considerable processing difficulties developed and some packs prepared from frozen salmon did not pass inspection. It is proposed to study freezing and storage techniques to see how they affect the final canned product.

6. Freezing of pink salmon. Pink salmon, which fades badly when canned, remains a bright pink when frozen. After only a few months cold storage, however, it discolors badly. It is proposed to try some of the newly developed techniques, such as application of antioxidants, in an attempt to develop a product with a suitable storage life.



ORIGINAL BUILDING OF THE FISHERY PRODUCTS LABORATORY IN KETCHIKAN, ALASKA; IS OPERATED JOINTLY BY THE FISH AND WILDLIFE SERVICE AND THE FISHERIES EXPERIMENTAL COMMISSION OF ALASKA.

PROCESSING AND CURING:

1. Canning of little tuna. This new fish off the Middle Atlantic Coast offers possibilities of becoming an important canned product. Studies will be made to establish recommended practices on preparation and processing.

2. Preparation of the manual "The Curing of Fishery Products." The final stages of reviewing and editing the manuscript on "The Curing of Fishery Products" are nearly completed. The report will serve as a technical handbook on the principles and methods of fish curing.

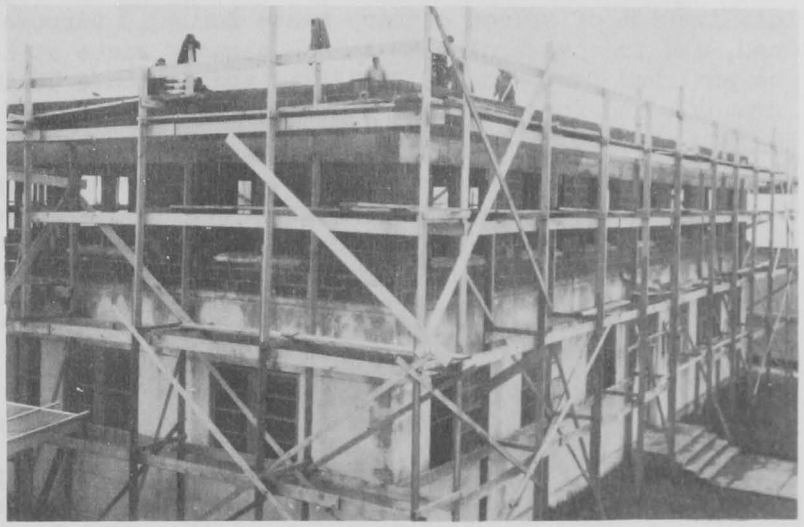
SANITATION AND BACTERIOLOGY OF FISH:

1. Isolation and identification of microorganisms from fish and the holds of fishing vessels to determine their role in fish spoilage. Isolation and identification of microorganisms from fish and the holds of fishing vessels were made to determine their role in fish spoilage. To develop effective methods for improving general quality of fishery products, it is necessary to obtain information of the types of bacteria responsible for fish spoilage. Several hundred cultures have been examined to date. The samples now on hand will be completed and no new samples will be started. The data collected will be summarized into a report. The project will be dropped in order that the personnel can be shifted to other projects of more immediate importance.

2. Handling crab meat. Studies are to be made to establish recommended practices for the handling of this highly perishable product, making use of such data on this subject as have already been collected by the laboratory personnel.

ANALYSIS OF FISH:

1. Cooperative work with the Association of Official Agriculture Chemists on the determination of oil in fish meal. Studies were made to improve the A.O.A.C. recommended methods for fat determination in fish meal since the present methods are totally inadequate and give results as much as 20 percent of true value. Accurate testing methods are necessary to avoid confusion between buyer and seller of fish meal. The fact that the apparent fat values decrease as the meal ages merely adds to the confusion. The work was limited to improving the precision of the acetone extraction procedure. It was shown that (1) no difference resulted from use of paper or alundum thimbles, (2) the height of thimbles could be varied about 50 percent without affecting the results, (3) in the



KETCHIKAN FISHERY PRODUCTS LABORATORY. SHOWS CONSTRUCTION IN PROCESS FOR THE ADDITION OF A SECOND STORY TO THE ORIGINAL BUILDING.

particular Bailey-Walker equipment used, the rate of extraction varied with the position of the extraction flask, (4) anhydrous and recovered acetone gave the same results, (5) rates of distillation are significant variables. Further tests during the preceding fiscal year were discontinued because of lack of personnel and urgency of other projects. During the present fiscal year, the work will be projected towards developing an improved procedure so that as near to 100 percent as possible of the oil in fish meal is extracted under all conditions, regardless of the age of the meal.

2. Correlation of biological and spectrometric methods for the determination of vitamin A potencies. Much additional data were required by the American Oil Chemists Society and members of the Vitamin A industry on the factors affecting the biological assay of Vitamin A and correlation of the biological and spectrometric data. Biological data to date indicate that one unit per day feeding of U.S.P. standard Vitamin A is too little for a positive assay, and that a three unit level is too much. The levels now used are $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{4}$, and $2\frac{1}{2}$ units per day. Collaborative spectrophotometric data of U.S.P. Vitamin A study were obtained under sponsorship of the Committee of Revision of the U. S. Pharmacopoeia. Other tests indicate that the U.S.P. Reference Standard is reliable for at least a year when stored as specified. It is the objective of the present study to derive basic information about the two methods in question in order to recommend proposals which will result in improved correlation.

BYPRODUCTS:

1. Determination of the vitamin A content of fish and fish livers. To determine potential sources of oil and vitamin A in fish and fish livers, analyses were made of fishery products obtained from Alaskan and Atlantic Coast waters. Data on a limited number of fish have been collected to date. A report on a phase of this project is in preparation.

2. Cooperative tests with Petersburg, Alaska, fur farm. The U. S. Department of Agriculture operates an experimental fur farm at Petersburg, Alaska. Here different diets for mink are tested and the Department is interested in utilization of salmon cannery waste for this purpose. It is proposed to collect, can, and freeze samples of salmon cannery waste at Ketchikan. These samples will be analyzed for protein, fat, ash, and moisture at the Service's Ketchikan laboratory, and for certain vitamins at the Service's Seattle laboratory. The bulk of the samples will then be shipped to Petersburg for feeding tests.

FISH FACTS

DO YOU KNOW .....

That touch is the most highly developed sense of fish. Organs in the form of buds or small pits in contact with the nerves are distributed over the entire body and are especially numerous in the barbels and feelers .....

--Fishery Leaflet 132