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# FISH INDUSTRY IN THE UNITED STATES

## HEARING

BEFORE A

### JOINT SUBCOMMITTEE OF COMMERCE AND FISHERIES

UNITED STATES SENATE

SIXTY-FIFTH CONGRESS

SECOND SESSION

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TUESDAY, OCTOBER 1, 1918



WASHINGTON  
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Mr. FLETCHER, of Commerce.

Mr. NUGENT, of Fisheries.

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# FISH INDUSTRY IN THE UNITED STATES.

TUESDAY, OCTOBER 1, 1918.

UNITED STATES SENATE,  
SUBCOMMITTEES OF THE COMMITTEE ON  
COMMERCE AND COMMITTEE ON FISHERIES,  
*Washington, D. C.*

The subcommittees of the Committee on Commerce and Committee on Fisheries met at 10 o'clock a. m. in the committee room of the Committee on Commerce, Capitol, in joint session, pursuant to call, Senator Duncan U. Fletcher presiding.

Present: Senators Fletcher (chairman) and Nugent.

Present also: Senator Robert L. Owen and Senator James D. Phelan; Dr. Carl L. Alsberg, Chief Bureau of Chemistry; Dr. E. D. Clark, assistant to Chief Bureau of Chemistry; Dr. F. W. Weber, chemist in charge of Animal Physiological Laboratory, Bureau of Chemistry; and Dr. M. E. Pennington, Chief Food Research Laboratory, Bureau of Chemistry, of the Department of Agriculture; Dr. R. E. Coker, assistant in charge of Division of Scientific Inquiry, Bureau of Fisheries, and Mr. L. Radcliffe, assistant in charge of Division of Statistics and Methods, Bureau of Fisheries, of the Department of Commerce.

The CHAIRMAN. Dr. Alsberg, will you kindly make a general statement for the purpose of the record?

## STATEMENT OF DR. CARL L. ALSBERG, CHIEF OF BUREAU OF CHEMISTRY, DEPARTMENT OF AGRICULTURE.

Dr. ALSBERG. The Bureau of Chemistry has had a small appropriation of some \$14,000 or \$15,000 for four or five years for the promotion of the utilization of fishes for food and other uses. When the present war emergency arose it seemed wise to spend a part of that appropriation in stimulating the production of fish in various seaboard States, among others in California. For that purpose Dr. E. D. Clark, who had been under Dr. Pennington in charge of the fish-handling work which was done in the Southeast and Gulf waters, was sent to California in order to stimulate the production of fish for food purposes there. The work which he was instructed to undertake was along several lines. In the first place, he was instructed to investigate the best methods of canning and packing the various fish now being canned and packed in California—in the main sardines and various varieties of tuna—and in addition to endeavor to induce the California packers to can other varieties not now used to any appreciable extent for food, such as barracuda and anchovy and a considerable number of other varieties that are now but little used.

In addition he was instructed to look into the question of the shipping of fresh fish inland, which he had already studied with Dr. Pennington.

A further direction in which he was instructed to work was to promote the preservation of fish by other methods than canning, such as by salting, smoking, kippering, and drying, which have some advantages over canning in that they do not require so extensive equipment, nor use tin plate, but have a disadvantage in that the product is not so completely perishable as are canned foods.

These are the three directions along which he was instructed to operate: To improve methods of canning and to endeavor to stimulate the use of varieties not now utilized; to assist in whatever way possible in the transportation to market of fresh fish, especially varieties not now being utilized. I might mention shad, the roe of which is shipped and the fish itself is not eaten very much in the bay cities in the vicinity of San Francisco. My statement on that is right, is it not, Dr. Clark?

Dr. CLARK. Yes.

Dr. ALSBERG. And also to stimulate and investigate the salting and smoking and similar methods of curing and preserving fish. As I said, those are the three lines of work that he was supposed to undertake. Some of our bulletins, reports, and statements to the trade are submitted for the Senators' inspection.

Senator FLETCHER. Has the Bureau of Fisheries cooperated in that work, or has your investigation been independent of that?

Dr. ALSBERG. No, Senator; there has been nothing done by the Bureau of Chemistry which has not been done with the cooperation and knowledge and approval of the Bureau of Fisheries. No work has been undertaken at any time by the Bureau of Chemistry without getting the approval of the Bureau of Fisheries before it was begun.

Are you interested in learning how the Bureau of Chemistry got into this work at all?

Senator OWEN. I would like to know it.

Dr. ALSBERG. Well, it is largely my fault, personally. A good many years ago, before I had any connection whatever with the Federal Government, except that of any other citizen, I was an instructor in chemistry in the medical faculty of Harvard, and in the summer the Bureau of Fisheries used to employ me for three months during my vacation to go down to Woods Hole, where they have a station, to make analyses of food fish. That was in the days when Mr. Oscar Straus was Secretary of Commerce and Mr. Bowers was Commissioner of Fisheries. At that time I suggested to Mr. Straus and Mr. Bowers, whom I happened to know personally very well, that in my judgment it would be a very wise thing for the Bureau of Fisheries to undertake a rather extensive piece of work to investigate and promote the industrial side, as you might call it, of the industries which are based on sea products, such as the proper methods of cold storing fish and handling fish, the manufacture of glue, the production of oil from fish and its utilization, the possibility of utilizing fish oil for food purposes, the manufacture of potash from kelp—all of that sort of thing—and the production of leather from various sharks and porpoises, and the use of fish which are not now being used. Both Secretary Straus and Commissioner Bowers approved of the general idea and said that they would take it up with Congress. Whether that

was done or not I do not know. At any rate, no appropriation was made and the work was not started.

Then, when I became, about eight or nine years later, Chief of the Bureau of Chemistry under Secretary Wilson, I went to Secretary Wilson and asked for his approval—the Bureau of Fisheries not having procured an appropriation—for the Bureau of Chemistry to ask Congress for money to make a beginning in this work. Secretary Wilson signed a memorandum to me, which I prepared for him, that he approved of the plan. I asked him to do that, because he was about to retire, there being a change in administration; and when the new administration came in I put this question to Mr. Houston, showed him Mr. Wilson's approval, and received Mr. Houston's consent to ask for a small appropriation from Congress, some \$15,000. We asked actually for \$25,000, but we got \$15,000. We have had that now for four years, is it not, Dr. Pennington?

Dr. PENNINGTON. Just about four years.

Dr. ALSBERG. That appropriation was very small to carry on the many kinds of work, and it seemed wiser to put almost all our eggs into one basket in the beginning than to fritter a small appropriation away in many lines of work.

The particular part of the fish industry which seemed to require help was the question of properly marketing fish. The waste which occurs in sending fresh fish from the coast inland is terrific. They are handled badly; nobody has ever made a study of the right way to ship them, how to freeze them, how to chill them, and all that sort of thing. It happened we had made just that kind of study for poultry and eggs, which, like fish, are very perishable. So the first piece of work we undertook was the improving of the methods of transporting fresh fish, in order that the consumer should get fresh fish and at a reasonable price, and so that we would overcome some of the prejudice against fish as they exist.

When I say "fresh fish," I am including the frozen fish, and using that term as opposed to canned or salted or smoked or kippered fish, because a properly frozen fish is a perfectly satisfactory article, a perfectly satisfactory food. The trouble with frozen fish has not been, and the prejudice against them is not due, to the fact that freezing is an unsatisfactory way of preserving them, but it is due to the fact that a good deal of freezing has been done by people who do not understand how to do it, because the way to do it is immediately to chill the fish away below the freezing point and to dip him in fresh water. The fish, being much colder than the water, instantly covers itself with a hermetic seal of ice, and then it is put in storage and it is sealed as perfectly, as long as it is kept cold enough to keep ice on it, as though it were canned by some housewife in a Mason jar with a rubber seal. If the fish is not consumed within two or three months, then the seal has to be renewed and the fish has to be redipped, because ice separates without melting, which is not generally realized. It is what the physicists call subliming. That is the main point about freezing fish. But there are a lot of tricks about how to handle them and keep them fit from the time they are caught to the time they are frozen; and that is the trouble.

So the bulk of the money which we had was spent on improving the quality of the fish and teaching people around the country who were handling fish how to get them in right shape for the market.

Bulletins have been issued giving directions for the proper methods of freezing fish, handling shrimp in the South, and also bulletins on the food value of fish.

A smaller sum of money was spent on helping to improve the pack of sardines on the Maine coast.

Among the localities in which we have endeavored particularly to promote this handling of fresh fish has been the Carolinas and Florida. On the Gulf coast of Florida, or at any rate in Florida, there are many varieties of fish which never come into the market, because nobody has made a serious effort to market them; and in the Carolinas the transportation conditions—concerning which Dr. Pennington, if you wish details, can give you more information than I can—are such that a large percentage of the fish before they reach the northern markets have to be thrown away—go to the dump—because the transportation conditions are not right. That also is the condition in Florida. It was necessary to organize the transportation in cooperation with the railroads. It was necessary to get the railroads to put on proper refrigeration service, and it was necessary to study what that service must be—how the fish should be iced.

When the food-production bill came, I asked the Secretary of Agriculture to allot to us some money with which we could expand and make more effective the work which we were then doing, and it is with some of that money that Dr. Clark was sent out to California. It is with that money that Dr. Pennington undertook a service which may be interesting, if you care to listen about it, to popularize and put upon the market fish from the west coast of Florida in such cities as Indianapolis, Louisville, and Nashville.

Before that work was undertaken it was taken up with the Bureau of Fisheries. In Florida the Bureau of Fisheries had Mr. Douthart cooperating with Dr. Pennington and Mr. Hill, of the Bureau of Chemistry, and in California Dr. Clark was continuously cooperating with such of the Bureau of Fisheries people as happened to visit that district.

I may add that before we got the original small appropriation, four years ago, I went to Dr. Smith, who had just recently been made Commissioner of Fisheries, and asked him whether it was agreeable to him for us to go into this work. He said that inasmuch as they had not succeeded in developing the work, that it ought to be done by somebody, and if we could get the appropriation to do it he would not object; and we have had a sort of direct understanding between us that whenever the Bureau of Fisheries was in a position to carry on this work on a more extensive scale or to better advantage than we could carry it on, we would readjust it, and the Bureau of Chemistry would, if it seemed wise, gradually draw out of it.

Senator OWEN. So Dr. Clark then made this particular inquiry on the California coast, and he has now the samples of those different packs and fish products that are used there?

Dr. ALSBERG. Might I say, Senator, that we have put up a good many experimental packs of new products ourselves? But we did not have many of them available in the Bureau of Chemistry, and there was not time to telegraph to California and get them by express. So Dr. Clark—

Senator OWEN. That could be added and put in with this matter by an addenda.

Dr. ALSBERG. Oh, Dr. Clark is in position to discuss it, but he is not in a position to show it; that is all.

Senator FLETCHER. We will now, if you please, hear Dr. Clark.

**STATEMENT OF DR. E. D. CLARK, ASSISTANT TO CHIEF OF BUREAU OF CHEMISTRY, DEPARTMENT OF AGRICULTURE.**

Dr. CLARK. My chief, Dr. Alsberg, has spoken my speech for me, because he has outlined in a concise way everything we did.

One of the main troubles we found when we went to California over a year ago—and I may say that we went there at the request of Mr. Ralph P. Merritt, the able food administrator of California—that some reform was necessary in the methods of packing fish in southern California. I do not need to describe that in detail, because Dr. Alsberg has outlined the situation in Maine, and it existed in California to some extent. The packers realized this and had a large mass meeting at the Athletic Club in Los Angeles. Mr. Merritt addressed them, and after the meeting was over they asked us what we thought should be done. We told them that the quality of the pack as well as sanitary conditions in the canneries would have to be improved, and they immediately asked me to draw up a series of rules and regulations for the standardization and improvement of the quality of the pack. We did that, and at another meeting a little later—

Senator OWEN. Will you put those rules and regulations into the record?

Dr. CLARK. I have them right here. I can give them to the stenographer later.

(The rules and regulations referred to were subsequently furnished by Dr. Clark, and are here printed in full, as follows:)

*Proposed rules for the inspection and standardization of sardine canneries.*

CATCHING.

1. Keep fish in boxes not over 8 inches deep or in wells with water.
2. The custom of walking on fish should be forbidden.
3. Keep fish always wet and away from direct sunlight.
4. Fish boxes and other storage places to be washed after every load.

RECEIVING.

1. All belly-blown and soft fish should be refused at the dock.
2. Avoid all handling or rough treatment that may result in bruising the fish.
3. Store in containers not more than 8 inches deep.
4. All boxes, tools, conveyers coming in contact with the fish should be washed daily.

CLEANING.

1. Removal of entrails to be complete in all cases.
2. Fish to be thoroughly washed after cleaning.
3. All boxes, benches, and woodwork to be washed thoroughly at least once daily.
4. All knives, tools, and metal utensils to be sterilized and steamed at least once daily.

DRYING AND COOKING.

1. Drying and cooking to be carried out in a uniform way as to temperature and time, depending upon the method used in each individual plant.

## PACKING.

1. All fish to be on flaking trays or packed and processed within five hours of the time received from the fishermen.
2. Fish to be packed in a uniform way, depending on the size of the can and the style of the pack; only fish of given size and number to be placed in each can.
3. Sauces and oils used are to be of uniform high quality and of the grade commonly used for food purposes.
4. The pack should be full net weight, or slightly over.

## PROCESSING.

1. Time, temperature, and style of process to be uniform in each plant, depending on the general method used there.

## LABELING.

1. A label should not be misleading in any way and should conform in every way with State and Federal laws.
2. Goods packed and inspected as herein stated may bear on the label the following legend: "Packed and inspected in accordance with the official standards of the Southern California Packers' Association."

## BOXING.

1. Cases of goods packed and inspected according to these rules shall bear a stamp giving the inspector's number and the date, to aid in placing responsibility in case of complaints received later on.

## DUTIES OF INSPECTORS.

1. To pass on the quality of fish received from the fishermen.
2. To see that all the above regulations concerning the catching, receiving, cleaning, cooking, packing, and labeling of fish are carried out in every particular, especially regarding cleanliness and standard pack.
3. To see that the general sanitary regulations are strictly adhered to in all cases.

## GENERAL SANITARY REGULATIONS.

1. Whitewash should be used frequently on walls and ceilings of workrooms and canneries.
2. Screens should be installed to exclude flies in rooms where raw or cooked fish are exposed.
3. Workrooms should be as light as possible. This is in the interests of efficiency and careful grading, as well as sanitation.
4. Wash rooms and toilets should be kept scrupulously clean and due provisions made for maintenance of strict personal cleanliness on the part of all employees.
5. All metal knives, tools, trays, and baskets should be sterilized with steam at least once in 24 hours.
6. The floors should be of concrete, if possible, and frequently flushed with running water.
7. Worktables should be kept clean, as free from litter as possible, and thoroughly washed with lye or antiseptic solution daily.
8. Forewomen should see that the hands of those who handle fish are thoroughly washed after each absence from the room.
9. Caps to cover the hair, and a clean apron should be worn by women employees handling fish.
10. Forewomen should observe carefully the general health of women under them and also watch especially for any signs of skin or local disease.

Dr. CLARK. We outlined the rules and regulations that seemed to us would make the desired improvement, both with a view to improving the sanitary quality and standardizing the pack. Of course, it is obvious in any packing organization that the standardization of the different operations must be as nearly complete as possible, not

necessarily between the different canneries but in any given cannery they must pack their fish as far as possible and handle them in exactly the same way. If they do not you will always notice great differences in the quality of the product.

SENATOR FLETCHER. Does that apply to the particular kinds of fish they were packing there, or does it apply generally?

DR. CLARK. I think it applies to anything. Would you not say so, Dr. Weber?

DR. WEBER. All the different kinds of fish.

DR. CLARK. The Senator wants to know if you do not think it is necessary to standardize the processes, so that the packer will always do about the same thing with any particular kind of fish.

DR. WEBER. They all ought to be handled the same way. That is true particularly of fish where they are being salted; they ought to have the same degree of salting.

DR. CLARK. Later another meeting was had with these fish canners. They unanimously approved these proposed regulations that we had drawn up, and the next thing they did was to install an inspection service similar to that in Maine among the sardine canners. At that time there were about 22 canneries in southern California packing sardines. This applied only to sardines, by the way. They began to organize and immediately made arrangements to get a capable chemist to head that inspection work. It happened that they chose one of our chemists from the Bureau of Chemistry, and since then he has been carrying on that work.

SENATOR OWEN. Who is in charge of that work?

DR. CLARK. Mr. Hendrickson, formerly a member of the Food Research Laboratory and a member of the Bureau of Chemistry for 10 or 11 years. He has met with considerable success, and it is a source of great satisfaction to us that the final rules and regulations that have been adopted by the inspection service after experience with them are practically identical with the ones we tentatively drew up over a year ago.

This spring the packers of fish in California—who, by the way, had increased in number from 22 to over 30—unanimously agreed to put the packing of tuna under the same rules for standardization and improvement of quality as sardines. So, at the present time in southern California there are over 30 canneries banded together in a self-imposed inspection under the leadership of a man who has had a great deal of food-inspection experience and a great deal of chemical training. He also has a chemical laboratory to control the whole thing and 25 inspectors.

I am giving that to you in detail, because I think that it is one of the good things we have done, although we did not do it in our own office, we were directly responsible for it, and Mr. Merritt, the food administrator, and others familiar with the California situation say it has been a life-saver for the industry.

SENATOR OWEN. As I understand it, the difficulty about packing fish is that fish undergo a rapid deterioration unless properly packed and properly handled.

DR. CLARK. And very promptly.

SENATOR OWEN. And otherwise ptomaines are liable to develop in the food itself?

Dr. CLARK. That is it exactly.

Senator OWEN. And results, therefore, in danger to human health if the packing is not done uniformly under a fixed system which will safeguard the product against ptomaine poisoning?

Dr. CLARK. Of course, when you say "ptomaine," a chemist always wonders exactly what you mean.

Senator OWEN. We will let that pass. It means poisoning the public.

Dr. CLARK. It means disturbance of digestion more or less severe.

Since that time we have been continuing our work, as I might say, along the technical line; that is, we have had one chemist spending all of his time in the sardine canneries and tuna canneries of southern California helping them in the actual troubles they meet. We have insufficient funds for the necessary experimental cannery and laboratory.

Senator OWEN. Are they salted, or are they packed in oils, or how are they packed?

Dr. CLARK. They are not packed the same way they are in Maine. The sardine industry in California is an entirely different proposition. The fish are not caught in weirs, because the coast on the western part of this country sheers off into deep water. There are no flats and no places to put weirs, and the only way one can get sardines is to go out with nets. The Japanese and Italians are especially efficient and go out just before daylight, and by the phosphorescent gleam in the water can encircle a school of sardines and bring them in. Sometimes they get so many they can not land them in the boat. From the time the fish are caught until they are actually packed in the cans there are a great many differences in the way that the fish are handled.

Senator OWEN. There must be a limited amount of time between the catching of the fish and the packing?

Dr. CLARK. There is a limited time between the catching of the fish and the packing. One of the original rules was that not more than five hours should elapse between the time the fish were caught and when they were processed. However, that was not found practicable, and they had to extend the time to seven hours. We also had to make rules and regulations regarding the depth of fish in the boats.

Senator OWEN. To prevent crushing?

Dr. CLARK. Yes. In Maine, as I understand, there were more canneries than fish. The opposite is true in California. In California it is often perfectly feasible to go out a few miles and catch more fish than the boats can bring in; and the fishermen naturally want to bring all the fish they can, and they were in the habit of filling the boat 2 or 3 feet deep, and the Italians and Japanese walked all over them with hip boots. So one of the regulations was to make the limit of the height of fish not to exceed 8 inches, but that was found too stringent and it had to be extended to 10 inches. I have noticed the Japanese and Italians paint a white line around the inside of the boat at 10 inches, and that is the dead line. Mr. Hendrickson's inspectors—who, by the way, are also deputies of the Food Administration—insist that the fish should not be loaded above that white mark. That, of course, is to prevent the weight of the delicate fish crushing each other, since they will crush by their own

weight, and the bottom fish will have their bellies broken through, and when canned will look bad.

Dr. ALSBERG. You might explain to the Senator, Dr. Clark, how recently the sardine industry began and how really it was a side issue in California.

Dr. CLARK. It is a most interesting development. About two years ago the tuna industry came to its high point. In other words, the beginning of the tuna industry itself does not go much back of 1911 or 1912, and at great expense, even at the expense of selling fish below cost, the people who were interested in tuna sold a can of tuna at 10 cents when it cost 20 cents to put it up. They had to do that to meet the competition with salmon, which is a staple article. Tuna is now established and usually sells for a little higher price than salmon.

Over 8,000,000 cases of salmon, each of 48 cans, were packed in the United States and Alaska in 1917; also about 150,000 cases of sea and river herring and 400,000 cases of tuna; probably 10,000 cases of mackerel and 2,000,000 cases of sardines in Maine, while about 1,500,000 cases of sardines were canned in California. Small packs of desirable but insufficiently introduced fish like yellowtail, bonita, etc., were also made. It is likely that the fish canners of the United States received about \$65,000,000 in 1917 for their product.

The Bureau of Chemistry has recently investigated the packing of river herring on Chesapeake Bay. There are approximately 60 establishments of this sort packing salt river herring, canned river herring, and canned roe. It is estimated that 40,000 barrels of salt fish, 54,000 cases of canned fish, and 44,500 cases of roe are packed annually. This is estimated to require 37,000,000 fishes.

In the field of the preservation of fish by salting and drying, it may be said that about \$6,000,000 or \$7,000,000 worth of codfish and related fishes were preserved in this way at Gloucester, Mass., and stations in Alaska. About 30 per cent of the amount of salt dried codfish prepared was exported principally to the West Indies, South America, and Central America.

At present the importation of sardines and kippered herring is practically negligible, owing to the disorganized condition of the producers in Europe, embargoes, and the shipping situation in general. However, in 1913, the year before the war, the United States imported something over \$2,500,000 worth of sardines and anchovies in oil and over \$3,000,000 worth of pickled and canned herring together with over \$1,000,000 worth of salt mackerel.

It is very difficult to secure statistics of the total value of fish produced in any country. The latest accurate figures for the United States are those of the census made in 1908. However, it is possible to secure accurate figures in the case of Alaska for 1917 and conservative estimates have been made for the United States in 1917 and other countries from the latest available figures and the totals are shown in the table below. The value to the producer is the one given here. In the United States the retail values would be from 50 to 100 per cent greater than these figures.

*Estimated value of fish produced in the United States and foreign countries.*

Country.	Year.	Value.
United States, continental only.....	1917	\$60,000,000
United States, Alaska only.....	1917	51,000,000
Canada, including Newfoundland.....	1916	45,000,000
Great Britain.....	1916	54,000,000
France.....	1913	33,000,000
Germany.....	1913	11,000,000
Norway.....	1913	14,500,000
Japan.....	1911	63,000,000

Tuna can only be caught about three or four months in the summer, and at best it is a highly uncertain undertaking.

Senator OWEN. Are they caught with nets?

Dr. CLARK. They are caught with hook and line mostly, and it is only at certain times they can catch them. They have to be caught one at a time. Often the fishermen go out for many days and do not see any tuna, and the next time they will find so many tuna that all they have to do is just put out hooks and lines and just drag them in.

Senator OWEN. How large are they?

Dr. CLARK. They vary greatly in size, depending on their age and species. Of course, when I say "tuna," I mean there are three different fishes packed as tuna, all closely related.

Senator OWEN. Does the barracuda belong to that family?

Dr. CLARK. No; that is a different type of fish. There is a fish on the Atlantic known as "tunny" fish, which is nearly identical, or at any rate very closely related to the tuna in California.

Senator OWEN. What is the difference?

Dr. CLARK. Albacore is the name of one; and then the real or leaping tuna, and another. I think they call the yellow-fin tuna. Personally, I can not pick out all of those different species, but the fishermen can readily tell the difference. All are accepted and paid for at the same rate.

Senator OWEN. Are they packed in salt?

Dr. CLARK. They are packed in cottonseed oil in a different way from sardines. It is an entirely different industry, but owing to the uncertainty of the catch, the people who carry it on realized they would have to look to other fields, firstly, in order to keep going continuously and keep their organization of labor together; and, secondly, because of the uncertainty of the tuna catch, they never knew whether the next year they would have any fish or not. In that haphazard condition of tuna packing, they began trying to pack sardines.

So that, as Dr. Alsberg said, the sardine industry really developed as a side line of the tuna industry, in the attempt to keep plants going all through the year. In California sardines can be caught about 10 months in the year. In fact, they can be caught practically 12 months in the year, but not always in commercial quantities; but, I understand, in Maine that in certain months of the winter they can not operate. Probably in Maine the season is from April to November.

Senator FLETCHER. Is tuna found anywhere else except on the California coast?

Dr. CLARK. They are found in the Hawaiian Islands and also in Japan and off Lower California.

Senator OWEN. Are the sardines found off the Florida coast?

Dr. CLARK. I think not, but, perhaps, Dr. Coker will tell us.

Dr. COKER. They are not the same sardines. There is nothing quite corresponding to the California sardine, which is the nearest thing to the European. There is one small sardine in the West Indian waters, but it does not come very much to Florida.

Senator OWEN. Are they there in sufficient quantities to justify packing on the Florida coast?

Dr. COKER. I do not believe they are. There are times when they are fairly abundant, but are erratic in quantity.

Senator FLETCHER. Is menhaden related to the sardine?

Dr. COKER. They belong to the same family of fishes, the herring family.

Senator OWEN. But the menhaden is not packed for human consumption?

Dr. CLARK. I think not; no; not in any quantity.

Dr. ALSBERG. The menhaden are being eaten, to a small extent, by the foreign population in some of the large cities. There is not any reason why the menhaden should not be eaten as human food, and it has been in some cities by people who do not object to the oil.

Dr. CLARK. As I was saying, we are trying now in every way we can to assist the canners in technical ways, and by that I mean by improving the methods of their plants. We found we had to standardize the drying in the packing process and that great trouble comes from improper drying of the pack more than from any other one thing. It is one of the crucial points in packing.

Senator OWEN. How is that drying done?

Dr. CLARK. That drying is done in various ways. Some people claim that to put up the best sardines they should be dried in the sun on a wire screen before cooking, but you can readily understand that even in California it rains sometimes. So, during the winter season and usually in order to save time, they dry with mechanical dryers. The fish pass through on a long galvanized-wire screen belt that passes slowly back and forth in a heated compartment, where the temperature is kept at 90° to 100°, and the warm air circulated by fans. The fish go into the dryer wet and come out dry, and this drying process is all automatic and continuous.

Senator OWEN. Do they use the vacuum process for drying purposes?

Dr. CLARK. One cannery uses something which they call a vacuum process. The main thing is to have the fish properly dried. If the fish are not properly dried when they go into the hot oil, the results are not satisfactory. They are usually fried in cottonseed oil. All those except the ones packed in round cans are fried, with a few exceptions. We feel a sardine that is steamed, at least under the California conditions, is not quite up to the standard we would like.

Senator OWEN. I was under the impression that olive oil was used in canning sardines.

Dr. CLARK. It is in the packing. The frying is merely a cooking process, just the same as you would fry them in your home.

Senator OWEN. Then they are packed in olive oil?

Dr. ALSBERG. It might be added that the European—Spanish, Portuguese, and French—method is to fry in peanut oil, and then let the oil drain off, and then put the fried fish into the can and fill with olive oil.

Senator OWEN. They are not cooked in olive oil?

Dr. ALSBERG. No; because the cooking ruins the flavor, and you might just as well cook in a cheaper oil, such as peanut oil.

Senator FLETCHER. Is that so-called olive oil refined oil from cotton seed?

Dr. CLARK. No. It has been misbranded, but not lately.

Dr. ALSBERG. I would not put it that way. We prosecuted about 75 people under the food and drugs act, mostly Italians, small men around New York, New Haven, and Boston, for doing that.

Senator OWEN. For packing in cottonseed oil?

Dr. ALSBERG. No; for adulterating olive oil with cottonseed oil. We can now say, without much danger of being wrong, that when

an article is branded olive oil in this country it is genuine olive oil, although every once in a while some little manufacturer will endeavor to put something over by labeling cottonseed oil as olive oil, and every year we have a certain number of prosecutions.

Senator OWEN. Does the flavor of the fish keep as well when packed in cottonseed oil?

Dr. CLARK. The question of using cottonseed oil or olive oil for packing fish is a question of taste rather than of anything else. By some sort of a peculiarity of nature it seems as though tuna which is packed in cottonseed oil does not taste bad, possibly because the fish oil has been cooked out. But when sardines, under certain conditions, especially if not properly handled in the plant, are packed in cottonseed oil they do not have a flavor that is pleasant to many people. But I do not wish to take the position that cottonseed oil is not the proper thing to pack sardines in. It seems to me that the Maine industry, which uses largely cottonseed oil, is on a very good foundation. They are putting out an article for which there is great demand and which has as high food value as the California sardines. In other words, people who in the past would buy foreign sardines, and pay 25 or 30 cents for a quarter-pound can, packed in olive oil, prefer to buy the California sardines and pay the price. In other words, there are two distinct markets for olive-oil and cottonseed-oil sardines.

Dr. ALSBERG. In time past a great quantity of the sardines packed in Maine were sold at retail for 5 cents a can. That is true, is it not, Dr. Weber?

Dr. WEBER. Yes.

Dr. ALSBERG. They sold at 5 cents a can. They had to be packed in cottonseed oil to be sold at that price, and so far as actual food value is concerned there is not anything that would give more food value for 5 cents than such a can of sardines. Of course, they are not selling for that now. Five cents for a quarter pound of food consisting of nitrogenous material packed in oil is certainly very cheap.

Senator FLETCHER. It looks as if the can would be worth that much.

Dr. CLARK. They are almost, under the present conditions.

Senator OWEN. Are any of those fish absolutely dried out into a dry powder and used in that way?

Dr. CLARK. No. Dr. Alsberg called me back to Washington about a month ago, and just before I left California one of the firms that has had the greatest success in producing dried vegetables started experiments on the dehydration of fish by the same process.

Senator OWEN. By the true-vacuum process?

Dr. CLARK. I think so, but I have never had an opportunity to go to Santa Rosa, where their plant is, to examine it.

Senator OWEN. Have you any samples of absolutely dried fish with you here to-day?

Dr. CLARK. I have not; it is all an experiment so far.

I believe, however, that Dr. Weber has done something along that line on the Atlantic coast with the fish caught there. And I think there is a future along that line. I was going to say, however, in passing, that at the present time we are trying to extend this work

on packing sardines so as to pack mackerel in the same way as tuna, and also skipjack, bonita, and yellowtail, and a whole group of other fish of the very highest food value, which are not at present utilized in any way.

Senator OWEN. Are those fish abundant in California?

Dr. CLARK. They are very abundant in California, and as they are of different species they run at different times, so that a plant, operating on tuna and sardines, could get two or three kinds of these other fishes throughout the year and thus keep continuously at work.

But the great difficulty is to get the people to eat these new kinds of fish. For instance, I will show you some very attractive cans of yellowtail, mackerel, and bonita, which are just as good as tuna fish, and cheaper than tuna, and if you taste the yellowtail you will think it has just as good a flavor as any tuna. But you can not sell much of it for it is difficult to educate the people to eat it.

Senator OWEN. They do not like the yellow name of the fish?

Dr. CLARK. They do not like the yellowtail name on the label. If we change to "amber fish," there is the same difficulty. In the four years I have been working on fish questions the thing that has most impressed me is the enormous amount of prejudice people have against fish. Many people will not eat it at all; others will eat it only once a week, and it is a pretty hard proposition to get people to eat a new fish or fish product any time.

Senator OWEN. Did not the department name one fish the dogfish?

Dr. CLARK. The Bureau of Fisheries christened some of these fish with new names.

Senator OWEN. Would it not be advisable to give them a baptismal name that is more attractive than "dogfish"?

Dr. CLARK. Yes; but regard must be had to the pure-food law in that respect.

Dr. ALSBERG. In the long run, Senator Owen, it pays better to keep the names, to a certain extent, straight. Now, take the sardine industry. Five or six years ago, when canners were thinking of going into the industry to fill in between the tuna pack, they wanted to be permitted, under the food and drugs act, to pack real sardines under the name of herring, but we objected to that. Of course, we felt that real sardines are a much better fish than herring, and that it would be bad policy to allow them to be called herring. I do not doubt that to-day they are very glad that they packed them as sardines and not as herring, as they had originally intended.

In the same way, at the present time they have immense quantities of anchovies on the coast which they are not using at all. That is one of the fish that they wanted to pack as sardines. The anchovy is a fish which, in the markets of the East and of Europe, has a higher value than the sardine; and I am sure it would be better policy for them to go, perhaps, a little slower and pack them for a year or two as anchovies and to put them out on their merits.

In the case of the dogfish and the yellow tail, for which little market exists at present under those names, it is an entirely different question, as anchovies have an actual market at present in certain districts.

The Bureau of Fisheries renamed the dogfish, with our consent, the "grayfish."

Senator FLETCHER. Has not the tilefish come back into use?

Mr. RADCLIFFE. Yes, sir.

Senator FLETCHER. How are they holding out?

Mr. RADCLIFFE. Very well.

Senator FLETCHER. Are they canning those fish at all now?

Mr. RADCLIFFE. No; they are all sold fresh.

Senator FLETCHER. There is a singular thing connected with the catfish that they get out of the Florida rivers; they are regarded there as having no food value at all. But when they ship it up to Tennessee and other States it is considered as fine a food as codfish; they consider it as very choice food.

Dr. CLARK. The same condition exists in California in regard to shad and striped bass, which were planted in California rivers; they are not native to California. The people of California do not eat the flesh of the shad, except in very limited quantities. The roe is canned and it is also shipped fresh, and is eaten fried with bacon; it is considered one of the great delicacies in San Francisco during the season. But they have found out in California during the last few years that they can ship this shad east—from the Sacramento River to the eastern cities—and make a good profit out of it after paying \$600 to \$700 express charges on a carload. That is because that shad is not appreciated in the State where it grows. The undeveloped fish resources in California and Florida are enormous, but such new fish must be introduced to the people.

Senator OWEN. So that the market for fish seems to be somewhat whimsical, does it?

Dr. CLARK. Yes; it is a matter of prejudice; the flavor of the fish has little to do with it. The Californian does not eat shad, because his mother did not cook it for him when he was young; but he will eat the shad roe, and he thinks it is fine.

Senator FLETCHER. Did you ever experiment with any other fish except the sardine and the tuna that you have mentioned?

Dr. CLARK. Yes; I was going to discuss that in a few minutes.

Senator FLETCHER. All right.

Dr. CLARK. The need for work is very great along the lines of canning these different new fish that I have mentioned, like yellowtail, bonita, skipjack, anchovies, barracuda, rock cod, and sea bass. Those fish are not utilized in canning in any quantity. There is great need of an experimental cannery to work out all these things in a practical way.

Senator OWEN. Can they be canned in large packages, say, of 15 or 20 pounds each?

Dr. CLARK. I doubt it. It is not possible to completely sterilize anything in too large a can. The tomato canneries have found that when they tried to pack tomatoes in 1-gallon cans sometimes they would spoil before they got into the hands of the consumer. It is not always possible to sterilize in large cans.

Senator OWEN. On account of decomposition taking place?

Dr. CLARK. Because the package is too large.

Dr. ALSBERG. In order to sterilize them you have to heat them through, and in trying to get the heat to penetrate all through in a large-sized can you burn the outside before you get the heat into the interior, so that you run the risk of not having the interior sterilized, and it will decompose.

Dr. CLARK. And that, of course, would be very much worse in the case of fish than with vegetables, because the decomposition products are so very much more offensive. So that I doubt if it is feasible to pack fish in large cans.

Senator OWEN. So that the packing of fish must be done in comparatively shallow cans?

Dr. CLARK. Yes; until we have further knowledge on the subject. I should say, offhand, that it is a pretty good guess to say that cans larger than 1 pound for fish could not be used successfully.

Senator OWEN. But if the moisture could be absolutely extracted, so as to leave an absolutely dry fish, it could be canned in a can of any size, could it not?

Dr. CLARK. That is probably true. But we should not confuse dehydrating with canning. When you dehydrate fish you put it in such a state that the bacteria can not grow in it. Now, you are using the absence of water in the same way in dried products that you are using the heat in the other kind of preservation by canning. The preservation of fish by drying is an entirely different process from the preservation of fish or other products by canning.

Senator OWEN. I understand that. But I was considering this matter in connection with furnishing Europe with a rapid supply of foodstuffs from our packing industry; I thought that possibly the fish, which are available in such quantities in this country, might be packed on a large scale and supplied to the people of Europe, who are now suffering for food.

Dr. CLARK. Surely. But when you used the word "packing," you led me astray, because in the fishing industry the term "packing" is very often used in a technical sense, meaning canning. I thought you meant to use it in that way.

Senator OWEN. Well, I have no technical knowledge of the industry; but I have been impressed with the lack of food supplies in Europe; and I thought that America might respond to that need by packing fish on a very large scale and furnishing fish to the European people along with the other food supplies that we are compelled to send them anyway.

Dr. CLARK. I think we could do it.

Senator OWEN. What would be the best method of preserving fish for the purpose of furnishing Europe with food?

Dr. CLARK. For export?

Senator OWEN. Yes.

Dr. CLARK. That would be a pretty difficult question to answer. If methods of drying fish were worked out so that they would be perfectly satisfactory, I should think, offhand, that that would be the best method, because they would take less space, and no tin would be required.

Senator OWEN. In that case, they would not have to ship water?

Dr. CLARK. No.

Senator OWEN (continuing). Which carries with it the possibility of decomposition?

Dr. CLARK. Yes; and you would not have to use tins, which is a serious matter at this time.

Senator OWEN. The fish might be packed in boxes of cardboard, or something of that sort, might it not?

Dr. CLARK. Yes; if it was sufficiently dried.

Senator FLETCHER. Is there any way of preserving it by the use of salt?

Dr. CLARK. There is; yes.

Senator FLETCHER. Salting them and shipping them in cases?

Dr. CLARK. Yes. Of course, there are two large fish-drying industries in the United States at the present time. One is the salt-cod industry around Gloucester and the other is the salt-cod industry in Alaska. We have made several successful smoked and salted fish products in California lately.

Senator OWEN. Those fish can be handled in barrels, can they not?

Dr. CLARK. They can be handled in barrels or in any way you want to handle them, provided the fish do not get damp, or if the temperature does not get too high.

Senator PHELAN. If it gets too high?

Dr. CLARK. Yes.

Senator OWEN. What would be the best method of packing fish for European consumption?

Dr. CLARK. I am not prepared to answer that question; but I should think dehydrated, if we can do it, would be the best all-round method.

Senator OWEN. But your bureau has not had a sufficient appropriation yet to justify you in carrying on experiments in the drying method?

Dr. CLARK. Dr. Weber has, possibly, in New England; but I did not tackle that problem in California. Our funds there were only sufficient to begin our work on canning and salting and smoking fish in a small way.

Dr. ALSBERG. We have not had enough funds to go into the dehydration of fish generally; we have gone more into the dehydration of vegetables.

Senator OWEN. Well, in the dehydration of vegetables, I understood you to say that you found a very great success?

Dr. ALSBERG. Yes; it is a question at present largely of merchandizing; it is the same proposition with these new products of "putting it over," so to speak, with the public; that is the present difficulty.

Senator OWEN. Does that dehydrating process also apply to fruit juices?

Dr. ALSBERG. We have not worked out a dehydrating process for ordinary fruit juices satisfactorily as yet. We are at work on it at present, but do not consider that we have solved that problem.

Senator OWEN. My attention was called some time ago to the freezing process, by which the fruit juices would be subjected to a great deal of cold and frozen and then be rotated rapidly, as in a milk separator, so that the fruit juices would flow outside and leave the water as ice on the inside, and in that way the concentrated juice was a self-preserving fluid.

Dr. ALSBERG. We have done that, but we have not regarded that as dehydration. You can take apple juice and remove about two-thirds of the water and get a reasonably thick sirup that will keep for quite a long time, and that only has to be diluted to get back the original flavor; that is substantially the method you outlined. You can do that with most fruit juices, but we have not yet convinced

anybody that there is enough money in that particular proposition to have it taken up commercially. We have demonstrated it and received most flattering opinions concerning the product, but no one has yet felt like risking an investment in it.

Senator PHELAN. You spoke of marketing dehydrated fruits and vegetables. I understand that dehydrated vegetables are a commercial success and are on the market now.

Dr. ALSBERG. They are on the market now, Senator, but I think it is a bit early to say whether they are a commercial success or not.

Senator PHELAN. The Government has purchased from one man in California \$1,200,000 worth of dehydrated vegetables. And he told me the last time I spoke to him that he had already received \$600,000 on account from the Government.

Dr. ALSBERG. Yes. I did not know the orders were as large as that. He has had Government orders. But, of course, that was not what I had in mind; that is an ephemeral matter: that is a thing that will end when we bring our people back from France.

Senator PHELAN. But the Government would not have made these purchases unless the products were satisfactory.

Dr. ALSBERG. I do not mean to imply that the products were not satisfactory. They are satisfactory; but the average housewife at present is not buying them and the average restaurant keeper or hotel keeper is not buying them.

Senator OWEN. There is nobody really offering them in a definite way to the market, is there?

Dr. ALSBERG. No; that is also true at the present time. Nobody has undertaken the kind of campaign that has to be undertaken to market a breakfast food; that remains to be done. The public does not know about them.

Senator PHELAN. Well, a man like Horst, when the Government ceases to be a customer, will probably develop his trade elsewhere.

Dr. ALSBERG. We hope so.

Senator PHELAN. I asked, on his behalf, that the commissary of the Army and of the Navy accept samples of his goods in various camps so as to try them, and they refused to do so, on the ground that they had no present intention of purchasing the products, and there was no use in sending samples; so that the purchases must have been made for use abroad and not in this country.

Dr. ALSBERG. My understanding of the situation in this country, so far as the Quartermaster Department is concerned, is as follows: The Quartermaster Department says this is no time for trying experiments, and that the Quartermaster Department will endeavor to feed the men, wherever they may be, in as nearly the same manner as the men are accustomed to in their own homes as possible.

Senator PHELAN. Now, we are appropriating money for the Quartermaster Department to carry on its operations, and there is an enormous item for transportation alone. And they ship these things in cans—and tin is a very valuable mineral product at this time—and it seems to me that it is very well worth while trying this experiment. I should think the answer of the Quartermaster Department should be rebuked.

Dr. ALSBERG. That is for shipping abroad; and the attitude of the Quartermaster Department, as I understand it, is that that department will buy these materials in so far as the shipping situation

makes it necessary, and not a bit more. They have bought some of these materials for shipment abroad, because the Shipping Board told them they could not get the space to send ordinary canned goods.

Senator PHELAN. But the Agricultural Department must have told them that these dehydrated vegetables are a good food.

Dr. ALSBERG. Oh, yes.

Senator PHELAN. Then, if they are good for the camps abroad they are good for the camps at home.

Dr. ALSBERG. Unquestionably.

Senator PHELAN. And I understand that their use would save the use of 150 cars in sending the same food value in the dried product that was sent of the canned product.

Senator OWEN. I agree with Senator Phelan that the Quartermaster Department deserves a rebuke. They have no right to sit there and disregard the saving of freight in this country when the Agricultural Department has demonstrated that these materials are just as good as fresh vegetables when you add water.

Senator PHELAN. That is my understanding; they are a wholesome kind of food.

Senator FLETCHER. I think there is no doubt—in fact, I can produce authority for the statement, if needed—that a manufacturer in Canada put up some of these dehydrated vegetable products at the time of the Boer War, and he had some left over, and they are now being used.

Dr. CLARK. Yes, I think that is a fact.

Dr. ALSBERG. That is correct.

Senator FLETCHER. They are perfectly good now. I have tasted some soup made of dehydrated vegetables, and you can not tell the difference from that made from fresh vegetables.

Dr. ALSBERG. You can not in the case of a stew or a soup. When you are serving the vegetable as a vegetable, it may have a different flavor. Its food value will be the same, except in one respect, that some vegetables after they are dried have lost their antiscorbutic properties.

Senator PHELAN. What properties?

Dr. ALSBERG. Anti-scorbutic; the property of preventing scurvy. Of course, under modern conditions that is not a factor; we do not have scurvy, except in infants who are fed on certain abnormal foods; we do not have the scurvy here nowadays, and I have not heard from any one who has been in France that there is any evidence of danger from it there. But it is only fair to say that some vegetables lose this particular property—or, at least, in part. Otherwise they have exactly the food value of the fresh vegetables.

Senator OWEN. What effect has the embargo on olive oil had on the packing of fish?

Dr. CLARK. Of course, I can only speak for California.

Senator OWEN. I am speaking of California.

Dr. CLARK. It happened in Monterey that the packers were pretty well supplied with olive oil at the time the embargo went into effect. That is for the reason that the Monterey factories are canning ovals mostly, so that the amount of olive oil they keep always on hand there would pack enough quarter or half pound cans for them. In southern California the people were not in such good shape; they

were quite disturbed when the embargo order came out. We wired the Food Administration for relief, but the Food Administration and the War Trade Board said that the embargo would have to stick. As soon as we advised the packers of that, they knew they had to do something quickly; and in California there was a resource in the case of the peach-kernel oil; a great many peaches are dried and canned in California; and the pits have heretofore been thrown away or used in the boilers for fuel, at \$4 a ton. They are now used for gas masks.

Dr. ALSBERG. They used to be cracked and sent to Germany before the war.

Senator OWEN. Did they use the oil from the peach kernel?

Dr. CLARK. Yes. By pressing the kernel they get a very good oil. There is one firm near San Diego that has practically a monopoly of it, and that firm will produce somewhere between 300,000 and 400,000 gallons of peach-kernel oil a year. Of course, you know what happened—some of the packers rushed to these people and got big contracts, so that the others who did not get any early did not get any at all. So that some of them have had to fall back on peanut oil. We have had a good many different kinds of peanut oil.

Senator OWEN. How does peanut oil serve the purpose?

Dr. CLARK. The peanut oil is very good, but for people who like the real olive oil it has not the same flavor; there is nothing like the olive-oil flavor. That is because people have been accustomed to it. They will pay any price for it.

Senator OWEN. The olive oil, then, is preferred in the markets which have been established heretofore?

Dr. CLARK. Yes; right in California, olive-oil sardines are preferred to a great extent.

Senator PHELAN. Why was olive oil put under embargo?

Dr. CLARK. I think it was because of the shipping situation.

Senator PHELAN. The shipping situation?

Dr. CLARK. Yes.

Senator PHELAN. Were our native olive oils shipped abroad?

Dr. CLARK. No; for some reason or other it was claimed, first—I am speaking from memory only—that the people in Spain and Italy did not produce enough olive oil to export, they needed it at home; and secondly, it was said the Shipping Board did not want to use space on ships coming back to this country.

Senator OWEN. I do not think that claim is justified by the facts in either case, because the information I have in regard to the matter is that they have a surplus of olive oil in Spain; they are compelled to carry over a full year's extra supply, because they can not market it; and that there are Spanish vessels which would be released that could bring that oil to the fish packers in America.

Dr. CLARK. That may be true. I have heard rumors to that effect myself. But at the present time the fish packers can not get olive oil, and the only olive oil they have is what they happened to have in stock; and in some canneries I have seen large numbers of pint, quart, or gallon cans of olive oil of different brands—every brand of olive oil I ever heard of—being put in cans of sardines in order to fill their contracts for olive-oil sardines.

Senator OWEN. Has olive oil increased very much in price?

Dr. CLARK. From \$3.50 to \$7.50 a gallon, in carload lots, paid by the packers.

Senator PHELAN. How about the olive oil produced in California?

Dr. CLARK. The olive oil produced in California is a fine product for eating on a salad, but it will not satisfy the requirements for packing fish, because there is too much acid in the oil; they are not careful enough in making it. By refining, this acid can be removed, but when it is most of the flavor is lost also. So the California canners do not use California olive oil.

Senator PHELAN. I saw a statement yesterday that cottonseed oil is being substituted for olive oil.

Dr. CLARK. For sardines?

Senator PHELAN. No; for the table. And the Agriculture Department said that it was a fraud under the pure food and drugs act, because it was labeled and marketed as olive oil and it is not olive oil.

Senator FLETCHER. Are the fish packers having any trouble by reason of having their men taken away from them?

Dr. CLARK. Yes; that has been a very serious situation in California.

Senator FLETCHER. That has been one great difficulty in Florida, and I am informed that a good many people engaged in the fishing and canning industry have been obliged to abandon it because they have lost their men.

Dr. CLARK. That is a very serious condition. We have had a great many fishermen coming in to see if they could not get deferred classification in the draft.

Senator PHELAN. How about conditions in Monterey?

Dr. CLARK. There is not so much difficulty there. Most of the fishermen who go from San Francisco to Alaska are Americans or naturalized Americans, and many of them were taken from the salmon-packing operations in Alaska.

Another thing that I should like to have go into the record that is going to limit the production of food fish from California is that it is almost impossible to secure enough twine for making nets. Now, if there is any possible influence that the Senators can use with the imports bureau of the War Trade Board, or with the War Industries Board, to get twine through from the Orient or from Scotland to California it should be done, because without those nets the fishermen can not catch the fish. At the present time they are using cotton nets, which do not give satisfaction. They will not stand up like the linen nets. And it is claimed that the price of linen twine for making nets has risen in a most unreasonable manner. I am not qualified to say whether that is true or not; but the fishermen are continually complaining about the price they have to pay for linen twine for making their nets. And that is a limiting factor, of course, in getting the fish.

Senator PHELAN. How about Scotland?

Dr. CLARK. A little comes from there, and little comes in from Japan now. As I said, a good deal of cotton is used; but cotton is not satisfactory. A good linen net will stand for two or three years; a cotton net will not last one season. And certain of these nets are many hundred yards long; and some of them cost several hundred dollars.

Senator FLETCHER. Can you use hemp from Manila?

Dr. CLARK. They have tried to use hemp from Manila, but it is not altogether a success; in the water it frays out and goes to pieces, I believe.

Senator OWEN. Do we pack our fish by the same process as they do in Portugal and Spain?

Dr. CLARK. I can not answer that question positively, but in California I think they do, especially where it is fried.

There are two types of fish packing: One is called the round-can method, which was the first kind used; that consisted in packing the fish raw and then steaming it; in other words, cooking the fish by live steam and letting the water run out of the can. That was a good idea in the beginning; but, as in the case of all of these other things, the people got careless; the fish were not properly cleaned; they would leave the entrails in; and it was owing to that carelessness that this system of inspection that I mentioned a while ago was started. But good round-can sardines are perfectly good food and are being packed now in considerable quantities.

Senator OWEN. In packing the sardines they are packed whole, are they not?

Dr. CLARK. Minus their heads and entrails.

Senator OWEN. They do clean them, do they?

Dr. CLARK. They are supposed to, and under the inspection they are required to do so. The fish are cut by hand. A person who can invent a machine that will cut and clean the fish will develop a great industry, if it will do the work well.

Senator PHELAN. Like the machine that takes the seed out of the raisin grape? Could they use some such principle as that?

Dr. CLARK. Yes; if they could develop that. They have a machine now in use in the salmon canneries that they call the "iron Chink." It is called Chink, because it takes the place of several Chinamen. They used to have a gang of four or five Chinamen doing the work that one of these large machines now does—that is, in gutting, sliming, and handling the fish for canning; it makes all that a mechanical operation. If we could do the same thing in sardine canning it would be a great improvement.

Dr. ALSBERG. The bureau has been at work, under Dr. Weber's direction, for several years on developing a machine for just that purpose. We have taken out several patents for one or another feature of it; the patents, of course, are taken out for the benefit of the general public. At present at Gloucester the Gorton Pew Co. are experimenting with that particular machine, under his direction. Whether or not it will be a success we do not know.

Senator OWEN. Have you any dehydrated fish at all here that you can show us?

Dr. ALSBERG. We have some up in our laboratory, but I think none here. None of your dried-fish samples are here; are they, Dr. Weber?

Dr. WEBER. No; none of them are here.

Senator PHELAN. How do they preserve those fish that are not put up in cans?

Dr. ALSBERG. They are dried, salted, and smoked.

Senator PHELAN. Sun dried?

Dr. ALSBERG. No; usually dried and smoked.

Senator OWEN. The smoking acts as a preservative, does it?

Dr. ALSBERG. The smoking acts as a preservative.

Senator OWEN. And it is preservative that is harmless and really adds an agreeable flavor?

Dr. ALSBERG. Yes; adds an agreeable flavor.

Senator OWEN. The thing that I think is of urgent importance is to ascertain whether or not we can add, in an immediate way, to the supplies of food we send to Europe. If the dehydration of fish could be worked out by the department—the fish certainly are abundant enough—if they could be dried and packed so as to be free from the possibility of fermentation.

Dr. PENNINGTON. In some places and at some times, Senator; but we have been having a very marked fish shortage. For instance, croakers have been selling for \$23 a barrel at the catching point; they were \$18 a barrel yesterday on the Maryland and Virginia coasts—200 pounds of fish sold for \$18 at the catching point. To try to increase the fish supply the Food Administration has arranged with the Emergency Fleet Board to build 75 fish trawlers, to be in operation this winter.

Senator OWEN. Well, there are parts of the country in which fish are very abundant, and in dealing with an international question the thing to do would be to go where the fish are, and not to pay any attention to a place where they are not, because that is not of any interest.

Dr. PENNINGTON. If we could get the fish everywhere that they happen to be—

Senator OWEN. Yes.

Dr. PENNINGTON. Unfortunately, the fish do not happen to be always in one place; and we have these very migratory fish to deal with—that we have to follow around, more or less—and we can not take either a drying factory or a canning plant along with us; and, therefore, we must take the fish to the drying factory or canning factory.

Dr. ALSBERG. That is part of the problem; and another part of it is, can we get the people on the other side to take that kind of food?

Senator OWEN. I should think the people who were starving would take almost any kind of food, especially a food which has a high protein value.

Dr. ALSBERG. They ought to, but people are very peculiar about that. It is my understanding that the Commission for Belgian Relief had the greatest difficulty in getting the Belgians, starving as they were, to eat corn meal; they had to give it a fancy name. As long as they called it by the French equivalent for corn the Belgians looked on it as cattle feed, and they could not be made to eat it. Then they called it Cerealine, or Cerealose, or something like that—camouflaged it—and they managed to get rid of it.

Senator PHELAN. There was a great campaign conducted once by a man named C. J. Murphy, under the Agricultural Department, to educate the people up to the consumption of corn. He had kitchens in different parts of Europe; and I understood he had made a success of it. They called him Corn Meal Murphy; he is still alive; I know him.

Dr. ALSBERG. The question is, whether we can fairly say he made a success of it, because the only countries where they ate corn meal

before the war were countries like Italy, Roumania, Bulgaria, Greece, and the Levant, where they also produce it—including southern Russia. There was very little corn eaten in Great Britain or France, excepting in the form of corn-starch; or in the Scandinavian countries. The hardest thing in the world to do is to change people's food habits.

Senator PHELAN. You can mix the corn meal with something else and get them to eat it?

Dr. ALSBERG. Yes; that is the way they do it; which, of course, meets with the objection of the millers.

Senator OWEN. Dr. Pennington, you offer the substantial objection that the fish on the Atlantic coast, at least, are so migratory that they would not be available for any packing plants on a very large scale throughout the year. Is that what I am to understand?

**STATEMENT OF DR. M. E. PENNINGTON, CHIEF OF FOOD RESEARCH LABORATORY, BUREAU OF CHEMISTRY, DEPARTMENT OF AGRICULTURE.**

Dr. PENNINGTON. No; I would not go quite as far as that. But the question is, on the east coast, that the consumption of the fresh fish in competition with the canning plant or the drying plant is one which is a good deal more important than it is on the west coast, where the canning industry has had rather the right of way in the past.

Of course, we have the Gloucester dried-fish industry, and salted fish, and the sardine industry of Maine; those are the two real industries in the way of rendering fish imperishable on the east coast, aside from freezing, which is, of course, another method of preserving fish; and so far as they are hard frozen they are practically imperishable.

But we have never had the development of the canning or the drying on the east coast, partly because of the difficulty in locating near the factories the fish to be canned—just such trouble as they had in canning, because they had to go too far to get their supplies. And then there is the competition with the fresh fish.

Now, that is one thing that we may be able to do something with in Florida, where the supply is heavy ordinarily; it has been pretty short this summer. Where we can have an all-the-year-round fishing business, where the winter weather does not interfere with it, and where we have a large number of new fishes that have not been used for food heretofore—only locally used—and which can be handled in such wise that we can send them a long distance, either under ice or hard frozen, or when we know how they can undoubtedly be smoked or salted and canned, as on the Gulf coast, we may be able to do something. We have one cannery on the Gulf coast now. I telegraphed yesterday for samples of their product, but, unfortunately, there has not been time for them to get it up here. The products that that cannery is putting out are very attractive in a great many ways. It is an entirely new industry down there.

Senator OWEN. The test really has not been adequately made, as I understand it, of completely dehydrating the fish—the flesh of the fish?

Dr. PENNINGTON. For food purposes?

Senator OWEN. So as to reduce it to a powder, or to a dry meal?

Dr. PENNINGTON. We have the fish meals, which are used for cattle feeds and poultry feeds, and for fertilizers.

Senator OWEN. Yes.

Dr. PENNINGTON. It is not as fine as flour, but it is a fine meal.

Senator OWEN. How is that done—just by subjecting it to heat?

Dr. PENNINGTON. Ordinarily the oil is subtracted first, because in many cases the oil is the more valuable product.

Senator OWEN. Yes.

Dr. PENNINGTON. Then the remaining material is dried by hot air and pressure.

Senator OWEN. But for human food the fish has not been really put on the market as a dried meal, with the oil remaining in the fish?

Dr. PENNINGTON. Not that I know of.

Dr. COKER. We have been making some experiments with the fresh fish, and we now have a product that looks satisfactory; but we are not sure as to its keeping qualities. It will take some time to test that out. Then there are problems as to flavor and texture.

Senator OWEN. When the fish has been dehydrated, does the oil of the fish seem to be sufficient to act as a preservative?

Dr. COKER. The fish does seem to be very well preserved. I am not enough of a chemist to know whether the oil would have much effect or not.

Dr. WEBER. I think that is one of the points that will have to be given very careful attention to determine whether the oil will not become rancid when it is dried, and therefore spoil the product.

Senator OWEN. Yes.

Dr. WEBER. There are certain varieties of fish which will dry more quickly than others.

Senator OWEN. Yes; I understand, as a matter of fact, that the oils themselves undergo decomposition because of water being left in the oil.

Dr. WEBER. Yes.

Senator OWEN. And if the extraction of the water is complete the oils are self-preservative.

Dr. WEBER. Well, the other factors there are light and temperature, which cause rancidity; if you remove the moisture entirely, you remove one of the causes of the oil spoiling. Now, a dried product of fish might contain 4 or 5 per cent of moisture. In fact, the commercial feeds from fish do contain from 5 to 8 per cent of water. They are very dry, and will rattle around; still that might be sufficient water to cause rancidity in the oil.

Mr. RADCLIFFE. While it is not part of this hearing, I may say that the Bureau of Fisheries are conducting experiments now with regard to the dehydration of fish, and we are pushing that work as rapidly as we can to see what can be done in the dehydration of fish.

Senator OWEN. That experiment is being carried on by the Bureau of Fisheries, is it?

Mr. RADCLIFFE. Yes.

Senator OWEN. Where?

Mr. RADCLIFFE. In New York City. A very small plant has been assembled, and we are gradually making experiments to start the development of this thing.

Senator OWEN. Are you doing that by a vacuum system?

Mr. RADCLIFFE. Yes; a vacuum system.

Senator OWEN. The advantages of the vacuum system, as I understand it, are that, not using heat, the results are more reliable than where heat is used, as that may result in decomposition.

Mr. RADCLIFFE. Yes. One of our initial experiments will go to the other extreme, the use of cold.

Senator OWEN. The use of cold?

Mr. RADCLIFFE. Yes, sir. We freeze the fish and extract the moisture.

Senator OWEN. Just as you would in the case of fruit juices?

Mr. RADCLIFFE. I am not familiar with the method employed with fruit juices.

Senator OWEN. Dr. Weber, will you explain the operations at Gloucester?

The CHAIRMAN. The salting process.

Senator OWEN. What you have done in the way of preserving with salt.

Dr. WEBER. We have not been preserving with salt.

Senator OWEN. What have you done at Gloucester?

Dr. WEBER. We have been interested in the canning and storage of fish and experiments on the process of improving the canning of dogfish, or grayfish. We have some samples of those here that I would like to show you.

Senator OWEN. All right.

Mr. WEBER. And in dehydrating fish. Those were the three main features of the work we were proposing to do. When you mentioned a moment ago the method of drying in a vacuum it reminded me that we are installing a vacuum apparatus for drying fish there, which had just arrived when I was called down here.

But the surprising thing is that fish can be dried to a very nice product, and a good-appearing product, by simply driving air into these funnel pipes, such as they use in the drying of sardines; by cooking the fish previously and drying it into a comparatively dry condition it dries down into a very nice product.

Senator OWEN. The old-fashioned herring—I do not know how it is treated—but I have always regarded it as a very attractive fish.

Dr. WEBER. It is smoked—

Senator OWEN (interposing). It is dried and smoked and salted, is it not?

Dr. WEBER. A great deal of water is taken from the fish previous to drying by the salting. It is put down in salt brine and held for a few days and then kept in the atmosphere a few days until it is thoroughly dried. The smoking also acts as a preservative.

Senator OWEN. It looks to me as if you would get the moisture back again.

Dr. ALSBERG. It does to some extent, but you see they are packed in salt, and the salt being hygroscopic removes the water and dissolves itself.

Senator OWEN. Yes; I guess that is right.

Mr. WEBER. The salt is for the purpose of extracting the water. The dried products came back dehydrated in very nice shape and form.

I was talking about the use of oil in the fish a moment ago. Such fish as the whiting and the cod will dry to much better advantage than mackerel, for instance, which is a very fat fish and which you will not be able to dry at all; that is, the amount of fat is very much augmented in the dried product. They can be returned to their original condition by soaking in water—they will return very nicely to their original condition. The fiber is not quite as soft as it is in the original fish. We are planning, before saying anything definitely about that, to test out whether this dried product will keep properly; whether or not, when it is put upon the market, it will become rancid and unpleasant. The little experience we have had so far as to that, particularly with dried roe—

Senator OWEN (interposing). The dried, salt herring seems to stand very well; that seems to have been very stable, and it has been very popular.

Dr. WEBER. That has been very popular; quantities of dried smoked herring are shipped to the southern climate.

Senator OWEN. That would seem to have fairly tested out the drying and salting of fish, would it not?

Dr. WEBER. Well, the smoking adds a preservative to that and at the same time gives it a distinctive flavor.

Senator OWEN. Yes; it gives it a distinctive flavor. I wanted to ask, Dr. Weber, what the Government, in your judgment, should do with regard to extending these experiments and providing the means necessary for developing them?

Dr. WEBER. I think there is more opportunity in the fishing industry—my experience is only on the Atlantic coast, however—of extending the work along those lines and developing additional foods than with any other food product. It seems to me that the fishing industry has been less exploited than any other of similar importance.

Senator OWEN. There has been very little exploitation by the Government of the fish industry of America, has there not?

Dr. WEBER. Yes, that is true. There is one other thing I should like to say:

I have had a good many of the fish people ask for Federal inspection—this was unsolicited on my part—but they have rather felt that they could reach the desired quality in their product better if they had Government inspection, particularly in regard to storage houses. The people who have been interested are people who would put their products into storage warehouses.

Senator OWEN. Has your department been furnished with all of the means you could profitably employ along this line?

Dr. WEBER. As I say, I think we could expand to a very much greater degree than we are doing now.

Take Gloucester, for instance: There is every opportunity to do an enormous amount of work there: conserving the waste products, for instance, and even insisting on marketing the waste products. We have some products that we have developed from the use of fish which are not readily sold fresh, and in which their canning products are limited; and the combination of these fish with a cereal makes a good cereal loaf.

The Gorton Pew Fish Co., which has been referred to, and with which we are cooperating, is getting ready to advertise and feature one of these products in their advertising campaign: it is a combination of a cereal, such as hominy or barley, with whiting, making a loaf and canning it; and that will be put on the market this coming year.

We have also given some assistance to those same people in putting clam extract on the market. I have several samples of that here which are rather tasty. That is, by the use of vacuum drying or dehydration, extracting a great part of the water out of the clam liquor when it comes from the steamer and evaporating it down to a paste, and then, by the addition of a small amount of that water, bringing it back.

Senator OWEN. Then, in your judgment, there is a large field for the development of food products, both for our markets and for export abroad?

Dr. WEBER. Oh, yes. If this dehydration of fish proves satisfactory and we can develop even a few products from certain varieties of fish, I think there will be a wonderful use for such a thing as that. It goes without saying that there will be advantages in shipping; in fact, in many ways there will be an advantage in the use of that product.

Senator OWEN. I do not think Members of Congress have had much opportunity of knowing what the opportunities are in the development of values for food from fish. So many men live in the interior and never come in contact with the question, and there is no particular reason why they should have their attention called to it.

Dr. ALSBERG. Senator, I have always felt that if only small sums had been spent for the last 10 or 12 years for the development of the fish industry, or this packing industry, it would have been of immense benefit. Of course, the question arises—it is only fair to say that—whether that development should be through the Department of Agriculture or through the Bureau of Fisheries. I think we are all agreed that an experimental cannery and laboratory should be started both on the Atlantic and Pacific coasts under some one's control.

Senator OWEN. I do not think that is of great importance. They seem to have been working happily together, so far as they have gone.

Dr. ALSBERG. Very much so.

Dr. WEBER. I want to say that our work there in these matters has been in direct cooperation with the Bureau of Fisheries.

Senator OWEN. Then it comes right back to Congress to develop this matter adequately, in order to meet the increasing demands of the American people for food, and also to utilize the values which our fisheries really have if they are properly developed. We have had an enormous output of products in the United States through agriculture and through our factories, and partly from our fisheries, but I am quite sure nothing like the way the fisheries could be developed if it were given orderly attention.

Dr. WEBER. That is absolutely correct.

Dr. CLARK. I will submit a list of publications by the Department of Agriculture relating to the subject. (The list referred to was

subsequently submitted by Dr. Clark and is here printed in full, as follows:)

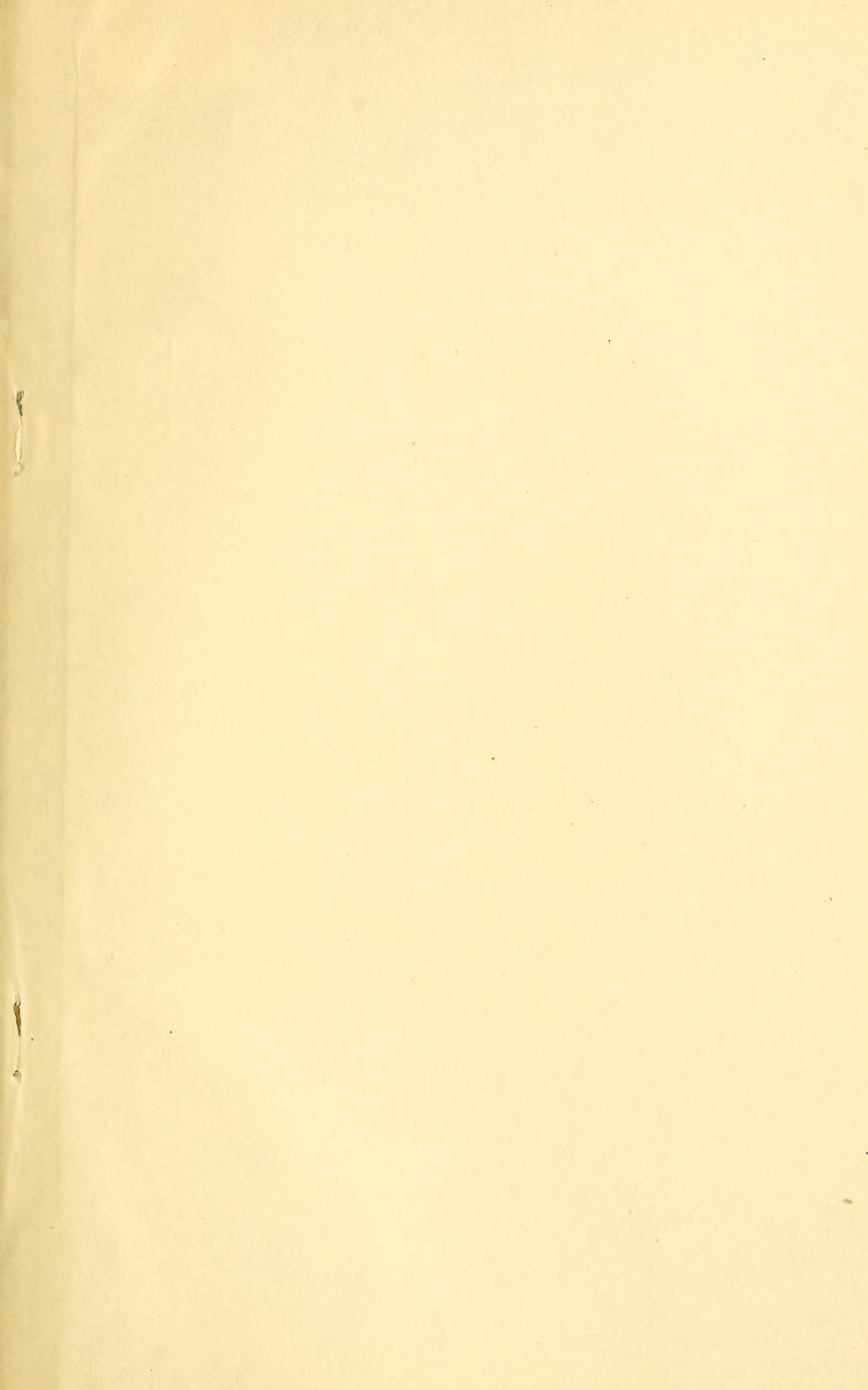
*List of bulletins and publications of the Bureau of Chemistry relating to fish and submitted herewith.*

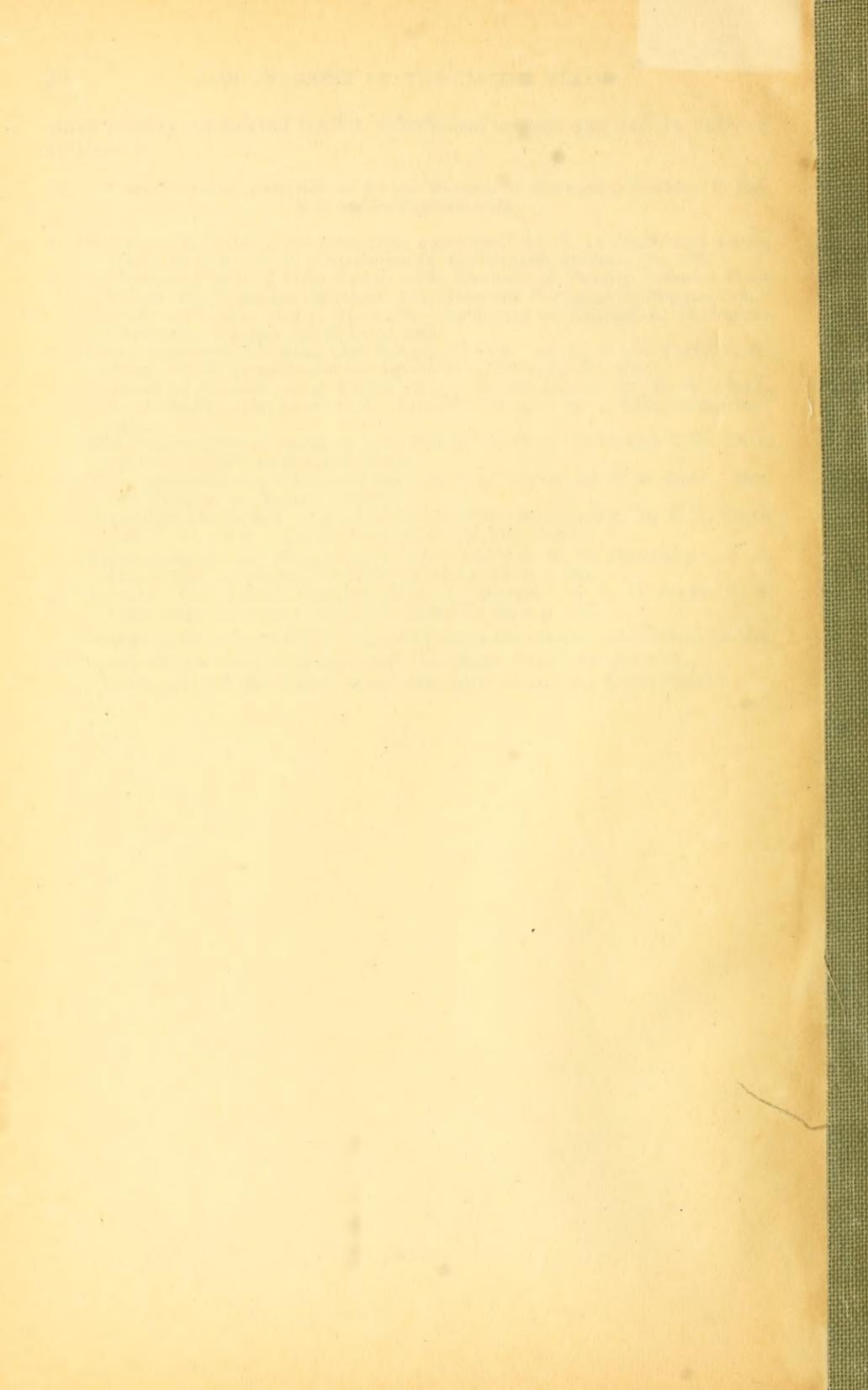
1. "Shrimp; Handling, Transportation, and Uses," by E. D. Clark and Leslie MacNaughton. U. S. Department of Agriculture, Bulletin No. 538.
2. "A Chemical Study of Food Fishes—The Analysis of Twenty Common Food Fishes with Especial Reference to a Seasonal Variation in Composition," by E. D. Clark and L. H. Almy. Published in Journal of Biological Chemistry, Volume XXXIII, p. 483.
3. "The Commercial Freezing and Storing of Fish," by E. D. Clark and L. H. Almy," U. S. Department of Agriculture, Bulletin No. 635.
4. "Analyses of Twenty Food Fishes of the Pacific Coast," by E. D. Clark, E. M. Brown, and D. B. Dill. Unpublished data for a forthcoming bulletin.
5. "The Preservation of Sardines by Smoking," by E. D. Clark and H. D. Davi. Special bulletin to the fish trade.
6. "The Preparation of Kippered Shad," by E. D. Clark and H. D. Davi. Special bulletin to the fish trade.
7. "Kippering Barracuda, with Especial Reference to Canning," by E. D. Clark and H. D. Davi. Special bulletin to the fish trade.
8. "Supplementing Our Meat Supply with Fish," by M. E. Pennington, U. S. Department of Agriculture Year Book for 1913, p. 191.
9. "Shipping Fish Three Thousand Miles to Market," by E. D. Clark, U. S. Department of Agriculture Year Book for 1915, p. 155.

(Samples of fish and fish products were thereupon exhibited to the members of the subcommittee and the other Senators present.)

(Thereupon, at 12 o'clock noon, the subcommittees adjourned.)







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