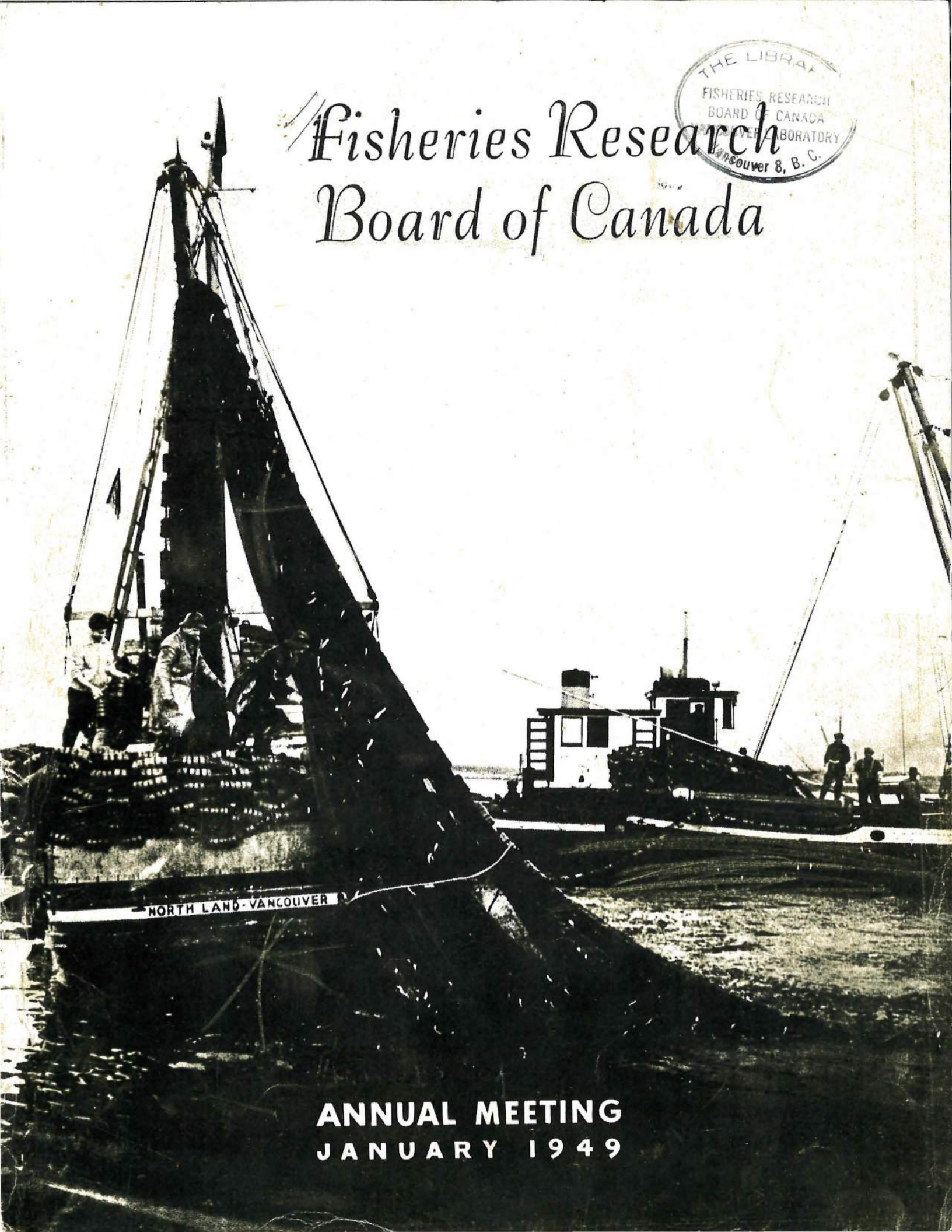
Fisheries Research Board of Canada



ANNUAL MEETING
JANUARY 1949

A DEPARTMENT OF FISHERIES PUBLICATION

Introduction

The increasing interest being shown in the work of the Fisheries Research Board of Canada has suggested the usefulness, not only to industry, but to others as well, of this review of Board operations in 1948. It is additional, of course, to the official report which the Board will submit to Parliament through the minister.

The present report is not to be regarded as a complete review of the Board's work during 1948, but rather as containing some of the highlights of the operations. If reference has not been made to certain field investigations or station studies, it is simply because neither time nor space made their inclusion possible.

This special report, aside from the interest and value it will be to its readers, will also serve as a modest recognition of the fiftieth anniversary, observed in 1948, of scientific investigation into the fisheries of Canada.

FISHERIES RESEARCH BOARD OF CANADA, 1949

Officers of the Fisheries Research Board of Canada were re-appointed for 1949 at the annual meeting in Ottawa. The only new member on the Board is Dr. A.L.Pritchard, Director of Fish Culture Development, Department of Fisheries, who replaces J. A. Rodd, now retired. Shown above are the members of the Board. Left to right, front row, Deputy Minister Stewart Bates; Dr. G.B. Reed, Queen's University, chairman; Fisheries Minister R. W. Mayhew; Professor J.R. Dymond, Toronto University, vice-chairman; O. F. McKenzie, Halifax, chairman of the Atlantic sub-executive committee; Dr. W. A. Clemens, University of British Columbia, Vancouver; back row, Dr. A.L. Pritchard; Dr. C.W. Argue, University of New Brunswick, Fredericton; Dr. D.L. Thomson, McGill University, Montreal; R.E. Walker, Vancouver, chairman of the Pacific sub-executive committee; J.H. MacKichan, United Maritime Fishermen, Halifax;Dr. G. Prefontaine, chairman of the Gaspe sub-executive committee, Montreal; Professor I.M. Fraser, University of Saskatchewan, Saskatoon; D.H. Sutherland, executive director. Members of the Board not included in the above group are Dr. J. L. Tremblay, Laval University, Quebec City; Dr.J.H.L. Johnstone, Dalhousie University, Halifax, and K. F. Harding, Prince Rupert, Fishermen's Co-operative Association.

Contents

FISHERIES RESEARCH IN CANADA BEGAN FIFTY YEARS AGO

Scientists studying the biology of the various species of fish which inhabit the sea and inland waters of Canada have brought a wider understanding of the habits and propagation of the life of the fish caught by the fishermen of this Dominion.

The value of this type of work received government recognition as far back as 1898, when a $15,000 grant was given to a number of scientists for work on the Atlantic coast. These scientists constructed a floating laboratory and for a number of years carried on several experiments and made observations at different locations along the shores of the Maritime provinces and Quebec.

This research marks the beginning of fisheries investigation under federal auspices and in 1948 the Fisheries Research Board of Canada celebrated 50 years of scientific research into fishery problems.

Research into fisheries began to expand when the floating laboratory became of no further service. Work was started on the West Coast where a shore station was established in 1908 at Departure Bay in British Columbia through the efforts of Rev. George Taylor, who became its first curator.

Growth of scientific investigation on the Atlantic Coast was marked by the establishment of a shore station at St. Andrews, N. B., in 1909. These ventures developed into the Biological Board of Canada, established by Act of Parliament in 1912 and operated under the Minister of Fisheries. A station in Georgian Bay, Ont., dealt with fresh water fishery research for several years.

Early work was predominantly biological, and was largely fundamental research, since the requisite basic knowledge had to be acquired before it could be applied. In 1924 a technological station was established at Halifax, N. S., and in 1925 another at Prince Rupert, B. C. The eventual destruction, through some infective organism, of the Malpeque oyster industry led to the setting up of a biological sub-station at Ellerslie, P. E. I., in 1929 to discover the cause of the mortality and to aid in the re-establishment of the oyster industry.

Indicating the wide scope of the work of the Biological Board was the Act of Parliament in 1937 which changed the name of the Board to the Fisheries Research Board of Canada.

In 1936, a technological station was established at Grande Riviere on the Gaspe Coast to care particularly for the needs of the

French speaking population of the Quebec and northern New Brunswick coasts. This station was first operated in rented premises, which were destroyed by fire in March 1943. The board acquired property at Green Point, Grande Riviere, and a modern, fireproof, self-servicing station was constructed. It was opened officially in October 1945 by the Minister of Fisheries, then the late Hon. H. F. G. Bridges, P. C., K. C., B. A., LL. D.

In 1944, a Central Fisheries Research station was established with headquarters at Winnipeg to concern itself with freshwater fisheries research.

The Fisheries Research Board is an honorary administrative body. The Board meets once each year as a unit for the consideration of work in progress and the development of policy. At the annual meeting officers are elected and charged with administration of the board's research and other activities. During the year meetings are held by the executive committee, the Atlantic sub-executive, the Gaspe sub-executive, and a Pacific sub-executive committee.

PERIOD OF ACTIVE EXPLORATION

During the first 25 or 30 years of fishery research the greater part of the investigational work was done by university scientists as summer work. This was a period of active exploration of marine biology and related subjects. Application to fisheries problems was often remote. During the last 20 years full-time staffs of biologists, oceanographers, chemists, biochemists, bacteriologists and engineers have been employed and provided with the facilities for a greatly expanded program of work. The world food situation stimulated a marked enlargement of the board's budget in 1942 and permitted the undertaking of long term projects which are beginning to come to fruition.

The general types of work carried out are biological and oceanographic, technological and explorative. Biological work is centred in three stations, the Atlantic Biological Station, St. Andrews, N. B., the Pacific Biological Station at Nanaimo, B. C., and the Central Fisheries Station at Winnipeg. For the technological work three stations are maintained, the Atlantic Fisheries Experimental Station at Halifax, N. S., the Pacific Fisheries Experimental Station at Vancouver and the Gaspe Fisheries Experimental Station at Grande Riviere, Que. The Sub-station at Ellerslie, P. E. I., is concerned with work in the shellfish field.

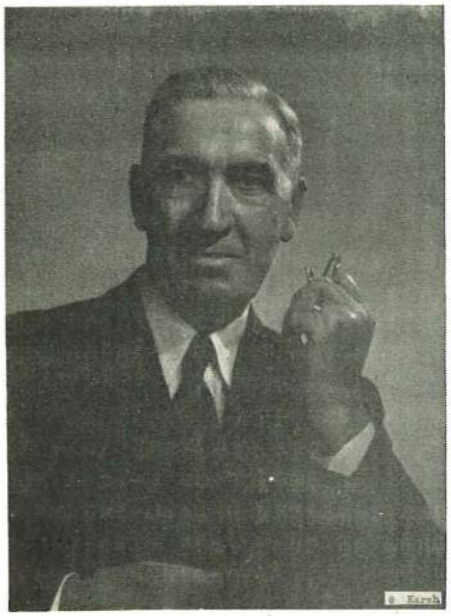
In 1944, the Board carried out work that had been assigned to it by the North Pacific Planning Project. To this end field parties investigated the fisheries resources of the Mackenzie River Basin, Great Slave and Great Bear Lakes, and in 1945 a similar investigation was undertaken in the Yukon Territory. Reports of these investigations are in the record of the Board. In 1947 an exploratory party was sent to investigate the fisheries resources of the Eastern Arctic.

The Fisheries Research Board of Canada consists of 15 members appointed by the Minister of Fisheries. Two are from the Department of Fisheries; two representing the fishing industry on the Atlantic Coast and two representing the fishing industry on the Pacific Coast. The remaining nine members are scientists selected from a list including nominations which may be made by any Canadian university whose staff embraces scientists engaged in research work in any way bearing upon fishery problems.

The chairman, vice-chairman and executive director are the officers of the Board, and with four other members comprise the board's executive committee. Of these seven executive members at least two are to be representatives of the fishing industry.

Not more than four members of the Board are appointed at the annual meeting as a sub-executive for the Atlantic Coast, not more than four members as a sub-executive for the Pacific Coast, and not more than four members as a sub-executive for the area served by the Gaspe station. The chairman, vice-chairman and executive director of the Board are ex-officio members of all sub-executive committees. Directors of stations may be appointed as secretaries of such committees.

The functions of the executive committee include the direction and supervision of investigations which may be of sufficient importance to the fisheries of Canada to be initiated by the Board and approved by the Minister, and of investigations which may be especially assigned to the Board by the Minister. The executive committee also has the general supervision of the scientific and non-scientific staffs employed by the Board and of the properties of the Board.



"HEADLIGHTS OF THE FISHING INDUSTRY"

By the HON. R.W.MAYHEW
Minister of Fisheries

I think if I were asked to give a simple explanation of the Fisheries Research Board of Canada, I would describe it as the "headlights of the fishing industry". Perhaps such a metaphor has never occurred to you before. And yet, if you look at the Board objectively ——and it is a good thing to look at things objectively once in a while—— I think you will agree that such a description has some merit.

Perhaps no other industry is travelling along a road that has more hazardous turns or more unknown ups and downs. Industry alone is not able to map out this road, to foresee the rough stretches, to prescribe alternative routes. But you, as scientists, can do so, and are doing so with considerable success. And as a consequence, as you light up this road, industry is able to steer its course with greater confidence.

These headlights, gentlemen, must always be kept on "high". Dim lights are good only for parking and in your work there can be no parking. Dim lights are dangerous and frustrating and unless we have our headlights on full at all times we cannot go forward with the confidence and determination which we need.

I am sorry that it has not been possible for me to visit all of your stations and to look more closely at the work you are doing. But I have seen some of them and what I have seen, at first hand, and what the Deputy Minister and others have told me, has convinced me completely that your services to the industry——and to Canada——are of great importance.

Perhaps I might digress at this point to make a suggestion. The Research Board is, for all practical purposes, a million dollar corporation with some thirteen million stockholders. To each of these stockholders——the people of Canada——you are accountable. It is true, of course, that as your Minister I account for you through Parliament. That is a duty demanded by law and must be discharged each year. But I believe we must go farther than that. I believe we must place great importance on the need of telling the public at large of the work the Board is doing. And I believe we must do it frequently. It seems to me that we would fail in our democratic duty if we did not recognize and utilize the means at our disposal to make our story known. And so my suggestion is this: you have available to you in the Department an Information Branch enthusiastic about your work and keen to help. It is your Information Branch as much as it is the Department's. And I believe if you use it more fully, if you co-operate with it, that it can perform for you, and for the public——your stockholders——services of a most necessary and useful kind. But the Information Branch is not the only branch of the Department whose services are available to the Board. Other units, such as our Legal Services, our Engineering Branch, our Fish Culture Branch, our Administrative Branch and our Economics Branch are fully available to you at all times. These people, I can assure you, share the same enthusiasm about your work and have the same keen desire to help. I think it is important that you should keep this always in mind and have a full understanding of the co-operation that is yours from the Department as a whole.

You have today, gentlemen, a great challenge facing you; greater, certainly, than at any time since the beginning of fisheries research in Canada a half century ago. Perhaps at no other period in our history have we been more conscious of the tremendous potentialities of our fisheries resource, or more conscious of the urgency of scientific research in both the biological and technological fields.

I am afraid there are some people who believe there are no more frontiers to develop. That may be so geographically, but I do not believe that it is so either industrially or scientifically. By the very nature of your own work you are opening new frontiers, both on the biological and technological sides.

For example, in working toward high quality in our fisheries products——which also involves developing better methods of processing, warehousing, transportation, cold storage, and merchandizing——you scientists on the technological side have significant services to perform. What you already have done, of course, has been outstanding. I think at the moment of your achievements in designing new type smokers, artificial driers, and the progress you are presently making in developing a new low-temperature refrigerator car. When that car has been successfully designed and tested——as I am confident it will——you will have opened the way to means of practically revolutionizing the frozen foods industry of Canada. And while the industry, especially the fishing industry, will benefit from your labours——and here I must pay thanks

to the National Research Council and the railway companies for their help -- the consumer will benefit even more, for the car will represent a long step forward in our joint efforts toward achieving quality control.

You scientists on the biological side have, of course, responsibilities of similar importance. It is interesting, in fact, to note that when the government of 1898 decided to carry out research work in the fisheries, it was biologists whom they engaged. So I suppose there is some validity to your claim that you are the senior service. I trust that this observation of mine will not lead to a break between you biologists and technologists in your very happy diplomatic relations!

Fisheries biology is, actually, the foundation for all fisheries research. On the shoulders of biologists rest the responsibility for scientific studies in development of the resources themselves, conservation, and in the best methods of regulation. Your headlights must always shine brightly for the industry.

You have already done fine things for the industry. Your studies of fish species, migratory habits, spawning, dangers of stock depletions, new sources of supply, better methods of catching -- all these and many more play a vital part in stabilizing this great resource.

The Board's work in oceanography -- a specialized field in itself -- is important not only to fisheries but to others as well. It is a tribute to your work in this field, and to the importance of the work itself, that the Royal Canadian Navy has so actively supported your studies.

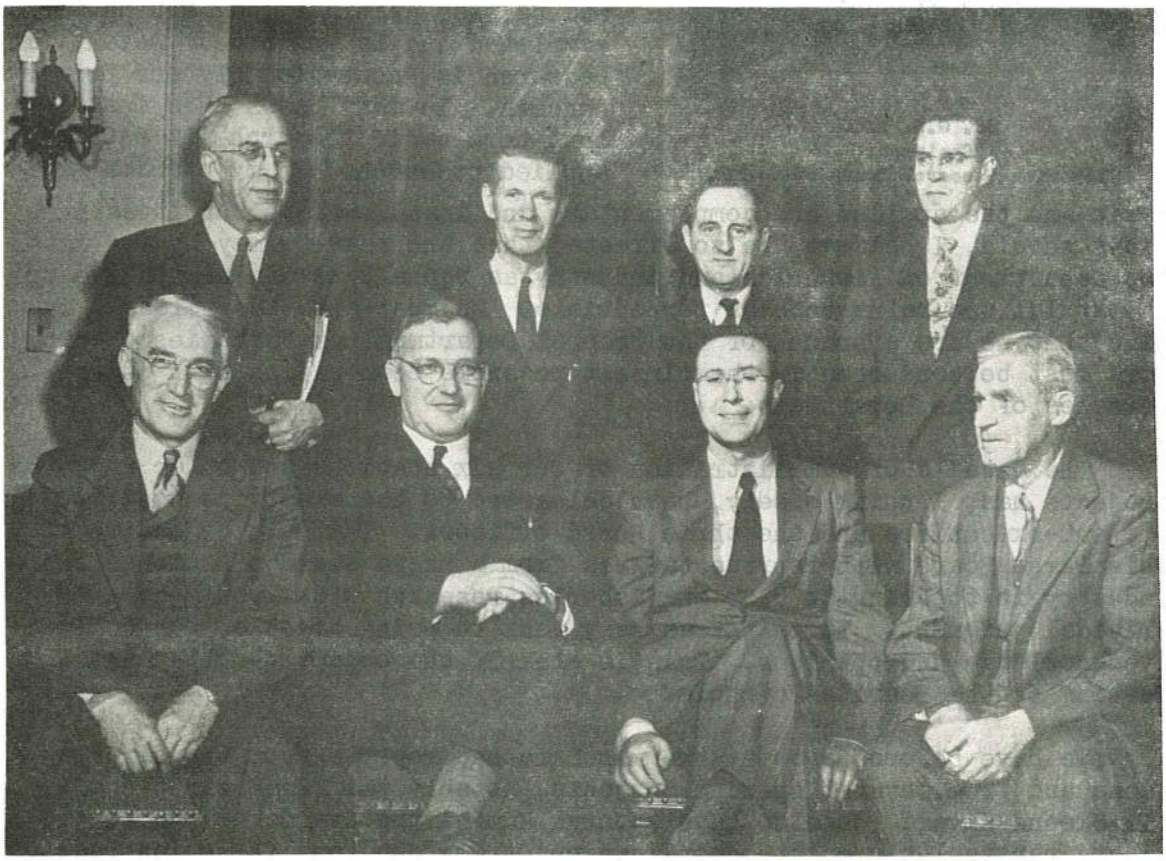
I cannot pay these sincere tributes to you without paying equally sincere tributes to those gentleman of the universities of our country who are giving so generously and unselfishly of their time to the work of the Board as a whole. They do truly national service and the industry, the government, and the people of Canada have much to thank them for. That our Board, through its stations, has acquired the high degree of prestige and confidence it holds today is in no small measure attributable to the splendid services of these men.

I want to say here that your Department, and the Government itself, is fully conscious of the essentiality of the Research Board and that you may expect from both the fullest possible support. As your Minister, I want you to know that you have an enthusiastic backer and that I shall do everything within my power to stand four-square behind you.

The work of the Research Board, of course, has a significant influence on the work of your Department. You will note that I said "your" department. Gentlemen, I want you to regard the Department as yours because, although for working purposes some degree of division is perhaps desirable, we are, in the final analysis, one. We have one goal. You on your side, do the research; the Department, on its side encourages the application of your research. You are, to the Department,

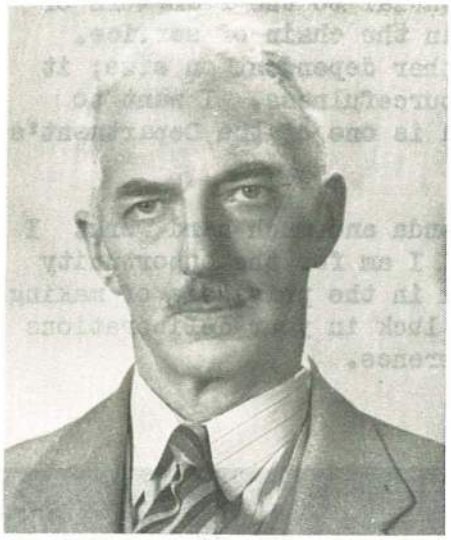
the scientific arm, just as engineering is the engineering arm, economics the economics arm, and so on. Each of these arms has its own degree of importance, but all are essential to the framework of the federal Department and all are links in the chain of service. The strength of these links is not altogether dependent on size; it is dependent on knowledge, skill, and resourcefulness. I want to say here that the Fisheries Research Board is one of the Department's strong links.

You have ahead of you a long agenda and much hard work. I want to say then, in closing, how grateful I am for the opportunity of being with you today and how happy I am in the privilege of making so many new friends. I wish you all good luck in your deliberations and happy fellowship throughout your conference.



Station directors of the Fisheries Research Board took a leading part in the discussions on Canada's fisheries problems at the annual meeting. Shown above are left to right, front row, Dr. S.A.Beatty, Atlantic Experimental Station, Halifax; Dr.A.W.H.Needler, Atlantic Biological Station, St. Andrews; Dr.Wilfred Templeman, in charge of fisheries research in Newfoundland; Dr.A.G.Huntsman, Toronto, editor of the Board's publications;back row,Dr.R.E.Foerster, Pacific Biological Station, Nanaimo;Dr.N.M.Carter, Pacific Experimental Station, Vancouver; Dr.A.Nadeau,Gaspe Experimental Station, Grande-Riviere, Que., and Dr.Kenneth H. Doan, Central Research Station, Winnipeg.

DR. REED'S ADDRESS



DR. G.B. REED
Chairman,
Fisheries Research Board of Canada

The Fisheries Research Board of Canada as now constituted consists of some fifteen members representing the various fields of science and industry impinging on fisheries.

Our function is to administer the several research stations and certain other research projects, to formulate a broad policy on fisheries research and to pass critical judgment on work completed and in progress. Scientific research is unquestionably our primary concern. In many cases this must be long-term basic research but equally applied research. In my opinion the basic and the applied are complementary and inseparable. Our investigations should, I believe, be so directed that the results may be fed into the Department of Fisheries and industry as rapidly as administrative or industrial use value becomes perceptible. We must also keep clearly in mind that we are a branch of the federal Department of Fisheries. Our work must be conducted in the closest possible cooperation with other branches of the Department.

The details of administration of our six stations and other research projects has, I think wisely, been delegated to the executive committee, the sub-executives and the three Board officers. The main objective of this large Board with representatives from a broad field of science and industry is to bring to bear on fisheries research wide knowledge and critical judgment. It is not an easy task to bring together our collective knowledge and opinions. This is clearly the object of this Annual Meeting of the Board as a whole.

We have before us today the mimeographed reports from the six stations and from several special projects, notably the five-year project on the Skeena River. We also have several administrative memoranda to consider, particularly on the coordination of Newfoundland fisheries research with our total effort. This is an imposing mass of material. It has reached you before this meeting so that there has been enough time for at least a preliminary study. Last year we adopted the committee method of bringing our experience and opinions to bear on this material. If you again approve this method we shall divide into a series of groups to consider special projects and reassemble as a Board to hear the results of the committee deliberations and to formulate general policy.

PROF. DYMOND'S ADDRESS

Prof. J.R. Dymond
Vice-Chairman
Fisheries Research Board of Canada

The biologists of the Fisheries Research Board of Canada investigate the fish while they are still alive and in the water. After they are caught, methods of keeping them fresh or of otherwise preparing them for market become the concern of other scientists.

The biologist investigates the life histories of the fish --- where and when they spawn, the factors affecting their hatching, survival and growth, their migrations and conditions determining their numbers.

More and more in recent years our biological investigations have been directed towards finding out how many fish of different kinds we have in our waters, what determines the numbers of each, what part of the stock is removed by commercial fishing and angling and how such fishing affects the numbers in succeeding generations.

Study of populations is of basic importance to fisheries management as well as to research, since it is numbers which determine whether an industry will be successful or not. In research we need to know how the various factors we study (climatic conditions, predators, pollution, fishing, etc.) affect numbers. Unless we have some reasonably accurate methods of estimating populations much of our biological work is of less value than it might be.

It is for these reasons that the Board has been emphasizing various types of population studies. At this meeting the subject is to receive special consideration by the Committee on Biological Investigations when Dr. Wilder will discuss methods and results of studies of lobster populations, Dr. Pritchard will discuss the estimation of Pacific salmon populations, and Dr. Kennedy populations of lake fishes.

Fish populations are notorious for their wide fluctuations. Sometimes a species may be abundant and in a year or two scarce. Many of these drastic changes in abundance are undoubtedly due to climatic or other natural conditions. If they are, there is little we can do about them at the present time except try to foretell years of scarcity and years of abundance. Within the last few years the Board's biologists have begun to give forecasts for some species, notably Pacific herring and some

kinds of Pacific salmon. This service is of very considerable value to the industry. As scientists we should strive to improve the accuracy of our forecasts and extend it to other kinds.

It is important to distinguish between decreases in abundance due to natural causes and those brought about by over-fishing. If a fishery is restricted in the amount of catch the industry is allowed to take, in the belief that decreased abundance is the result of over-fishing when as a matter of fact it is natural, there has been an economic loss in not taking as many fish as might have been taken. On the other hand if so many fish are taken that reproduction is reduced, the country suffers an economic loss through not taking full advantage of the productive capacity of our waters. As biologists we must therefore strive to improve the accuracy of our methods of estimating fish populations.

Population studies are expensive. In the case of abundant sea fishes such as the herring studies must be made in many areas and large numbers examined in order to give estimates that can be depended on to be reasonably accurate. Boats must be used to take samples and assistants employed to examine scales to determine the years which contribute most or least to the fishery.

For accurate counting in salmon research, fences are erected across streams, forcing upward migrating adults and downward moving young into traps from which they can be counted.

Parliament has been reasonably generous in granting funds for providing facilities and employing personnel for this important phase of research. If our investigations are to be expanded to give more accurate information and to extend them to other kinds, still more funds will be required. I am sure as biologists we shall do our best to give value in the way of increased scientific knowledge for every dollar of increased appropriations placed at our disposal.

The public believes in scientific research. I am certain their confidence in the Fisheries Research Board can and will be justified.

A REVIEW OF THE BUSINESS SESSIONS

Problems affecting Canada's fisheries from the Atlantic to the Pacific were discussed during the business sessions of the Fisheries Research Board during the week of January 3rd to the 8th in the salon of the Chateau Laurier.

The results achieved by the Board's scientists who were investigating these problems during 1948 indicated that significant progress was being made in the various fields of research and exploration.

Reports of studies made were presented by the directors of the various stations of the Board and by others who were in charge of special investigations. These reports included studies of the waters of salmon streams in British Columbia; herring investigations; albacore tuna observations in Pacific waters; whale investigations; whitefish, goldeye and trout investigations in the Northwest Territories and in the Prairie Provinces; investigations into the fluctuations in the stocks of Atlantic salmon; groundfish,(meaning cod and haddock) lobster, scallop, oyster and clam research on the East Coast.

The Board, concentrating on its program of helping the industry deliver a quality product, continued its discussions on ways and means of improving methods of processing and distribution. Further progress on improving methods of refrigeration in transit and storage was reported, especially in the development of a mechanically refrigerated railway car which will undergo full-scale tests this year.

Studies of oceanography and conservation measures on the ocean shelves of the Pacific and Atlantic and exploratory work in Canada's eastern Arctic brought forth valuable information which will serve a useful purpose in the continuing program.

The Business sessions of the Board, which coincided with the 50th anniversary of fisheries research in Canada under Federal auspices were preceded by meetings of the Canadian Committee on Freshwater Fisheries Research, the Canadian Committee on Food Preservation and its sub-committee, and the Committee on Biological Investigations. The Board's staff of scientists are represented on these associate groups.

THOSE ATTENDING SESSIONS

Executive committee board members attending were Prof. G. B. Reed, of Queen's University, Kingston, chairman; Prof. J. R. Dymond, head of Dept. of Zoology, University of Toronto, vice-chairman;

and Dr. W. A. Clemens, University of British Columbia, Vancouver; O. F. MacKenzie, Halifax Fisheries Limited, Halifax; Prof. Georges Prefontaine, Montreal; R. E. Walker, vice-president, British Columbia Packers, Ltd., Vancouver, and D. H. Sutherland, Department of Fisheries, Ottawa.

Other members of the board attending were Prof. C. W. Argue, University of New Brunswick, Fredericton; Prof. D. L. Thomson, McGill University, Montreal; Prof. J. L. Tremblay, Laval University, Quebec City; Dr. J. H. L. Johnstone, Dalhousie University, Halifax; K. F. Harding, general manager, Prince Rupert Fishermen's Co-operative Association, Prince Rupert; Prof. I. M. Fraser, College of Engineering, University of Saskatchewan, Saskatoon; J. H. MacKichan, United Maritime Fishermen, Halifax; and Dr. A. L. Pritchard, Director of Fish Culture Development, Department of Fisheries.

Directors of the six board stations presenting reports were Assistant Deputy Minister of Fisheries Dr. A. W. H. Needler, Atlantic Biological Station, St. Andrews, N. B.; Dr. R. E. Foerster, Pacific Biological Station, Nanaimo, B. C.; Dr. S. A. Beatty, Atlantic Fisheries Experimental Station, Halifax, N. S.; Dr. A. Nadeau, Gaspe Fisheries Experimental Station, Gaspe County, Que.; Dr. N. M. Carter, Pacific Fisheries Experimental Station, Vancouver, B. C. and Dr. K. H. Doan, Central Fisheries Research Station, Winnipeg. Dr. A. G. Huntsman, Zoological Building, University of Toronto, consulting director, reported on field work on Atlantic salmon and the publications that were issued by the Board during the year.

The following members of the six station staffs at the meeting in addition to the directors were: Nanaimo, F. Neave, D. J. Milne, and J. R. Brett; Vancouver, Dr. B. E. Bailey, Otto Young and N. E. Cooke; Gaspe, Dr. L. C. Dugal; Halifax, A. L. Wood and W. A. MacCallum; Central, Dr. W. A. Kennedy and St. Andrews, Dr. D. G. Wilder, Dr. M. W. Smith and Dr. P. F. Elson.

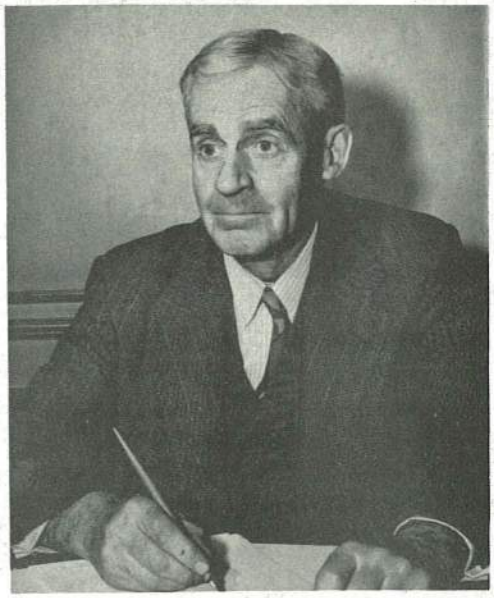
Other scientists present included Dr. Wilfred Templeman, Director of Newfoundland Scientific Research of St. John's, Newfoundland, and Dr. Maxwell Dunbar, Professor of Zoology, McGill University.

MINISTER GIVES LUNCHEON

Minister of Fisheries R. W. Mayhew visited the Board while it was in session and in addition, was host at a luncheon tendered to the members of the Board, the directors of the six research stations and members of their staffs who accompanied them to Ottawa, senior officers of the Department of Fisheries. Special guests included Minister of Veterans Affairs Milton F. Gregg, Dr. C. J. Mackenzie, president of the National Research Council; Dr. O. M. Solandt, chairman of the Defence Research Board, and Dr. W. H. Cook, director, division of applied biology, National Research Council.

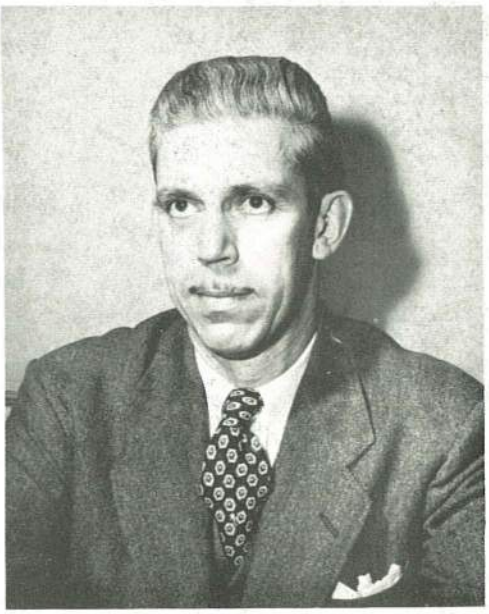
Stewart Bates, Deputy Minister of the Department of Fisheries, was present at some of the sessions and also addressed the Board. Also attending was E. K. Turner, Chief Treasury Officer of the Department who has been appointed honourary treasurer of the Board, replacing F. O. Weeks who has retired from this post.

DR.A.L.PRITCHARD, Federal Director of Fish Culture, appointed to the Board to replace J.A.Rodd.



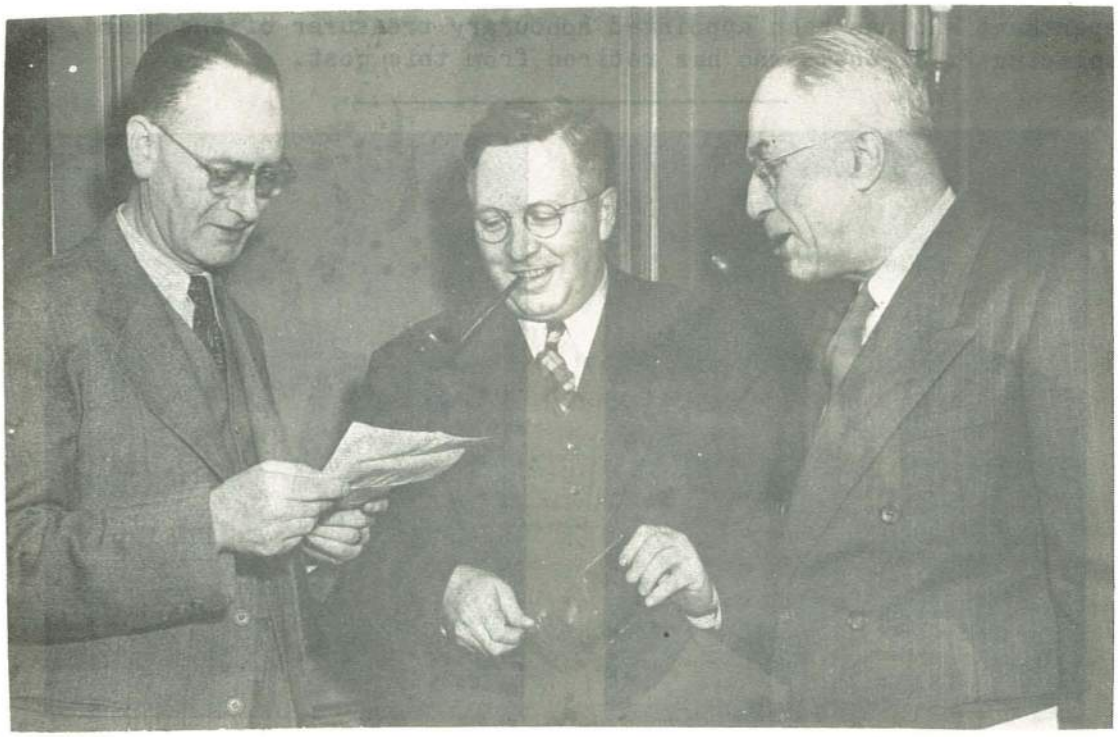
DR.A.G.HUNTSMAN, editor of publications and consulting director of the Fisheries Research Board.

DR.M.L.DUNBAR who heads the Board's fishery investigations in Canada's Eastern Arctic.



E.K.TURNER, Chief Fisheries Treasury Officer, who is the Board's new honorary treasurer.

INFORMAL PHOTOGRAPHS . . .



GEORGE CLARK
Director of Western
Fisheries
Ottawa

DR. A.L.PRITCHARD
Director of Fish Culture
Development
Ottawa

DR. R.E.FOERSTER
Director of Pacific
Biological Station
Nanaimo

R.E. WALKER
Chairman of Pacific
Sub-executive Committee

DR. WILFRED TEMPLEMAN
St. John's Nfld.

DR. A.W.H. NEEDLER
Assistant Deputy Minister
and Director
St. Andrews Biological Station N.B.

. . . AT THE ANNUAL MEETING

PROF. J.R.DYMOND
University of Toronto
Vice-chairman

DR. WILFRED TEMPLEMAN
St.John's, Nfld.

STEWART BATES
Deputy Minister

DR.G.B.REED
Queen's University
Chairman

DR. K.H. DOAN
Acting Director of Central
Fisheries Research Station

DR. S.A. BEATTY
Director of Atlantic Fisheries
Experimental Station

ATLANTIC BIOLOGICAL STATION

A Review by Dr. A.W.H.Needler, Director

Biological fisheries research, the work of this station, is designed to enlarge and maintain the supply of raw materials to the industry, and to improve their availability through its contribution to techniques of capture. The work includes exploration for new resources, investigation of intensive fisheries to devise regulations which will give the best long-term yield, and development of methods of increasing production by positive cultural action. It also includes improvement of fishing techniques which, insofar as they are related to the habits of the fish, present problems with biological aspects.

Effort has been concentrated on those species, the use of which is limited by supply rather than demand, and which together contribute a considerable proportion of the Atlantic coast fisheries income. In some cases there is prospect of improving the supply principally through cultural methods (oysters, soft-shelled clams, trout, salmon), in others principally through regulation (lobsters, scallops, smelts) and in still others principally through exploration (shrimp, bar-clams) or the development of fishing techniques (tuna and bill-fish), although more than one of these methods of attack is applicable to most individual species. Attention has also been given to the important groundfish fishery by laying the basis for meeting over-fishing should it occur, and by improving catching methods to reduce costs in a highly competitive industry. An attack has been started on the problems of control of eel-grass, a potential menace to clam and oyster culture, and some additional assistance has been given to the development of the Irish moss industry.

INTERESTING DEVELOPMENTS IN 1948

Lobster. The lobster fishery is the most valuable of our Atlantic inshore fisheries. Being highly intensive and limited by supply rather than by demand, there is prospect of maintaining or

increasing its yield through proper management. Our investigations are obtaining the knowledge on which to base sound regulations, to offer predictions of natural changes in abundance, and otherwise to increase the stocks or improve their exploitation.

The tagging of lobsters has been used to estimate the proportion caught by the fishery in a number of typical localities, and it is found to vary from about 35% to about 85%. Applying this knowledge to the quantities of lobsters caught and to the area of the fishing grounds, estimates of the population densities of lobsters of catchable size have been made, varying at different places and times from about 4,000 to about 50,000 per square mile. Marking and recapture of measured lobsters at Tignish, P. E. I., and Grand Manan, N. B., indicated an annual growth of 15.2% and 14.3% and further experiments are in progress giving us our first reliable information on growth. The knowledge of the proportions caught, the population densities and the growth are providing a sounder basis for deciding at what sizes lobsters should be caught to give the greatest yield and, consequently, for selection of size limits.

The results of our demonstrations in the past few years of the effects of lath spaces on the sizes of lobsters caught are the basis for the proposed requirement of minimum spaces suited to the two size-limits now in force in the "market" and "canner" areas. It is expected that this will contribute to the effectiveness of the size-limits. In "canner" areas $1\frac{1}{4}$" spaces and in "market" areas 1 5/8" spaces permit most of the small lobsters to escape without reducing the catch of lobsters of legal sizes.

Oyster. The oyster-farming industry, which is based to a very large degree on the results of the station's oyster investigations, continues to grow and there is continued need both for technical services to the industry, such as prediction of the settlement of spat, and for development of improvements in oyster-farming methods. Both were continued in 1948 at the sub-station at Ellerslie, P. E. I., and elsewhere in the oyster-producing areas of the Maritimes. In experimental farming special attention is being given to the possibilities of reducing oyster farming costs through the moderate mechanization our operators can afford.

Soft-shelled clam (Mya). The demand for soft-shelled clams far exceeds a dwindling supply both in the Maritime provinces and New England, and an investigation of methods of clam farming and fishery management has been carried on for some years. Much of the basis has been laid for the methods and policies best adapted to our conditions and results have been applied to regulation of clam digging.

Experiments have shown the effects of crowding on growth, have compared the values as seed stock of stunted clams from high levels and small clams with more normal growth rate and have cast light on many other aspects of clam-farming methods. Growth has been found to be disappointingly slow and prospects for profitable clam-farming are

limited to a few specially favourable areas. A number of plantings have been made to test the potentialities of these and it is hoped that a limited clam-farming industry may yet be developed.

Scallop. Investigations of the valuable scallop fishery have been accelerated. In the Digby area the fishery is intense and is currently suffering from a scarcity of scallops. There are indications that the fishery is wasteful in taking scallops at too small a size. Preliminary results of marking experiments indicate a moderate fishing intensity and, combined with information on growth rate and yield of meat in relation to size, confirm the need for a size-limit not lower than the present 4". Enforcement being difficult because shells are discarded at sea, the effect of mesh size of the drags on the sizes of scallops caught is being studied in order to develop an effective means of protecting small scallops.

Groundfish. The groundfish fishery is the most important on the Canadian Atlantic coast when offshore and inshore fishing of all kinds are included. There is as yet no evidence of over-fishing and this branch of the industry is limited by processing and marketing rather than by supply. Our investigations have two principal aims: (1) provision of the basis for recognizing over-fishing should it occur and for recommending remedial action, and (2) improvement of the industry's competitive position by increasing the effectiveness of our fishing effort with better methods and better knowledge of fish stocks and movements.

(1) The suggested establishment of an international body to investigate and regulate the groundfish fishery of the northwestern Atlantic emphasizes the need for sound information in this field on which to base Canada's policy. Her interests in this resource are, in the long run, threatened both by possible over-fishing and by possible pressure for too many restrictive measures. We are, therefore, obtaining the information necessary to recognize changes in the abundance of groundfish, including special statistics on catches, on fishing effort and on sizes and ages of fish. This is already yielding information on seasonal and annual changes in availability and on the variations in abundance of year-classes which are part of these changes and which offer some prospect of predicting them.

(2) The groundfish fishery is so highly competitive both internationally and domestically that relatively small changes in costs of production may have an important effect. The most efficient methods of catching must be made available to both large and small operators. The station has played an important part in testing the value of "long-lining" (the hauling of set lines with power) in our waters and in its demonstration and adoption, and in the recent establishment of inshore flounder dragging on a small but increasing scale. In 1948 preliminary tests with promising results were made of the "Danish seining" method. It is planned to carry these further and also to explore the potentialities of other methods including, in the near future, gill-netting.

Smelt. Smelt are in high demand, and the fishery in the principal producing area, the Miramichi estuary, is very intensive and its catch declining. Our investigations are designed to provide the basis for improvement of production and regulation of the fishery.

It has been shown that removal of obstructions in spawning brooks causes an increase in the spawning area occupied and that the consequent reduction of crowding of eggs leads to a higher production of young smelt. These results are now being applied.

Marking of smelt has shown that the fishery takes a very high proportion (over 75%) of those which enter the estuary during the open season, but that large quantities remain out of its reach, entering after it ends at the middle of February to form the spawning run in the brooks. The need for drastic restriction of fishing is not clear and depends on the relationship, now being studied, between various parts of the stock.

Atlantic salmon. In 1948 special attention has been paid to the effects of reduction of fish-eating birds on the production of young salmon. In the Petitcodiac system, as in the Margaree, bird control has resulted in a great increase in young salmon but has been accompanied by a similar increase in other kinds of fish, which may yet become detrimental to salmon production.

PACIFIC BIOLOGICAL STATION

A Review by Dr.R.E.Foerster, Director

The marketed value of the fisheries along the Canadian Pacific coast in 1947 amounted to almost $59,000,000. These fisheries represent a self-perpetuating natural resource if they are so regulated or "managed" that maximum catches can be made, yet adequate numbers of fish left over to mature and spawn. Thereby adequate numbers of young fish - "recruits" - will be added to the total population each year to keep the stock at a high level. It is the purpose of fisheries research to study carefully the various fish and fisheries and determine what must be done to keep those fisheries at a high level of production.

Pacific salmon constitute British Columbia's greatest fishery. Five species of salmon are involved, the sockeye, pink and chum which are taken chiefly by gill net or seine, and the spring and coho which are caught by trollers, gillnetters and seiners. At the present time production of all species fluctuates greatly from year to year and the general average is much below that of earlier years. It is therefore desired to determine the causes and attempt to rectify them.

SKEENA RIVER INVESTIGATION

For sockeye the fishery on the Skeena river has been given special attention and in 1949 a five-year intensive study was completed. This study included, (1) an analysis of the commercial fishery as far back as reliable records were available, (2) the tracing of the sockeye's migration in from the ocean and up the rivers to the spawning grounds, (3) the determination of the age classes involved, (4) an examination of the Indian fishery in various parts of the upper Skeena area, (5) a survey of the spawning grounds and count or estimation of the numbers of spawning fish, and (6) an examination of the conditions in the "nursery" lakes where the sockeye spend one or two years before migrating to the ocean. The work involved the full-time services of seven biologists

working under Dr. A.L. Pritchard, Senior Biologist (now Director of Fish Culture Development for the Dominion Department of Fisheries), two technicians and twelve summer field assistants. The findings of the five-year investigation, recently reported, indicate that there has been a gradual decline in the commercial fishery and in sockeye production generally over the past forty years. This is believed to be due to over-fishing principally but contributory factors have been a heavy Indian fishery in the upper river areas and change in the conditions in spawning streams and in nursery lakes. It has been recommended that certain fishing restrictions be increased to allow a greater escapement of sockeye to the spawning grounds, that an intensive study be made of the factors influencing and limiting spawning and production of young sockeye in two important areas, Lakelse lake and Babine lake, and that appropriate stream improvement measures be undertaken to improve spawning conditions throughout the Skeena system. The discovery of effective improvement measures for sockeye production on the Skeena will, of course, have application in other sockeye streams along the British Columbia coast.

STREAM IMPROVEMENT STUDIED

For pink and chum salmon, which inhabit the many coastal streams where stream flow and water level conditions fluctuate greatly from year to year and within the year, studies are being made at two field stations. One is at Nile Creek on the east coast of Vancouver Island; the other at Port John Creek in the central area of the B. C. coast near Namu. In charge of Mr. Ferris Neave, assisted by three full-time biologists, three full-time technicians and several seasonal field assistants, the studies have revealed that water conditions in the streams are an extremely important factor in young pink and chum salmon production. In certain years it is indicated that even if there were no commercial fishing, the production of young fish would not be sufficient to maintain the runs. With a commercial fishery removing one half or more of the returning adult fish the situation is decidedly worse and drastic measures may have to be applied to maintain the stocks of fish. Stream improvement studies are planned and experiments are being made to determine whether certain artificial propagation operations might be effective in cutting down losses in eggs and fry which occur normally in streams due either to over-crowding of spawners in certain sections of the stream, to freshets, which scour out of the gravel beds where eggs are laid, or to droughts which leave the spawning beds high and dry or imprison the fry in the shallow pools. A considerable expansion of this work seems highly desirable in order to obtain quickly effective measures of control for application along the coast.

The Pacific herring fishery is the second most valuable fishery in British Columbia. At the present time the supply of herring is good but it is desired to determine the best methods of management to keep it that way. Two management systems are being studied. One, effective in the lower east coast of Vancouver island area, is testing out the quota system of regulation. The catch of herring is being limited to 40,000 tons annually and the general trend in the stock is being followed to determine whether this drain on the population is too great, is reasonable or can be increased. Studies are being made by Mr.

J. C. Stevenson and his staff of three full-time biologists and six field technicians of the various age classes of herring in the fishery and the extent to which they are increasing or decreasing, of the extent of spawning each year and the extent to which each year's spawning adds young recruits to the general population. Migrating habits are also studied.

HERRING POPULATIONS OBSERVED

The other management study being tested is that now effective on the west coast of Vancouver Island. This involves no restrictions to the fishery except an annual closing date when the fish are mature and gather in the coastal inlets to spawn. The purpose of this experiment is to determine whether there is any advantage in limiting the fishery and in building up a large spawning escapement. It has already been observed that in some years when there have been large spawnings there have not been extensive additions of young fish to the stock and , conversely, when there have been only small spawnings there have been heavry recruitments of young fish. General weather and tide conditions at time of spawning and inshore ocean conditions during the young fry stages may be the most important limiting factors to survival and to maintenance of herring populations and may make ineffective any policy of regulated or quota system of management. In northern British Columbia waters where good schools of herring abound, the fish do not appear to come in to coastal seining areas until they are well matured and thus not of good quality. Exploration work to determine the economic value of a summer fishery would seem to merit consideration.

OTHER SPECIES STUDIED

Trawling or dragging for several species of flat fish and for a number of species of round fish - ling cod, dogfish, rockfish, grey cod etc - is moderately important fishery along the B. C. coast. The fish are used chiefly in the fresh fish trade or for vitamin oil content. Research, under Dr. J. L. Hart, with three assistant biologists, several field observers and the trawler Investigator No. 1, seeks to reveal the migratory habits of the fish involved, spawning times and places, rates of growth, ages of the fish of commercial sizes and the effect of present fishing intensity on the stocks of fish. Suitable methods of regulation are being investigated. The investigation is of relatively recent origin, the field of operation embraces the whole coastline and therefore the study has been to date essentially a fact-finding one. Valuable data are being collected, however, and will soon be sufficient for critical analysis.

Studies are being made on other fisheries as well, such as pilchard, crab, albacore tuna and whale. A very valuable tuna fishery developed off the West Coast in 1948 but whether it was merely an abnormal and ephemeral one due to unusual oceanic conditions bringing the albacore tuna in closer to shore and further north than normally occurs has not been determined. Further observations are contemplated for 1949.

Prediction of the likely occurence and abundance of commercially important fish each year is of value to industry. It enables more efficient and effective plans for fleets and fishing operations to be arranged. As more and more knowledge is gained of the habits of the various species of fish and of the relation of their movements to oceanic or weather conditions, fishery biologists can prepare more accurate and significant forecasts. On the basis of information now being obtained for the pilchard, the herring, the pink and the chum salmon, useful predictions are possible and are being made. There is much to be learned, however, before the predictions can be considered highly significant. Progress is being made.

OCEANOGRAPHY DATA OBTAINED

One important factor is the knowledge of oceanic conditions for fish in the sea and of water flow conditions in our streams and rivers for salmon. Data for the former are now being obtained by collecting from eleven light-house stations along the coast daily records of salinity and temperature. These reveal the conditions in the in-shore coastal waters and can be related to land drainage conditions as affected by weather and climate generally. There is a need for correlating these inshore conditions with conditions applying in the ocean offshore and a plan is now laid to run lines of observation stations out some 300 miles from shore periodically and thus obtain information on oceanic currents and conditions. Such data should help to reveal the relation of pilchard, herring, tuna, salmon, etc., movements and abundance to factors prevailing in the ocean and thus make more accurate long-term predictions. Through the cooperation of the Royal Canadian Navy, the National Research Council and the Fisheries Research Board of Canada, a combined oceanographic program, operating under a Joint Committee on Oceanography, is being undertaken. This pooling of facilities and personnel should advance rapidly much-needed oceanographic research off the Canadian Pacific coast. The work will be supervised by Dr. J. P. Tully.

In order to get pertinent data relative to stream conditions along the coast, in relation to salmon production, a series of gauging stations is being set up, in cooperation with the Dominion Water Bureau, Department of Mines and Resources. The records thus obtained will be correlated with data on salmon spawning and production of fry in certain selected streams where accurate counts can be made. In this way forecasts over wide areas of coast will be possible.

CENTRAL FISHERIES RESEARCH STATION

A Review by Dr. K.H.Doan, Acting Director

To overcome heavy losses sustained by producers and shippers of whitefish due to conditions particularly serious in the Prairie Provinces and northwestern Ontario was the original purpose in establishing the Central Fisheries Research Station in Winnipeg in 1944. Contributions of the Central Station to the solution of this problem have included:

1. Assistance to the Inspection Service of the Department of Fisheries.

2. Assistance to Provincial Governments in grading lakes as to the suitability for export of the whitefish produced in them.

3. Biological studies to discover means of raising the quality of whitefish to assure a higher percentage of the production is suitable for export.

GREAT SLAVE LAKE FISHERY

The provision of supplies of food in northern Canada is a matter of importance in times of peace as well as war, and surveys begun by the Board in 1944 and 1945 have since paid off by leading to the establishment of a commercial fishery at Great Slave Lake, N.W.T. A unique opportunity was presented to follow the trend of the fishery statistically, and, since this is the deepest and the fifth largest lake on the continent, the changes in fish population from the virgin condition can add much to our understanding of fisheries management. For four years the fishery operated under a quota of $3\frac{1}{2}$ million pounds, and about 60 per cent of the catch has been lake trout and 35 per cent whitefish. Summer fishing required refrigerated barges and extensive hauls to railhead.

At this rate of fishing no depletion in abundance of fish can be detected nor any severe decrease in the average size of fish produced. With the completion of a highway from Grimshaw in northern Alberta to Hay River on the south shore of Great Slave Lake in August, 1948, the gateway to expansion was opened. Winter fishing, employing mechanized equipment on the ice, enabled the fishing effort to be spread over more of the year.

The availability of lake trout increased from west to east in Great Slave Lake while the average size decreased from west to east. These facts, along with information from tagging, indicated that most trout originated in the eastern part of the lake and those found in the western part have migrated there. Similar observations showed that most whitefish originated in the western part. Thus a clue is provided suggesting that emphasis be placed on a winter fishery in the west end for whitefish and a summer fishery in the more distant eastern portion of the lake for trout. No quantities of coarse fish were present in the neighbourhood of Hay River to supply any proposed northward extensions of fur farming.

The Winnipeg goldeye has long been a famed and distinctly Canadian contribution to the delight of epicures. This recognition created such a demand for the fish that supplies were unable to keep pace and the decline in catch caused much concern. Investigation of the life of this fish, and possible management to increase production, were begun in 1945 when knowledge of the goldeye was so scanty that nobody was certain when it spawned, nor had a young goldeye ever been reported. Investigation began in Lake Winnipegosis in Manitoba, where most of the existing commercial production came from, and details of growth, food, size at maturity and catch in relation to size of mesh were obtained. In subsequent years it was discovered that dams operated for the control of water levels in connection with muskrat management in the delta of the Saskatchewan River proved limiting to goldeye abundance. A plan for allowing the escape of small amounts of water from the dams at crucial periods was put forward, based on experimental tests in order that young goldeye might be liberated from the marshes which were so lethal to them.

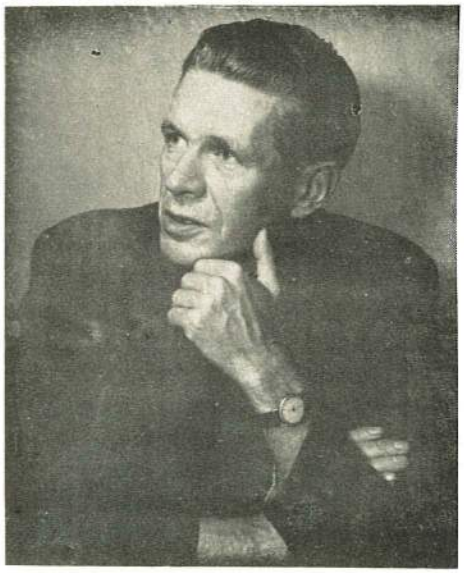
Extensive stocks of goldeye were discovered in Lake Claire in Wood Buffalo National Park in northern Alberta and investigated as to commercial potentialities and biological properties. In conformity with the latter, recommendations were put forward for a fishery which, if realized, would quadruple the existing Canadian catch and so ease the market demand. Owing to technical difficulties in commercial operations the full quota was not realized in 1948, but investigations showed the supply of fish in the lake to be adequate. In 24 days the fishery took a catch equal to the annual catch in Manitoba, the traditional source of supply. Several investigations, now only in early stages or not as extensive as those reported above, should be mentioned. A preliminary study of Arctic char was made on the coast of Hudson Bay about 250 miles north of Churchill; at Churchill an attempt to mark white whales to trace their movements was not successful, but aerial counts were made of their abundance with a view to future utilization; south of Churchill certain details of the life history of speckled trout in tributaries of the Nelson River were checked and a plan of investigation for management has been operated by the provincial department concerned with fisheries.

It is now apparent that the Fisheries Research Board of Canada can make important contributions through research to the fisheries economy of central Canada, and that the small station established five years ago in Winnipeg is filling a need in producing more knowledge leading to a better management of fisheries resources.

PACIFIC FISHERIES EXPERIMENTAL STATION

A Review by Dr. Neal M. Carter, Director

The agencies that contribute to deterioration in quality and eventual spoilage of freshly caught fish are now pretty well known. Living bacteria and chemical enzymes are the chief instigators of spoilage. The flesh of a healthy, freshly caught fish is free of bacteria; though there will be some in the slime, gills and digestive tract. From almost the moment the fish is caught, however, it is subject to various handling or cutting operations that can introduce a much greater number and variety of bacteria unless careful precautions are taken to avoid further contamination, and to keep as low as possible the rate of multiplication of those living bacteria that unavoidably remain. The enzymes play an essential role in the tissues of the living fish, but cause undesirable, though often slow, changes in the constituents of the fish after it is dead. They cannot be removed from the flesh, since they are chemically integrated with it; but bleeding and removal of the viscera by careful gutting gets rid of many of the enzymes that cause the more rapid changes.



This station, along with the other two technological stations of the Board, has repeatedly carried out experiments with our own Canadian-caught fish to demonstrate the importance of the principle that fish must be clean, cold, and carefully handled if it is expected to retain its freshness for a reasonable length of time. In our laboratories we supplemented the work of other laboratories in studying the nature and action of the bacteria invading the fish both on board the fishing vessel and during processing at shore plants, with particular reference to conditions obtaining on the B. C. coast. Improved methods of dressing and stowage of fish on fishing vessels were developed, and the suitability of numerous chemical cleansing solutions was studied for maintaining proper cleanliness in fish holds and processing equipment ashore.

In all of this work, much of which was initiated during the earlier days of the station some twenty years ago, continual stress was placed on the necessity of realizing that if the fish is to be sold as

"fresh", the sooner it is chilled to a temperature close to its freezing point (about 30°F.), and the closer it is kept to this temperature during unavoidable holding periods, the fresher it will remain. The activity of both bacteria and enzymes is greatly reduced as the temperature of the fish is lowered. Freezing and holding at or below 0°F. practically halts bacterial and enzymatic action and if, for other reasons also investigated extensively at this station, the freezing is rapid enough, fish can be held at below 0°F. for many months provided certain precautions are taken.

The handling of fish on the Pacific coast has always been fairly good, and in recent years has been still further improved, partly by the initiative of the industry itself, and partly through adoption of some of the findings of this and other investigational laboratories. Further improvements are yet possible, and the station is continuing to pursue the answers to fundamental and applied problems. For example, in connection with the general principles for fresh fish preservation mentioned above, the possibilities of more rapid chilling of fish in a vessel hold were investigated last year with renewed emphasis at both this and the Halifax station because it became realized that even when surrounded with melting ice, the temperature of the inner flesh of the fish took many hours to reach 34°F. and that it probably would never reach 32°F. within the time it was in contact with the ice under practical conditions. Yet getting the flesh from 34° to 32°, small as the lowering may seem, has more effect in retarding bacterial growth than would a similar two-degree lowering from 36° to 34°F. Furthermore, experiments at the Vancouver station in 1948 confirmed by a new method that neither marine nor freshwater fish flesh freezes until it reaches 29.3°F. Consequently, by gentle refrigeration to about 30°F., still more improvement in preservation is possible without actual freezing. Some further fundamental work on the nature of the enzyme systems giving rise to certain deteriorative effects in fish muscle and fats was also commenced during the year.

RAILWAY CAR REFRIGERATION

Referring again to frozen fish, one of the prominent features of the station's work in 1948 was the consummation of plans for investigation of mechanical refrigeration in Canadian railway refrigerator cars. For many years the station has been advocating holding temperatures of 0°F. (or lower) for frozen fish, and has been instrumental in assisting cold storages to achieve this performance. The rapidly expanding frozen fruit and vegetable industries insist on similar temperatures. The time taken to transport frozen fish, fruit or vegetables by railway across most of the continent may not seem to be very great in relation to total frozen storage times, but if transportation temperature is higher than that of prior storage, the effects on the product are undesirable.

Some ten years ago the station demonstrated the practicability of the present method of refrigerating the cars with ice and salt in overhead tanks instead of in end bunkers, thereby ensuring greater

uniformity of temperature in the car and achieving a somewhat lower temperature than that previously obtained. Still more recently, in collaboration with the National Research Council, the addition of another chemical (ammonium nitrate) to the ice and salt was investigated. But consistenly low temperatures of 0°F. or lower could not be secured during cross-Canada runs in hot weather. The interior of a refrigerator car loaned by the C. N. R. was completely remodeled last year, and one self-contained, specially adapted "Thermo King" mechanical refrigeration unit was installed. This unit is powered by a small gasoline engine, and the refrigeration is applied to the load by a blast of cold air, controlled thermostatically to the desired temperature, circulating in an outwardly insulated "jacket" surrounding the load. To permit the car to be used in cold weather for shipment of commodities that must not freeze, the refrigerator unit cycle can be reversed by merely turning a switch, allowing it to abstract heat from the cold outside air, and to deliver this heat at the thermostatically-controlled temperature by the same system of air circulation.

The car is designed to contain two complete units. The one first installed was subjected to rigorous shunting tests while in place and running, and later a test run with a load of frozen produce was made between Vancouver and Edmonton to ascertain the reliability of the mechanism under continuous running conditions. It functioned perfectly; and this year, after installation of the second unit, longer trips are planned under conditions calling for heating and cooling, respectively.

UTILIZATION OF RESIDUES

Another active field of investigation in 1948 was exploration of the special utilization of various residues arising in fish and whale processings. Years ago the station drew first attention to the value of B. C. fish livers for their vitamin oil content, and later pointed out the vitamin values in certain other visceral organs. A new and flourishing industry was thus built up in the province, and researches on vitamin A are still continuing in our laboratories.

In more recent years attention was turned to the possible economic values in products already known to be derivable from other organs or components of fish, part of the material that ordinarily goes to a reduction plant for conversion into fish meal and oil. Nutrient media for the culturing of bacteria, enzymes for use in one stage of leather manufacture, iridescent lacquer ("pearl essence"), and various phamaceutical products such as sterols, hormones, protamines, amino acids, etc., are among the special materials that have been investigated. Last year working tests were made to estimate the cost of separating and collecting various organs as they passed towards the reduction plant, and similar attention was paid to the possibilities of utilizing certain organs from the recently revewed whaling industry in B. C. The vitamin A value in a single sperm whale liver can run as high as $1,200, if all recoverable--yet whale livers had never been used commercially for this purpose in previous B. C. whaling.

The amino-acid constitution of the proteins of various fish wastes, fish meals and "stickwater" were intensively investigated last year for their livestock feeding value. Stickwater (the aqueous liquid from fish meal presses) was allowed to run to waste until last summer, when one B. C. plant commenced concentrating it. In addition to proteins, it contains vitamin B and other valuable animal growth factors.

Many other lines of investigation were followed during the past year, some new, some continued. Technological assistance to the freshwater fisheries of the Prairie Provinces continued to be rendered in the fields of analyses for food value, and assistance and advice on canning, smoking and reduction. X-ray and other optical methods of detecting worm larvae in whitefish flesh were tested, but showed no advantage over present means of "candling" over white light.

A new air-conditioned smoke tunnel was built at the station, and other types of smoking equipment were designed for various local firms. Canning investigations centered largely on improvements in the commercial sardine-type canning of anchovies, and in developing a new system of retorting and pressure-cooling flat oval cans of fish.

The well-received book-size bulletin on the chemistry and technology of marine animal oils prepared at this station and published in 1941 (now out of print) has been revised and brought up to date and is scheduled to appear this year. It includes a summarization of interesting investigations made in recent years at the station, dealing with the separation and characterization of the non-fat constituents of some fish oils.

Further details of the work reported above, as well as of other work at the station in 1948, have been published currently in the four issues (Nos. 74-77) of the Pacific Progress Reports which appeared during the year.

GASPE FISHERIES EXPERIMENT STATION

A Review by Dr. Aristide Nadeau, Acting Director

The I948 activities of the Gaspe Fisheries Experimental Station were chiefly concerned with two main investigations, the salt fish and seal oil problems, without, however, neglecting other problems of importance. The investigation of salt fish under the direction of Dr. H. Fougere has so far covered phases relative to the mechanism of salting, including study of the swelling and the coagulating effect of salt on fish proteins, the salt and water exchange in weight, the absorption and desorption of water, and the equilibrium salt and water content of codfish muscle in the presence of salt.

These studies have resulted in a better understanding of salt fish and have therefore been of some help in preparing lightly salted fish of the type of the Gaspe cure. These studies have also been of some value in outlining a classification for salted codfish, based on principles inherent to the product itself, that is, on the salt content of the fish. This classification comprises three categories of salt fish, slack-salted, medium salted and heavily salted.

As applied to salted cod, salt fish can be logically classified in terms of its salt content. Such a mode of classifying fish can, with the aid of experimental data, give to the economist an appreciation of the fish in terms of the various steps necessary for its production.

Most of the dried salt fish produced is exported into southern countries where it is submitted to severe conditions. Therefore the study of the keeping quality of dried salt fish during transportation was carried out in 1948 to determine the maximum temperature and relative humidity at which a dried fish of a given moisture content could be stored without danger of alteration.

Heat treatment of salt was found effective for the removal of red bacteria, although the practical application of this process offers many

difficulties. Removal of red bacteria from salt fish could not be effected by cold storage even for long periods of time.

A yeast like organism still unidentified has been isolated from salt fish. It appears in the form of cream colored growth mainly on the skin surface of the fish and does not seem to cause any breakdown of the fish flesh.

To increase its efficiency, improvements were made to the dryer; installed last year at Riviere au Tonnerre for drying capelin. It was possible with a minimum of adjustment to use this dryer for the heavy salted codfish. The results were so satisfactory that over 35,000 pounds of finished dried salted fish were handled in six days of full operation.

The investigation on artificial drying of Gaspe cure was resumed with the results that the temperature between 60°F and 80°F do not appreciably influence the drying rate, and it is only upon reaching the lower relative humidities such as 40% and 50% that a perceptible change in the drying rate takes place.

To complete the work on the artificial drying of capelin, experiments were carried out in order to study the possible applications of infra red rays for drying fish. When using infra red rays the drying rate is more constant in comparison with those that are obtained by usual drying methods. The heat has then a greater penetrating power so that the temperature of the interior of the fish is maintained at the same degree as that of the surface of the fish. The rate of moisture diffusion is increased; moreover the crust formation on the surface is minimized. The inconvenience is the rather high temperature obtained with the infra red rays. This is not a serious inconvenience in the case of capelin. But for drying codfish it would be necessary to control the rays in one way or another in order to avoid cooking on the fish by exposure at too high temperatures.

It is considered quite advantageous to have on hand a rapid and reliable method of computing the weight loss in moisture when drying fish from a known to a desired moisture content. This is quite desirable if the industry is to be maintained on a logically controlled basis. For this purpose a nomograph was drawn which was found a very useful guide for the proper control of a drying plant.

SEAL OIL PROBLEMS

Canada has not produced very much oil and has to import most of the vegetable oils that its paint industry requires. This country is also an importer of finished oils. During the war Canada faced a major problem when it was cut off from its normal supplies of oils; there were several solutions:

1. Increase the production of oils

2. Find new sources of oils

3. Find ways of working up the available oils into useful products.

Among the oils which were already being produced was seal oil. Before the war the production of that oil amounted to something like 100,000 gallons a year. It was known that production of that oil could be increased enormously, but unfortunately the lack of vessels available to the industry on account of the requirements of the navy prevented the industry from increasing its output.

The price of seal oil went up, and consequently the price paid to the hunters of seals also increased during the period. Most of the hunters can now make a living out of that industry. In a few years, however, it is expected that the normal supply of oils will again be available. Since seal oil has disadvantageous characteristics by comparison with other oils, some special use, where it will not have the competition of vegetable oils, was sought by the Grande Riviere Station. The other problem was that of finding processes for transforming the oil into finished products usable as such by the industry, because up to now seal oil has been exported in the raw form to other countries which work it up into finished products which are then sold to Canada.

The scientific research, which is being carried on at the Grande Riviere Station, includes studies on refining, bleaching, deodorization, hydrogenation, blowing, sulfonation. These are all processes which are applied by the industry to oils in general, and it may be explained that research is necessary because seal oil is different from other oils and consequently the processes developed for vegetable oils, for instance, would not apply in the case of seal oil.

Refining. This is a term used by the industry to describe a process by which detrimental products present in an oil, that is, free fatty acids, are removed from it. There are many ways in which refining has been applied to various oils, and our problem consisted in finding a method which would be easy to apply, would not be too costly and would yield the greatest quantity of refined oil. By studying a great number of processes it has been possible to devise a method which gives excellent results. It is based on the use of lye which forms soaps with the free fatty acids; the soaps are insoluble in the oil, they grain out easily and thus can be removed from the oil.

Bleaching. This is a process to remove the colour bodies from an oil. They are processes which use chemicals such as hydrogen peroxide and others which use clays. The former transform the colour bodies into colourless compounds while the clays absorb the coloured bodies and remove them. Our work has been concerned with the details of the processes such as finding out what quantities of clay or chemical to use, at which temperature to conduct the operation and what results to expect from such operations.

Deodorization. This is a process by which the taste and smell of an oil can be improved. It consists of passing steam through the oil in a special apparatus where a vacuum can be realized. Here, again, our work has been concerned with finding out the details of operation leading

to the best results.

Hydrogenation. This consists in passing hydrogen gas through the oil. This has for effect to transform the oil into a fat, that is to make it solid at room temperature. It also makes the oil keep much longer before the taste and smell become noticeable. One of the most important points to consider in hydrogenation work is how much longer than the fresh oil the hydrogenated oil is going to keep. This is part of our work for 1949.

Blowing. This is a treatment to make an oil thicker so that it can be used in paints and varnishes.

Sulfonation of seal oil has been found easy to do; the most important precaution to be taken during the preparation of this product is to keep the temperature as low as possible. Sulfonation consists in adding sulfuric acid to an oil while mixing. This gives a new kind of oil which mixes easily with water and thus permits oils to enter into leather giving what is called "oil tanning". This kind of oil is also used in the textile industry.

ATLANTIC FISHERIES EXPERIMENTAL STATION

A Review by Dr. S.A.Beatty, Director

The bacteriologists of the Atlantic Fisheries Experimental Station, Halifax, N.S., have discovered that good fish can be landed only if the fish has been cooled to and kept at 32°F. It has been shown that it is impossible to obtain the required low storage temperatures in fish piled immediately under the deck, against the sidewalls and bulkheads in uninsulated fishing vessels. If ice is placed in these areas it melts off rapidly. The deckhead and bulkheads of one vessel have been insulated and the pen walls jacketed with refrigerated air to prevent heat from entering the vessel from outside. Cool air is also circulated through the hold. The inside of the fish pens, deckhead and bulkheads has been lined with sheet aluminum to promote cleanliness. Self-closing hatch covers were installed in the hatch coaming, to keep warm outside air from entering the hold.

The hold of a second vessel has been entirely insulated and lined with sheet aluminum, but not mechanically refrigerated. Both installations were designed and installed under the supervision of the Atlantic station's mechanical engineering staff.

With fish adequately iced (about 25 tons) in the first vessel, fish storage temperatures were quickly brought down to 32°F. and kept there during trips made in the warm summer months of 1948. High quality catches have been landed and in addition bait and ice were extremely well maintained. An opportunity to obtain records of the quality of catches from the second vessel should present itself during the summer months of 1949.

This station is now able to demonstrate that spoilage of fresh fish is largely caused by bacteria which exist in the slime and feces of the fish themselves. Further, the fish flesh, beneath the skin is practically sterile, when the fish is landed under normal conditions. Therefore, the problem would seem to be cut out this sterile fillet,

without infecting it with the bacteria present on the skin. It has been demonstrated that if fish is:

1. Thoroughly deslimed before filleting
2. Filleted, skinned and packaged under improved sanitary conditions
3. Fillets are cooled at once to between 30° and 32°F. and kept within this temperature range

then the normal storage life of fresh fillets may readily be doubled or even tripled. The effect of this on the economy of the industry can hardly be estimated.

Fish when landed are, or should be, near 32°F. but during filleting and packaging they may reach as high as 60°F. To cool these packages in a wooden box surrounded by crushed ice takes a day or more. It is a fact that fish frozen rapidly and immediately defrosted cannot be distinguished from unfrozen fish. This station has demonstrated that the outer surface of a 20 lb. block of fresh fillets can be frozen in a metal fillet box and in a cold air blast in about one half hour. If this box of fillets is then immediately packed in ice, the entire block of fish will reach a temperature of 32°F. about 2 1/2 hours later.

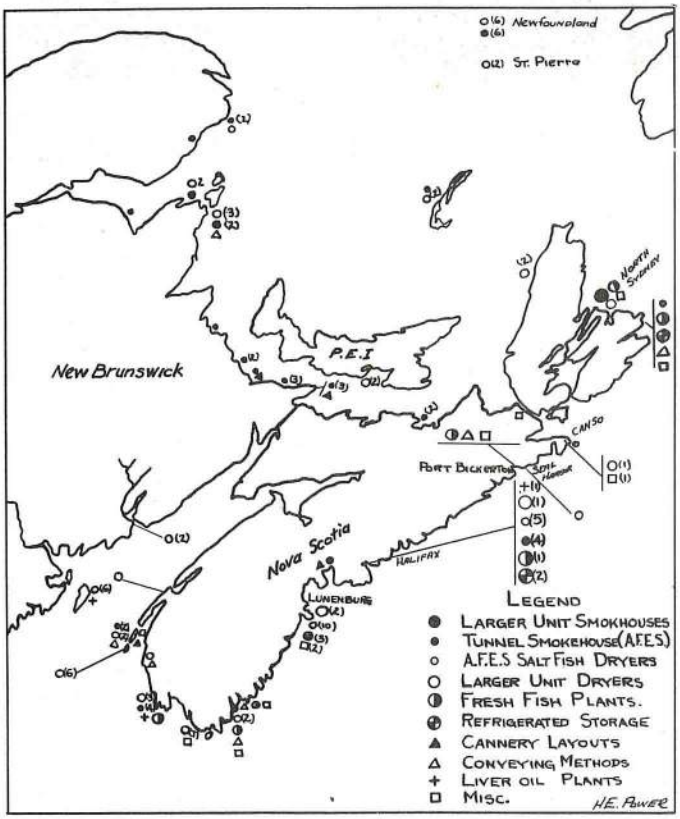
An experimental model of a machine for desliming round fish was built during 1918 at this station. A mechanical fillet skinning machine has also been constructed and was on display in operation at the Fishermen's Exhibition in Lunenburg last autumn.

The cost of freezing packaged fish by means of plate freezers in Nova Scotia is relatively high. Basic data has been gathered at the Atlantic Fisheries Experimental Station, which indicate that an air flow method of freezing may produce "quick frozen" saleable thicknesses of packaged fillets at considerably lower cost than the present plate freezers now in use in Nova Scotia. Air velocity of about 1,000 feet per minute and air temperature of - 10°F. have proved suitable. Various types and thicknesses of packages have been investigated, as well as methods of packing.

Design of a small commercial air flow freezer is nearing completion at the Halifax laboratory. Two unit sizes are being considered;a single unit to freeze 1,000 pounds of packaged fish per hour and occupy a floor area 27 feet by 11 feet and a duplex unit of twice this capacity and floor area. Trucks for these units will accommodate any of the usual types, sizes and shapes of packaged fish now being frozen as well as specially designed cans for the pre-cooling of fish fillets for the fresh fish trade. Provision is also made for the freezing of whole fish.

The actual preservative action of wood smoke on cod fillets is being studied. Although this work has just started it appears that if the fish is good to begin with forced circulation smoking does reduce the bacterial count on the fish and considerably lengthens the storage period. The A.F.E.S. Tunnel Type Smokehouse is now being used successfully in the commercial smoking of white fish fillets, and a larger model has been requested. This station continues to recommend multiple units of the original design, as the larger model has not demonstrated itself successfully.

About 15 A.F.E.S. Salt Fish Dryers were installed during 1948, making a total of 50 now in operation in the Maritime Provinces. Practically the whole dried salt fish output of Nova Scotia and New Brunswick could now be processed in indoor dryers. All but one were erected under this station's supervision, all but three of our own design, and all were designed from our basic experimental data.



INDUSTRIAL FISHERY INSTALLATIONS DESIGNED OR INSTALLED UNDER THE SUPERVISION OF THE ATLANTIC FISHERIES EXPERIMENTAL STATION HALIFAX N.S.

DEC. '48
No. 333

Salt fish showing a yellow colour are often found in the industry. Station biochemists have found an excess of iron in some typical samples of such fish and it is known that the presence of iron in salt may cause such a colour. It is important that salt should not contain more than traces of iron.

A modern oil research laboratory has been installed at this station during last year. As a result, a new process has been discovered by which about 95% of the oil is recovered from cod livers with a single run, and the residue is left intact for further treatment.

Some samples of Arctic char have been received for examination. When smoked, they took on a very good appearance and flavour, and should make an excellent product, if they can be produced at reasonable cost.

A radio beacon which can be picked up by radio direction finders, is now in operation at this station. This unit is small, compact, needs no batteries and is of moderate cost. It may be a valuable aid in locating dories from the mother vessel in fog or snow.

At the Lunenburg Exhibition a map was displayed of the Maritimes showing the type and location of industrial installations designed or installed under the supervision of the experimental station.

EASTERN ARCTIC RESEARCH

Valuable biological material was obtained in 1948 by the Fisheries Research Board of Canada during marine investigation in Ungava Bay, Dr. Maxwell J. Dunbar reported at the annual meeting.

The tempo of fisheries research in the Eastern Arctic will be quickened this year by the Calanus the new acquisition to the board's research fleet, which is presently at Fort Chimo on the shore of Ungava Bay. The vessel was especially designed and built for fishery investigations in the Canadian Eastern Arctic.

Launched in the late summer of 1948, the Calanus reached the Eastern Arctic too late to participate in any experimental work, but she is expected to play an important part in the future in biological and oceanographical studies in that area. The construction and launching of the Calanus, and her transfer from Nova Scotia to Ungava Bay, represents another stage in the fulfillment of a program of scientific work in the Eastern Arctic which had been planned for some time by the board.

Capt. E. L. Ritchie, of Yarmouth, N. S., who piloted the vessel on her maiden voyage, in his report stated that she "is a fine seaworthy ship," and that her manoeuverability "is about perfect for a single screw ship".

Dr. Dunbar, professor of zoology at McGill University, reported that Henry Hildebrand and Philip Orkin made up an advance party preceding the Calanus to Ungava Bay last summer to make marine investigations for the Board.

The purpose of the expedition was twofold. One was to take part in the native sealing in order to gain data relating to the biology of the seal in Ungava Bay, and, secondly, to investigate other sources of fish food that might be available there.

On arrival at Fort Chimo the pair made arrangements to board with the Anglican missionary, Rev. Arnold Ruskell, during the time they would be in that area. The two men explained their purpose to study sealing under native sealing conditions to Simeon Suppa, the Eskimo whose fairly large boat they had chartered for the summer.

Gear, which had been stored at Fort Chimo from earlier investigations, was found to be in good condition, and several days were spent preparing it for the summer's work. A decision was made not to mount the hydrographic winch until sealing was completed due to the fact that four kyaks had to be carried aboard the Suppa boat,

and the hold would be used for the storing of seal meat and the bunking of five Eskimos. When the expedition was ready to start Simeon Suppa was sent to the mouth of the Koksoak with his family with word to return to Chimo when sealing was possible.

Dr. Dunbar in reviewing the work of the two men revealed that they had brought back with them a valuable collection of material on the food organisms and parasites of Ungava Bay seal, and of the codfish of the Burwell area. In addition, they collected information on temperatures, on plankton, and on the numbers and biology of seal and useful fish. He said it was evident from reports that seals are not abundant in Ungava Bay, that the season is short, and that hunting conditions are difficult.

Long-line fishing in the depths feasible to work from the Peterhead board of the Suppa's was unsuccessful even though the lines were laid in the best hand-line fishing areas. Young Arctic halibut were again found in cod stomachs, and it is hoped that deep water long-lining from the Calanus will bring to light the fishing grounds for these very valuable fish. The same applies to Greenland shark.

Emphasizing the need for the development of marine resources in the Ungava Bay area, Dr. Dunbar stated that it is clear that the Arctic char run in this region cannot be relied upon to supply the natives with the necessary food and dog-feed. "Without the information which we hope to gain next season about halibut and shark," said Dr. Dunbar, "it is not possible to recommend yet a remedy for the situation of the Ungava Bay natives, but it is already becoming obvious that if they are to use such marine resources as the bay offers, the whole economical basis of the area will of necessity be changed".

The most important thing in the 1949 season programme of work is the completion of the survey in Ungava Bay itself. The investigation contemplates the inclusion of the hydrographic section across the mouth of Hudson Strait, sounding the bottom and trawling operations for flatfish, cod and shrimp, and, if possible, experimental long-line fishing in deep water for halibut, cod and shark.

Other valuable data was supplied to the board by E. H. Grainger who was placed as an observer and biologist on a private vessel, the three-masted schooner Alfred and Emily, which fished for Arctic char in Frobisher Bay, Baffin Island, reported Dr. Dunbar. Mr. Grainger during his two months aboard the vessel made some general observations on the Arctic char, and from samples made measurements, and took samples of stomach and intestinal contents, scales, etc. From the material and information collected it is hoped that something may be learned regarding length, age and sex, feeding habits, etc., of the Arctic char. Up to the present little biological research has been done on this or other Arctic species.

CANADIAN COMMITTEE ON FOOD PRESERVATION

Sub-Committee On Fish

The Canadian Committee on Food Preservation, as one of the associate committees of the National Research Council of Canada, concerns itself with food research of all kinds. To give research workers in the various food fields an opportunity to exchange their views and findings, the committee is divided into various sub-committees which meet during the year prior to their joint annual meeting at Ottawa.

The sub-committee on fish brings together all workers concerned with technological fisheries research in the federal and provincial fields as well as in the universities.

At the annual meeting of the sub-committee, which was held in the auditorium of the National Research Council in Ottawa, January 3, 1949, some forty members and visitors were present. These represented the Fisheries Research Board of Canada and the Federal Department of Fisheries, the National Research Council, the Federal Departments of Agriculture and Pensions and National Health, the fisheries divisions of the Nova Scotia Department of Trade and Industry and the New Brunswick Department of Industry and Reconstruction, the Nova Scotia Research Foundation, Dalhousie University, Queen's University, Laval University, the Universities of Saskatchewan and British Columbia, and the Canadian National and Canadian Pacific Railways.

Dr. Ernest Hess, Director of the Federal Fish Inspection Laboratory, Halifax, N. S. who was elected chairman, succeeding Dr. S. A. Beatty, director of the Atlantic Fisheries Experimental Station, presided over the meeting.

Reports were presented by staff members of the Atlantic and Pacific Fisheries Experimental Stations of the Fisheries Research Board and the Fish Inspection Laboratories of the Federal Department of Fisheries. They covered the progress made in the development of fishing vessel refrigeration, air flow freezing of fish and smoke production for smoking fish. A new fish fillet skinning machine was described as well as the use of antioxidants in the preservation of frozen fish. Other reports covered the isolation of amino acids from fisheries products, the use of whale products and the production of margarine from edible fish oils. In the fish canning field studies on the use of tomato purees in the canning of herring in tomato sauce were reported.

ATLANTIC HERRING INVESTIGATION COMMITTEE

The Atlantic Herring Investigation Committee was established by an exchange of letters between the governments of Canada, Newfoundland and the four Atlantic provinces, in which they agreed to co-operate in an investigation of the herring fishery for an initial period of seven years. The discussions leading to the formation of the committee were initiated by the governments of Newfoundland, Quebec and Nova Scotia and were continued by the representatives of all six governments early in 1944.

The principal aim was to improve our utilization of the herring stocks especially through the development of means of catching herring more cheaply and over a longer season. One of the uses in mind was reduction to produce fish meal and oil which were in high demand and would provide additional markets for Atlantic coast herring without damaging competition with other branches of the Canadian fishery. To fulfil this principal purpose it was necessary to study the herring stocks and to explore various catching methods not in use on the Atlantic coast. This work was to be carried out in the first place in the Gulf of St. Lawrence region in which all of the six governments were interested.

The committee was set up with a Dominion Government chairman and scientific alternate chairman and a member from each of the other five governments. Canada, Newfoundland, Quebec, Nova Scotia, New Brunswick and Prince Edward Island agreed to contribute to the expenses of the committee in the proportion of 4:4:4:4:3:1 and Canada, Newfoundland and Quebec also seconded one scientific investigator each. The principal administrative authority was given to the scientific alternate chairman (A. W. H. Needler). Another Fisheries Research Board employee (A. H. Leim) was appointed investigator-in-charge and the Atlantic Biological Station provided laboratory and administrative facilities, including Miss N. M. Parker as honorary recording secretary. The cost of these additional services by the Atlantic Biological Station averaged $12,000. This represented a contribution by the Dominion Government over and above its share noted above and the Department of Fisheries has also provided an eighty-four foot vessel at a nominal charter cost although the committee has borne the costs of operation and repair. With a budget for the past three years of $60,000 and a Dominion Government share of $12,000 the total cost to the Dominion Government is estimated at not less than $40,000 per year. The total contribution of the other five governments, when the cost of seconded staff is included, had during the same period been about $55,000 per year.

The first meeting of the committee was held in November, 1944, and funds first became available late in the fiscal year 1944-45. Expenditures in successive fiscal years have been as follows:

1944-45	$21,181.56
1945-46	42,685.90
1946-47	59,890.92
1947-48	59,871.00
1948-49 estimated	59,900.00

The current year is therefore the fifth during which the committee has been in existence although only the fourth during which operations were possible for any great proportion of the year. It was not until 1947 that the eighty-four foot seiner-dragger, so necessary to the exploratory fishing which was the principal part of the committee's work, was available for use.

Results to date include:

1. Our knowledge of the hydrographic conditions in the region has been greatly increased.

2. Sampling of the herring stocks has shown the existence of six divisions of the herring stock in the region differing in meristic characters, growth, position and movements. Apart from the west and south coast of Newfoundland, which have large winter fisheries, these stocks are now exploited almost exclusively in a relatively short spring season.

3. Extensive sonic sounder records and exploratory purse seining have shown that concentrations suitable for this method of fishing do not occur in the summer months. They do occur in Newfoundland waters in the winter but weather conditions are suitable for a very short period.

4. Preliminary trials have been conducted with bottom trawls including the Dutch herring trawl. Lack of success in this direction is not yet conclusive.

5. Some progress has been made in the development of a mid-water trawl, the need for which is indicated by many of the sonic sounder records.

6. Age composition of the herring stocks indicates that the present fishery is having no serious effect on supplies and that the catch could be greatly increased without danger of over-fishing.

Continuation of the investigation would be valuable to:

I. Test the efficacy of bottom trawls more conclusively.

II. Develop and test mid-water gear.

III. Obtain better information on the seasonal distribution of herring both in the Gulf of St. Lawrence and in the neighbouring areas (this depends to some extent on the use of the gears mentioned in I and II.

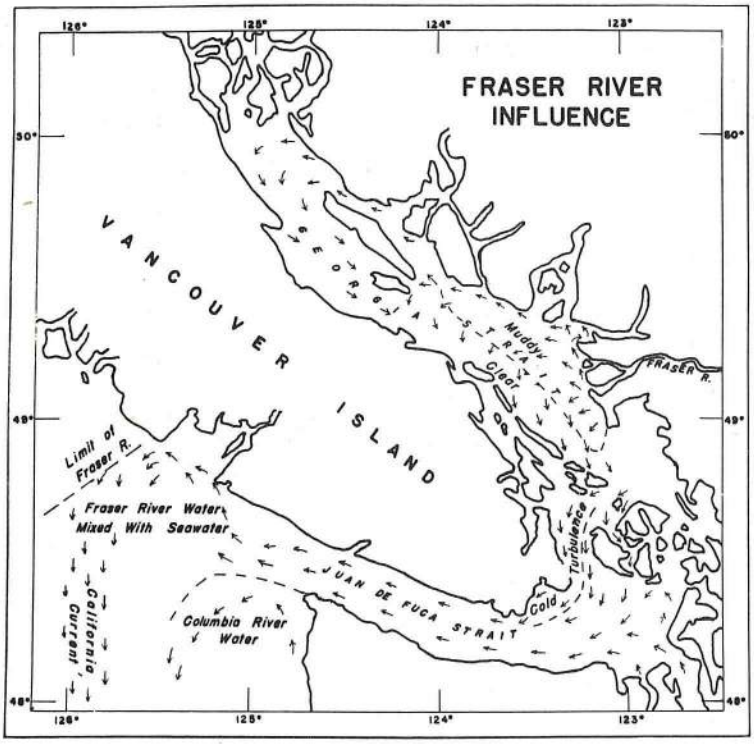
IV. Improve our knowledge of the hydrographic and biological factors controlling herring movements and abundance.

The entrance of Newfoundland into Confederation with acceptance by the Dominion Government of the major responsibility for fisheries administration and development, makes further contributions from the Newfoundland government improbable. This may lead other governments to discontinue their contributions although two more years remain of the initial seven-year period agreed upon, and although certain governments have indicated their desire to continue, a sudden and complete cessation of the work at this stage would be wasteful. It is recommended that an attempt be made to continue the work for at least one more year with a slight modification of the present arrangement to provide, if necessary, for Newfoundland's new position. This is to be explored with the governments concerned in the next few weeks. The possibility remains, however, that continuance of the work would be impossible without a considerably increased contribution from the Dominion Government through the Fisheries Research Board. The operation of the vessel is necessary if the continuation of the work is to be worth while. This, when cost of operations and provision of gear are included, represents over two-thirds of Committee expenses and no major reduction of the present budget of $60,000 can be made if the most important parts of the work are to continue.

A. W. H. Needler and A. H. Leim.

CANADIAN JOINT COMMITTEE ON OCEANOGRAPHY

The Canadian Joint Committee on Oceanography was created in 1946, and now is comprised of representatives of the Royal Canadian Navy, the Fisheries Research Board of Canada, the National Research Council of Canada, and the Canadian Hydrographic Service. This committee was set up to direct, through the Chief Oceanographer, the work of the Atlantic and Pacific Oceanographic Groups located respectively at the Atlantic and Pacific Biological Stations of the Fisheries Research Board. The Meteorological Service of Canada is also interested in the activities of the Joint Committee, and its interests in the work are covered temporarily by the attendance of a representative at meetings of the Joint Committee.



Showing the area of the Fraser River influence. Arrows illustrate water movements which are of funadmental importance to the understanding of salmon migrations.

During the past year considerable progress was made in the organizing of the research groups, the training of personnel, and the furthering of co-operative oceanographic research on a national as well as an international basis. A general summary of activities is presented herewith.

ACTIVITIES IN THE WESTERN NORTH ATLANTIC

The Atlantic Oceanographic Group co-operated in the following activities.

Gulf of St. Lawrence

Two cruises of the Gulf of St. Lawrence were made, one in late

May and the other in October, involving a co-operative effort between the Atlantic Oceanographic Group, the Atlantic Herring Investigation Committee and the Naval Research Establishment. Some 620 hydrographic stations were occupied, furnishing information on the temperature and salinity of these waters as a background for intelligent fishery investigations in this area.

Hudson Bay

An observer and equipment were assigned to the R. C. N. cruise in Hudson Bay in September and 84 hydrographical stations were occupied. These data are of interest to the Eastern Arctic investigations of the Fisheries Research Board and were of considerable value in indicating the expanding influence of the Atlantic in sub-arctic areas over the past several years.

Great Lakes

Through activities of the R. C. N. in the Great Lakes records of temperature from 208 hydrographic stations were obtained.

Scotian Shelf

Activities on the Scotian Shelf resulted in observations from 170 hydrographic stations. In particular, a winter cruise was made of the Cape Sable Island Triangle, a transition zone between Bay of Fundy waters and those of the Scotian Shelf, of interest in a study of the halibut fishery of that area.

Gulf Stream

An observer and equipment were assigned to a survey of the northern edge of the Gulf Stream. This survey was a co-operative venture between the Naval Research Establishment and the Woods Hole Oceanographic Institution. Some outstanding information on the positioning of the northern edge of the Gulf Stream, and the currents associated therewith, was obtained. The observations were made possible through the use of two new facilities——Loran, and the Salinity-Temperature-Depth Recorder.

Miscellaneous

Progress was made in the design and construction of an underwater camera. The equipment is ready for field tests.

Sea water temperatures are being collected at three coastal points and these data are being made available to the Meteorological Service of Canada as well as being used to follow seasonal and annual variations in our inshore waters.

ACTIVITIES IN THE CANADIAN PACIFIC

The Pacific Oceanographic Group was involved in two major problems, and was able to report progress as well in others.

Skeena project

The Skeena project involved the determination of hydrographical conditions in Chatham Sound as of interest to the Skeena River Salmon Investigations. Conditions during the exceptionally heavy floods of early summer were observed in contrast to those obtaining in late summer. These observations are basic to an understanding of the dispersal of Skeena River waters where an intensive investigation of the salmon is in progress.

Nodales project

A co-operative project, involving the Pacific Naval Laboratory, the U. S. N. Electronic Laboratory and the Pacific Oceanographic Group, was probably the largest joint oceanographic research operation undertaken in Canadian waters. The project involved four major ships, two auxiliary craft, and twenty four scientific personnel. While the project was strictly a naval one, the Pacific Oceanographic Group was heavily involved, providing the oceanographic information and being responsible for much of the co-ordinating efforts. The Canadian Hydrographic Survey was involved in a charting of the area previous to the investigation.

Alberni project

The Alberni project, which is concerned with pollution studies, both preceding and following the construction of a pulp mill on the Alberni Inlet, was completed. A survey was made to assure that there was no evidence of the depletion of oxygen in the waters of the Alberni Inlet and no other form of pollution from the mill.

Lighthouse observations

A program of daily observations of sea water temperatures and salinities was initiated on the Pacific coast in 1914 with one station. This has been increased at intervals, until the present total of eleven stations was reached in 1939. The data are being published in mimeographed volumes, and to date, those collected to the end of 1943 have been published.

Miscellaneous

An inspection was made of Sakinaw Lake to determine whether sea water was entering to a degree that would affect sockeye salmon spawning. It was found that the amount of sea water entering was of little consequence.

H. B. Hachey,
Chief Oceanographer,
Canadian Joint Committee on Oceanography.

FISHERIES RESEARCH BOARD OF CANADA

Publications

The series of publications is designed for the presentation in non-technical form of subjects of interest to the general public, in particular that related to the fishing industry.

1. The Canadian plaice. By A.G. HUNTSMAN
2. The lumpfish. BY PHILIP COX
3. The angler. BY C. J. CONNOLLY
4. The muttonfish. BY WILBERT A. CLEMENS
5. Natural lobster breeding BY A. G. HUNTSMAN
6. A standard pickle for lobster canning. BY A. P. KNIGHT
7. Insulin from fish. BY N. A. McCORMICK
8. The discoloration of canned lobster. BY GUILFORD B. REED
9. Methods of handling fish. I. The processing of dried fish. BY A. G. HUNTSMAN
10. The preparation of lobster paste. BY R. F. ROSS
11. Fundamental principles of chemistry and physics. BY H. RITCHIE CHIPMAN
12. Discoloration of halibut. BY F. C. HARRISON and W. SADLER (out of print)
13. Arctic ice on our eastern coast. BY A. G. HUNTSMAN
14. Pacific salmon migration: the tagging of the pink salmon and the chum salmon in British Columbia in 1928. BY ANDREW L. PRITCHARD
15. Pacific salmon migration: the tagging of the coho salmon on the east coast of Vancouver island in 1927 and 1928. BY WILBERT A. CLEMENS
16. Sockeye tagging on the Fraser river, 1928. BY LLOYD L. BOLTON
17. Water fowl in relation to the spawning of herring in British Columbia. BY J. A. MUNRO and W. A. CLEMENS
18. Observations on the cod-fishery in the strait of Belle Isle. BY GEORGE W. JEFFERS
19. Methods of handling fish. II Instructions in curing and packing pickled mackerel. By Fisheries Experimental Station, Halifax, N.S.
20. The processing and handling of frozen fish, as exemplified by ice fillets. By A. G. HUNTSMAN
21. The maritime salmon of Canada. By A. G. HUNTSMAN
22. The oysters of Malpeque bay. By A. W. H. NEEDLER (Reprint)
23. The fish trade of southern Ontario. By R. A. McKENZIE
24. The canning of brine-frozen mackerel. By ERNEST HESS
25. The haddock. By ALFREDA BERKELEY NEEDLER
26. Pacific salmon migration. The tagging operations at Quatsino and Kyuquot in 1927, with additional returns from the operations of 1925 and 1926. By H. CHAS. WILLIAMSON and W. A. CLEMENS
27. Pacific salmon migration. The tagging of the spring salmon on the east coast of Vancouver island in 1927 and 1928 with notes on incidental tagging of other fish. By W. A. CLEMENS
28. List of publications in connection with the work of the Biological Board of Canada 1922-1930. By M.S. RIGBY

29. Salt as a control of bacterial decomposition of halibut. By ROBERT H. BEDFORD
30. The Commercial crab, Cancer magister Dana, in Clayoquot Sound, Vancouver Island. By G.J. SPENCER
31. Pacific salmon migration. The tagging of the pink salmon and the chum salmon in British Columbia in 1929 and 1930. By ANDREW L. PRITCHARD
32. The trout and other game fishes of British Columbia. By J.R. DYMOND (Obtainable from the King's Printer, Ottawa)
33. Factors in the shipment of live lobsters from eastern Nova Scotia. By A. F. CHAISSON
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