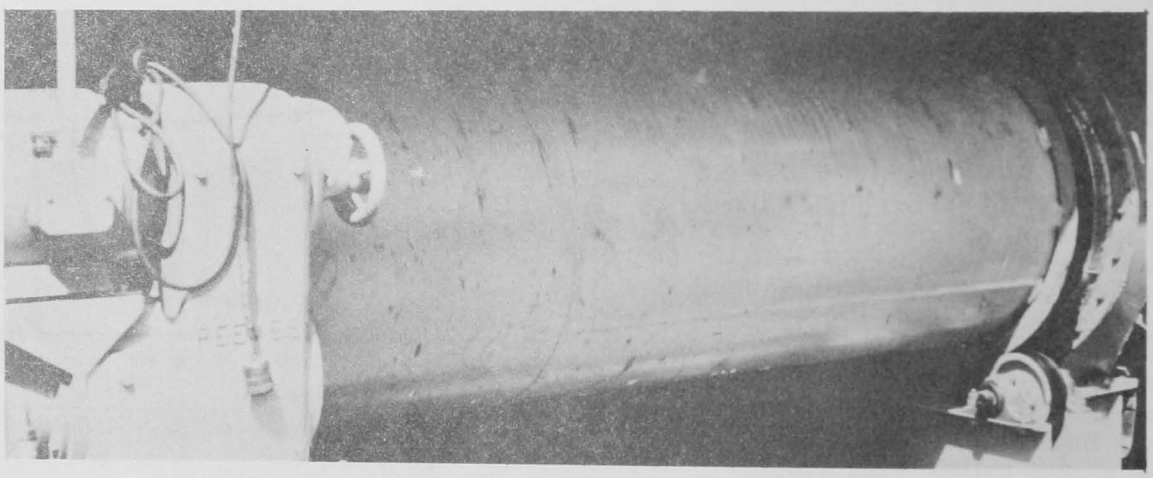
MANUFACTURE OF EXPERIMENTAL MENHADEN FISH MEAL ON A PILOT-PLANT SCALE

One of the major problems confronting the menhaden industry is the control of processing variables so that satisfactory meals can be made consistently by the best available production equipment at reasonable costs. When one considers the capital expenditure for plant, equipment, etc., which is in use only 6 months at the average factory and indeed only 2 months for some, it becomes an even more important item than in a factory which operates on a year-round basis.



Cylinder of pilot-plant dryer.

During the summer and fall of 1955, staff members of the Fishery Technological Laboratory, College Park, Md., produced menhaden meals with pilot-scale equipment at one of the menhaden fishery centers. The pilot plant was supplied by a manufacturer of large-scale equipment to a commercial plant which serviced and maintained it for the use of Service personnel.

In the production of menhaden meal with the equipment generally used today there are theoretically about 15 variables which can be adjusted to alter the final products. In the case of the pilot plant it was not feasible to study all of these variables. The pilot plant consisted of four basic pieces: the cooker, the press, the beater, and the dryer. There was also a centrifuge available to separate oil from the press liquor. The fish were fed directly from a hopper to a 6-inch screw auger which carried the fish in a tight cylinder about 6 feet long while cooking. The fish were cooked by live steam introduced into the cooker through several manifolds. The amount of steam and the duration of cook could be controlled within limits.

The press, to which the cooked fish were next brought, was a continuous Rennenberg press about 4 feet long and $2\frac{1}{2}$ feet in diameter. It was essentially a constant diameter cylinder containing a tapering screw auger with the small end at the inlet to the press. The press liquor was extracted through screens which formed the walls of the cylinder. This press had a variable-speed driving motor. Attached to the motor was an industrial analyzer which permitted, in part, the determination of the power required to operate the press under different conditions.

The resultant press cake was broken up by means of a beater consisting of a power-driven shaft with numerous rodlike side arms rotating at high speed. The action of this beater broke the large pieces of press cake into smaller lumps so that there was a larger surface area per unit weight exposed to the drying action in the dryer.

From the beater the press cake was conveyed by means of a drag-chain elevator to the dryer. The dryer was heated by a gas-fired furnace which supplied a forced draft of hot air to the large drying cylinder about 5 feet in diameter and 15 feet long. The speed of rotation of the drying cylinder could be controlled to determine the time of travel of the scrap. The heat of the air in the dryer could also be regulated, but not the air speed.

After passing through the dryer the scrap fell through a trap door for collection. The air went through a cyclone separator to trap small particles of scrap. The cyclone separator acted as a collection unit when another type of drying cylinder, known as the "Dehydromat," was used during the last week of the experimental period. However, it is necessary to grind the press cake to much smaller particle size to use this dryer successfully. The pilot plant, as presently designed, did not include such a grinder and the trial with the "Dehydromat" dryer was not successful.

During the past summer and fall the staff found that the present design does not permit a satisfactory degree of control for all processing variables. For example, the cooker originally supplied had to be modified several times because the capacity was such that even when operating at the slowest speed with the least amount of steam introduced to cook the fish there were too many fish for the press to handle. This obviously prevented operation of the press at any but the highest speed. Other difficulties, such as wrong pressure valves on the gas supply to the dryer and absence of a press-cake grinder, also plagued the operators.

Nevertheless it was possible to study the effects of such variables as size and quality of raw fish, degree of cook, and temperature of drying on resultant meals. The effect of these variables on the nutritive quality of the meals produced will be determined by chick and broiler growing tests this coming winter.

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CANNED SARDINE SPECIFICATION REVISED

A proposed revision of Federal Specification PP-S-51 (Sardines, Canned) has been prepared by the U. S. Fish and Wildlife Service and the Quartermaster Corps Food and Container Institute for the Armed Forces. The specification incorporates requirements for Federal purchases of Pacific and of Maine sardines. It has been submitted to members of the sardine industries for comment. This draft, dated November 21, 1955, has not been approved and is subject to modification.

COLLABORATIVE PROGRAM BETWEEN SEATTLE FISHERY TECHNOLOGICAL LABORATORY AND UNIVERSITY OF CALIFORNIA

A collaborative study has been started under the Saltonstall-Kennedy research program wherein employees of the U. S. Fish and Wildlife Service's Seattle Technological Laboratory work in the Food Technology and Poultry Husbandry Department Laboratories of the University of California at Davis. Two programs are currently under way: (1) concerning the nutritive value of fish meal, and (2) the oxidative deterioration taking place in the meat of fish, fish meal, and fish oils which results in rancidity and discoloration. The latter program is under way at the Food Technology Department of the University of California where much important research of a similar nature has been carried out in the past on meats and other foods. The experience and findings from research on these other foods is now being adapted to problems of the fisheries in the current collaborative program.

During November a three-day meeting was held at the Seattle Fishery Technological Laboratory to acquaint the new collaborative employees and University of California staff supervisors with special problems of the fisheries. Discussions and demonstrations were directed toward pointing out problems in the fisheries which differed from those dealing with other foods. At the same time the University of California personnel were able to suggest several important applications of techniques used in research on other food products which will benefit other correlated projects being carried out at the Seattle Laboratory.

FEEDING FRESH-WATER FISH TO FUR ANIMALS

Sheepshead, carp, goldfish, burbot, and gizzard shad are species of fish from the Lake Erie area that may be used for feeding fur animals. Of these, only sheepshead were found to have no thiaminase when the whole fish were assayed. The other species in the particular series of samples tested, contained this enzyme in considerable amounts. This does not prohibit their use for feed, but it means that the fish will have to be cooked, or fed in a special feeding schedule.

The protein content of the whole fish was found to vary from 14 to 17 percent in the samples analyzed. The fat content was lowest in burbot, namely, 5 percent; then sheepshead, 8 percent; goldfish, 11 percent; carp, 12 percent, and highest in the gizzard shad, 18 percent. The fish can be classed as medium fat except for the gizzard shad.

Samples of fresh-water fish will be analyzed from time to time so data will be available on the effect of factors, such as geographical location and season, on nutrient content.

POSSIBLE USE OF ALASKA FISHERY WASTES AS POULTRY FEED

In Alaska, as in other fishing areas, the disposal of fish and shellfish wastes is always a problem. One of the possible methods for partially or wholly utilizing the waste material is to process the waste into meal for use in poultry feeding. Little information is available, however, concerning the feeding value of certain meals which could be produced from material available in Alaska. To obtain such

information, the Fishery Products Laboratory at Ketchikan has prepared experimental meals from pink salmon eggs, pink shrimp waste, and dungeness crab waste. These experimental meals are now being evaluated at the University of California and the University of Wisconsin for protein quality and unknown growth factors when used as poultry feeds. These universities are two of the contractors participating in the U. S. Fish and Wildlife Service research program now under way with funds made available under Public Law 466, commonly referred to as the Saltonstall-Kennedy Act.

PROGRESS ON OYSTER RESEARCH

The fourth bi-monthly report has been received from the group at Louisiana State University describing the research in progress with Louisiana oysters. The frozen oysters have been stored for six months, with no marked changes observed to date. Data on composition of oysters collected by the State from specific areas representing typical seed and growing areas have accumulated to the stage where certain seasonal trends are becoming evident. The group has also developed and evaluated two quick colorimetric tests for approximating the total bacterial count of fresh oysters. These tests may be of value in plant sanitation control or to indicate the probable storage life and general quality of oysters.

YELLOW DISCOLORATION IN FROZEN LOBSTER MEAT

Experiments carried out in Halifax, Canada, show that the yellow discoloration and the accompanying off-flavor that develop in stored frozen lobster meat appear to be associated with the oxidation of the red pigment to a yellow one. The oxidation occurs especially in the tips of the claws, which have a higher fat content than the rest of the meat. Development of discoloration is rapid in the window and open-seam push-cover types of can, neither of which should be used. The use of sealed cans, or vacuum pack cans, coupled with quick freezing and storage at low temperatures, should prevent any discoloration. Antioxidants, such as ascorbic acid, may also be effective.

--Atlantic Fisheries Experimental Station
Circular No. 2, 1953,
Fisheries Research Board of Canada.