FISHERIES of Canada

July–Aug. 1970

Vol. 23 No. 1

Department of Fisheries and Forestry, Ottawa

JULY-AUGUST, 1970

FISHERIES of Canada

The Hon. Jack Davis, Minister

Dr. A.W.H. Needler, Deputy Minister

CONTENTS

COVER PHOTO — A view of the courtyard of Nanaimo Biological Station, showing the newly-opened laboratory wing at right. See also pages 10, 11.

Published by the Department of Fisheries and Forestry, Ottawa

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ICNAF Delegates Take Action To Conserve Fishery Resource

Although they failed to reach unanimous agreement on all recommendations, delegates to the 20th Annual Meeting of the International Commission for the Northwest Atlantic Fisheries, held in St. John's, Nfld., June 1 to 6, took action to show they are deeply concerned about the future of the high seas fishery resource.

The 14-nation body voiced unanimous agreement to the need for acceleration and co-ordination of research on the herring stocks of the Northwest Atlantic, approved adoption of a scheme of international inspection at sea, and established an annual catch quota for harp seals in the Gulf of St. Lawrence and the "Front" area off Labrador and Newfoundland.

Presiding at the meeting, held at Memorial University, was Dr. A.W.H. Needler, Deputy Minister of Fisheries and Forestry for Canada, and Chairman of the Commission.

Dr. R.R. Logie, Assistant Deputy Minister (Fisheries Service), federal Department of Fisheries and Forestry, and a member of the Canadian delegation to the 6-day ICNAF meeting, expressed Canada's concern at the rapidly expanding herring fishery of the Northwest Atlantic and the lack of adequate assessment data to keep abreast of the expansion. He urged restraint on further expansion of the fishery and proposed that an ICNAF Working Group on Herring Research be set up to plan, propose and co-ordinate international research on herring in the Convention Area, which extends from Greenland to Cape May, New Jersey. The proposal was unanimously adopted.

INSPECTION AT SEA

To ensure adherence to ICNAF's international conservation measures, the Commission approved the adoption of an international scheme of inspection at sea, similar to that already in effect in the Northeast Atlantic. Steps leading to the introduction of such a scheme have been undertaken during the past several years when a number of ICNAF-member countries exchanged inspection visits by enforcement officers. During the visits nets, and composition of catches taken at sea were inspected. The exchanges contributed to the development of understanding and trust between the fisheries administrators and the fishing industries of the participating countries. The scheme will come into effect in the northwest Atlantic July 1, 1971.

On the question of sealing, the Commission agreed that the annual catch of harp seals in the Gulf and in the "Front" area off Labrador and Newfoundland should be limited in 1971 to 245,000 seals, including an allowance of 45,000 for landsmen,

Part of the Canadian delegation to the ICNAF convention at St. John's, Nfld. Left to right: Dr. A.W.H. Needler, Deputy Minister, Department of Fisheries and Forestry, and Commission Chairman; Commissioner S.G. Lake; Dr. R.R. Logie, Assistant Deputy Minister (Fisheries), Department of Fisheries and Forestry; Commissioner K. Henriksen.

thus making international quota regulations applicable to these herds for the first time.

The total catch of harp seals in the two areas in 1970 by Canada and Norway, the only two countries which prosecute this fishery, was 255,000. In the Gulf area Canada's take was 90,000 harp seals and on the Front, 50,000. Norway, which doesn't participate in the Gulf seal fishery, took 115,000 seals from the Front area. It was also disclosed that the catch of harp seals in the two areas over the last 25 years (1946-1970) has averaged 285,000 seals.

The hunting of seals in the Gulf and Front areas was discussed at a meeting of ICNAF's Panel "A" Committee, which is comprised of three countries – Canada, Norway and Denmark.

Dr. A.W.H. Needler, Deputy Minister of Fisheries and Forestry for Canada and Commission Chairman, addressing the official opening of the ICNAF convention at Memorial University, St. John's, Nfld. Seated to Dr. Needler's left are L.R. Day, executive secretary of ICNAF, and Eugene F. Whelan, parliamentary secretary to the Minister of Fisheries and Forestry.

BRIEFS ON SEALING

During the Panel "A" session, briefs were received from the World Federation for the Protection of Animals, Comité d'action pour le sauventage des phoques, Geneva, and the Swiss Section of the European Committee for the Protection of Seals. The organizations requested in their briefs that member countries of the Panel limit the total catch of seals and enforce regulations which would ensure humane killing of seals.

The Panel agreed to inform the three groups that further measures to protect the seal stocks have been seriously considered and that a limitation of the total catch of harp seals had been agreed upon for the 1971 season.

In addition to the catch quota for 1971, member countries also agreed that the open season for taking harp and hooded seals commence not earlier than March 12 and close not later than April 24.

The sealing operations on the east coast of Canada depend almost solely on the harp seal populations, which constitute about 95 per cent of the annual take in numbers, the remainder consisting of the hooded seal.

Canadian sealing vessels from the Maritime Provinces and Newfoundland have engaged in hunting harp seals since late in the nineteenth century. Norway entered the picture in 1938. In the Gulf, the operation has been entirely a Canadian one since 1965, while on the "Front" both Canadians and Norwegians participate.

SALMON CONSERVATION

The problems of salmon conservation in the Northwest Atlantic were given long and serious consideration by the Commission. The prohibition of salmon fishing outside national fishery limits recommended by the Commission in 1969 has not been fully effective as it was not accepted by all member governments. To avoid escalation of fishery for salmon, the Commission at its recent meeting also recommended, by a majority vote, that countries limit the aggregate tonnage of vessels used to fish salmon outside territorial waters on their catch to 1969 levels. It also recommended prohibition of the use outside territorial waters of any trawl net, any monofilament net or any troll. It recommended that these measures apply in 1971. Salmon conservation problems will be reviewed again at the Commission's 1971 annual meeting.

The Commission also gave serious consideration to the effects of heavy

fishing on yellowtail flounder stocks in the Commission's Subarea 5 (the Gulf of Maine-Georges Bank region). It recommended that the total annual catch of yellowtail flounder on the grounds east of 69°W be limited to 16,000 tons and on those west of 69°W to 13,000 tons and also that the minimum sizes now in effect for trawl fishery for cod and haddock apply also to yellowtails.

In the Commission's Subarea 1 (West Greenland region) a minimum mesh size of 130 mm (5 1/8 inches) is already in effect for trawl nets used for catching cod and other groundfishes. The Commission is recommending that this same minimum mesh size apply in Subareas 2 (off Labrador) and 3 (off the east and south coasts of Newfoundland) with continued exemption of nets used for fishing ocean perch in the southern part of Subarea 3 for which a small mesh is permissable.

CANADA ON TOP

Preliminary statistics released by the Commission showed that Canadian fishermen outfished all other members of the 14-nation body fishing in the Northwest Atlantic in 1969. The Canadian catch of all major species amounted to approximately 1,200,000 metric tons. The USSR catch totalled 875,000 tons; Spain, 294,000 tons; USA, 254,000 tons; West Germany, 253,000 tons; Portugal, 182,000 tons; Poland, 160,000 tons; Norway, 52,000 tons; Denmark, 39,000 tons; Iceland, 14,000 tons; United Kingdom, 6,000 tons. Figures for the French and Romanian catches were not available.

OPENING CEREMONY

Speakers at the official opening included Eugene F. Whelan, Parliamentary Secretary to the Hon. Jack Davis, Canada's Minister of Fisheries and Forestry; Captain Earl W. Winsor, Acting Minister of Fisheries, Province of Newfoundland; and Mayor W.G. Adams of St. John's. The ceremonial opening ceremonies were presided over by Dr. Needler.

Mr. Whelan noted that there are many difficulties in the way of application of international conservation measures. He said too often they are not applied until the fish stocks have already been seriously over-fished.

Captain Winsor suggested that one of the greatest threats which faces the future of civilization could be the scarcity of food to feed the exploding world population. "More and more we must look to the oceans of the universe as a source of supply," he stated, adding that there is the frightening possibility that even with proper management "our oceanic resources may not be able to stand up to the anticipated pressures."

Canadian Commissioners attending the meeting, in addition to Dr. Needler and Dr. Logie, were S.G. Lake and K. Henriksen.

The 21st annual meeting of the Commission will be held in Halifax, Nova Scotia, May 27-June 5, 1971. At this meeting the Commission will welcome the delegation of the Government of Japan, which will have become a member of ICNAF later in 1970.

Plenary session of the 20th Annual Meeting of the International Commission for the Northwest Atlantic Fisheries.

U.S.-Canada Hold Top-level Talks On Great Lakes Pollution Problems

Ministers and representatives of the governments of Canada and the United States met June 23 in Ottawa to discuss common problems of pollution in the Great Lakes. The Canadian delegation included the Minister of Energy and Resources Management from the Province of Ontario. At the meeting they discussed each country's current plans, programs and legislation to improve water quality in the Great Lakes.

Ministers and representatives discussed the recommendations in a Special Report submitted in April by the International Joint Commission on potential oil pollution, eutrophication and pollution from watercraft. It was agreed:

a) The Canadian contingency plan for the Great Lakes for spills of oil and hazardous materials which will shortly come into operation, will be fully coordinated with the new United States plan.

b) Inputs of phosphates into the Great Lakes should be reduced in order to arrest and reverse eutrophication of the Great Lakes. Canadian legislation will permit the Canadian Government to implement the Commission's recommendations for reducing and eliminating phosphates from detergents and the Canadian Government has announced its intentions to take action that would meet the IJC recommendations. Standards are in effect on the United States side of the Lakes which will require the achievement of an 80 per cent removal of all phosphates from municipal and industrial sewage (including detergents) by 1973, and in advance of the target date of 1975 recommended by the Commission; the United States Government is continuing its intensive review of the removal of phosphates from detergents.

c) In both countries legislation exists for the regulation of waste disposal by commercial vessels and pleasure craft; and the Ministers concerned have agreed to achieve compatible regulations.

It was noted that the Ontario Government intends to modify its gas drilling program on Lake Erie to conform to the recommendations of the Commission in the Special Report. There is no gas well drilling by Michigan, Ohio, New York or Pennsylvania in Lake Erie. It was further noted that phosphate removal facilities are being initiated by Ontario with a view to meeting the recommendations of the Commissioners.

DEEP CONCERN

Ministers and representatives expressed deep concern about the critical situation in the Great Lakes, and noted the determination of the Governments to take decisive action.

The Ministers have agreed to the establishment of a working group to consider common water quality objectives and implementing programs which may be proposed by either government to the working group. This working group will report back to this Ministerial Conference which will be reconvened subsequent to the final report of the IJC.

The United States delegation was led by the Hon. Russell E. Train, Chairman of the Council on Environmental Quality; United States Ambassador Adolph Schmidt; Carl L. Klein, Assistant Secretary of Interior for Water Quality Research, and Rear Admiral Robert W. Goehring, Chief of Operations, U.S. Coast Guard, who were accompanied by senior officials from the Department of State, the Department of the Interior, the Department of Transportation and the Council on Environmental Quality.

The Canadian delegation was led by the Hon. Mitchell Sharp, Secretary of State for External Affairs; the Hon. J.J. Greene, Minister of Energy, Mines and Resources; the Hon. Jack Davis, Minister of Fisheries and Forestry; the Hon. Herb Gray, Minister without Portfolio and the Hon. George Kerr, Minister of Energy and Resources Management for Ontario.

Freshwater Fishermen Given Final Payments

The Freshwater Fish Marketing Corporation's final payments to fishermen on the 1969-70 winter season's fishing operations amounted to $194,241. The payments have been computed at $0.06181 per pound for pickerel and sauger, and $0.0922 per pound for trout. Cheques from the Corporation went out to fishermen in northwestern Ontario, Manitoba, Saskatchewan, Alberta and the Northwest Territories during June.

Total market sales for the year totalled some $14,093,106. Final payments which represent profit earned on behalf of the fishermen equalled 6.1% of sales.

The Corporation's holdings of inventories in all forms reached a peak in December of more than 4,000,000 pounds. At the beginning of June these amounted to 1,480,000 pounds. Total weight of fish and fish products sold in the twelve month period was 29,987,146 pounds.

A.W. Lantz Honored by Food Technologists

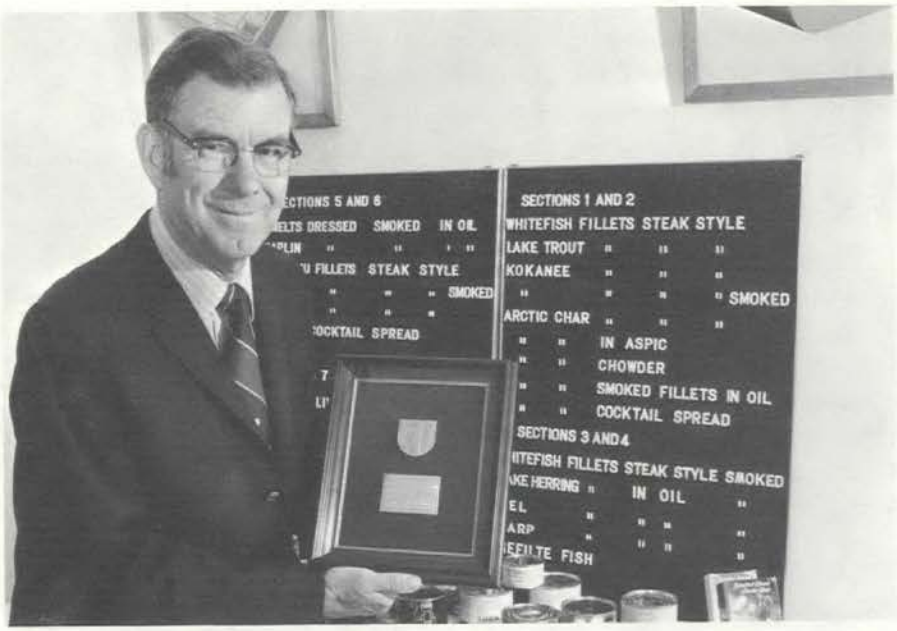
A.W. Lantz, of the Fisheries Research Board, Freshwater Institute, Winnipeg, was honoured with the W.J. Eva award at the annual conference of the Canadian Institute of Food Technology held in Windsor, Ont., in June.

In presenting the award Dr. Norman W. Tate cited the work of Mr. Lantz over many years. The citation referred to Mr. Lantz's "outstanding contribution and assistance to the advancement of food technology."

The recognition of Mr. Lantz's work by the Institute of Food Technology comes during his retirement year after 23 years' service with the Fisheries Research Board of Canada. Prior to joining the Board in 1944, he spent seven years with the meat packing industry. In 1953 he was granted leave of absence for a period of three years to become director of a Colombo Plan project in Ceylon. This was a Canadian project to introduce modern fishing and processing methods and involved the construction of a harbour and a modern fish storage and processing plant.

Considered by many as the "Father of Freshwater Fish Technology" in Canada, Mr. Lantz has done pioneer work in encouraging and demonstrating new uses for underutilized species. He has been largely responsible for the introduction of new products like canned whitefish, smoked arctic char, canned sucker, alewife, and fish sausages and fish bologna. His book, "Special Products from Freshwater Fish", published by the Queen's Printer in 1966, has been an outstanding success.

Mr. and Mrs. Lantz will retire to their home in Chilliwack, B.C.



A.W. Lantz, of Winnipeg, with the W.J. Eva award from the Canadian Institute of Food Technology.

Hunt Alternative Species For Fish Meal Industry

The need of the Atlantic coast fish meal industry for large quantities of alternative species to herring has resulted in a widespread search for capelin and sand launce.

The federal Department of Fisheries and Forestry is exploring both inshore and offshore waters south and east of Newfoundland for these species.

Fisheries and Forestry Minister Jack Davis said the growing importance of herring for human consumption has made it necessary to find large supplies of other suitable fish to replace it as the mainstay of the Atlantic coast fish meal industry.

Between now and the end of September, the 100-foot mid-water trawler *Lady Anna*, out of Saulnierville, N.S., will be under charter to the Industrial Development Branch of the Department's Fisheries Service. She will survey the Burgeo, St. Pierre and Grand Banks before moving north to Trinity, Bonavista, Notre Dame, Green and White Bays.

A mid-water trawl will be used in the exploratory work because this type of gear is more versatile and less vulnerable to damage over unknown grounds than the conventional purse seine.

Although large stocks of capelin and sand launce are the main objects of the *Lady Anna's* search, the survey is also expected to provide fishermen with information about the size and location of herring stocks in the areas to be covered.

Dr. Needler to Direct Huntsman Marine Laboratory

Dr. A.W.H. Needler, Deputy Minister of Fisheries and Forestry for Canada, will become the first Resident Director of the Huntsman Marine Laboratory in St. Andrews, New Brunswick, on his retirement from the public service in March, 1971.

The appointment was jointly announced by Fisheries and Forestry Minister Jack Davis and Professor Keith Ronald, Chairman of the Department of Zoology of the University of Guelph and President and Chairman of the Board of Directors of the Huntsman Marine Laboratory.

Dr. Needler will act as chairman of a marine pollution symposium when the new laboratory is officially opened on August 24, 1970.

The Huntsman Marine Laboratory is a non-profit corporation whose aim is to promote teaching and research in the marine sciences. The corporation has a current membership of 19 Eastern Canadian universities and the Fisheries Research Board of Canada.

The Laboratory will be operated in close cooperation with the FRB Station at St. Andrews, and research facilities and residence accommodations for the Huntsman Lab are to be developed on a 20-acre site adjacent to the Station.

The new centre will enable university students to benefit from practical application of classroom learning and to gain an introduction to marine sciences. It is named in honour of retired University of Toronto Professor A.G. Huntsman, renowned marine biologist who was the first full-time Director (1920-34) of the St. Andrews FRB Station.

The present Station Director, Dr. John Anderson, was instrumental in the establishment of the new consortium, and is its treasurer.

Universities which will participate in the operation of the new laboratory are:

Ontario – Brock, St. Catharines; Guelph; Ottawa; Toronto; Trent, Peterborough; Waterloo; Waterloo-Lutheran; Western Ontario, London; York, Toronto. Quebec – Laval, Quebec; McGill, Montreal; Montreal. New Brunswick – Moncton; Mount Allison, Sackville; New Brunswick, Fredericton. Newfoundland – Memorial, St. John's. Nova Soctia – Acadia, Wolfville; Dalhousie, Halifax; St. Mary's, Halifax.

New Director For Central Region

Robert E. McLaren, 48, of Vancouver, has been appointed Regional Director of the federal Fisheries Service Central Region with headquarters at Winnipeg, Man.

Assuming his new duties in July, Mr. McLaren will be responsible for the administration of federal Fisheries Service operations in the provinces of Alberta, Saskatchewan, Manitoba and Ontario, and in the Northwest Territories. He succeeds Robert N. Gordon, formerly of Vancouver, who moved to Halifax, N.S. last fall as Fisheries Service Regional Director for the Maritimes Region.

Born in Vancouver, Mr. McLaren served with the Royal Canadian Air Force in the Middle East and the United Kingdom during the Second World War. He received a B.A. in zoology from the University of British Columbia and in 1950 joined the Department of Fisheries Resource Development Branch in British Columbia as a biologist.

He was promoted to Chief Biologist in 1958 and four years later was appointed Head of the Resource Development Branch in the Pacific Region. His work during this period was related to environmental control and enhancement, and salmon development programs at Big Qualicum River, Babine Lake and other British Columbia areas.

Mr. McLaren has been Assistant Regional Director of Fisheries, Pacific Region, since 1966. He is a Governor and past President of the Vancouver Public Aquarium Association, and a past President of the Federal Institute of Management in Vancouver.

APPOINTMENTS

Dr. A.W.H. Needler, Deputy Minister of Fisheries and Forestry of Canada, has been appointed a Canadian Commissioner on the International North Pacific Fisheries Commission in place of S.V. Ozere, who retired from government service on March 13, 1970. Dr. R.R. Logie, Assistant Deputy Minister (Fisheries) has been named as alternate Canadian member of the Commission.

Another change names Dr. Logie as a Canadian delegate to the International Council for the Exploration of the Sea, replacing Dr. Needler.

Great Lakes Commission Seeks Action on Pollution

The rehabilitation of the Great Lakes as producers of valuable fish will be impossible unless present environmental abuses are corrected, according to Canadian and United States fishery officials.

Potential threats must also be identified and prevented from becoming serious if the lakes are to be saved from further deterioration as a source of high grade fishery products.

The degradation of freshwater fisheries was the main topic of discussion at the annual meeting of the International Great Lakes Fishery Commission in St. Paul, Minn., in June. Also discussed was the improved progress in the joint campaign against the sea lamprey, the predator which has wreaked havoc with stocks of high quality fish in the Great Lakes.

Officials of both countries pointed out that the rehabilitation activities of the Commission and co-operating agencies were in danger of being nullified by worsening environmental conditions. Prime examples of the problems are current difficulties with mercury and DDT contamination. These are international in scope and require concerted action by the two countries.

The Commission is making two recommendations to the governments of the U.S. and Canada. One is that the International Joint Commission be asked to establish water quality standards for the protection of the fishery resource of the Great Lakes. The I.J.C. has authority to deal with pollution problems in boundary waters.

The second recommendation is that the governments of the two countries require industries and municipalities to provide evidence that their effluents will meet the standards set for them. Where standards have not been established for new wastes, industries would be required to show that their discharge into the Great Lakes would not reduce the water quality for fish.

LAMPREY PROGRAM

The Commission approved the program to control the sea lamprey, reports on which struck an optimistic note.

The Department of Fisheries and Forestry of Canada and the U.S. Bureau of Commercial Fisheries, which act as the Commission's agents in the control program, said that the numbers of lamprey in Lakes Superior and Huron had been reduced. In reviewing the status of fish stocks, they reported that there had been a surprisingly high catch of salmon and trout in the Upper Great Lakes last year.

This information was based on a creel census in Wisconsin waters and a postcard survey in Michigan. Anglers on the upper lakes took about 300,000 lake trout, 230,000 steelhead trout, and 340,000 coho salmon.

Chemical control operations against lamprey will be continued at the present level of intensity on Lakes Superior, Michigan and Huron, and treatments in Lake Ontario will be extended. The Commission asked its agents to investigate the damage that might be caused to the environment by the lampricides themselves. It also urged exploration of methods for biological control of sea lamprey.

E.W. Burridge, Deputy Director of the Resource Development Branch, Fisheries Service, Department of Fisheries and Forestry, Ottawa, was elected Chairman of the Commission for the ensuing year. Vice-Chairman is Dr. W.M. Lawrence, Deputy Commissioner for Administration for the New York State Conservation Department, Albany, N.Y.

DR. H.L. TARR HONORED

Dr. H.L. Tarr, director of the Vancouver Laboratory of the Fisheries Research Board of Canada, was recently honoured by the Pacific Fishery Technologists Society at their annual meeting in Seattle, Washington, for "outstanding contributions and world-recognized leadership in pure and applied research in the fishery field".

Dr. Tarr, a charter member and former president of the society, was guest of honour at the annual banquet at which he was presented with an engraved gold pen and a book on his favourite hobby – sailing.

Shortly to retire from his post at Vancouver, Dr. Tarr has devoted 44 years of his life to scientific work.

An aerial view of the Nanaimo Biological Station of the Fisheries Research Board of Canada, showing the enlarged facilities.

Nanaimo Facilities Enlarged

Facilities for research at the 62-year-old Nanaimo, B.C., Biological Station of the Fisheries Research Board of Canada have been considerably expanded with the completion of a $3,500,000 addition to the station.

Fisheries and Forestry Minister Jack Davis officially opened the new wing during a special ceremony at the Departure Bay site, May 25. Describing the Nanaimo station as "our window on the underwater world", the Minister said the new building would not only be a scientific asset but would symbolize "the concern of sensitive Canadians about their environment."

K.R. Allen, director of the station, said the new facilities offer one of the most modern laboratories in Canada and will provide working quarters for a staff of 186, including 46 research scientists. "The new wing will make it possible for the station to conduct more advanced techniques of research which require temperature-controlled water and other special services" he said.

Construction of the addition began in 1967. It contains 30 laboratories and 31 offices as well as a conference room and a library.

The Nanaimo Station, one of eight across Canada maintained by the Fisheries Research Board, is engaged in investigations relating to marine biology and oceanography, the results of which assist in the effective management and development of the undersea resources of Canada's Pacific coast.

Studies include the distribution, population dynamics, life history, migration behaviour, genetics, parasitism and diseases, predators, the identification of stocks and physiology of salmon, herring, cod, flounders, shellfish and other forms of marine life.

"The new facilities will enable us to expand our efforts" said Mr. Allen "to solve urgent problems in the management of recreational and commercial fisheries, and in the protection of the aquatic environment".

Following the opening ceremonies, representatives of the fishing industry and members of the general public were invited to tour the new wing and inspect the many exhibits on display.

K.R. Allen, Director of the Nanaimo Biological Station, seated at the console of the station's IBM 1130 computer.

Michael Smith, a technician with the Fisheries Biology Group, releases a blackcod into a culture tank after its monthly weighing. Fed on a diet of dogfish chunks, the fish weigh 4-1/2 lb. (half commercial size) after one year in the tank.

Research scientist Norbert P. Boyce, of the Experimental Biology and Pathology Group, conducting an autopsy on an adult pink salmon.

Shrimp Conference Planned for Fall

Bright prospects for a profitable Atlantic coast shrimp fishery have sparked plans for a federal-provincial conference to probe the industry's potential. The three-day meeting opens October 27 in Saint John, New Brunswick.

Built from practically nothing in five years, the fast-growing east coast fishery landed 2,514,000 pounds of shrimp in 1969, surpassing by 400,000 pounds the output of the long-established British Columbia shrimp industry. The total Canadian shrimp catch had a landed value of well above $1,000,000.

Pink shrimp (*Pandalus borealis*), a gourmet delicacy rivalling in taste and popularity the larger shrimp species of the Gulf of Mexico, is the basis for the east coast fishery. The product is marketed mostly in Europe and the United States.

Fishing operations to date have been carried out mainly in the Bay of Fundy area, with some production from the Gulf of St. Lawrence and waters southwest of Nova Scotia. Exploration is proceeding this year to assess the total shrimp potential of the Gulf and Canadian Atlantic coastal waters including northern Newfoundland.

New Brunswick processing plants handled three-quarters of the 1969 Atlantic catch, and Quebec most of the balance. Last winter, substantial landings were made in Nova Scotia, which reported 949,000 pounds to the end of June. New Brunswick landings in the same period totalled 711,000 pounds. Quebec shrimp production to the end of May was 250,000 pounds.

Specialists from Canada, Europe, Japan and the United States attending the October conference will present papers discussing shrimp biology, resource management, harvesting, handling, processing, production and marketing.

Revise Federal Assistance Program For Fishing Vessel Construction

A revised program of financial assistance for the construction of fishing vessels in Canada is now in effect.

The new program, which applies to all new vessels or more than 45 feet in length built in Canadian yards, replaces two existing programs: the so-called "wooden fishing vessel" program previously administered by the Department of Fisheries, and the "large steel trawler" program which had been administered by the Department of Industry, Trade and Commerce.

Explaining the new arrangement in the House of Commons, Fisheries and Forestry Minister Jack Davis made the following statement:

From now on our Industrial Development Service in the Department of Fisheries and Forestry will screen each application. Officials in this department will have a voice in whether construction is to go ahead or not. Their knowledge as to modern fishing vessel designs and the development of the latest fishing techniques will be brought to bear in this way.

As Hon. Members know, we have licence limitation plans in effect in Canadian fisheries waters. The catching capacity is being tailored to fit the size of the resource on the one hand and our aim of raising the income of individual fishermen on the other. Where there are too many boats already, applications for assistance will be turned down. Where new species are being developed or where new fishing techniques can really pay off, they have a good chance of being approved.

Old-fashioned terms such as "wooden fishing vessels" and "steel fishing vessels" will disappear from our regulations. No distinction will be made, from now on, as to materials used in construction. Fibreglass, aluminum and ferro-cement will be included along with wood and steel. Each new vessel will receive the same degree of financial assistance rather than different rates, depending mainly on size, as in the past.

RATE OF ASSISTANCE

The new rate of assistance will be 35 per cent. It will be 35 per cent for vessels in the 45 to 75 foot category. It will also be 35 per cent for larger vessels of more than 75 feet in length. In the smaller category the payment will be made directly to the vessel owners. In the larger, or 75 foot plus category, the payments will go directly to the shipyards.

Hon. Members wishing to address questions to the government about the fisheries aspects of this program should continue to direct them to the Minister of Fisheries and Forestry. On the other hand, if they are concerned about shipyards they should address their enquiry to the Minister of Industry, Trade and Commerce.

Recognition of Bunker Oils By Thin-layer Chromatography

By J.C. Sipos, R.G. Ackman and R.F. Addison, Fisheries Research Board of Canada, Halifax, N.S.

Much has been heard of the spillage of crude oils from tanker disasters. The wreck of the *Arrow* in Chedabucto Bay has underlined the fact that bunker oils are shipped in large quantities, as well as being present in the fuel tanks of many merchant ships and slicks may wash ashore from both sources.

Crude oil is a material with a very wide boiling-range and after a spillage the proportions of different materials change rapidly as there is successive loss of volatile fractions corresponding to gasolines, kerosenes, diesel oils etc. as well as of more water-soluble compounds. Bunker oil, most commonly bunker "C", is normally based on residues remaining after distillation and cracking in a refinery has removed all volatile fractions. The properties and exact composition are determined by the origin of the starting crude oil, the treatment, and any blending with other oil fractions (fluxes). However, the very rough treatment given the oil causes breakdown and rearrangement of thousands of heavy compounds of crude oil to many fewer basic skeletons.

Coronene and perylene are examples of the type of stable aromatic nuclei which may be formed, although these two are rather low boiling to remain behind in most bunker oils. "Aromatic" compounds of this type have the property of fluorescing or giving out light, often bluish, when irradiated with light of another wavelength such as to us invisible ultraviolet or UV light. Although there are many of these skeletons, and not all fluoresce, they fall into groups of similar structural types. If these groups could be recognized and proportions estimated, it would be possible to examine oil slicks or beach deposits and compare the oil with samples from suspected ships or other sources, and to examine animal life for bunker oil pickup. Compounds of this type, with one or two insignificant exceptions, are not normally found in marine plants or animals.

Dr. D.J. Scarratt (wearing lifejacket), of the Fisheries Research Board, St. Andrews, and Kenneth Lord, Resource Development Branch, Maritimes Region, with crew members on the patrol boat "Cratena" during diving operations to study the effects of the "Arrow" oil spill on marine life.

SIMPLIFIED PROCEDURE

The procedure adopted has been kept as simple as possible so that field examination in isolated areas can be carried out if necessary. A few solvents and a little glassware are needed, but it is not necessary to have electricity as battery operated UV lamps are available.

In thin-layer chromatography (TLC) a drop of solution of the material to be analysed is put on a glass or plastic sheet coated with a powder, in this case alumina. The lower edge of the sheet is placed in a solvent which creeps up the sheet carrying and separating the various components in the material. The sheets may be purchased precoated and ready for use.

The TLC chromatogram of the bunker C oil gave a long faint fluorescent streak with several bright superimposed oval shaped spots. These were

visible only under UV illumination. The origin contained a tear-drop shaped brown (in visible light) spot, probably of acidic and carbonaceous materials. In all TLC solvent systems tested two reference compounds, perylene and coronene, showed the greatest similarity in mobility to the bunker C spots. These, and two other types of condensed aromatic systems tested possess a satisfactory degree of fluorescence and appropriate TLC mobilities permitting easy separation. Some of these had R_f values similar to the main spots in the bunker oil, though precise coincidence was not demonstrated. It would be unexpected with this broad spectrum approach to find an identical standard because of the large number of very high-boiling hydrocarbons in the oil and the limited number of standards on hand. It is, however, obvious that discrete class separations can be achieved.

Fishery Officer Aubrey McKinnon examines a mass of oil on the beach at Arrow Point, N.S.

ACIDIC COMPONENTS

To determine the approximate ratio of the acidic components in the bunker oil, a petroleum ether solution of oil was extracted with 2N aqueous sodium hydroxide. There was no obvious change in the mobile fluorescent part of the chromatogram, but the nonfluorescing brown spot at the origin was slightly reduced in intensity, suggesting the presence of only a small proportion of acidic components.

Better separation of the bunker oil was achieved by two-dimensional TLC. Hexane-benzene (1:1) was used as the mobile phase for the first direction and methanol-chloroform (1:1) for the second direction. The spots with low mobility in the first solvent showed a greenish rather than the bluish fluorescence of the three major mobile spots.

Sensitivity of the TLC method was examined with solutions of bunker oil and of perylene of known concentrations. One microgram of bunker C oil and 0.002 microgram of perylene were easily detectable after development. Thus TLC appears to be a quick and sensitive method for the detection of small quantities of bunker C oil in biological samples.

To establish the feasibility of a method of detecting bunker oil in biological samples, a small amount was added to a lipid extract and analyzed by TLC. Ten g of small crustaceans containing about 1m lipid were extracted with 20 ml of hexane and the extract was divided into four equal amounts. To two of these was added 1 mg of bunker C oil in a solution of benzene-petroleum ether (1:1). Two of these extracts, of which one contained the added oil, were saponified and the unsaponifiable matter extracted with diethyl ether.

All four solutions were then concentrated to the same volume (about 0.5 ml). TLC of these was carried out as before on Eastman Chromagram Alumina sheets developed in hexane-benzene (1:1). Sample No. 2 fluoresced freely under the UV lamp and, except for a somewhat lower intensity, the TLC pattern was similar to that of the original bunker oil. Background interference was negligible. Sample 4, the isolated unsaponifiable matter, which included the bunker oil added to the total lipid, was barely detectable when spotted from the same concentrations with reference to starting sample. The obvious loss during the extraction of the unsaponifiable matter was not further investigated but the choice of organic solvents is probably critical.

One could conclude, therefore, that a straight lipid extract would be suitable for a screening program based on TLC for detecting bunker oil in biological samples, once it has been concentrated to a small volume. No. 3 showed no spots and no detectable streak, so a concentrate of nonsaponifiables would be satisfactory if hydrocarbon loss did not occur. Alumina retains acidic and weakly polar substances at the origin. Only a small proportion of natural lipid will

'Cygnus' Captain Ends Career

Following 43 years in Government service, the "grand old man" of the fisheries fleet, Captain Ralph Whitman Townsend, has retired.

He was recently honoured at a dinner tendered by members of the Department of Fisheries and Forestry marking his retirement as captain of the *Cygnus*, one of the department's Maritimes Region deepsea protection vessels.

Born in Lunenburg country, Captain Townsend started to sea in 1921 at the age of 14, beginning as a dory fisherman aboard a Gloucester banker, the *T.M. Nickerson*. At the age of 18 he joined the Department of Marine and Fisheries, first serving as a seaman on the old *CGS Arleux*. He later became quartermaster on that vessel.

During the Second World War, Capt. Townsend served in the Royal Canadian Navy when that service took over all Canadian Government ships. In 1945 he was appointed first officer aboard the *CGS Melville*, a Bangor-class minesweeper which was turned over to the department from the Navy. This vessel became the first *Cygnus* of the fisheries fleet and Mr. Townsend became her captain in 1950. When a new *Cygnus* was completed in 1959 it was natural that Captain Townsend should become her first commander.

Now in his 63rd year, Captain Townsend has retired to Lunenburg where he says he is "just going to relax and maybe do a little fishing on the side."

Capt. R.W. Townsend

BUNKER OILS

(Continued from previous page)

be mobile in most samples of marine origin.

The separation of bunker "C" into at least five spots by two-dimensional TLC suggests that the occurrence or relative proportions of these or other classes or groups of hydrocarbons could be used as a "fingerprint" approach to the identification of oil slicks etc. The two dimensional TLC pattern of oil recovered from the wreck of the *Arrow* differed from that of the test bunker C in emphasizing the most mobile spot to the virtual exculsion of the others. The pattern was also identical to that of oil extracted from sand removed from the beaches of Sable Island and believed to be originally from the *Arrow*.

(This material has been issued in more detail as New Series Circular No. 37 of the Halifax Laboratory, Fisheries Research Board of Canada.)

New Director Of Inspection

Dr. Chesley M. Blackwood, 40, of Halifax, has been appointed Director of the Fisheries Service Inspection Branch in Ottawa. He was the successful candidate in a Public Service Commission competition. The position had been vacant since the death of H.V. Dempsey in June, 1969.

The Inspection Branch is responsible for the inspection of fish processing and handling facilities and of fish products entering interprovincial or export trade, as well as imported fish products.

Dr. Blackwood, formerly the Department's Assistant Regional Director for the Maritimes Region, assumed his new duties in July.

Born in Brookfield, Bonavista Bay, Newfoundland, Dr. Blackwood graduated from Dalhousie University, Halifax, with a Bachelor of Science degree and a Food Technology diploma. He received his Master's degree in Food Chemistry from the University of Toronto, and in 1961 received his Ph.D. in Biochemistry from the University of Washington.

He joined the Technological Unit of the Fisheries Research Board of Canada at St. John's, Nfld., in 1952, and two years later was seconded to the Department of Fisheries Inspection Laboratory in that city. After concluding his University of Washington studies he rejoined the Fisheries Research Board Technological Unit as Associate Scientist.

In 1962, Dr. Blackwood moved to Halifax on his appointment as Chief of the Inspection Branch for the Maritimes Region.

Manitoba Projects Assured Federal Support

Provincial government programs designed to re-establish and develop Manitoba's commercial fisheries will get strong support from the federal Department of Fisheries and Forestry.

A major part of the program under consideration is aimed at restoration of the valuable commercial fisheries – especially for whitefish and pickerel – on the three large Manitoba lakes and the Interlake region. Federal Fisheries and Forestry Minister Jack Davis has assured full support, in all research and development phases, of the Freshwater Institute of the Fisheries Research Board and his Department.

Among items in a preliminary planning stage is an experimental program to remove rough fish on Lake Manitoba. This experiment would be conducted by the Manitoba Department of Mines and Natural Resources with support of the Freshwater Institute scientists.

The objective of this program is to establish the effects on commercially more valuable species resulting from the removal of the less used, so-called "rough" fish. As it would be an ongoing program for a number of years and possibly not self-sustaining, government assistance might be required to maintain it.

On the other hand, the Freshwater Fish Marketing Corporation reports that there is a growing commercial demand for products prepared from species such as burbot (maria), carp and mullet (suckers). Accordingly, the Corporation will continue its Selkirk plant in operation, geared to this demand, where it expects a requirement for processing 6 million pounds of fish annually. This represents a higher level of operation than previously maintained for this plant.

Specialists of the Vessel and Gear Section of the federal Fisheries Department's Industrial Development Branch will assist in developing the most economical methods of harvesting in both the experimental and commercial operations for rough fish.

Dr. Ricker Honored By Royal Society

Dr. W.E. Ricker, of Nanaimo, Chief Scientist of the Fisheries Research Board of Canada, was recently awarded the Royal Society of Canada's Flavelle Medal in recognition of his "lasting contributions to fisheries and aquatic science".

The citation referred to the fact that Dr. Ricker had published more than 100 papers, and has a world-wide reputation as an expert in the study of fish population dynamics.

Another honour recently bestowed on Dr. Ricker was that of honorary degree of Doctor of Science from the University of Manitoba.

A native of Waterdown, Ont., Dr. Ricker was for 12 years Editor with the Fisheries Research Board and in 1963-64 served as Acting Chairman. He was elected a Fellow of the Royal Society of Canada in 1956 and has twice received the Wildlife Society award for outstanding publications. He received the Gold Medal of the Professional Institute of the Public Service of Canada in 1966 and last year was the first recipient of the American Fisheries Society's Award of Excellence.

Fisheries Council Elects New Slate

The Fisheries Council of Canada at its annual meeting elected E.L. (Bill) Harrison, of Vancouver, as its president and chairman of the council's board of directors for 1970-71. Mr. Harrison is executive vice-president and director of British Columbia Packers Ltd. and chairman of the Fisheries Association of British Columbia. He was the council's national vice-president last year.

E.L. Harrison

Leonard Omstead, Jr., of Omstead Fisheries (1961) Ltd., Wheatley, Ont., was chosen national vice-president. Named regional vice-presidents were:

Bernard Blais, St. Lawrence Sea Products Co., Quebec, Que.; George C.R. Clouston, A. Roy Clouston & Sons Ltd., Montreal, Que.; Senator D.A. McLean, Connor Bros. Ltd., Black's Harbour, N.B.; Denis Monroe, Fishery Products Ltd., St. John's Nfld.; E.S. Turnill, B.C. Packers Ltd., Vancouver, and S.F.H. Zwicker, Zwicker & Co. Ltd., Lunenburg, N.S.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	January – May 1969		January – May 1970	
	Landings[1]	Value[2]	Landings[1]	Value[2]
	'000 lb.	$'000	'000 lb.	$'000
CANADA – TOTAL	780,418	40,309	802,296	41,964
ATLANTIC COAST – Total	745,696	34,274	767,819	35,710
Cod	125,983	5,343	130,935	5,920
Haddock	54,305	4,288	26,895	2,729
Redfish	25,667	616	32,664	948
Halibut	1,853	735	1,783	861
Other Flatfishes	98,210	3,775	103,762	5,096
Pollock, Hake, Cusk	12,017	382	10,408	365
Catfish	2,964	100	2,510	87
Other Groundfish	1,634	23	1,804	37
Herring & Sardines	390,878	3,702	426,890	4,808
Mackerel	464	29	684	43
Swordfish	290	256	299	269
Tuna	619	103	1,148	270
Alewives	1,036	22	2,490	64
Salmon	318	214	280	197
Smelts	2,987	239	2,592	271
Other Fish	561	41	693	63
Clams and Quahaugs	2,111	162	2,179	185
Scallops	3,744	3,163	3,618	3,836
Lobster	14,535	10,134	10,604	8,739
Other Shellfish	5,520	783	5,581	694
Misc. Items	–	164	–	228
PACIFIC COAST – Total	34,722	6,035	34,477	6,254
Pacific Cods	7,402	605	5,231	508
Halibut[3]	7,453	3,031	8,403	2,981
Soles & Other Flatfishes	4,497	269	5,593	342
Herring	3,159	99	4,441	125
Salmon	2,045	1,154	2,201	1,442
Other Fish	2,524	53	2,043	114
Shellfish	7,642	824	6,565	742
Misc. Items	–	–	–	–
BY PROVINCES				
British Columbia	34,722	6,035	34,477	6,254
Nova Scotia	214,765	18,364	177,375	17,103
New Brunswick	62,857	2,608	46,216	2,600
Prince Edward Island	8,119	2,022	23,434	1,845
Quebec	42,715	1,714	41,599	2,193
Newfoundland	417,240	9,566	479,195	11,969

[1] Fish and Shellfish only. [2] All Products–Includes livers, seaweeds, tongues, scales, roes, skins, oil, seals, whales and bait worms.
[3] Includes halibut landed in U.S. ports by Canadian Fishermen.

MID-MONTH WHOLESALE PRICES – MAY 1970

		Montreal $	Toronto $
Cod fillets, Atl. fresh, unwrapped	lb.	.466	.563
Cod fillets, Atl. frozen, cello 5's	lb.	.360	.467
Cod fillets, smoked	lb.	.485	.607
Haddock fillets, fresh, unwrapped	lb.	.766	.847
Herring, kippered, Atl.	lb.	.304	.367
Mackerel, frozen, round	lb.	.218	.333
Lobsters, canned, Fancy	Case 48-1/2s	88.153	92.213
Sardines, canned	Case 100-1/4s	10.786	10.790
Halibut, frozen, dressed	lb.	.578	.733
Silverbright, frozen, dressed	lb.	.755	.890
Coho, frozen, dressed	lb.	1.044	1.150
Sockeye, canned, grade A	Case 48-1/2s	30.237	31.403
Pink, canned grade A	Case 48-1/2s	20.977	21.817
Whitefish, fresh	lb.	.669[1]	.767
Lake Trout, frozen	lb.	.544	.670

[1] Dressed.

PRICES PER CWT. PAID TO FISHERMEN

(Week ending May 16th)

	1969 $	1970 $
Halifax		
Cod Steak	5.75	–
Cod Market	5.5	–
Haddock, large	9	–
Plaice	4.5-5.25	–
Lockeport		
Haddock	9	11.25
Shippegan		
Herring	–	1
St. John's, Nfld.		
Cod	4-5	3-5
Flounders, round	3	4
Vancouver		
Ling Cod	7-16	13-19
Grey Cod	8	9
Soles	8-8.5	8.5-9.5
Salmon (Redspring)	–	45-100

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF MAY

	1969 '000 lb.	1970 '000 lb.
TOTAL – Frozen Fish, Canada	52,796	46,133
Frozen – Fresh, Sea Fish – Total	38,301	31,194
Cod, Atlantic, fillets	4,429	4,133
Cod, Atlantic, blocks and slabs	5,893	2,873
Haddock fillets	2,975	1,697
Haddock blocks and slabs	1,375	753
Redfish fillets	615	694
Redfish blocks and slabs	111	67
Flounders and Soles fillets	2,236	3,040
Flounders and Soles blocks and slabs	724	1,241
Halibut, Pacific, dressed and steaks	4,679	4,455
Halibut, Pacific, fillets and blocks	215	229
Turbot fillets	77	55
Turbot, blocks and slabs	35	29
Pollock fillets	195	104
Pollock blocks and slabs	115	88
Other Groundfish, dressed and steaks	1,396	935
Other Groundfish, fillets and blocks	1,290	915
Salmon, Pacific, dressed and steaks	2,949	1,726
Herring, Atlantic and Pacific	292	160
All Other Seafish, all forms	4,568	4,406
Lobster, whole and meat	787	975
Scallops, breaded and unbreaded	819	562
All Other Shellfish, all forms	2,526	2,057
Frozen – Smoked Fish – Total	1,382	1,018
Cod, Atlantic	593	400
Sea Herring, kippers	226	289
Other, all forms	563	329
Frozen For Bait and Animal Feed	13,113	13,921

SALT FISH STOCKS AS AT END OF MAY

		1969 '000 lb.	1970 '000 lb.
Salted and Pickled Fish, Atlantic Coast			
Wet-Salted – Total		4,654	3,238
Cod		3,409	2,118
Other		1,245	1,120
Dried-Salted – Total		6,309	575
Cod		6,100	312
Other		209	263
Boneless – Total		439	211
Cod		399	155
Other		40	56
Pickled – Total[1]	(barrels)	5,095	4,076
Herring	"	4,577	2,099
Mackerel	"	(2)	779
Alewives	"	518	1,198
Turbot	"	–	–
Bloaters	(18 lb. boxes)	45,311	(2)
Boneless Herring	(10 lb. boxes)	4,304	(2)

[1]Excludes Newfoundland in May 1969.

[2]Confidential.

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS
JANUARY – APRIL

	1969 $'000		1970 $'000	
TOTAL EXPORTS		75,728		80,654
By Markets:				
United States		46,742		55,467
Caribbean Area		5,674		7,163
Europe		20,118		16,355
Other Countries		3,194		1,669
By Forms:				
Fresh and Frozen		47,132		53,561
Whole or Dressed	14,346		15,284	
Cod, Haddock, Hake	266		436	
Halibut, Pacific	1,358		2,324	
Salmon, Pacific	6,706		6,018	
Swordfish	179		179	
Other Seafish	1,833		1,788	
Whitefish	1,900		2,237	
Pickerel	664		687	
Other Freshwater Fish, n.e.s.	1,440		1,615	
Fillets, Blocks and Slabs	21,257		24,168	
Cod, Atlantic	6,368		9,433	
Haddock	3,299		1,821	
Ocean Perch, Hake, Cusk, Pollock	2,713		3,190	
Flatfish	5,567		6,353	
Pickerel	591		353	
Other Fillets and Blocks	2,719		3,018	
Shellfish	10,763		13,200	
Lobsters (in shell & meat)	6,768		8,957	
Scallops	3,058		3,116	
Other	937		1,127	
Frozen Fish & Shellfish, pre-cooked	766		909	
Cured		6,668		9,633
Smoked	831		823	
Herring	418		313	
Other	413		510	
Salted, Wet & Dried	5,020		6,257	
Cod	4,421		5,391	
Other	599		866	
Pickled	817		2,553	
Herring	516		2,283	
Mackerel	108		125	
Other	193		145	
Canned		15,978		9,755
Salmon	12,959		5,458	
Sardines	2,037		2,666	
Lobsters	146		269	
Other	836		1,362	
Miscellaneous		5,950		7,705
Meal	4,175		4,830	
Oil	323		713	
Other	1,452		2,162	

Survey Probes Fish-Eating Habits

A bold, new approach to fish marketing in Canada was presented at the annual meeting of the Fisheries Council of Canada at St. John's, Nfld. The new approach, if implemented, promises to explode fish consumption by 20 per cent within two to three years.

The marketing study was jointly sponsored by the federal and provincial governments and the fisheries industry. Under the management of Stevenson & Kellogg Ltd., Toronto, it utilized the newest and most sophisticated techniques of market research to find out what people think about fish, why some people eat it and some don't, and what can be done to boost consumption.

UPGRADING NEEDED

Main findings were that the industry must continue to upgrade and improve products, remove undesirable features, and establish its own grades and standards backed by a 'fish mark'.

Freshness-on-the-plate must be guaranteed and delivered. And industry should strive to create exciting new products, new 'flavor experiences' for the consumer.

The industry's marketing strategy for the distribution trade should place more emphasis on selling the chains and larger institutional buyers. This could be done by top management level discussions and also through strong brand identification; education and training programs for store personnel and food service operators.

A marketing strategy for the consumer, the study said, should differentiate between the three basic kinds of consumers – those who already like fish; those who are neutral, and those who dislike it.

The biggest opportunity to explode the consumption of fish lay in 'levelling up the market' – moving light users to medium users, and medium users to heavy users.

NEW FISH PRODUCTS

The study designed new fish products and new ideas in five categories that would appeal to these three classes of consumers. It considered 43 marketing concepts for processors. Four of these 'concepts' were put to a concept testing panel of housewives and favourably received.

One of these concepts was a line of fish sauces and seasoning mixes to go along with frozen fillets; another, fish recipes of internationally known restaurants; a third, dual-pak frozen fish dinners (everything in one package), and a fourth, canned fish salads, a brand new idea.

The industry was urged to adopt a vigorous program of advertising, sales promotion, public relations and education. The communications strategy would call for promoting and upgrading the image of fish; telling people how to prepare fish in new and exciting ways; and enlarging the market for improved existing products and new ones.

The fish marketing strategy study was the result of the combined teamwork of Stevenson & Kellogg, Brand, Gruber & Co., Huntington Woods, Michigan, and Canadian Facts Company Ltd., Toronto.

SHALLOW MARKET

It found that 'the Canadian market for fish is a very broad one, but at the same time a very shallow one'. A national attitude study of 1,500 Canadian families across Canada showed in a typical week only two out of three – or 66 per cent – had one meal with fish as a main course. Canadians consume only about 15 pounds of fish a year per person compared with 10 times that amount in meat.

Opportunities were being neglected, the study found, to make eating fish a memorable taste experience. In a market where all kinds of appetizers are in demand, only two per cent of all appetizers served consists of some form of fish.

While condiments enhance the taste of many other foods, fish typically is served with lemon, ketchup or nothing. The survey found that in fewer than half of the meals at which fish is the main dish is any more imaginative embellishment employed.

Frozen fish represented 'a tremendous opportunity for fish' – and one largely unexploited – yet in only 32 per cent of evening meals where fish is served is the product in frozen form.

If undelivered return to:
DEPARTMENT OF FISHERIES & FORESTRY
OTTAWA

CANADA
POSTAGE PAID
PORT PAYÉ

Reassuring Signs

Supermarkets and other retail stores in Canada have responded enthusiastically to an offer by the federal Department of Fisheries and Forestry to supply mounted reproductions of the Department's advertisement reassuring consumers that no contaminated fish is reaching the market. The ad appeared in leading daily newspapers across Canada early in June. Photo above shows English and French versions of the ad on display at the fish counter of an Ottawa supermarket.

FISHERIES of Canada

Sept.-Oct. 1970 Vol. 23 No. 2

Department of Fisheries and Forestry, Ottawa

SEPTEMBER – OCTOBER, 1970

FISHERIES of Canada

CONTENTS

COVER PHOTO
Inshore fisherman at Queensport, Nova Scotia, gutting his catch of cod and pollock.

Published by the Department of Fisheries and Forestry, Ottawa

Editor:
E.H. Hearnden

Salmon Come Home To the East River

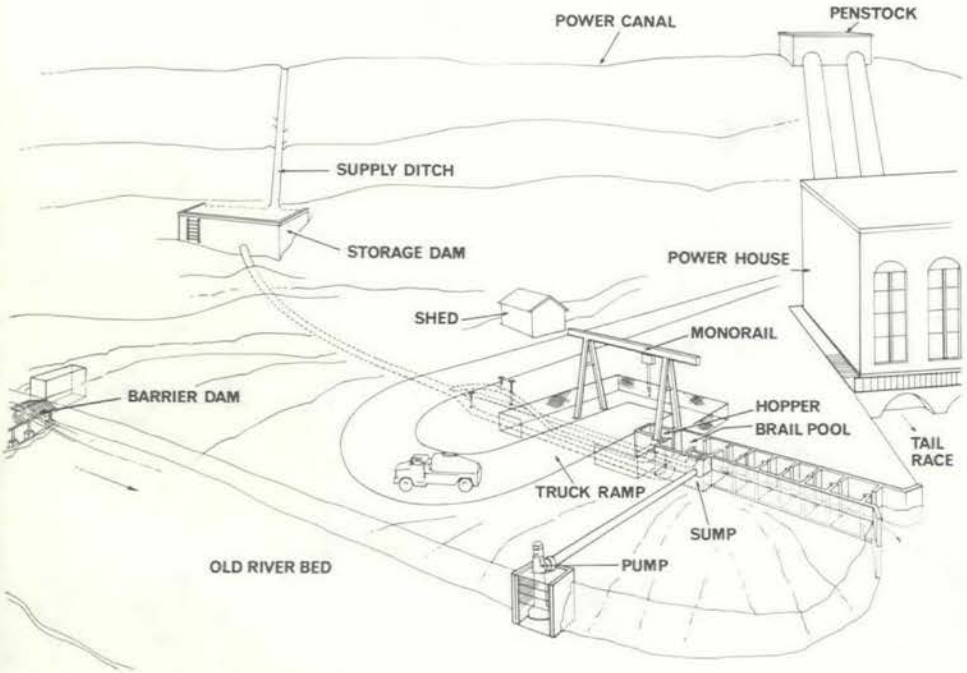
BY W J. LEVER

For the first time in 40 years industrialists, anglers, conservationists, commercial salmon fishermen, federal and provincial fisheries officials and news media representatives, witnessed a run of spawning Atlantic salmon make its way up Nova Scotia's East River, near Sheet Harbour, Halifax County.

They were guests at a recent "Open House", sponsored by the Resource Development Branch, federal department of Fisheries and Forestry, which was organized to relate the story of the branch's East River "Atlantic Salmon Rehabilitation Project".

Throughout the history of Nova Scotia, the East River was always regarded as an excellent salmon stream, but in the early 1920's the need for electrical power in the area spelled the end of salmon migration in this fine waterway.

James E. Rutledge writes in his history of the Sheet Harbour area that "the coming of electric energy to Sheet Harbour was notable in two ways; first, there was the employment given by construction and the permanent jobs on the works, together with the blessing of electric power and the light that soon came to the villages; then, there was to be faced the almost complete destruction of net fishing in the harbour for salmon bound for East River waters, likewise the river, an angler's paradise, was ruined perhaps for all time...."



Trapping and trucking facilities as developed at Nova Scotia's East River for its rehabilitation as a salmon stream.

Subsequent hydro-power development on the river did ruin the salmon runs and the people of the area were convinced they had lost the East River for all time. They had, for example, in the years 1911, 1914 and 1917 respectively, taken 7,000 pounds, 11,000 pounds and 11,800 pounds of salmon from nets in the harbour. The net catch, following the power development, shrank to almost nothing.

MULTITUDE OF PROBLEMS

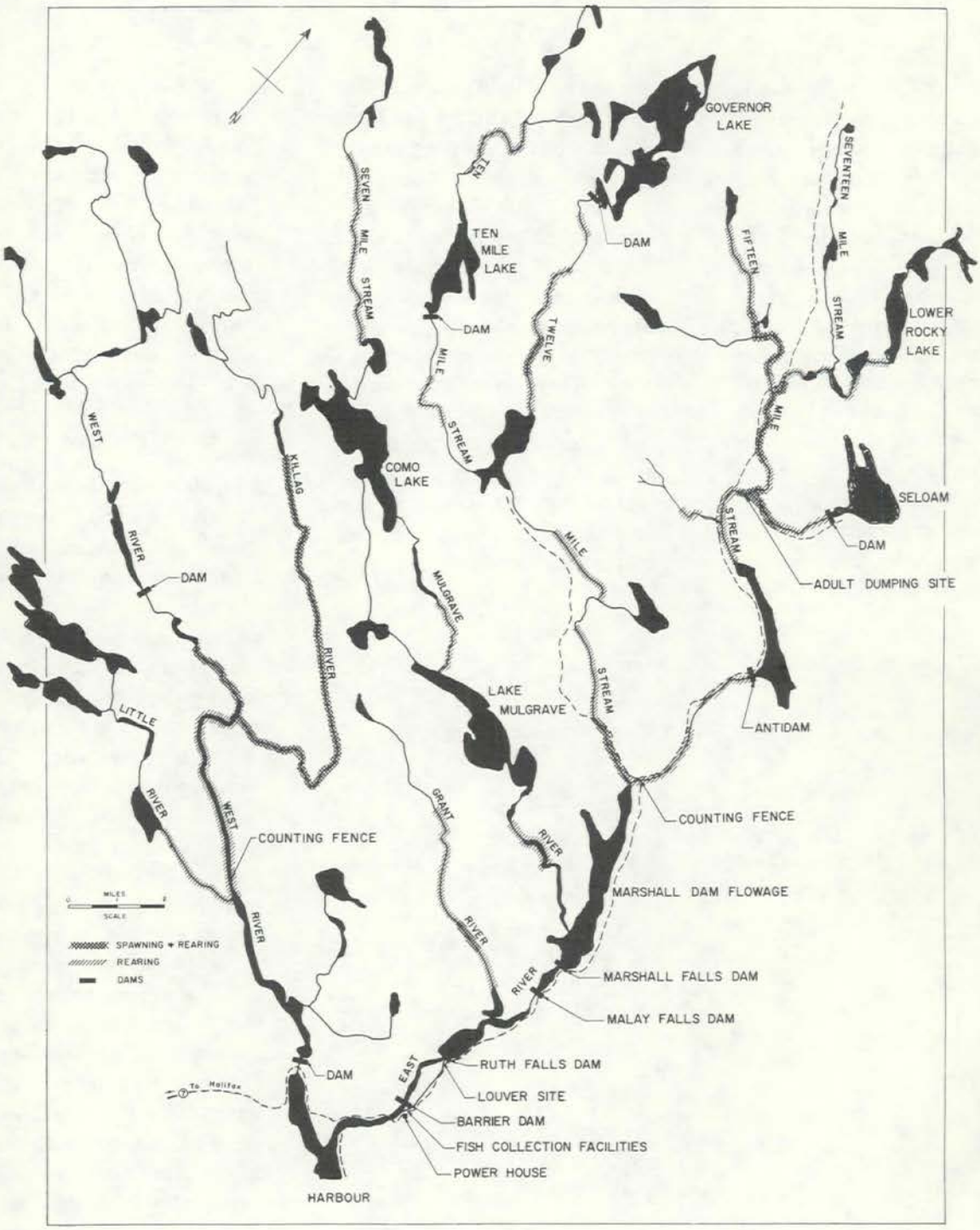
Rehabilitation of the East River as a productive salmon stream was the challenge accepted by the Resource Development Branch of the department of Fisheries and Forestry in 1964. The engineers, biologists and technicians of the branch were faced with a multitude of problems because in order to reinstate Atlantic salmon in the East River system, it was necessary to (i) find a suitable source of live stock to initiate a new run of salmon; (ii) provide adult salmon access to the upriver spawning grounds; and (iii) protect the seaward smolt migration from the hazards of turbine wheels at two power stations.

The first problem was met by taking adult salmon from the nearby West River at Sheet Harbour and transplanting them in suitable waters of Fifteen Mile Stream, part of the headwaters of the East River. Because East and West Rivers present great similarities in their characteristics, West River salmon were considered best suited to survive and reproduce in the East River. The adult transplant method was a new approach to fish stocking in the

Maritimes. It allowed the fish to spawn naturally and their progeny to be exposed immediately to the natural conditions of the stream. It was assumed that the surviving adults would accept the East River as their home water... they did.

In providing adult salmon access to the upriver spawning grounds, the Resource Development people found that conventional fishways were uneconomical because of the East River's multiplicity of obstructions (three major dams within five miles of saltwater).

Thus, a single trapping and trucking system was adopted. Fish collected near the mouth of the river are transported past four dams where they are released to resume their migration to any of the three major tributaries that form the East River. The eggs which hatched



The Sheet Harbour area, showing the East and West River systems, location of dams, and salmon spawning and rearing areas.

A pivoting steel basket is used to transfer salmon from a holding pool to a tank truck for transportation to breeding grounds in the upper part of East River.

several years ago in a natural environment, produced smolts which migrated to sea. Returns from these smolts are the spawning salmon which are entering the river this year.

The collection facilities consist of a concrete vertical slot fishway made up of nine pools. The first seven pools serve to attract and convey the fish from the tailrace. The eighth pool is equipped with a brail, or pivoting steel basket, which herds the adult salmon into the "hopper pool". The hopper is then hoisted and emptied with a safe volume of water into the fish transport truck. And so the problem of transporting the salmon to upstream spawning grounds was overcome.

The third problem of protecting the seaward smolt was solved with the installation of louver deflectors. Young Atlantic salmon of the East River migrate seaward at two or three years during the period May 15 to June 15. Since, after May 15, water is seldom

Salmon smolt congregate in a trough on the East River during their downstream migration to the sea.

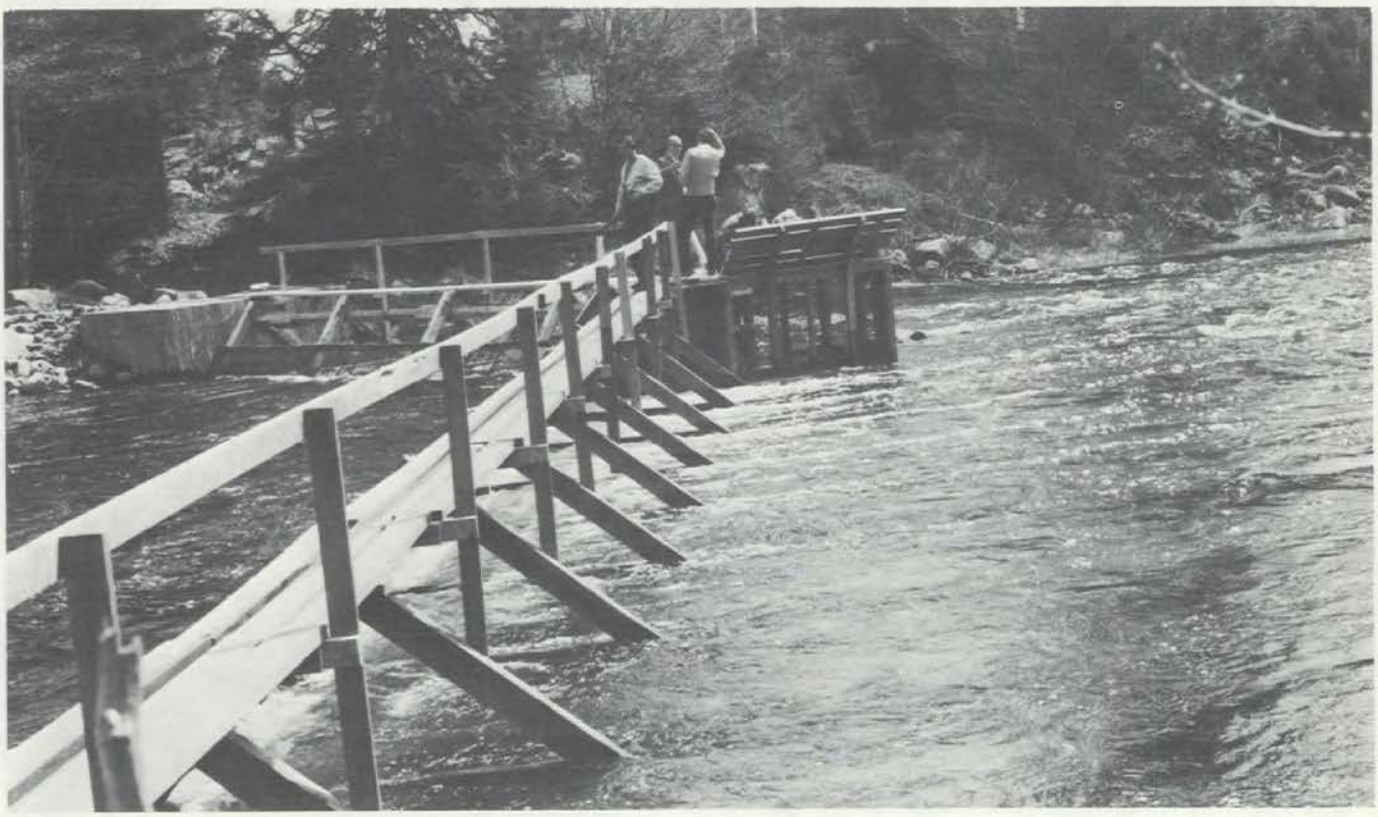
released through the spillways of two of the dams, most migrating salmon juveniles (smolts) would be expected to enter the power canals and to pass through turbines where the run would suffer a mortality of 10 to 15 percent. Thus, louver deflectors were installed three years ago in order to guide salmon smolts around a power station and so prevent them from entering the turbines. A second louver installation is being planned.

The louver guiding system consists of two conveying lines of vertical bars which are spaced about six inches apart, set at a 90-degree angle to the direction of the flow. Smolts descending in the power canal tend to avoid the louvers and are guided into the apex of the V-shaped louver lines, thence into a bypass and back to the old river channel where they are able to migrate safely to sea.

Speaking to the guests of the "Open House", C.P. Ruggles, Chief, Resource Development Branch, said that the cost of the project, some $250,000, was more than justified. He estimated that for each salmon caught by a sports fisherman, the community would realize approximately $50.

The biologist in charge of the project, Andre Ducharme, said it was within the realm of possibility that the East River could be one of the best, if not the best, salmon-producing rivers in the Maritimes within a relatively few years. "Eventually", he added, "some 2,000 adult salmon can be expected to return to the river each year".

Andre Ducharme, biologist in charge of the East River rehabilitation project, is interviewed for a CBC television program.



Counting fence installation on the East River.

Canada's Lakes and the Phosphate Problem

EDITOR'S NOTE – Eutrophication – over-abundant water plant growth in lakes caused by nutrients from detergents, sewage systems and agricultural run-offs – is a problem with which federal fisheries scientists have become deeply involved. Working closely with other federal and provincial government departments and agencies, they have made a major contribution to new knowledge in this important area of inquiry. The following article is based largely on information supplied by the Eutrophication Section of the Fisheries Research Board of Canada's Freshwater Institute, Winnipeg.

Cool, clear lakes are part of Canada's heritage and image, but eutrophication – runaway water plant growth – is changing all that.

The problem has arisen in both Europe and North America from the fertilization of lakes with nutrients from man-made sources. These nutrients – notably compounds of phosphorus and nitrogen – have triggered the growth of algae and aquatic weeds, thus lowering the value of waters used for recreation, fishing and drinking water supplies.

The typical consequences of eutrophication include the fouling of beaches with plant slimes and weeds, oxygen depletion of bottom waters, taste and odour problems in drinking water, undesired changes in fish populations, clogging of filters on water intakes lines, lowered property values and a general deterioration of the aesthetic aspects of the environment.

Eutrophication problems typically arise in lakes rather than streams for a number of reasons: the longer residence times of water in lakes, the associated tendency for lakes to hold pollutants in one place for long periods of time, and the generally greater transparency of lake water, which permits more favourable penetration of the sunlight needed for plant growth.

Since rivers are most frequently the medium into which municipal and industrial wastes are discharged, lake chains along rivers that pass through areas of dense population or intensive farming tend to man-made or 'cultural' eutrophication.

As water courses of this type are a predominant feature of the Canadian landscape, new problems of cultural eutrophication can be expected to arise as our population grows and new technological uses for compounds of phosphorous and nitrogen are found – past examples being the widespread use of fertilizers, and phosphate-based detergents.

The full extent of present problems in Canada and the number of lakes that may be approaching critical points in the process cannot be stated in exact terms. Serious problems do, however, now exist in the lower Great Lakes, some lakes of the Okanagan, Muskoka and Trent Valley areas, and probably in numerous lakes and embayments that have not been studied in detail.

Less than 10 per cent of the municipal sewage originating from all Canadian sources receives secondary treatment involving activated sludge plants. Also, both this type of treatment and the more common and less efficient lagoon systems are relatively ineffective in terms of nutrient removal. As a result most of the fertilizing elements present in municipal wastes are liberated to the receiving water, causing accelerated plant growth in downstream areas, particularly in lakes.

Treatment processes for phosphate removal alone have been shown to be effective in controlling plant growth downstream from population centres. Although no such treatment processes are yet in full-time operation in Canada, some provincial and municipal agencies are taking active steps toward that end.

What is eutrophication?

According to the trophic system of lake classification, oligotrophic lakes are poorly supplied with plant nutrients and support little growth. As a result, biological production is generally low, the waters are clear and the deeper waters are well supplied with oxygen throughout the year.

Eutrophic lakes, on the other hand, are lakes rich in

nutrients and support heavy growths of plants. As a result, biological production is generally high, the waters are turbid because of the dense growth of phytoplankton, and the deeper waters during periods of restricted circulation become deficient in oxygen as a result of the decomposition of the organic material produced.

The long-term effect of oxygen deficiency in the deeper waters is the reduction in numbers of cold water species of fish such as trout, whitefish and pickerel.

Natural eutrophication is associated with the progressive reduction in volume of water bodies as they fill in with sediments over long periods of time. The predominant cause appears to be related to funnelling of a constant supply of nutrients into an ever-decreasing volume of water, coupled with an increased recycling of nutrients from sediments to water in the terminal part of the process.

Cultural eutrophication results from increased supplies of man-derived nutrients to a water body. In centres of dense population and industry it is a rapid process, measurable in years to tens of years, versus thousands to tens of thousands of years in the case of natural eutrophication. Cultural eutrophication is largely, if not completely, reversible following the reduction of nutrient inputs (e.g. by sewage diversion). The process of natural eutrophication, on the other hand, is practically irreversible.

The nutrients most commonly involved in the triggering of eutrophication are those present in the lowest quantities relative to plant needs. In the vast majority of cases tested to date phosphorus and nitrogen have been identified as the critical triggering nutrients, with phosphorus playing the predominant role as the overall growth-controller.

Cases are known of deficiencies in the supply of available iron, silicon, molybdenum, manganese, carbon and some other elements, but there is no evidence for attributing a principal role to any of these in either the causes or control of eutrophication.

Can eutrophication be controlled?

It is important to note that the addition of small amounts of phosphorus and nitrogen can trigger greatly increased growth of plant tissue. The problem associated with cultural eutrophication is that the bulk of the phosphorus and nitrogen compounds present in sewage pass through the sewage treatment plant to fertilize the receiving water.

Cultural eutrophication can be prevented by restricting the supplies of man-derived nutrients. The principal sources of the nutrients involved are municipal wastes (human excreta and detergent phosphates), agriculture (run-off from over-fertilized lands and livestock-holding areas), and some industrial wastes (e.g. food processing plants).

Sewage diversion schemes that channel the wastes away from affected lakes to other less critical areas have been used in some instances, but the more commonly accepted approach in densely populated inland areas has been to attempt removal of the causal nutrients prior to discharge into the receiving water.

Particular attention has been focused on phosphates because they are the principal, overall growth-stimulating agents in lakes and, more important, they are controllable by man. The treatment of sewage with lime, iron or alum to remove phosphates markedly lowers the fertilizing capacity of sewage.

Heavy duty laundry detergents and automatic dishwasher detergents constitute the single largest source of all the phosphates present in municipal sewage (50 per cent to 70 per cent). The other major source of phosphates is human physiological waste.

As was recognized by the International Joint Commission in dealing with eutrophication problems in the lower Great Lakes, there are good reasons for exercising separate controls on phosphates arising from both sources. These reasons are:

(1) Phosphates from detergents are more amenable to rapid and direct control at the source rather than in a sewage treatment plant because the number of manufacturers of phosphate-based detergents is limited relative to the number of 'manufacturers' of human physiological wastes. This is largely a matter of timing and ability to deal effectively with one major aspect of the problem.

The removal of phosphates from detergents alone will not solve the problems of eutrophication in our lakes. Chemical precipitation of phosphorous from human wastes at sewage treatment plants will also be necessary.

(2) In the case of alum treatment for phosphate removal, costs rise in proportion to the amount of phosphate removed. Annual additional chemical costs, based on the alum treatment, for removal of detergent phosphates in the lower Great Lakes basin alone have been estimated to be $5 million per year in Canada and $17 million per year in the U.S.A. In the case of treatment with lime and iron salts, it costs just as much to treat sewage high in phosphate as it does to treat sewage low in phosphate. Overall costs of this process (including sludge removal) could limit its use in some areas.

To achieve comparable removal at the sewage treatment plant alone would demand an overall removal of 96-98 per cent at large municipalities where such facilities are economically feasible. (The target of 98 per cent would be necessary to compensate for those cases in which phosphates from both major sources would not pass through treatment plants with phosphate-removal facilities, e.g. small municipalities, isolated houses and cottages, storm overflow.)

(3) If phosphates are eliminated from detergents and 80 per cent of the remaining phosphates in municipal sewage are removed at the sewage treatment plant, the total removal amounts to 94 per cent. (Reduction from 100 per cent to 30 per cent by eliminating detergent phosphates at the source, and reduction from 30 per cent to six per cent by treatment of the remainder at the sewage treatment plant.)

The costs for phosphate removal at the treatment plant range from 1/2 to 5 cents per thousand gallons of sewage. Since each of us contributes about 100 gallons of waste water per day, it costs between 18 cents and $1.80 per year per person.

In Volume I of the Report to the International Joint Commission on the Pollution of Lake Erie, Lake Ontario and the International Section of the St. Lawrence River, the capital costs for phosphorous removal are estimated at $ (Can.) 40 million, and $ (U.S.) 265 million for municipal and industrial waste treatment.

For the approximately 18 million people living in the Lower Great Lakes Basin of Canada and the U.S., the capital expenditure amounts to roughly $17 per person.

Due to the sharp increase of phosphate-removal costs as one approaches complete (100 per cent) removal, average efficiencies of the order of 98 per cent are not likely to be economically feasible in most instances.

Since phosphorus and nitrogen are the two predominant nutrients involved in triggering eutrophication, one naturally wonders whether phosphate removal from municipal sources alone, by any method, will be sufficient to contain the problem.

First of all, in areas of intensive agriculture and/or livestock holding, adequate measures must be undertaken to limit supplies of phosphorus introduced to streams by run-off.

Secondly, phosphate control must be recognized as the most direct and effective step that can be taken at the present time. Accessory problems resulting from nitrogen inputs may arise in future years, but the impact of eutrophication problems will be markedly reduced by phosphate control.

With respect to potential replacement for phosphates in detergents, the most promising compound appears to be nitrilotriacetate (NTA). It is being used on a small scale in Canada and the United States and has been used in detergent formulations for over two years in Sweden. NTA is degraded in normal sewage treatment processes, but the overall environmental impact of large-scale use has not been fully tested.

Accelerated programs to determine the environmental effects of NTA have been underway in Sweden for some years and are now in progress in Canada and the United States. Although NTA is more expensive than the sodium tripolyphosphate (STPP) now commonly used in detergents, it is also more effective as a water-softening agent, with the result that there is relatively little price difference between the two compounds in terms of their performance in detergent formulations.

The carbon question

In the March/April issue of Canadian Research & Development magazine, Robert F. Legge and Douglas Dingeldein claimed that carbon is the key controlling element in eutrophication. Their information was based on the work of three investigators, Dr. W. Lange, Dr. L.E. Kuentzel, and Miss Pat Kerr, who have recently questioned the massive body of evidence gathered by experienced limnologists over the past 40 years which shows that phosphates and nitrogen are the prime factors in eutrophication.

This confusing claim by CR&D is unfounded and inconsistent with what is known about lakes and the process of eutrophication. In criticizing as a "hoax" the recent report to the International Joint Commission on pollution in the lower Great Lakes, CR&D failed to realize that the argument for phosphorus control in the lower Great Lakes' drainage basin is not only based on the well established significance of phosphorus as a major factor in eutrophication, **but also on the fact that phosphorus is the only chemical element involved in triggering eutrophication that is controllable by man.**

Some of the evidence against the significance of carbon in eutrophication is:

(1) The levels of carbon in the lower Great Lakes have not changed appreciably during the past 100 years, whereas algal blooms associated with eutrophication have increased dramatically. This is also true of most other lakes affected by cultural eutrophication.

(2) If carbon were the principal factor in eutrophication, fish culturists would be adding carbon compounds, such as sodium bicarbonate, to accelerate the growth of aquatic plants since plants form the base of the food chain leading to fish production. Actually, fish culturists use inorganic phosphate and nitrate fertilizers in preference to complex organic manures with the same phosphorus and nitrogen content.

(3) Most natural waters contain high concentrations of carbon in the form of bicarbonates, and this carbon is rapidly and automatically converted to the carbon dioxide used by plants in photosynthesis. Thus, there is no shortage of carbon in the aquatic environment.

(4) The determination of photosynthetic rates of algae in natural waters by the C-14 method (C-14 is

an isotope of carbon) demands simultaneous measurement of the supply of inorganic carbon present in the water at the time of sampling. Among the several hundred thousand measurements made since the technique was developed in 1952, only in rare cases has any relationship been noted between the supply of carbon and the rate of photosynthesis.

(5) Dr. Lange, one of the proponents of the carbon thesis, in testing the effects of seventeen different nutrients on the rate of growth of algae in water from western Lake Erie, did not even include carbon among the nutrients he added. This in itself is a tacit admission from one of the proponents of the carbon thesis that carbon is insignificant as a controlling factor in eutrophication.

(6) Regardless of whether carbon is significant or not in eutrophication, there is no mechanism by which it can be controlled due to ready exchange with the carbon dioxide in air. Control of phosphorus is the only available mechanism at present known to be capable of controlling cultural eutrophication in cases where diversion and/or land disposal are not feasible.

Plan Joint Research Program On Pulp and Paper Pollution

A co-operative government-industry research program aimed at lessening water pollution by the pulp and paper industry was announced Aug. 20 by Fisheries and Forestry Minister Jack Davis and Energy, Mines and Resources Minister J.J. Greene.

The objectives of the program are to accelerate and co-ordinate Canadian research efforts on the problems of water pollution caused by the pulp and paper industry, and to develop more effective means of pollution abatement.

The authorized level of federal expenditure in the fiscal year 1970-71 is $500,000.

Approval in principle has also been been given for continuation of the program until 1976 at a level up to $1 million per year, provided industry's level of expenditure increases an equivalent amount over its contribution for '70-71.

The concept of the co-operative research program was developed by the two departments in consultation with senior representatives of the pulp and paper industry.

The ministers said that a committee representing federal government departments and the industry will be established to assess priorities, plan the program, review progress and advise on allocation of funds.

They also stated that this program is an excellent example of government-industry research co-operation on problems besetting industry and of great concern to Canadians at large.

Students Take Part in Taste Test

Sixty university students recently took part in a taste test of experimentally cold-smoked rainbow trout, conducted by the Fisheries Research Board's Freshwater Institute, Winnipeg.

In preparation for cooking the fish was thawed and the skin slit along the backbone. Each fish was individually wrapped in foil, with the dull side of the foil on the outside and the fold of the wrap along the belly flap. The fish was then baked at 400°F. for 20-25 minutes until the flesh was no longer translucent.

Samples served were taken from the dorsal portion of the fish and consisted of approximately 3 flakes of fish. Fish samples were served with water and unsalted soda crackers. Tasting took place in a home economics laboratory with individual judging stations. A nine-point hedonic scale was used to estimate acceptability.

The mean score for smoked rainbow trout was 7.15, indicating that the product was very well-liked indeed. The distribution of the ratings of the 60 judges showed that 50 of the 60 judges liked the fish "moderately", "very much" or "extremely", i.e. scores of 7, 8 and 9 respectively. Comments suggested that the smoked flavor was enjoyed but considered unusual; several said that the product would be most suitable as an hors d'oeuvre.

In other studies with canned smoked whitefish using 60-member taste panels, the highest hedonic score was 6.5. It seems likely that the attractive salmon color of the smoked trout may favor its acceptability. The flavor of the smoked rainbow trout resembles that of smoked goldeye but the flesh appears desirably firmer.

Full-course Meal Features FPC

Fish protein concentrate passed a critical "consumer test" in Halifax recently when more than 100 persons sat down to what was described as "The World's First Full-Course Fish Protein Concentrate Dinner".

The dinner, attended by the lieutenant-governor and premier of Nova Scotia, was hosted by Cardinal Proteins Ltd., of Canso, N.S., whose newly-built FPC plant goes into production this fall.

The menu was purposely designed to contain no meat, poultry, fish, eggs or dairy products. It contained honeyed half grapefruit, consomme Xavier, spaghetti Canadien, asparagus vinaigrette, cauliflower fines herbes, bread, Torata Borracha for dessert, coffee and cookies. With the package of six cookies, the meal's protein content amounted to 65% of an adult's daily requirement and more than adequately supplied those of a child's.

Once the meal was over, the guests were informed which of the dishes contained FPC and further told that had the soup, main course, bread, dessert and cookies not been fortified with FPC, the total protein content would have provided only 18% of the total daily requirement. The additional protein increased the cost by less than four cents per person per meal.

Chef Antoni Casagrande, who prepared the meal, found the protein concentrate easy to work with and expressed the desire to see it incorporated in many of our everyday foods.

UNLIMITED POSSIBILITIES

The possibilities of FPC are unlimited in the overpopulated, undernourished areas of the world, said Mrs. Odette David, Halifax region consumer consultant for the Department of Fisheries and Forestry. In addition to being an inexpensive means of relieving hunger, she continued, it would also be of great importance in the treatment of kwashiorkor, a protein-deficiency disease, and in institutional and geriatric feeding and therapeutic diets in North America.

Dr. Charles Harlow, a well-known nutrition expert, said there was also a place for FPC in the everyday diet of Canadians. He pointed out that a high average of Canadians are overfed and undernourished because of unbalanced diets, high in carbohydrates and low in protein. Dr. Harlow expressed the belief that the introduction of FPC to many foods would prove valuable in alleviating this deficiency.

Other Canadians simply cannot afford to purchase the high protein sources, such as meat products. A few teaspoons of FPC in their bread, spaghetti or other inexpensive foods, at the cost of three or four cents per day, would change this, declared H. Wilson DuVal, President of Cardinal Proteins. He pointed out that in underdeveloped countries of the world, FPC could provide the answer to the most important problem – nutrition.

HALIFAX RESEARCH

Bringing FPC to its present stage of development has taken twenty years. Today it is widely known by scientists as "the Halifax process" as the process was first researched at the Halifax laboratory of the Fisheries Research Board of Canada. Dr. D.R. Idler, Director of Research, Atlantic Region, said research is still continuing on the product, although the initial aim to produce a tasteless, odorless product that would keep indefinitely and be of the highest possible protein content had been achieved.

The $5-million Cardinal plant at Canso will employ 60 to 70 people and obtain its supply of fish mainly from nearby Acadia Fisheries. The plant is expected to process 200 tons of fish daily and will utilize not only the popular varieties of fish but also those which, although perfectly edible, have no retail value. The Canso plant is the first commercial plant of this type to be constructed in the world.

Premier G.I. Smith, of Nova Scotia, pointed out that this was only one example of the research that is being carried on in Nova Scotia, which could make the province an important centre for new industry, referring to it as "aquaculture".

"Looking ahead," he said, "I can see this dinner recalled as a milestone in research on food. It will be ranked with other achievements which have made this province pre-eminent in fisheries investigations and experimentation."

Elected Fellow of Royal Society

One of Canada's leading fisheries oceanographers, Dr. L.M. Lauzier, of the Fisheries Research Board of Canada, Ottawa, has been elected a Fellow of the Royal Society of Canada.

Born in Quebec City, Dr. Lauzier is a graduate of Laval and New York Universities. He has specialized in oceanography of the Gulf of St. Lawrence and is a recognized authority on climatic and circulation changes in the waters surrounding the Maritime Provinces.

From 1945 until July this year Dr. Lauzier served as fisheries oceanographer at the St. Andrews Biological Station of the Fisheries Research Board. He is presently with the Environmental Section of the Board's Program Advisory Group in Ottawa.

'Fishes, Trees and Men' Exhibit Opens in Vancouver

"A sophisticated exhibition"... "one of the best of its kind"... "quite fascinating". These are some of the comments visitors are making about "Fishes, Trees and Men", a joint presentation of the federal Department of Fisheries and Forestry and Vancouver's Centennial Museum.

The show was officially opened by Fisheries and Forestry Minister Jack Davis on August 10. More than 400 invited guests attended the ceremony.

Housed in three galleries, each 60 feet long and 40 feet wide, grouped around an outdoor courtyard, the exhibit is designed to show the federal government's role in safeguarding and developing two of Canada's most important resources – fisheries and forestry. This is accomplished through use of the latest visual devices and with sounds and smells as well.

Visitors to the exhibition are first introduced to the story of salmon, from spawning stage through to their migration to sea as mature fish. This is depicted by means of wall texts, charts, photographs and live exhibits. A feature of this section is an "aquarium-in-the-floor", consisting of a model of a tidal pool protected on top by heavy glass.

The Department's role in conservation and protection of the salmon resource is featured in another area. The operations room at regional headquarters in Vancouver is reproduced as a large photo montage, showing how senior staff assess the catch figures and escapement of salmon to the spawning grounds in order to regulate the fishery. The display also explains how information on pollution at sea and in streams, infractions of fishing regulations, bad logging practices in spawning streams, contraventions of the 12-mile limit by foreign fishing vessels and other items of concern are fed into the headquarters operations centre.

A section on pollution control includes a feasibility study model of how the Fisheries Research Board's research centre may look when it is completed at West Vancouver. Suspended modular photographs illustrate pollution problems associated with pulp mills and other industrial plants.

The second gallery is dominated by a 25-foot model of the $8 million Babine Lake salmon development project in northern British Columbia, which is expected to add a million sockeye to the fishermen's catch in the Skeena River. Enlarged models along the walls show details of the project, such as the Fulton Lake dam and outlet works, gate house and diversion tunnel, Fulton River spawning channel No. 2 and the vertical slot fishway.

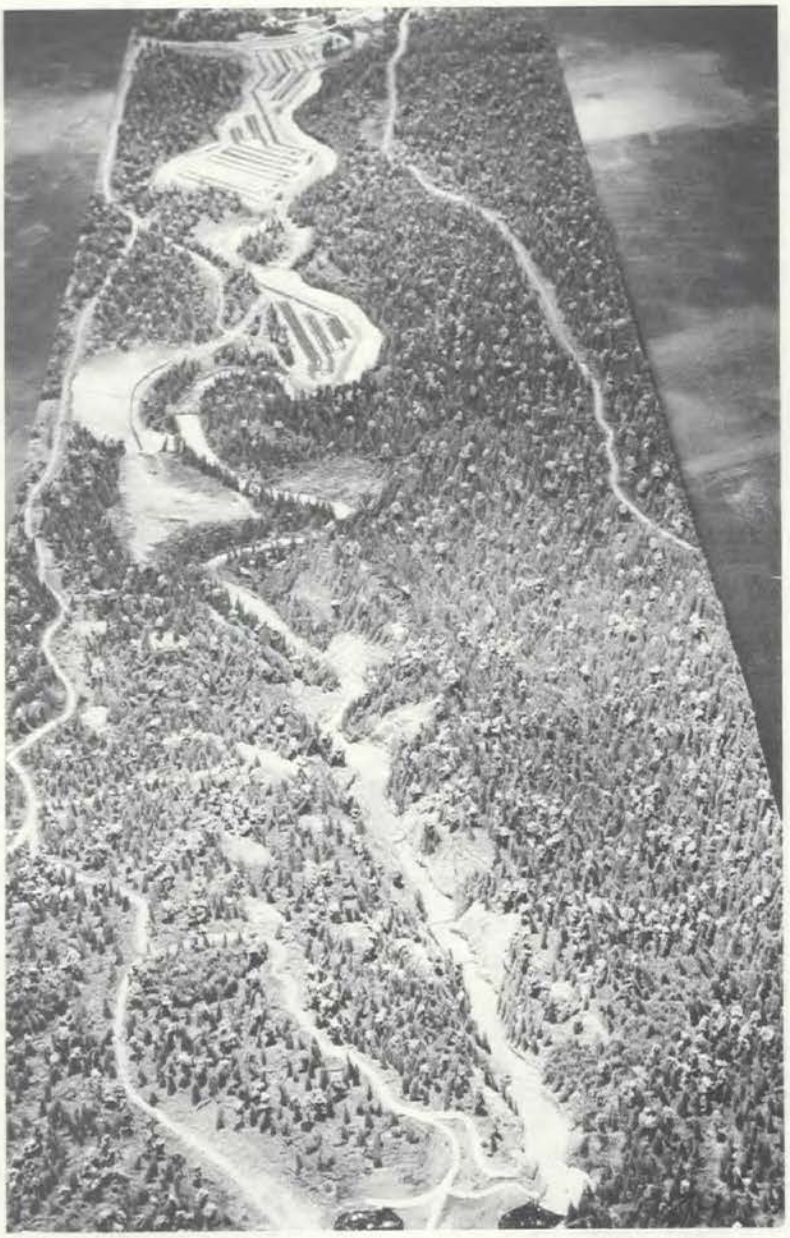
The entrance to the forestry exhibit simulates a natural forest with tree trunks blending into a background mural of a woodland scene. In addition to electronically-produced forest sounds, the illusion is heightened by wafting a "woodsy smell" through the gallery. The fight against forest pests is graphically described and models of machinery show how research supports industry.

Constructed in modular form,

Fisheries and Forestry Minister Jack Davis is shown how to barbecue salmon Indian-style by Mrs. Dominic Charlie.

Vancouver Centennial Museum, showing landscaping and pool.

with pie-shaped floor sections, the display is designed so that it may be easily transported and erected in another location, either in its entirety or as of smaller unit. It is expected that up to 500,000 people will view the exhibit during its 14-month run at the Vancouver Centennial Museum, after which it will go on display in other parts of the country.



RIGHT – One of the features of the display is a 25-foot model of the Babine Lake salmon development project.

Model of a proposed layout for the new Fisheries Research Board establishment at West Vancouver.

AFTERMATH OF THE ARROW

Task Force Report Points Way To Avoiding Future Oil Spills

BY R.J. CHILDERHOSE

Summer silence was on the campus when the Royal Commission of Inquiry sat down in a Dalhousie University lecture room to discuss the causes of the sinking of the oil tanker *Arrow* in Chedabucto Bay.

At one end of the platform sat Captain George Anastassopoulos, master of the steamship tanker *Arrow*. He looked glumly back at three full rows of officials – mostly lawyers – there to listen to, and pick at, his story.

The lawyers belonged to the ship's owners (Sunstone Marine S.A. Panama), the commission itself, the federal Department of Transport, and Imperial Oil which had chartered the ship to carry cargo from Venezuela to Port Hawkesbury, N.S.

The *Arrow* loaded 16,010 tons of Bunker C fuel oil and 79.5 tons of a lighter fuel at Amuay Bay, Venezuela, January 28, 1970, and left the same day for Nova Scotia.

Landfall was made approaching Chedabucto Bay "...prior to 0800 on February 4th, 1970..." according to the Inquiry report.

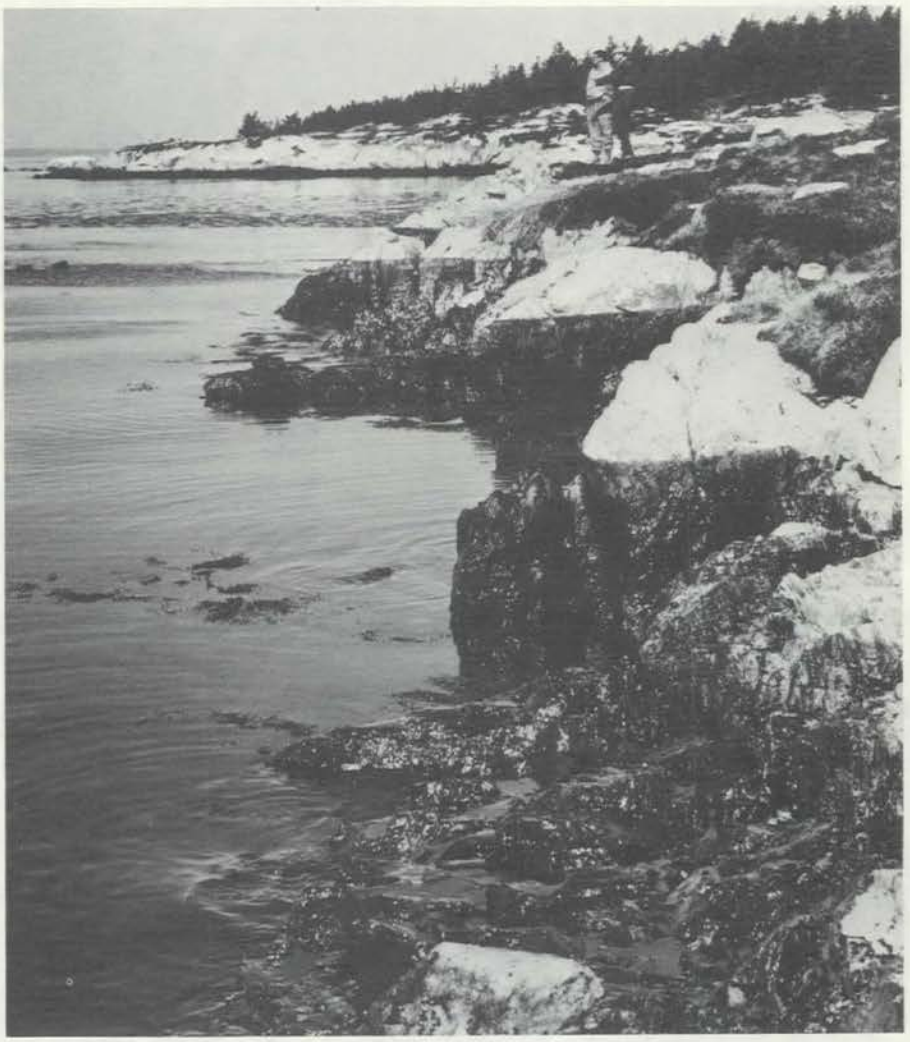
A SULLEN SEA

It was an Atlantic winter day, grey mist and rain. Beneath a sullen sky a still more sullen sea. Foam-streaked swells clutched at the tanker's sides, four-foot waves on ebb tide. A gale force wind was pushing at the *Arrow's* port beam.

Visibility was "...between five and six miles...in mist and spray..." when the captain assumed command at 0800. The *Arrow* continued at full speed under visual direction from the bridge.

At 0935 hours, a mile and a half off course, making 12.6 knots through the water, the *Arrow* ground herself onto Cerebrus Rock...the sole hazard to navigation in the deepest ice-free harbour on the Atlantic coast of North America.

The Inquiry concluded its report: "The grounding and subsequent sinking of the S.S. Arrow was caused by the improper navigation of Captain



Oil from the wrecked tanker "Arrow" coated 190 miles of shoreline. This scene is near Canso, N.S.

George Anastassopoulos in failing to maintain his plotted course for over an hour while he was proceeding at virtually full speed through waters unfamiliar to him."

The accident was almost identical to that of the Torrey Canyon "whose captain ran her onto a well-marked granite reef off England in broad daylight."

The Torrey Canyon was carrying 117,000 tons of Kuwait crude, compared to the mere 16,000 tons carried by the *Arrow*. But just as happened with the British in 1967, no one in Canada was prepared for a major oil spill.

The scene along the shores of Chedabucto in the days following the skewering of the *Arrow* on Cerebrus Rock was one of chaos and confusion.

An exception was the quick reaction of Captain J.L. Guimond, master of the fisheries patrol vessel *Shediac Bay*, who successfully came up alongside the stranded *Arrow* to rescue 21 of the Greek crewmen.

Seine net for containing oil slicks devised by the Industrial Development Branch of the Department of Fisheries and Forestry.

Shellfish from the bottom of Arichat harbour are examined by Ken Lord, of the Department's Resource Development Branch.

But on the shore, uncertainty. Giving orders were salvage operators, Imperial Oil representatives, and Department of Transport officials. There was no single identifiable authority.

The problem was identifiable. It was 529.4 feet of gutted tanker oozing entrails of thick brown goo into a frigid sea.

How to control it?

Differing ideas were heatedly argued until the next gale splattered the oily goo across the beaches of Chedabucto Bay from Canso to Petit-de-Grat.

It was this storm which ended initial hopes of using salvage company tug boats to split the tanker and to haul the stern section – which held most of the 3.8 million gallons of cargo – out to sea for sinking beyond the continental shelf.

Pounded by heavy seas, the *Arrow* slowly split apart. The stern section swung ninety degrees to the bow and hung, teetering, on the rock. A few days later it dropped off into 60 feet of water.

The problem then, for the people on the shore, was one of removing the submerged cargo of fuel oil without adding to the pollution problem.

The pollution problem was already with them. The beaches, wharves, jetties and boats of Chedabucto Bay were already fouled with the oily slime.

Attempts were made at burning the oil off, but the 60/40 slush-to-oil ratio of the goo made burning impossible.

On February 19 the executive director of the Science Council of Canada, Dr. P.D. McTaggart-Cowan, was asked to form a task force to take care of the oil in the wreck, to clean up the shoreline, and to compile a report telling how it had been done.

The major responsibility for the work was carried by the Department of Transport. But other departments – including Fisheries and Forestry – were involved in supporting roles.

An Esso International salvage master – Captain S.A. Madsen, of New York – devised a "hot tap" method of driving steam into the tanks of the sunken stern section and pumping the warmed oil to the surface.

The valves and hose connections were installed by Canadian Navy divers working under difficult conditions of freezing cold and oil-fouled gear.

The problem of floating oil was attacked from several directions. The idea of burning oil slicks was attractive, but, in the Chedabucto Bay spill, all

methods of ignition were found unsuitable.

Chemical dispersants – as were used in the Torrey Canyon disaster in 1967 – were not used due to the hazards of toxicity to marine life.

Similarly with sinking agents such as chemically treated sand or chalk. The French government used chalk in the Torrey Canyon spill, but Task Force – Operation Oil decided it was "merely sweeping the dirt off our own doorstep onto the doorstep of the lobster."

Garden-type peat moss was chosen over straw as an oil absorbent material. It is of value only if applied to fresh oil, having little absorbent effect on weathered oil-and-water emulsion.

A mechanical means of skimming the oil off the surface was required. A prototype "slick licker" was flown in from the West Coast, tested, and three more ordered for immediate use in Chedabucto.

The slick licker, according to the Task Force Report "...consists of a 3-foot wide continuous conveyer belt which dips into the surface; oil adheres to the oleophilic surface of the belt while water runs back down so that oil with very little water comes off at the upper end of the conveyer into suitable containers."

More basically, the "licker" is a terry-cloth covered conveyer belt. At the top end is a wringer to squeeze the oil out of the terry-cloth.

DAMS CONSTRUCTED

Two dams – Lennox Passage, Canso Tickle – were built to protect settlements from oil contamination once the ice which was blocking the passages had melted. These dams were removed late in the summer.

A forward defence line was the boom made of spruce-boughs and chain-link fencing strung on empty 45-gallon drums as floats.

This make-shift boom did an excellent job, but the Task Force wanted something more readily available for future use. The request went to the Department of Fisheries and Forestry's Industrial Development Branch. The result was a 'Seine Net for Containing Bunker C Oil Slicks'.

"As a component of the Task Force's Contingency Plan, a seine net boom was developed for deployment between two fishing vessels to contain a large oil slick. The 3/4-inch mesh net, 1,000 feet in length and 30 feet deep, has a float arrangement to provide sufficient freeboard and was quite capable of retaining the viscous cold Bunker C."

The Industrial Development Branch was also involved in devising a 'Net Laundry for Oil Contaminated Fishing Gear'. The "laundromat" was required to clean four commercially-owned purse seine nets which had been fouled with oil escaping from the foundered tanker.

The steam laundry specially constructed to clean oil from seine nets, shown in action at Point Tupper, N.S.

The huge seine nets – 1,500 feet long, 300 feet deep, weighing 11 tons – posed a difficult problem.

The "laundromat" took three weeks to plan, manufacture and set up for net cleaning operations. Said the Report:

"This device consisted of three tanks, the first lined with steam jets, the second containing diesel oil and an emulsifier, and the third providing a hot water wash. The nets were drawn through the tanks by means of a power block similar to those used on the seiners. Each net was cleaned in this way in about six hours..."

The remaining clean-up problem was that of the oil-soaked beaches and jetties. An Armed Forces beach-cleaning team – using peat moss to absorb the oil – tackled the beach mess.

Later, removal of contaminated material using both mechanical and manual labour was carried out on certain beaches using contract help.

"When this work is completed by mid-September, approximately 30 miles of tourist and community beaches will have been cleaned, with the remaining shore contamination left to weather naturally. Biodegradation experiments using organisms native to the environment will be conducted to determine the rate of clean-up via this mechanism."

CLEANING THE JETTIES

Cleaning of the fishermen's jetties using high-pressure water jets was tried on an experimental basis before the Task Force decided on steam cleaning.

"Four steam generators were mounted on the catamaran and, with two steam jets operating on each side of a jetty, cleaning could be accomplished in a few hours. The oil removed was collected on floating peat moss inside a net boom and then picked up by dip nets. Fifty-eight jetties and wharves were effectively cleaned in this manner."

Fisheries Research Board personnel were involved on a continuing basis in the aftermath of the Chedabucto oil spill. Field teams of FRB staff from St. Andrews and Dartmouth, and the Resource Development Branch were organized by mid-February to evaluate the effects of the oil pollution on fishing in the area.

Fortunately, the teams discovered no evidence that the "oil spill has altered the yield of commercial fisheries in Chedabucto Bay."

Studies are continuing on the long-term effects of oil in animals such as clams, scallops, periwinkles and sea urchin.

During the busiest days of Chedabucto, the Department had 34 personnel on site. Five fisheries patrol vessels were involved, including the *Shediac Bay, Lacuna, Cratena, Sabella* and the *Scatari Light*.

The achievement of the McTaggart-Cowan task force was remarkable. The effects of the oil spill was mitigated, the damage to marine life is considered minimal.

LOBSTERS NOT AFFECTED

Lobster fishermen in Chedabucto Bay enjoyed an "average to better-than-average" season; no lobsters have been found with oil-tainted flesh. The same is true for fish caught in the area.

Approximately 7,000 birds – mostly loons, gannets and gulls – were killed by the oil, the greater portion of these being in the region of Sable Island. The other casualties were clams, suffocated by oil as it washed up on the beaches.

Of the loss of the birds the Task Force Report said:

"While these kills are most regrettable, the Wildlife authorities assure no serious long-term effects on any particular species will result...It is concluded that, despite the relatively large amount of oil released from the wreck, the overall or lasting effect on the wildlife and fishlife in the Bay was not significant."

The aftermath of the Chedabucto oil spill, the rapid and concerted response of the government agencies called upon by the Task Force, could lead to self-congratulations and quick forgetfulness of the problem. However, the

To contain the spread of oil at Lennox Passage, a boom of spruce boughs and chain link fencing was erected and a temporary dam constructed (seen at right of bridge).

Captain B. Boudreau, of the Fisheries patrol vessel 'Scatarie Light', with crew member, checks seaweed rakings to determine oil contamination.

A group of the Department's "Operation Oil" task force. Left to right, D.P.O. Dan T. MacNeil, Warden A. Bourque, F/O E.L. Power and Co-ordinating Officer J.E. Creeper.

problem of large oil tankers foundering in Canadian waters remains.

The entire thrust of the recommendations of the Task Force Report – Operation Oil concerns the question: what can be done to prevent another *Arrow* disaster?

The recommendations included the following:

International Action

It was recommended that:
consistent with the initiatives taken by the Government with respect to Arctic pollution and at the IMCO special conference on pollution in 1969, Canada take a parallel initiative to convene a conference of all those concerned to write a new international convention for the operation and control of shipping throughout the world and that this convention be patterned on the principles of the Convention on International Civil Aviation;
the convention should ban all deliberate pumping of oil, oily waste or tank cleanings, or bilge cleanings into the oceans or any other body of navigable waters;
Canada should take the initiative with the appropriate international bodies to seek agreement on a series of definitions and descriptions that will permit the reporting of spills in an orderly and understandable manner.

National Action

It was recommended that:
extensive pollution control zones be established to cover the rest of the coast of Canada consistent with the position taken by the Government in the Arctic;
the law should make it clear that those who pollute pay the complete cost of clean-up, including the cost of any Canadian federal or provincial personnel used in the clean-up, that the ship concerned be impounded until this has been accomplished or assured and that the legal penalties be in addition to this liability for the complete cost of cleaning up the pollution.

Other recommendations were:

1) with respect to tanker operations, in order to enter Canadian waters, they provide evidence that they are fitted with adequate and serviceable navigation equipment
2) Canadian pilots be required on all vessels entering Canadian waters unless the ship and its captain have been given special clearance by the federal authority
3) standards of competence of crews of ships entering Canadian waters should conform with our national standards
4) the same principles as in 2) and 3) above should apply to Canadian ships in Canadian waters
5) there should be a compulsory filing of samples of all petroleum products loaded on ships and a requirement that any spillage of petroleum products, regardless of whether they originate from a shore tank or a ship, be immediately reported and sampled
6) the federal government establish one or more central laboratories capable of "fingerprinting" petroleum products in a manner acceptable to the courts.

Huntsman Marine Laboratory Officially Opened

A Co-operative Venture in Learning

BY E.H. HEARNDEN

Huntsman Marine Laboratory, which has been described as "a co-operative venture in learning", was officially opened at its picturesque site overlooking Brandy Cove, St. Andrews, N.B., on August 24.

Pioneer marine ecologist Dr. A.G. Huntsman, in whose honor the unique laboratory is named, snipped a ribbon and then unveiled a plaque to mark the opening. Dr. Huntsman, the first full-time director of the Fisheries Research Board of Canada's Biological Station at St. Andrews, which adjoins HML, referred to the new institution as a "venture into the unknown" in the realm of marine research.

A distinguished gathering, including the Hon. Wallace S. Bird, Lt.-Governor of New Brunswick, and federal, provincial and civic representatives attended the open-air ceremony.

Nineteen Canadian universities, representing widely-scattered points in the seven eastern provinces, are members of HML, together with the Fisheries Research Board of Canada. Commenting on the significance of this fact, Professor Keith Ronald, chairman of the Zoology Department, University of Guelph, and first president and board chairman of HML, said: "What it really means is that 6,000 faculty members and more than 75,000 students will have this facility available to them."

FACILITIES IN USE

Although much of the 20-acre site is still to be developed, the new laboratory has a variety of facilities already in use. These include a lecture room, fully-serviced laboratories, live specimen holding area, photographic dark room, greenhouse and residential accommodation for 50 persons.

There is also a marine aquarium and museum, which has already been seen by more than 15,000 visitors. The aquarium exhibits include a pair of king-sized lobsters, dubbed "Bonnie and Clyde", and an outdoor pool containing a group of playful harbour seals.

Dr. A.G. Huntsman, pioneer marine ecologist, officially opens the Huntsman Marine Laboratory at St. Andrews, N.B.

Dr. J.R. Weir, Chairman of the Fisheries Research Board, told the opening gathering that the FRB "welcomed its new neighbour with great enthusiasm." Many of the facilities at the St. Andrews FRB station will be made available to students and faculty at HML and he was confident the association would be mutually stimulating.

Two announcements of particular significance were made by speakers at the opening. The Hon. Ernest Richard, New Brunswick Minister of Fisheries, disclosed that the New Brunswick government would finance the purchase of the adjoining Sir Thomas Tait estate for use as a residence for HML staff and students. Mr. Richard added that his department would make a substantial annual grant to the new laboratory during the next five years. "We see a great potential for the growth of this laboratory and I should like to give assurance of our continued support in the years to come" he said.

ATLANTIC SALMON STUDY

Professor Ronald revealed that the International Atlantic Salmon Foundation, the first non-academic organization to join HML, will sponsor through HML a special economic study of the high seas fishery for Atlantic salmon in the West Greenland-Davis Strait areas. The study will be undertaken by Tore Badenduck, of Ste. Agathe des Monts, Quebec, in close collaboration with Dr. P.F. Elson, head of salmon investigations at St. Andrews Biological Station. It is expected to last

at least two years and is estimated to cost some $15,000 per year.

Prof. Ronald added that support for the study has also come from the Atlantic Salmon Association and the Miramichi Salmon Association.

Chairman for the opening ceremony was Dr. J.M. Anderson, director of the St. Andrews Station, who has played a leading role in the conception and initial planning of the HML project.

The bronze plaque commemorating the official opening has been given a unique setting. It is mounted beneath a weather-beaten wood and iron anchor which for years rested on the bottom of the Bay of Fundy until brought up in the net of fisherman Floyd Hawkins in 1953.

Following the opening, visitors toured the facilities of the new laboratory and watched a demonstration of underwater photography by closed circuit television from a submersible operating in Brandy Cove.

POLLUTION SYMPOSIUM

Prior to the opening of HML, a symposium on marine pollution entitled "Can Our Oceans Survive?" was held at the Hotel Algonquin, St. Andrews.

Keynote speaker was Dr. P.D. McTaggart-Cowan, executive director of the Science Council, Ottawa, who headed the task force assigned to clean up the oil spill following the sinking of the tanker *Arrow* in Chedabucto Bay, Nova Scotia, last February. Faced with 190 miles of polluted beaches, Dr. McTaggart-Cowan described how his task force set about the job and the ingenious manner in which many of the problems were solved. To date the clean-up has cost an estimated $3,000,000, with still many miles of beaches to be cleaned of oil.

Dr. A.W.H. Needler, Deputy Minister of Fisheries and Forestry for Canada, who will become the first resident director of HML next March, was moderator of the symposium. He said in the past the oceans of the world had been considered a gigantic garbage can and people didn't really think it was possible to pollute them. In recent years, however, scientists had come to doubt this.

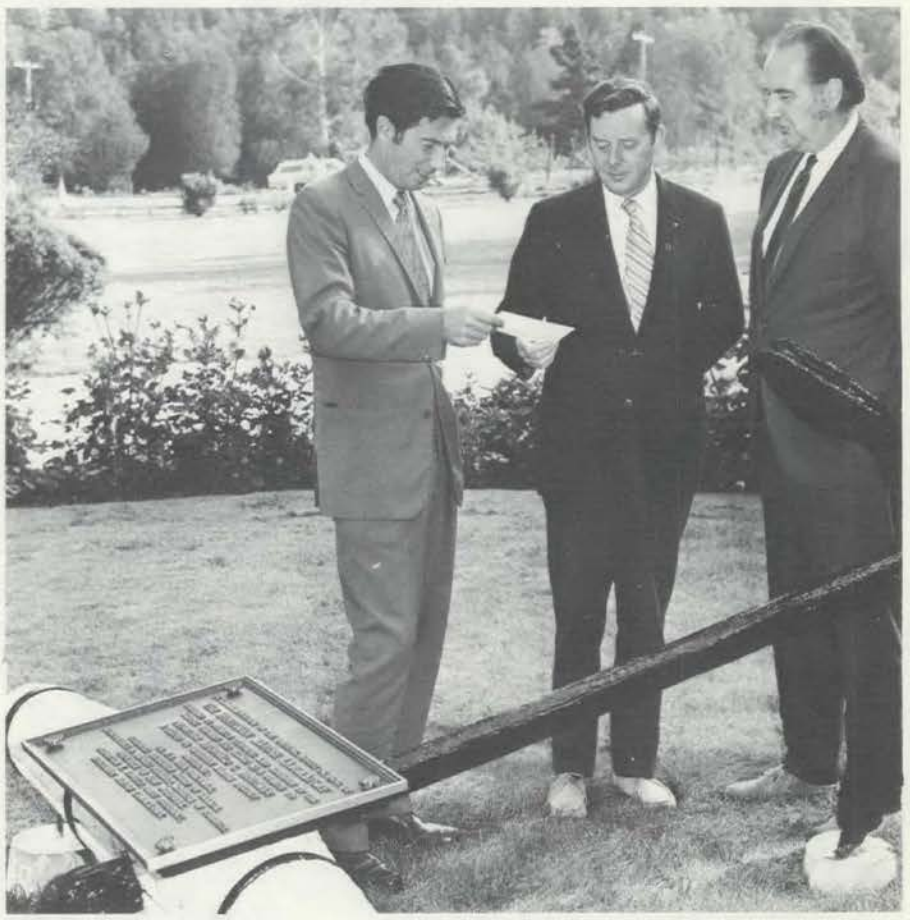
"The problems of environmental damage are so complex and technical that they can only be tackled with the very maximum of scientific resources we can muster" Dr. Needler said. In this connection, Huntsman Marine Laboratory could serve as a focus and channel through which Canada could enlist scientific competence for such a task.

One of the panel members, Dr. J.S. Tener, Director, Canadian Wildlife Service, Ottawa, described marine pollution as "completely unnecessary, enormously costly, and foolhardy".

Dr. Tener said he would like to see some form of aerial warning system developed, using military and/or commercial aircraft to pinpoint areas of pollution at sea. He felt much of the present pollution of the high seas could be controlled through better-designed cargo ships, improved navigation aids and more effective international regulations.

PUBLIC CONCERN

Dr. Tener pointed out that at the moment "we are riding the crest of public concern over pollution", but ecologists and biologists had been "caught with their pants down" – they didn't know all the answers to the



Dr. J.M. Anderson, (left) Director, FRB Biological Station, St. Andrews, receives a cheque for membership in HML from W.M. Carter, Executive Director, International Atlantic Salmon Foundation. At right is Dr. Keith Ronald, University of Guelph, Chairman of the board of directors of HML. The group is standing behind the official opening plaque with its unique mounting.

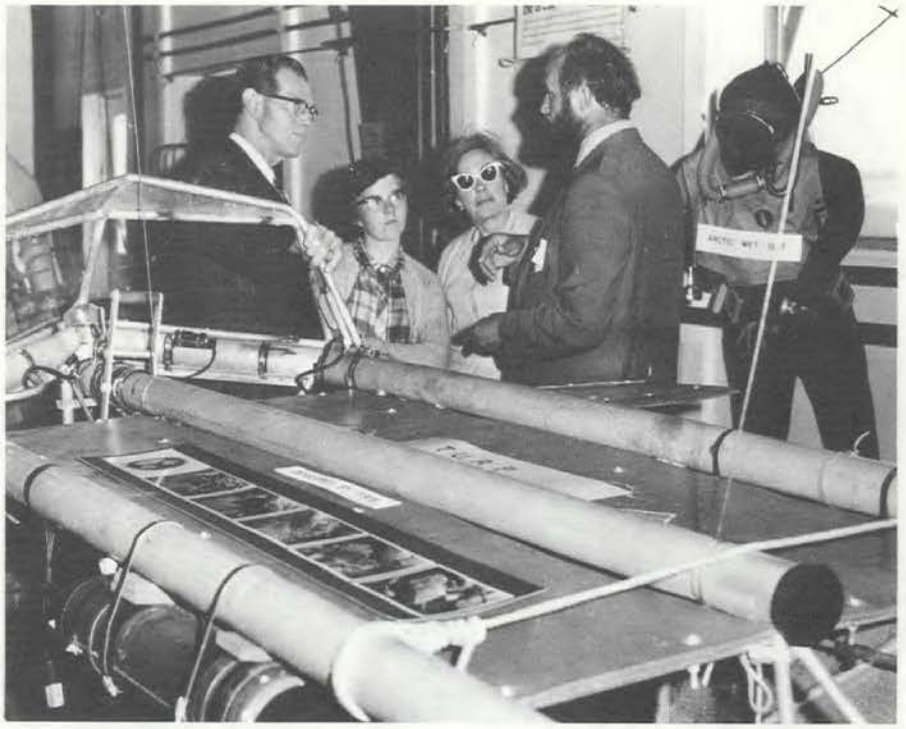
questions the public was asking. It was up to the scientific community to capitalize on this concern, but time was short.

Some of the pollutants that have come under close study in the Atlantic area recently were outlined by Dr. D.R. Idler, of Halifax, Atlantic Regional Director of Research, Fisheries Research Board. These included elemental phosphorus (cause of the "red herrings" in Placentia Bay, Nfld.), mercury, polychlorinated biphenyls (PCBs) and base metals discharged into rivers.

Dr. Idler said intensive sampling for mercury contamination in fish had been carried out in the Atlantic region, but it had been found that mercury posed no threat to commercial or sport fishing at the moment.

With regard to mining discharges, it was obvious much research had to be done on effluent chemicals not yet identified as problems, he said.

Dr. Idler added that among the research being carried out at St. Andrews was a study on how some pollutants affect the homing instincts of salmon. Possible reproduction problems with fish caused by PCBs in the environment was also being studied.



Visitors to an Open House at the FRB Biological Station, St. Andrews, learn about the Towed Underwater Research Plane (TURP).

During a closing discussion period, Dr. Needler said "sloppy technology" was very evident in the mercury problem which could have been stopped at the outset had we known the damage it would cause. He added that new amendments to the Fisheries Act gave the Minister authority to require any new plant to disclose details of its waste disposal plans. "If we can develop staff to follow this up, then a lot of pollution can be stopped at the source".

Dr. A.W.H. Needler, (left) Deputy Minister of Fisheries and Forestry, moderates a panel discussion on "Can Our Oceans Survive? ", held in conjunction with the opening of HML. Seated, left to right, are: Dr. J.S. Tener, Director, Canadian Wildlife Service, Ottawa; H.H. Clare, Imperial Oil Ltd., Toronto; Dr. D.R. Idler, Atlantic Regional Director (Research), FRB, Halifax; Dr. M.J. Dunbar, Director, Marine Sciences Centre, McGill University; and Mr. F.D. McTaggart-Cowan, Executive Director, Science Council of Canada.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	January – July 1969		January – July 1970	
	Landings[1]	Value[2]	Landings[1]	Value[2]
	'000 lb.	$'000	'000 lb.	$'000
CANADA – TOTAL	**1,479,572**	**97,695**	**1,321,886**	**99,337**
ATLANTIC COAST – Total	**1,379,281**	**69,603**	**1,205,636**	**69,464**
Cod	384,101	14,791	312,257	13,433
Haddock	64,245	5,154	33,897	3,477
Redfish	73,325	1,854	77,389	2,322
Halibut	2,537	1,003	2,327	1,084
Other Flatfishes	170,735	6,498	168,095	8,212
Pollock, Hake, Cusk	23,652	810	18,305	671
Catfish	5,122	175	4,311	152
Other Groundfish	3,082	46	3,364	76
Herring and Sardines	562,547	5,642	505,793	5,901
Mackerel	14,532	595	8,662	397
Swordfish	2,378	1,514	1,515	987
Tuna	1,041	131	3,125	707
Alewives	3,645	85	7,065	153
Salmon	4,063	2,137	3,357	2,162
Smelts	3,077	247	2,638	275
Other Fish	8,640	144	8,165	173
Clams and Quahaugs	4,266	315	4,194	350
Scallops	7,599	6,272	6,701	7,187
Lobster	26,303	18,283	22,908	18,209
Other Shellfish	14,391	1,550	11,568	1,318
Miscellaneous Items	–	2,357	–	2,218
PACIFIC COAST – Total	**100,291**	**28,092**	**116,250**	**29,873**
Pacific Cods	11,105	933	8,369	836
Halibut[3]	22,083	9,076	20,920	8,286
Soles & Other Flatfishes	8,234	484	8,803	536
Herring	3,535	134	5,186	186
Salmon	39,062	16,079	59,943	18,730
Other Fish	5,955	179	4,494	267
Shellfish	10,317	1,207	8,535	1,032
Misc. Items	–	–	–	–
BY PROVINCES				
British Columbia	100,291	28,092	116,250	29,873
Nova Scotia	373,497	30,969	266,983	27,890
New Brunswick	199,114	6,727	95,906	6,763
Prince Edward Island	17,578	5,206	33,783	5,439
Quebec	105,473	5,023	126,069	6,251
Newfoundland	683,619	21,678	682,895	23,121

[1] Fish and Shellfish only. [2] All Products – Includes livers, seaweeds, tongues, scales, roes, skins, oil, seals, whales and bait worms.
[3] Includes halibut landed in U.S. ports by Canadian Fishermen.

MID-MONTH WHOLESALE PRICES – JULY 1970

		Montreal	Toronto
		$	$
Cod fillets, Atl. fresh, unwrapped	lb.	.456	.573
Cod fillets, Atl. frozen, cello 5's	lb.	.352	.467
Cod fillets, smoked	lb.	.485	.607
Haddock fillets, fresh, unwrapped	lb.	.766	.860
Herring, kippered, Atl.	lb.	.304	.367
Mackerel, frozen, round	lb.	.225	.333
Lobsters, canned, Fancy	Case 48-1/2s	87.820	90.800
Sardines, canned	Case 100-1/4s	10.786	10.803
Halibut, frozen, dressed	lb.	.606	.733
Silverbright, frozen, dressed	lb.	.742	.890
Coho, frozen, dressed	lb.	1.054	1.150
Sockeye, canned, grade A	Case 48-1/2s	30.237	31.510
Pink, canned grade A	Case 48-1/2s	20.977	21.817
Whitefish, fresh	lb.	.669[1]	.717
Lake Trout, frozen	lb.	.554	.653

[1] Dressed.

PRICES PER CWT. PAID TO FISHERMEN
(Week ending July 11th)

	1968	1969
	$	$
Halifax		
Cod Steak	5.75	–
Cod Market	5.5	–
Haddock	9	–
Plaice	4.5-5.25	–
Lockeport		
Haddock	9	–
Shippegan		
Herring	1	1.1
St. John's, Nfld.		
Cod	2.5-3.75	2.5-4
Flounders, round	3	–
Vancouver		
Ling Cod	10-16	12-18
Grey Cod	7-8.5	8-9
Soles	8.5-9.5	8-10.5
Salmon (Redspring)	50-85	60-110

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF JULY

	1969 '000 lb.	1970 '000 lb.
TOTAL – Frozen Fish, Canada	87,965	76,011
Frozen – Fresh, Sea Fish – Total	70,681	60,339
Cod, Atlantic, fillets	6,618	4,200
Cod, Atlantic, blocks and slabs	19,811	7,641
Haddock fillets	2,298	1,397
Haddock blocks and slabs	1,032	758
Redfish fillets	4,293	3,947
Redfish blocks and slabs	195	499
Flounders and soles fillets	3,271	5,101
Flounders and soles blocks and slabs	1,315	2,392
Halibut, Pacific, dressed and steaks	9,210	8,746
Halibut, Pacific, fillets and blocks	780	739
Turbot fillets	578	461
Turbot, blocks and slabs	394	430
Pollock fillets	177	187
Pollock blocks and slabs	409	202
Other Groundfish, dressed and steaks	1,547	1,552
Other Groundfish, fillets and blocks	2,219	1,294
Salmon, Pacific, dressed and steaks	7,724	10,048
Herring, Atlantic and Pacific	358	496
All Other Seafish, all forms	4,567	5,934
Lobster, whole and meat	683	1,037
Scallops, breaded and unbreaded	867	1,095
All other Shellfish, all forms	2,335	2,183
Frozen – Smoked Fish – Total	1,478	1,226
Cod, Atlantic	710	473
Sea Herring, kippers	260	417
Other, all forms	508	336
Frozen For Bait and Animal Feed	15,806	14,446

SALT FISH STOCKS AS AT END OF JULY

		1969 '000 lb.	1970 '000 lb.
Salted and Pickled Fish, Atlantic Coast			
Wet-Salted – Total		19,811	12,656
Cod		16,173	10,033
Other		3,638	2,623
Dried-Salted – Total		5,305	3,485
Cod		5,061	3,321
Other		244	164
Boneless – Total		538	388
Cod		490	313
Other		48	75
Pickled – Total	(barrels)	10,067	11,623
Herring	"	3,641	4,200
Mackerel	"	2,929	830
Alewives	"	3,497	6,593
Turbot	"	–	–
Bloaters	(18 lb. boxes)	119,198	127,266
Boneless Herring	(10 lb. boxes)	4,029	2,500

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS JANUARY – JUNE

	1969 $'000		1970 $'000	
TOTAL EXPORTS		121,088		125,038
By Markets:				
United States		80,961		93,818
Caribbean Area		9,025		8,691
Europe		26,907		20,084
Other Countries		4,195		2,445
By Forms:				
Fresh and Frozen		80,974		89,800
Whole or Dressed	20,877		21,714	
Cod, Haddock, Hake	328		514	
Halibut, Pacific	2,581		3,699	
Salmon, Pacific	8,789		7,460	
Swordfish	927		891	
Other Seafish	2,646		3,085	
Whitefish	2,435		2,871	
Pickerel	1,067		1,004	
Other Freshwater Fish, n.e.s.	2,104		2,190	
Fillets, Blocks and Slabs	33,733		37,910	
Cod, Atlantic	9,799		13,615	
Haddock	4,986		2,807	
Ocean Perch, Hake, Cusk, Pollock	3,957		5,072	
Flatfish	9,579		10,830	
Pickerel	826		436	
Other Fillets and Blocks	4,586		5,150	
Shellfish	25,055		28,915	
Lobsters (in shell & meat)	16,751		19,825	
Scallops	6,228		6,899	
Other	2,076		2,191	
Frozen Fish & Shellfish, pre-cooked	1,309		1,261	
Cured		9,997		12,826
Smoked	1,244		1,184	
Herring	685		362	
Other	559		822	
Salted, Wet & Dried	7,528		7,844	
Cod	6,654		6,619	
Other	874		1,225	
Pickled	1,225		3,798	
Herring	858		3,470	
Mackerel	152		139	
Other	215		189	
Canned		21,062		10,932
Salmon	16,256		5,626	
Sardines	3,070		3,110	
Lobsters	558		474	
Other	1,178		1,722	
Miscellaneous		9,055		11,480
Meal	5,701		6,773	
Oil	640		1,284	
Other	2,714		3,423	

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It's natural in this day and age of news about environmental pollution to be concerned about the air you breathe, the water you swim in, and the food you eat, including fish.

But we can set your mind at ease about fish.

All fish processed in Canada for sale throughout the country or abroad is subject to careful Government inspection. If the inspectors are not satisfied, out it goes.

So please understand this. Federal Government inspectors are taking every precaution to ensure that the fish sold in your local store is a fine wholesome product suitable for family consumption.

Government inspection is not new. Catches are being inspected all over Canada. It's automatic and it's the law. If they are not up to our high standards, they are destroyed.

Your Government is telling you that the fish sold in supermarkets, stores or restaurants has never been of higher quality or more closely inspected.

So please set your mind at ease. Buy and enjoy Canadian fish whenever you feel like it.

DELICIOUS RECIPES FREE: Our Consumer Consultants have developed dozens of different ways of preparing delicious fresh water fish and seafood dishes. For free recipes write to Information and Consumer Branch, Department of Fisheries and Forestry, Ottawa.

FEDERAL DEPARTMENT OF FISHERIES AND FORESTRY

Minister, The Honourable Jack Davis

FISHERIES of Canada

February 1971 • Vol. 23 No. 3

Department of Fisheries and Forestry, Ottawa

February 1971

FISHERIES of Canada

The Hon. Jack Davis, Minister
Dr. A.W.H. Needler, Deputy Minister

CONTENTS

COVER PHOTO — Fish caught through the ice at a northern Saskatchewan lake being packed for air shipment.

Published by the Department of Fisheries and Forestry
Ottawa

Produced by the Information and
Consumer Branch of the Department of
Fisheries and Forestry, Ottawa.

Editor: E. H. Hearnden
Layout: I. D. Gott

Fisheries and Forestry to form Core of the new department of the ENVIRONMENT

An inscription carved into the stone above the vaulted entrance to Canada's Parliament Building in Ottawa proclaims proudly:

"The Wholesome Sea is at Her Gates; Her Gates Both East and West."

Wholesome though those seas may have been when the sculptor inscribed the words half a century ago, Prime Minister Pierre Trudeau has pointed out, the excesses of shipowners and operators and the complacency of public and government have degraded them into foul water, unfit in places for any but the lowest forms of life.

With this dramatic introduction, the Prime Minister unveiled in Parliament, October 9, 1970, the Canadian Government's plan for necessary action "to contain and remove the conditions of pollution on our western and eastern gates" and to wage the anti-pollution battle in non-coastal waters "with increasing vigour and efficiency."

Urgency of the need for assertive federal action was underlined October 8 in the Speech from the Throne setting out government policies for the current legislative session: This is "an age in which the life-support systems of the biosphere may collapse unless man reverses his present course and begins again to live in harmony, rather than in competition, with his environment. It is an age in which the forces of science and technology now in motion are so massive, so swift and so comprehensive that man may be facing his last opportunity to control his own destiny rather than be subject to it. . . . Pollution is a many-headed hydra and requires action in many forms."

In response to what was considered a pressing need to coordinate and consolidate anti-pollution efforts of various federal departments and agencies, the Government announced the establishment of a new department to be concerned with the environment and the husbanding of renewable resources, with a mandate for the protection of the biosphere.

Designated as the nucleus of the new department was the Department of Fisheries and Forestry. Its Minister, Hon. Jack Davis, was to be assigned "the responsibilities and related elements of the public service which would permit him to take a broad ecological perspective in the discharge of his responsibilities, and in particular to take the lead in the enhancement of the quality of our environment," Mr. Trudeau said.

By Government Order dated November 26, 1970, under the Public Service Rearrangement and Transfer of Duties Act, responsibilities for the following were transferred to the Minister of Fisheries and Forestry:

- the Marine Sciences Branch, the Inland Waters Branch and the Policy and Planning Branch of the Department of Energy, Mines and Resources;
- the 1970 Canada Water Act;
- the Air Pollution Division and the Public Health Engineering Division of the Environmental Health Directorate of the Department of National Health and Welfare;
- the Meteorological Branch of the Air Division of Ministry of Transport;
- the Canadian Wildlife Service of the Department of Indian Affairs and Northern Development;
- in addition, administration and personnel staff which service the elements transferred to the enlarged Department of Fisheries and Forestry. Details are under negotiation.

Legislation proposing establishment of the Department of the Environment is contained in Bill C-207, the Government Organization Act 1970, which received First Reading in the House of Commons December 9.

The Prime Minister stated during his address in Parliament in October that the establishment of the Department of the Environment would not result in the creation of a super agency to be responsible for all matters relating to the environment:

"The fight against the pollution of our environment is far beyond the capacity of one Minister and his department. Indeed, it cannot be waged effectively by the Federal Government alone, or the provinces individually, or even just by Canada. It is a fight that must be waged by all ministers, all governments and all people" the Prime Minister declared.

Thus, many federal departments will continue to have important responsibilities for the preservation of the quality of the environment, and will co-operate with the new Department of the Environment, which will have the principal tools to lead the fight against pollution and to help co-ordinate the efforts of others.

2

The Ministry of Transport, for example, will administer the Canada Shipping Act, to which extensive anti-pollution amendments have been proposed in legislation currently before Parliament, as well as the Navigable Waters Protection Act. The Department of Indian Affairs and Northern Development will be responsible for ensuring adherence by shipping and industrial interests to provisions of the Arctic Waters Pollution Prevention Act and the Northern Inland Waters Act, both passed by Parliament in June, 1970. Various other federal departments and agencies contribute either directly or otherwise to the cause of preserving and protecting the environment.

Provincial Governments have direct responsibility for pollution control within their own boundaries under powers assigned to them by the B.N.A. Act.

The choice of the Department of Fisheries and Forestry as the central element of Canada's new Environment Department reflects the historically prominent role of that agency in pollution control. The Canadian federal Fisheries Service was empowered under the Fisheries Act of 1868, one year after Confederation, to prohibit the input of "deleterious" substances into waters frequented by fish. This legislation served over the years as a foundation for punitive action against water polluters, and for some deterrent action as well.

Pulp mills on the Fraser River in British Columbia which were persuaded to install anti-pollution systems in consultation with Fisheries representatives, are regarded among the cleanest in the world.

Changes were introduced in the Fisheries Act in 1970 to emphasize the preventive role in pollution control while also imposing stiffer penalties for heedless industries and citizens.

Industries whose operations may affect aquatic life are now required to submit expansion plans to the Department for examination and approval in reference to needed pollution preven-

2
Fisheries and Forestry Minister Jack Davis at a recent press conference.

tion facilities. Cooperative action is sought at all times, but when friendly persuasion does not have the desired results, the Department may, subject to government sanction, halt construction and require the necessary alterations to be made. Fines of up to $5,000 a day may be levied on conviction for breaches of the Act.

To carry out pollution control responsibilities, the Fisheries Service has a field surveillance staff of over 200 supported by several hundred assistant patrolmen, ships' crews and others who patrol fisheries waters in Atlantic, Pacific and Arctic coastal waters and tributary fresh waters.

Teams of technical experts regularly assess water quality and its effects on fish. They investigate operating and proposed industries and other possible pollution sources; advise on control requirements and negotiate corrective measures. They in turn are supported by staff chemists, biologists, oceanographers and other scientists as well as special consultants as required.

While the development of programs and policies to be pursued by the new federal environment agency must await its formal establishment, indications of future policy lines have been spelled out in public statements by the Minister, Mr. Davis.

"Shaping our Canadian environment is the biggest challenge we face in the 70's," Mr. Davis declared in a House of Commons address. "It's a bigger challenge than unemployment. It's a bigger challenge than inflation..... To many Canadians it's a bigger challenge than all of our financial and social problems put together.

"There is real urgency here. We have to act on the environmental front quickly and with determination. We have to move ahead of events, rather than from crisis to crisis. Our critical path, in other words, must be laid out ahead of time. We must preserve our wildlife and our fish and our trees. We must renew our renewable resources as quickly and as effectively as we know how.

"Economic growth is essential. Social progress must also continue in the 70's. But their spin offs must not result in a deterioration of our surroundings."

Davis called for emphasis to be put on the wise management of living resources and the elements which support them. Industry and municipalities must keep their poisons to themselves by recycling their wastes and renewing their inventories. Industry must be more respectful of its surroundings and bend increasingly to environmental considerations.

The Minister stressed his faith in man's ability to better his environment:

"I disagree with those who look on our earthly biosphere as a timeless realm in which animals and plants jostle each other in humble harmony. They say that man must fit in, accept nature's limits, reduce his consumption, limit his reproduction, join the Society for Zero Population Growth. On the contrary, I believe that man can better his lot, improve his standard of living and still make the most of his environment."

Ecological improvements take time to develop. This is why sudden changes in the environment are to be deplored, Davis warned.

He cited this as the reason why government must "turn thumbs down" on those who would tax the so called assimilative capacity of water and air. No lake however large and no sky however vast is capable of absorbing man's harmful effluents forever, he said.

In preparation for his task as Minister of the new federal environment department, Davis outlined initiatives which could be taken before that agency is formally constituted:

- transfer of relevant branches, divisions and sections of other departments to Fisheries and Forestry to permit operation as a federal unit (effected Nov. 26, 1970);
- naming of a dozen key advisers in renewable resource development and environmental control to help set guidelines and map future programs; this group to form the nucleus of an eventual National Environmental Council;
- personal visits by the Minister to ministers responsible for pollution control in the ten provinces to discuss cooperative action, to seek advice on a proposed new Clean Air Act, and to press for designation of water management areas as regional water pollution control units envisaged under the Canada Water Act;
- the first nationwide standards under pollution provisions of the Fisheries Act to be released shortly will be brought into operation industry by industry. First industries affected will be those using elemental mercury, and those producing phosphorus and pulp and paper;
- tighten control on tanker owners and oil companies through the Canada Shipping Act; have standby task forces ready for future crises;
- launch high priority government-research projects aimed at developing processes satisfactory for treatment of waste effluents;
- encourage and inform community groups concerned with cleaning up the environment.

Action has already been taken to implement many of these proposals, and planning is underway on new programs aimed at restoring Canada's proud heritage of clean air, land and water.

Tagging shows heavy exploitation of Atlantic Queen Crab stocks

BY J. WATSON
Fisheries Research Board of Canada,
St. Andrews, N.B.

The queen crab *(Chionoecetes opilio)* used to be considered a nuisance by fishermen. This crustacean often created a sorting problem when caught in otter trawls and Danish seines during groundfishing trips. It also became entwined in the meshes of cod gill nets and was very difficult and time-consuming to remove.

Today there is a different attitude toward the crab. Commercial interest began in 1967 and since then the fishery has expanded rapidly. Fortunately for processors, this development came at a time when king crab landings in Alaska dropped sharply; consequently, there was a demand for high-quality crab meat which resulted in favourable prices for queen crab.

However, in conjunction with the rapid expansion came new problems. Increased production of queen crab in Canada and the development of a similar fishery in Alaska and stiff competition from Japan quickly stripped away the protective umbrella afforded by reduced supplies of king crab. In addition, the rapid increase of vessels fishing Canadian crab caused concern that stocks might become depleted before a continuing fishery was established.

Rapid Development

In 1965, an exploratory vessel from Nova Scotia discovered concentrations of queen crabs off the northwest Cape Breton coast. Further exploration in the Gaspe and Cape Breton areas and experimental processing in three pilot plants during 1966 encouraged commercial operations to commence in 1967. Subsequent exploration discovered even richer grounds, and by 1969 the fishery was operating in the waters of three of the Atlantic provinces and Quebec (Fig. 1). The catch of 1 million pounds by 15 vessels in 1967 rose to 18.3 million pounds by about 95 vessels in 1969 (Fig. 2). New Brunswick vessels increased their share of the catch from 69 per cent in 1968 to 76 per cent in 1969.

Prior to 1967 little was known about this animal, but recent co-operative studies between the Fisheries Research Board of Canada and Industrial Development Branch of the Department of Fisheries and Forestry have greatly increased our understanding of the queen crab. Preliminary reports on the fisheries biology and the development of the fishery have been published. Until this year, nothing was known of the effects of fishing on the stocks or the movements of the crabs. Recent tagging studies were designed to shed some light on these problems.

Tagging Study

A limited tagging study was conducted in 1966, but it was not until the developmental pattern of the fishery was becoming established that extensive tagging was begun. Two types of tag were used in 1969 – a body tag made of orange vinyl tubing which was tied around the crab's body (Fig. 3a), and a yellow anchor tag which was inserted through a leg membrane (Fig. 3b) or the scar resulting from a missing leg (Fig. 3c). A yellow body tag was used in 1966. Body tags were used to determine rate of fishing and movement but anchor tags which should be retained through a moult were intended mainly for growth studies.

In August 1966, 210 crabs were released off Grande-Rivière (Fig. 4).

During May 1969, 1,090 crabs were released at four locations off the Gaspé peninsula (Fig. 5). Poor weather prevented the release of tagged crabs in the offshore waters to the west and southwest of Orphan Bank where it was known the fishery would concentrate.

By 1969, 21 per cent of the 1969 releases were recovered. Table 1 shows the yearly returns in relation to vessels fishing the Chaleur Bay area.

Of 112 commercial crabs tagged (over 4" across the shell), 24 per cent were recovered; whereas, only 16 per cent of the 98 subcommercial tagged crabs were returned. Crabs returned in 1969 had not moulted for more than 3 years.

Many tags were returned from the May 1969 tagging. Few crabs were returned with the anchor tag intact, despite the increased reward ($1.50 as opposed to $1.00 for the tag alone). None of the crabs returned had moulted; therefore no information on growth was available. By December, 38 per cent of the body tags and 20 per cent of the anchor tags had been returned by fishermen and processors. An analysis by tag type, size of animal and area of release (Table 2), shows that high rates of fishing occurred in some areas.

Anchor tags may have caused mortalities of some crabs and, as they were frequently returned from plants, were not easily seen by fishermen, which helps to explain the lower recovery rate of these tags. Body tags are readily seen and we are confident that most of the tags from crabs recaptured during the 1969 fishing season were returned. The percent recoveries shown in Table 2 give only a minimum estimate of rate of fishing. There was no way to determine the the loss of tags due to moulting, death of crabs by natural means, or as a result of tagging and returning them to the sea. Thus, the 50-61 per cent recoveries of body tags indicate a much higher exploitation rate. Thirty vessels or 35 per cent of the fleet

FIG.1

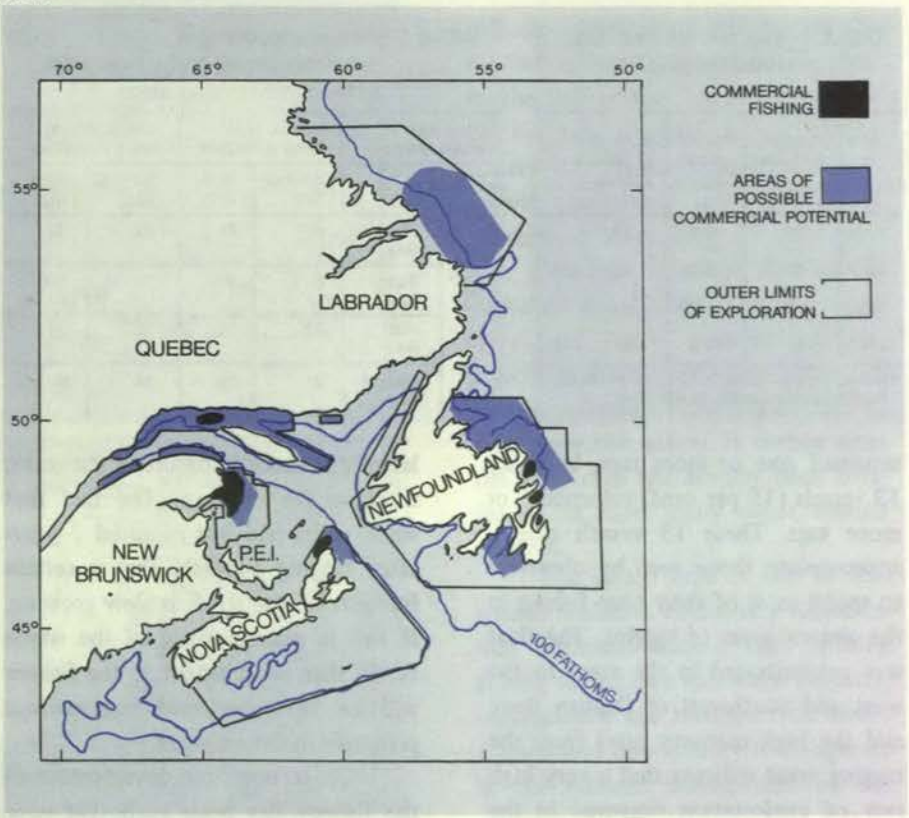


FIG.2

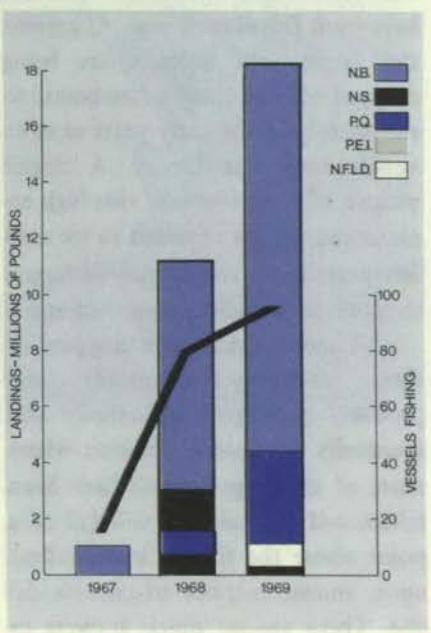


Figure 1. Areas of commercial fishing and potentially productive grounds for the snow crab in Canadian Atlantic waters.

Figure 2. Canadian Atlantic snow crab landings. The closed circles show the number of vessels fishing each year.

FIG. 3

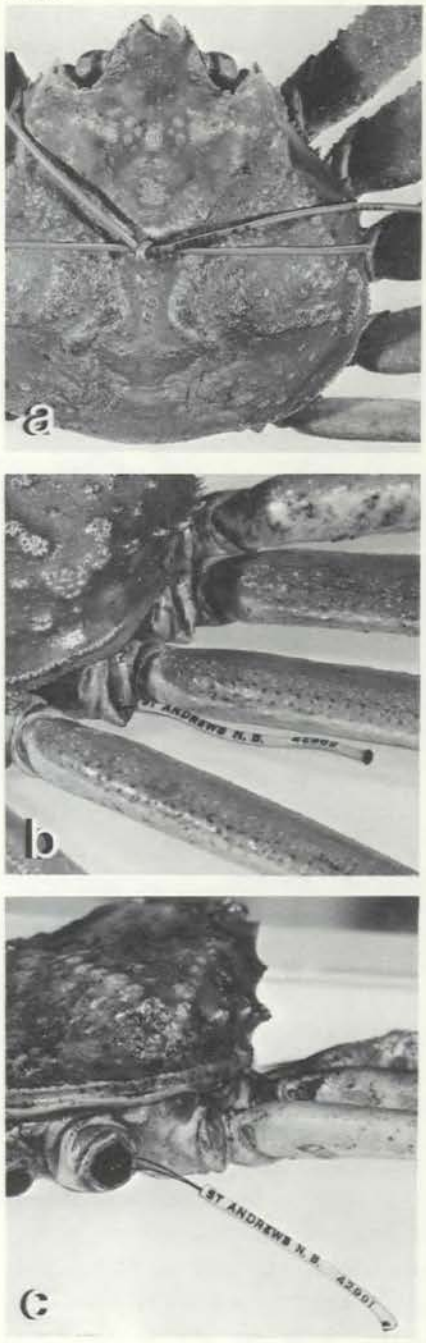


Figure 3. Tags used for snow crabs: a) Body tag; b) Sphyrion tag through a leg membrane; c) Sphyrion tag in leg scar.

Figure 4. 1966 tagging – recaptures from 1966 to 1969. Closed circles show the location of capture in relation to the release point (+).

Figure 5. 1969 tagging – recaptures during the 1969 fishing period. Closed circles show the location of capture in relation to each release point (+).

TABLE 1—Tag returns from the 1966 tagging

Year	Number returned	Percent of total tagged	Number of vessels fishing*
1966	13	6·2	2[a]
1967	13	6·2	10
1968	12	5·7	70
1969	6	2·9	13

*Based on observers' estimates of vessels fishing consistently in the area.

TABLE 2—Percent recovery of subcommercial crabs from each of the 1969 tagging areas

Crab size when tagged		Crabs less than 4 inches		Crabs more than 4 inches	
Tag type		Anchor Tag	Body Tag	Anchor Tag	Body Tag
AREA RELEASED	Chaleur Bay	6	7	27	32
	Beaufils Bay	6	27	21	50
	Mal Bay	25	39	15	61
	Gaspé Bay	13	29	34	51

returned one or more tags, but only 13 vessels (15 per cent) returned 5 or more tags. These 13 vessels closely approximate those seen by observers to spend most of their time fishing in the general areas of tagging. The fleet was concentrated in the areas to the west and southwest of Orphan Bank and the high recovery rates from the tagging areas indicate that a very high rate of exploitation occurred in the Orphan Bank area during 1969.

Figures 4 and 5 indicate that crabs do not move much. By 1968 the maximum recorded movement from the 1966 tagging was 8 miles. In 1969, three years after tagging took place, one crab was recaptured 28 miles from the tagging site. However, average movement during the 3-year period was less than 5 miles. Results from the 1969 tagging showed that 84 per cent of the crabs were captured within 10 miles of the release point and 99 per cent within 15 miles. No definite migrations could be determined from this study.

Cause for Concern

The heavy exploitation indicated by this study, coupled with the relatively nonmotile nature of the crabs, is cause for concern. The fact that some crabs had not moulted 3 years after tagging suggests that a certain fraction of the stock is slow growing. If this is characteristic of the whole stock, then recruitment to the fishery will be slow and will pose serious problems in future years.

Up to now, the development of the fishery has been such that new, untouched and productive grounds have been fished each year. At present the larger, old animals are being cropped off and landings are bound to rise sharply in the early years as more vessels enter the fishery. A clearer picture of the effects of this high exploitation will be obtained in the next few years when vessels may be forced to return to previously exploited areas.

Continued intensive cropping of these relatively nonmotile and probably slow growing animals will eventually produce a situation where most of the large animals have been taken, and the landings will fall to a point where the fishery is dependent upon annual recruits to commercial size. There are no quick answers to

FIG.4

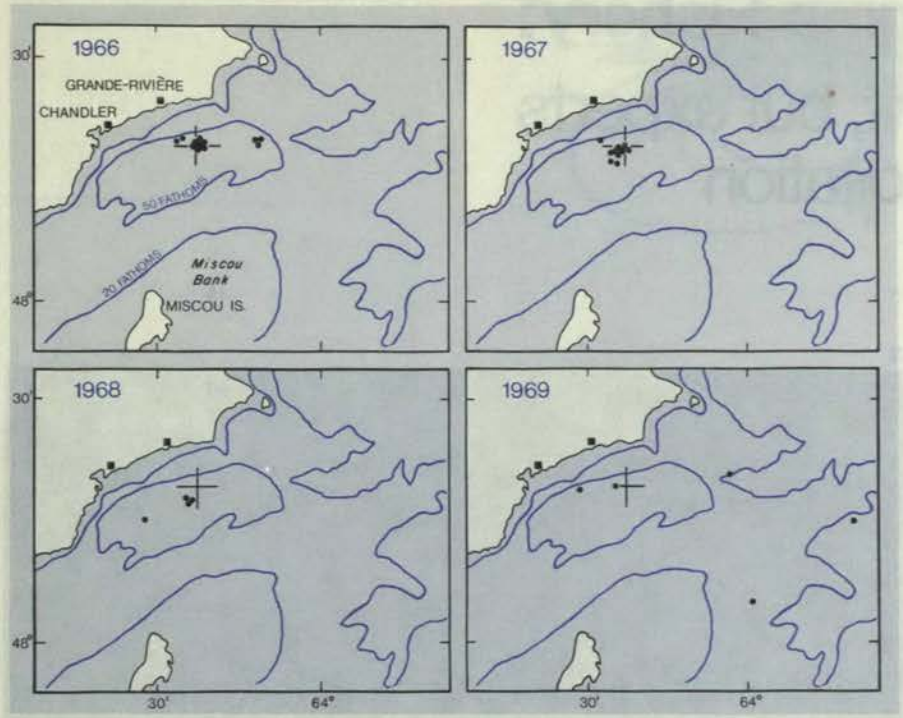
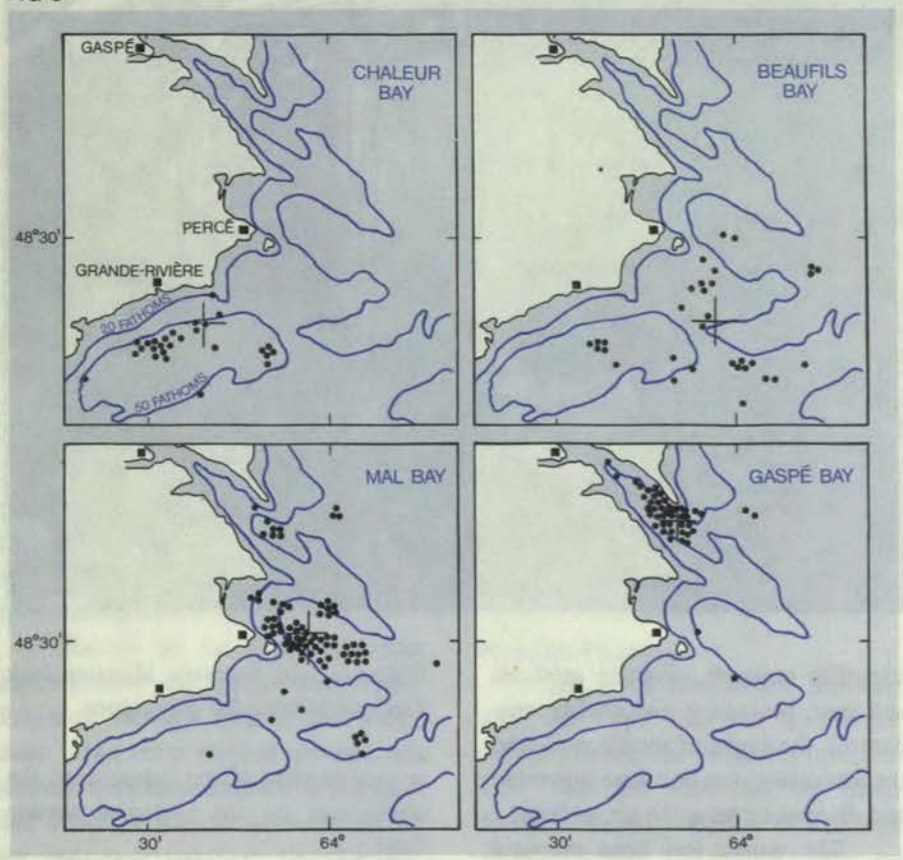


FIG.5



indicate when this point will be reached or what the sustainable yield to the fishery will be. Much depends on the rate of development of the fishery and a knowledge of size, age, growth, behaviour and reproductive capacity of the stocks.

Research data are slow to accumulate and if the fishery continues to expand, it is possible that the effects of over-exploitation may not become apparent until it is too late to take corrective action. In certain areas the king crab has already been overfished, as have many other marine animals.

The queen crab is one of few species which is exclusively fished inside territorial waters, thus limiting fishing to our own nationals. Industry, management and research thus have a tremendous opportunity to co-operate in the rational management of this resource, an opportunity that should not be lost.

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Atlantic Pink Shrimp Fishery:

Future looks bright, but experts warn of over-exploitation

BY JAMES KINLOCH

Confidence in the future of the Atlantic pink shrimp fishery, coupled with warnings against over-exploitation and neglect of marketing possibilities, were expressed at a recent conference on the Canadian shrimp fishery. It was held in Saint John, N.B., October 27-29, and predictions made during the sessions indicated the possibility of an Atlantic shrimp industry which would likely exceed that of the queen crab.

The meeting was sponsored by the Federal-Provincial Atlantic Fisheries Committee, made up of the Deputy Minister of Fisheries and Forestry of Canada and the ministers responsible for fisheries in Quebec, Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland. It was attended by more than 300, including representatives of industry, federal and provincial government officials, fishermen and shrimp specialists from the United States, Europe and Japan.

The fears of some critics of such conferences that too much enthusiasm would be generated for a particular fishery, with resultant disappointment, were not valid, said Dr. A.W.H. Needler, the federal Deputy Minister and chairman of the committee. He explained that in addition to assessing the potential of the fishery and outlining its possibilities, care was taken to point out the problems and dangers both in exploitation and marketing.

All Phases Covered

Thirty-one papers covering every phase of the shrimp fishery, including scientific research, catching methods and gear, processing and quality concontrol, the types of vessels used, and the marketing situation were presented and discussed during the six sessions.

The papers had been prepared by experts from Canada and from shrimp producing areas abroad, and, with the discussions, will appear in the Proceedings of the Conference as a special issue of Canadian Fisheries Reports, published by the Department

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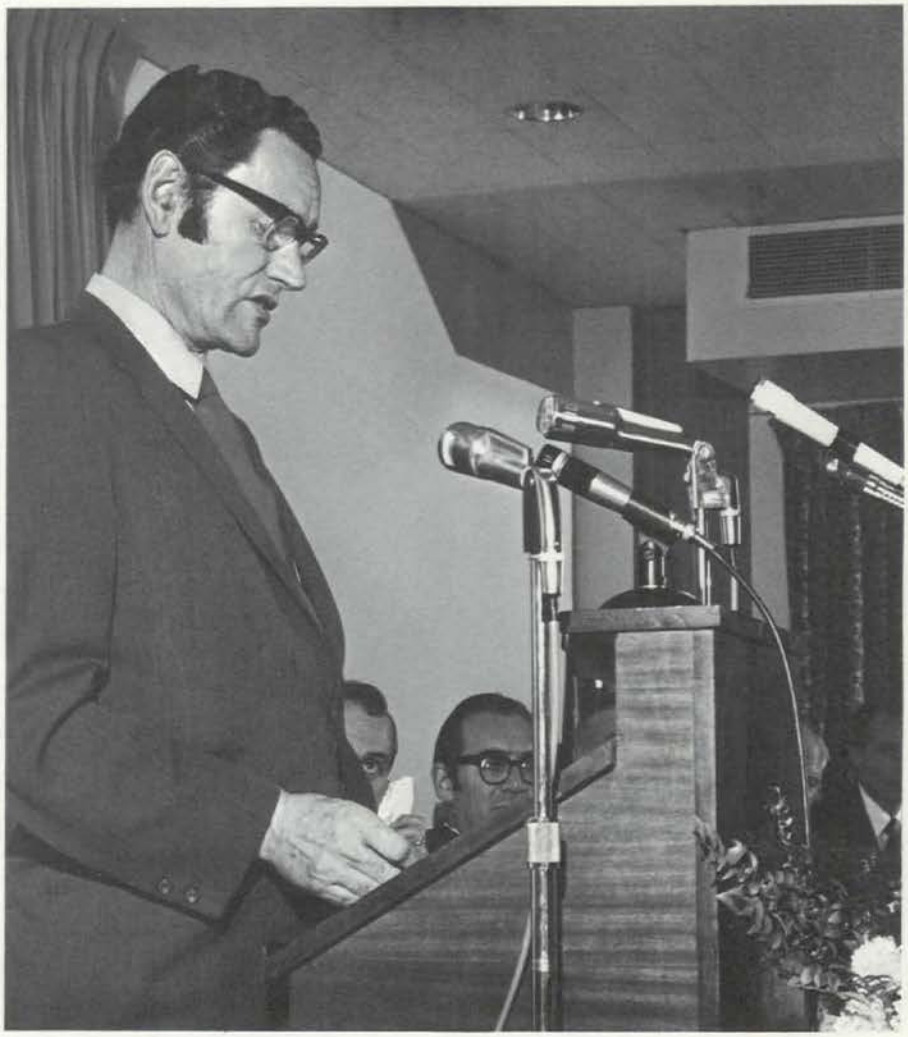

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Fisheries and Forestry Minister Jack Davis addressing the conference.

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A general view of the delegates at the conference on the Canadian shrimp fishery.

member of the committee, Eugene Gorman, provincial Deputy Minister of Fisheries, said that up to now Canada had had only a small share of the Atlantic coast shrimp fishery. He thought the conference was well-timed and was confident that one result would be guidelines for an orderly development.

Hope that the shrimp fishery

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of Fisheries and Forestry, Ottawa.

The participants were welcomed to Saint John on behalf of New Brunswick by Dr. Leonce Chenard, provincial Deputy Minister of Fisheries, who also spoke on the outlook in New Brunswick for the pink shrimp industry. He said it was only recently that fishermen and processors of the Canadian Atlantic coast had shown interest in the potential of the pink shrimp *(Pandalus borealis)*, and the new fishery presented a golden opportunity for fishermen to increase their earnings and to make good use of their investment in vessels and gear at a time of the year when small draggers were usually idle.

Results so far have exceeded expectations, he said, and from February through August this year, more than two million pounds of shrimps were landed in New Brunswick and Nova Scotia, an increase of 75 per cent over last year. Dr. Chenard also pointed out that shrimp offered a labour intensive processing operation ashore and provided for diversification in existing plants, with year-round opportunities.

Although a costly operation, the higher price paid for shrimps as compared with traditional groundfish species offered a great attraction.

Maurice Lessard, Associate Deputy Minister of the Quebec Department of Industry and Commerce, said that the existence of shrimp in the Gulf of St. Lawrence had been known for a long time, but it was only recently that the growing interest of foreign and domestic markets had led to large-scale commercial operation. He warned against the repetition of former errors in the exploitation of certain species of fish and stressed the need for rationalization in the further development of the shrimp industry.

Need for Planning

The need for careful planning and the hope that the conference would provide the necessary information was also expressed by Brian Meagher, Deputy Minister of Fisheries of Nova Scotia. The vital question, he said, was how much exploitation the shrimp stocks could support, and he hoped for a recommended program to determine approximately the sustainable yield.

The Prince Edward Island would prove a boon to Newfoundland's inshore fishermen was expressed by Eric Gosse, sixth member of the committee and Deputy Minister of Fisheries for the province. Mr. Gosse said that for too long the coastal fishermen of Newfoundland had depended on the ground fishery as their main source of income. There were clear indications that shrimp fishing so far had been a success, as a number of fishermen had decided on their own to convert their groundfish operations to shrimp trawling. He thought many others would follow as the proper catching techniques were learned.

L.S. Bradbury, Director of the Industrial Development Branch of the Fisheries Service, Department of Fisheries and Forestry, Ottawa, was chairman of the Conference Co-ordinating Committee. The general secretary of the conference was Jack Rycroft, chief of the Industrial Development Branch's Exploratory Fishing Division.

Untapped Resource

Fisheries and Forestry Minister Jack Davis, guest speaker at the conference dinner, spoke of the use now being made of fishery resources that

were ignored a few short years ago. Shrimp, he said, was an excellent example of an untapped resource being tested and proved and developed almost overnight into an important industry. It had been a similar story with the queen crab, a few years earlier.

But, Mr. Davis added, as recently experienced by the crab industry, finding and harvesting a resource was only one part of the story. Marketing was what made an enterprise either a success or a failure, and in this regard, there was much yet to learn.

Conscious of this need, he said, the Fisheries Service had this year introduced a marketing branch which worked in close co-operation with other agencies.

At the dinner meeting Dr. Needler received a surprise tribute from his fellow deputy ministers on the Federal-Provincial Atlantic Fisheries Committee. On their behalf, Mr. Lessard described the federal Deputy Minister not only as an outstanding scientist and administrator but also as an effective proponent of federal-provincial relations in the field of fisheries.

The reason Mr. Lessard injected his remarks into the proceedings was the forthcoming retirement of Dr. Needler from his Ottawa post to become resident director of the Huntsman Marine Laboratory at St. Andrews, N.B. The Quebec deputy referred to the fact that Dr. Needler had now chaired seven major fisheries conferences under the aegis of the F.P.A.F.C. and would be greatly missed in the future.

5
A glowing tribute to the work of Dr. A.W.H. Needler, Deputy Minister of Fisheries and Forestry, particularly in the field of federal-provincial relations, was paid at the conference by Maurice Lessard, Associate Deputy Minister of the Quebec Department of Industry and Commerce. Here Dr. Needler (left) is congratulated by Mr. Lessard.

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Conference receptionist Marie Cusack examines live shrimp and other shellfish in display area.

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Some of conference officials and participants. Left to right, Jack Rycroft, Ottawa; J. Jurkovich, Seattle, Wash.; Captain J. Derouet, France; Captain Francis Captiva, Pascagoula, Miss.; A. Chigusa, Tokyo, Japan; Jean Frechet, Quebec, P.Q.; Donald R. Whitaker, Arlington, Va.; Robert Hart, Ottawa; Maurice Lessard, Quebec, P.Q.; L.S. Bradbury, Ottawa.

"We have appreciated your council, your guidance and your understanding of our problems", said Mr. Lessard, addressing himself to Dr. Needler. "We shall miss you not only as a chairman, but also as a person whose mature judgment is recognized throughout the fisheries world".

Mr. Lessard's tribute occasioned a standing ovation for Dr. Needler from the more than 400 dinner guests.

Catching Methods

During the conference the delegates heard experts from Canada, Japan, the United States, Great Britain and the Netherlands explain the many different methods of catching shrimp in their particular waters. Gear and techniques were described, and in the session on quality control the contributors of papers gave what amounted to a short but intensive course in fish handling and processing.

Increased research in the biology of the shrimp and, indeed, in all phases of the fishery was indicated in other papers as a need for the orderly development of the industry.

Proposed new designs of multipurpose shrimp vessels were also discussed, as were marketing methods. One United States economist said there seemed to be no end to the growth of the world market for shrimp, although competition in selling all species was keen.

A paper on economic consideration in Canada's Atlantic shrimp fishery, exploited to any extent only in recent years, showed an encouraging prospect. It carried a warning, however, that care must be exercised that the development of this profitable fishery did not result in excess fishing and processing capacity in relation to the availability of the resource.

The final session took the form of a panel discussion on the industry's role in the development of the shrimp fishery. It was chaired by C. Gordon O'Brien, manager of the Fisheries Council of Canada. Speakers stressed the need for maintaining a high quality product and extreme caution in developing the industry.

Those who took part in this discussion were Rene Raby, Quebec United Fishermen, Quebec, P.Q., Basil Blades, of Sable Fish Packers Ltd., Clark's Harbour, N.S.; Captain Garnet Green, of Deer Island, N.B.; Andrew Kirk, Connors Brothers Ltd., Black's Harbour, N.B., and Captain Francis Mallet, St. Simon, N.B.

Haddock fishing closed on Georges Bank...

••• Fishing for haddock on Georges Bank was closed to Canadian fishermen from October 23 until the end of 1970, in keeping with one of several conservation recommendations made by the International Commission for the Northwest Atlantic Fisheries. Other member nations of ICNAF closed the fishery to their fleets on the same date.

ooo Announcing the closure, Fisheries and Forestry Minister Jack Davis said October 15 he had been advised that the overall haddock quota of 12,000 metric tons in Sub-area 5, which includes Georges Bank, was about to be reached. The ICNAF recommendation was that fishing for haddock by all member nations would cease ten days after such notification.

••• This is the first application of an international agreement establishing catch quotas in the Northwest Atlantic. "It is a significant step towards better management of the fishery resources of the North American Continental Shelf", said Mr. Davis.

••• The quota was coupled with a general agreement of the member countries of ICNAF reached at a meeting in Warsaw in June 1969. This provided that all members would refrain from fishing for groundfish for two months in certain designated areas which are normally heavily fished for such species. The two months in which fishing is banned are March and April, the spawning season for haddock, which is the species of greatest concern.

••• The countries party to the ICNAF Convention which agree to the restriction on haddock fishing, a restriction on high seas fishing not practised in the Northwest Atlantic until this year, are Canada, Denmark, France, Germany, Iceland, Italy, Norway, Poland, Portugal, Romania, Spain, the U.S.S.R., Great Britain, the U.S.A. and Japan.

Artificial rearing of lobsters

BY DR. D.G. WILDER
Fisheries Research Board of Canada
Biological Station, St. Andrews, N.B.

The concept of rearing of lobsters under artificial conditions has appealed to people in most lobster producing countries for many years. Initially, the principal objective was to rear lobsters through the larval stages in the hope that enough post-larval lobsters could be reared and liberated to increase the commercial catch significantly. To this end, rearing stations were built in Rhode Island, Maine, Connecticut, Quebec, and Europe. These had no obvious effect on the commercial fisheries and studies, particularly in Maine, showed the cost per larva to be high. Accordingly, the rearing stations were closed. Only the Martha's Vineyard station in Massachusetts has since been built for this purpose.

A recently constructed rearing station on Vancouver Island, B.C., is a special case, this station being built as one approach in the attempt to establish a breeding population of lobsters in the Pacific.

According to annual reports of the Massachusetts Division of Marine Fisheries, the average annual production of the Martha's Vineyard station since 1951 has been 182,000 fourth stage larvae (slightly over half an inch in length). Assuming the operating costs of an establishment of that size might be of the order of $50,000, then the larvae are costing about 27.5¢ each. There is little information on the fate of such larvae when planted, but it seems clear that a relatively small proportion reach legal size. At the St. Andrews Station we have observed virtually 100 per cent mortality among newly planted larvae from predation by flounders, sculpins, and cunners. Our best guess is that only about 10 per cent reach legal size. If so, the cost of each legal lobster reared artificially through the larval stages far exceeds its landed value. In any case, the economics of rearing to increase commercial production in nature are so uncertain that few agencies have attempted it in recent years.

Different Approach

Another approach is to retain the fourth stage larvae and rear them in captivity to commercial sizes. This was done at the St. Andrews station in the early 30's, and more recently by John Hughes at Martha's Vineyard and by Dr. D.J. Scarratt of St. Andrews. In each case, relatively few lobsters were involved – Hughes' 1962 report suggests that to that date he had reared 11 lobsters to a carapace length of 3-3/16 inches or larger. More recently, Dr. R.J. Ghelardi has reared several thousand lobsters in the Vancouver Island station, with appreciable numbers reaching stage 10 (total length two or more inches).

Although rearing in captivity to commercial sizes is possible on a small scale, it is extremely doubtful that, with current knowledge, commercial rearing from larvae to commercial sizes would be economically feasible. The fastest growth reported to date (Hughes, 1962) suggests that a minimum of 4 years is required to reach the Massachusetts legal carapace length of 3-3/16 inches or a weight of nearly 1 pound. The rest of Hughes' published data indicates that, under his experimental conditions, 5 to 7 growing seasons are needed to reach legal size. Such slow growth, coupled with disease, cannibalism, claw loss, and the relatively high cost of food, casts doubt on the feasibility of commercial rearing.

Although doubtful about rearing lobsters from egg to adult, it was decided at St. Andrews about 5 years ago to explore the possibilities of rearing half-pound lobsters to more valuable sizes. In this work, one phase of which is completed, we have considered size, sex, maturity, quality and quantity of food, water temperature, and degree of crowding.

In most of the experiments, the lobsters were maintained at constant, elevated temperatures and provided with individual compartments that they usually occupied. In 19 tests at 13 to 22°C, with lobsters stored at 1/4 to 2 pounds per square foot, mortalities over the 6-month growing

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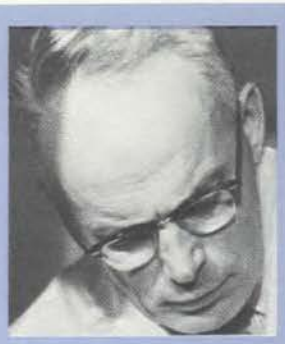

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Dr. D.G. Wilder with egg-bearing lobster at the Fisheries Research Board Biological Station at St. Andrews, N.B.

period ranged from 11 to 80 per cent and averaged 38 per cent. All claws were immobilized with plugs or rubber bands. Of the survivors, about 25 per cent lost one (usually) or both claws. The best growth per moult (average 38.5 per cent) was for lobsters held at a density of 1/4 pound per square foot.

In the best test, growth was just enough to balance loss of weight from mortality and loss of claws. Blood disease was a significant factor in only one of the tests. On the basis of these tests, we have concluded that with present knowledge this type of rearing is not economically feasible. Studies of the growth of lobsters both in nature and in captivity are continuing, however, here and elsewhere. These studies which are examining among other things the effects of growth hormones, nutrition and photoperiod may give more encouraging results.

Elevated temperatures

Another possible approach to lobster farming is to hold berried females at elevated temperatures to stimulate hatching, possibly as early as the first of January. Large numbers, but relatively small volumes, of larvae and post-larvae could then be held in water heated to optimum temperature until spring when the lobsters might be transferred to much larger, naturally heated, rearing ponds.

Under the right conditions, selected, fast growing lobsters might moult considerably more than 10 times during their first growing season and perhaps reach usable sizes by October or November. By usable sizes, we are not thinking of current legal sizes but rather something comparable to the Norwegian lobster *(Nephrops norvegicus)* or the freshwater crayfish that are popular in parts of Europe. If lobsters could be reared to a total length of say 5 or 6 inches in one growing season, and if a strong demand could be developed, a profitable operation is conceivable.

Compensate fishermen in new national park

Commercial fishermen whose inshore fishing areas lie within the limits of the new Kouchibouguac National Park, New Brunswick, will receive federal government compensation for the loss of their traditional fishing privileges, the Department of Indian Affairs and Northern Development has announced.

The compensation will be over and above cash grants, retraining programs and other aids provided by New Brunswick to assist park residents in relocation to other areas. In all 166 fishermen directly affected by the establishment of the new park will benefit from this federal grant.

In addition, local fishermen will be allowed to retain the use of a wharf and its facilities situated at Cap St. Louis inside the park, for deepsea fishing operations. The new park will not affect off-shore fishing in the area.

The agreement providing for the establishment of the new park, situated along the northern section of New Brunswick's Northumberland Strait, was signed by federal and provincial authorities in October 1969. Under the terms of the agreement, the province is responsible for acquiring the park land and turning it over to federal authorities. Development of the park is scheduled to begin in 1971 and it is expected that by August 1 of that year the last resident in the central portion of the park will have left the area. Residents of the remaining northern and southern extremities of the park are scheduled to leave the area by August 1972. By that date, all fishing activity in park waters will have ceased.

About 90 square miles in area, Kouchibouguac National Park includes waters on both sides of a 15-1/2-mile sweep of off-shore sandbars along the park's ocean front. Since commercial fishing is not in keeping with national park concepts, those involved are faced with the loss of their traditional fishing areas along Kouchibouguac's bay-intendent coastline, rivers, and other park waters.

SAFETY

9

Seek ways to improve safety practices at sea

The need to reduce hazards to fishermen at sea was reflected in recommendations put forward at a meeting held in Saint John, N.B., on October 26, to discuss safety practices on board fishing vessels.

Federal and provincial authorities and representatives of the fishing industry were unanimous in stressing the importance of reviewing present standards and practices with a view to updating legislation and operating procedures to improve conditions.

Between 12 and 20 Canadian fishermen lose their lives every year in isolated incidents while fishing aboard comparatively small boats. Loss of life is even more dramatic when a large trawler goes down.

The Saint John meeting, sponsored by the Federal-Provincial Atlantic Fisheries Committee, was attended by officials of the federal Departments of Fisheries and Forestry, Transport, and Manpower and Immigration, provincial departments concerned with fisheries in Quebec, Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland, and representatives of various schools of fisheries in the Atlantic coast provinces.

One recommendation was that existing marine legislation should be examined for its current applicability to fishing vessels, including design, construction, manning and operation. Appropriate action should be initiated where desirable and feasible.

Advisory Groups

The establishment of advisory groups to help prepare proposed amendments to legislation was also recommended. Membership in these groups will include representatives of the industry, vessel owners and fishermen, federal and provincial departments and fisheries training institutions.

9

Members of the Advisory Committee to the federal Government's Fishing Vessel Insurance Plan shown at a recent meeting in Ottawa. Front row, left to right, Roy Brown, legal adviser; Miss M.R. Loane, assistant co-ordinator; L.S. Bradbury, director, Industrial Development Branch; O. Clark, co-ordinator; Robert Hart, assistant director, Industrial Development Branch. Back row, left to right: Carl Sollows, manager, Maritimes Region; C.D. Parrott, manager, Newfoundland region; G.R. Morgan, manager, Pacific region; J.C. Rehel, manager, Quebec region.

The recommendations concerning the foregoing noted that safety regulations and training are definitely related and essential in the fishing industry. Operating conditions and requirements, the potential of manpower available and the training programs required should be considered in relation to the level and earnings of fishermen and economic practicability.

Chairman of the meeting was L.S. Bradbury, Director of the Industrial Development Branch of the Fisheries Service, Department of Fisheries and Forestry of Canada. It was stressed during the meeting that contributions made by such non-industry governmental departments and agencies not directly concerned with the fisheries, such as manpower, training, and various schools and colleges, were of the utmost value in developing the recommendations.

Mr. Bradbury, opening the meeting, said that operation of the federal Government's Fishing Vessel Insurance Plan had brought about an awareness of the extent of injury, damage and loss which exists all too often in the fishing industry.

Last year the Department of Fisheries and Forestry, through the Plan, paid claims for the total loss of 101 fishing vessels, mostly small craft. Claims for partial loss or damage were paid on another 126 boats. The appraised value of all these losses was more than a million dollars; replacement costs would be double that figure.

An unknown number of boats not insured under the Plan are also lost each year.

These grim statistics show that when fishing vessels put to sea they may face a multitude of dangers, including fire, collision, grounding, swamping, storms, dangerous equipment and practices, or the perils inherent in bad design, inadequate engineering, incompetence and carelessness.

Specific recommendation of advisory groups formed at the meeting will be reviewed at a later conference.

SAFETY

10

New film promotes marine safety

The National Film Board of Canada has recently completed a 25-minute colour film for the Department of Fisheries and Forestry to promote marine safety.

"End of the Nancy J" carries a convincing safety message as well as providing an entertaining story. The film is directed particularly to the smaller boat fishermen, but conveys a life saving message to all vessel owners and operators.

The producer was Bernard Devlin and the script was written by Munroe Scott, both of the Film Board. Walter Scott, of the Department's Industrial Development Branch, was the fisheries technical advisor. The film was mainly shot in and around picturesque Blue Rocks, Nova Scotia.

Fishermen and their families in the area gave ready co-operation in the filming of scenes, as well as the Nova Scotia Department of Fisheries, the federal Department of Transport and private companies.

Showings will be arranged as soon as possible throughout the fishing areas of Canada. Arrangements to view the film can be made through local officers of the Department of Fisheries and Forestry or the National Film Board.

10
National Film Board crew in action during shooting of the Department of Fisheries and Forestry's marine safety film "End of the Nancy J". Most of the film was shot on location in the Blue Rocks, N.S., area.

Scallop 'waste' served as delicacies

For years, Canada's East Coast scallop fishermen have been shucking their scallop catch, keeping the muscle portion, and tossing the rest of what's in the shell overboard.

This is because the only commercial demand in Canada is for the muscle meat. But this situation could change. Scallop "waste" may provide a new bonanza for the fishermen.

At a recent demonstration at the federal Department of Fisheries and Forestry's Fish Inspection Laboratory in Halifax, government and fishing industry representatives were treated to delicacies in the form of fish balls and cakes made from the normally-discarded scallop roes and rings. Reaction of the "tasters" was generally enthusiastic.

"I don't believe people are aware of just what they are throwing back in the ocean" said food technologist Louis Lipton, of the Chase Motel and Hotel organization in New York, who has been working on a scallop development project under contract with the Department's Industrial Development Branch.

"The roe and the ring represents 50 per cent of the scallop and contains more food value than the muscle part that is kept". Mr. Lipton added "Millions of pounds are being thrown away – it's such a waste".

The project began last August when the Nova Scotia Department of Fisheries obtained about 40 gallons of scallop roes and rings from Georges Bank and turned them over to the Inspection Branch's applied research and development laboratory for experimentation.

11

Technologists at the lab, working under Mr. Lipton and Abner Dewar, product development officer, came up with about 20 combinations for processing the roes and rings for both canning and freezing. Those served at the demonstration luncheon were prepared by being dipped in a batter containing, among other ingredients, bread crumbs, corn flake crumbs, corn meal and various spices and then deep fried. They were served as fish balls and cakes.

Scallop roes, considered a delicacy in many parts of Europe, are suitable for harvesting off Canada's East Coast between April and August. During that period last year some seven million pounds of scallop meat were landed by fishermen in Nova Scotia.

11

Fish balls and cakes made from normally-discarded scallop roes and rings were served at a demonstration luncheon held in Halifax recently. Here Mrs. Odette David, consumer consultant with the federal Department of Fisheries and Forestry, offers the delicacies to Robert Johnson, secretary manager of the Nova Scotia Fish Packers Association, and Brian Meagher, deputy minister of fisheries for Nova Scotia. (Photo by Nova Scotia Information Service).

PROPOSED MARINE PARK

FOR STRAIT OF GEORGIA

The world-famous French oceanographer and conservationist, Captain Jaques Cousteau, was among a group of international scientists who met in Vancouver, B.C., in October to discuss a proposal of the Hon. Jack Davis, Minister of Fisheries and Forestry, to declare the Strait of Georgia a national marine park.

Other scientists attending the three-day symposium were from Japan, the United States and Canada.

Capt. Cousteau expressed great enthusiasm for the underwater park. He advised Canada "to think bold, move ahead and grasp this imaginative concept".

He added: "I think Canada is one of the only nations that could roll up its sleeves and say 'All right, we will clean up the water'. It is a giant task, but absolutely feasible".

The symposium began with a press conference at Vancouver international airport, followed by flights in an airforce Argus over the Strait of Georgia, extending northwards as far as Bute Inlet.

The visitors were awed at the grandeur and beauty of the 150-mile long strait. They saw inlets gouged out by glaciers as yet unspoiled by the march of civilization. They learned there were still islands suitable for park purposes and that the inland sea was a haven for thousands of pleasure boats all year round. An abundance of salmon for sports fishing and exciting areas for scuba diving completed the recreational assets.

The first day of the symposium concluded with a smorgasbord at Vancouver Aquarium, featuring all species of fish, including octopus, caught in the Strait. Guests afterwards viewed films brought by the visiting scientists showing marine parks with which they had been associated. Dr. Joe McInnis, a specialist in underwater medicine, also showed an exciting set of slides taken during an underwater filming project in the Arctic.

Underwater trips

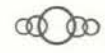
The symposium continued the following day at the Faculty Club of the University of British Columbia and wound up with a boat trip to Indian Arm were dives were made in Pisces submersibles.

Commenting on the symposium in a West Vancouver newspaper, Fisheries and Forestry Minister Davis said:

"The taped recordings of the seminar are historical documents. They will remind future generations how conservationists from France, Japan, the United States and Canada pooled their knowledge in the first pioneer steps to preserve a Canadian inland sea from the ravages of pollution and industrial blight and leave it in its relatively unspoiled state for the world to remember."

In addition to Capt. Cousteau, the visiting group participating in the symposium included Jean-Michel Cousteau, President, Living Sea Corporation, Los Angeles, Calif.; Dr. John Randall, marine zoologist, Bernice Bishop Museum, Honolulu; Dr. Carleton Ray, John Hopkins University, Maryland; Dr. Robert F. Dill, marine geologist, San Diego, Calif.; O.L. Wallis, aquatic research biologist, Washington, D.C., Charles Odegaard, Olympia, Washington; Casey Buchter, legal counsel, California Department of Parks and Recreation; and Dr. Tuyosi Tamura, vice-president, National Parks Association and Nature Conservation Society of Japan.

Others taking part in the discussions included W.R. Hourston, Regional Director of Fisheries, Pacific Region; E.W. Burridge, deputy-director, Resource Development Branch, Department of Fisheries and Forestry, Ottawa; K. Radway Allen, director, and Dr. W.E. Ricker, senior scientist, Fisheries Research Board of Canada Biological Station, Nanaimo, B.C.; Dr. M. Waldichuk, director, Pacific Environmental Institute, West Vancouver; and John Gordon, senior assistant deputy minister (conservation), Department of Indian Affairs and Northern Development.



REGIONAL INSPECTION CHIEF

Don D. Wilson, of Vancouver, has been appointed Chief, Inspection Branch, of the Pacific Region Fisheries Service of the federal Department of Fisheries and Forestry.

He replaces Reg. Bolton who recently retired and is now with FAO in Rome.

Discuss Salmon Conservation in North Pacific

A conservation problem being created by the salmon fishing activities of the Republic of Korea in the North Pacific was among items considered at the 17th annual meeting of the International North Pacific Fisheries Commission held in Tokyo. The three-week meeting concluded November 6.

There was unanimous agreement to request the member governments (Canada, Japan and the United States) to take more appropriate measures to deter the operations of the fishermen of the Republic of Korea. The Commission believes that such salmon fishing operations are detrimental to the conservation objectives of the Convention.

As in past years, the Commission reviewed the results of conservation programs and scientific research on North Pacific fishery resources. Approximately 100 administrators, scientists, and industry advisers took part in the discussions, which dealt primarily with the general problem of ensuring the continued orderly development of the North Pacific fisheries resources with a view to maintaining maximum sustainable yields. The Commission was assisted in certain of its discussions by a consultant from the International Pacific Halibut Commission.

Salmon Stocks

The Commission adopted a resolution recommending that the governments of the contracting parties give full consideration to the conservation needs of salmon stocks in areas of intermingling when preparing fishing regulations for future operations.

In the case of fishery resources which are exploited by fishermen of two or more of the member countries, king crab and tanner crab resources of the eastern Bering Sea and groundfish other than halibut in the Northeast Pacific Ocean are being studied.

The Commission developed recommendations to its member governments for conservation measures for halibut fishing in the eastern Bering Sea in 1971. Such recommendations have been made annually since 1963, when line fishing for halibut in the area first became open to fishermen from all three nations. For 1971 the Commission's recommendations are similar to those of 1970, with some modification on the period of open season in certain fishing grounds of the eastern Bering Sea. In addition, an extensive area in the southeastern Bering Sea, which is a nursery ground for young halibut, is again recommended for complete closure to halibut fishing.

In discussing the effects on the halibut stocks of the extensive trawl fisheries for other species in the Convention area, the Commission again urged its member governments to obtain data on the interrelationships between the condition of the halibut stocks and the trawl fisheries for other species.

Schedule of Penalties

Another provision of the Convention which was dealt with by the Commission this year is the development of a schedule of equivalent penalties for violations of the Convention. This topic is being studied carefully and will be reviewed annually.

Progress in publication of scientific research results was reviewed by the Commission and recommendations of the scientists for preparation of additional joint comprehensive reports on salmon and oceanography were approved.

Members of the Commission are: for Canada – Dr. A.W.H. Needler, James C. Cameron, Carl E. Giske, and Donovan F. Miller; for Japan – Kenjiro Nishimura, Yoshio Ohkawara, Shinji Miyoshi, and Haruo Nakai; for the United States – Charles H. Meacham, Edward W. Allen, Milton E. Brooding, and Elmer E. Rasmuson.

The annual meeting in 1971 will be held in Anchorage, Alaska, beginning November 1, 1971. Officers elected for 1971 are Mr. Elmer E. Rasmuson of the United States, Chairman; Dr. A.W.H. Needler of Canada, Vice-Chairman; and Mr. Kenjiro Nishimura of Japan, Secretary.

Big Run of Coho hits Fraser River

Coho salmon moved south from Vancouver Island's Big Bank to feed off the west coast of Washington state this year, but moved back up through the Strait of Juan de Fuca to give the Fraser River one of the biggest runs in history.

W.R. Hourston, Department of Fisheries and Forestry regional director, said oceanic conditions this year lured normal Vancouver Island west coast coho to the Washington coast where feed was plentiful. He said coho catches off the Big Bank up to the end of September this year totalled 224,000 as against 513,000 last year.

"In contrast, there have been 570,000 coho caught in Area C off the west coast of Washington, as against 63,000 for the similar period in 1969," Mr. Hourston said, "but large numbers of these salmon moved up through the Strait of Juan de Fuca."

- A reciprocal fishing agreement between Canada and the United States gives Americans trolling privileges off the three mile limit on the west coast of Vancouver Island and Canadian trollers, off the west coast of Washington.
- This allows the commercial trolling fleets of both countries to follow the variable migration pattern of salmon coming back to spawn. Last year American trollers were off Canada's west coast taking their share of Canadian coho.
- The Americans went into a large-scale hatchery program some years ago to compensate for natural spawning grounds lost as a result of the construction of hydro-electric power dams. Mr. Hourston said there would certainly be some hatchery-produced salmon taken by Canadian fishermen, but most would be naturally produced.
- "And to keep the picture in focus it must be remembered that under a treaty arrangement, the Americans harvest 50 per cent of the Fraser River sockeye and pink salmon which enter the Strait of Juan de Fuca. In addition, large numbers of Canadian chinooks, coho and chum salmon are taken in this fishery. We know that the U.S. catch of Fraser River coho at Point Roberts was a record this year", Mr. Hourston said.

Research shows foreign fleets depleting inshore cod stocks

A Fisheries Research Board study has confirmed that large foreign catches of cod in Labrador's offshore waters are primarily responsible for declining inshore catches by Canadian fishermen. Both catches are coming from the same stocks.

The offshore catch has increased since 1960, and the inshore catch has fallen off as a result of increased activity out over Canada's Continental Shelf.

Fisheries and Forestry Minister Jack Davis said: "While fishing by foreign fleets does not conflict with international law it threatens to deplete our fish stocks. Overfishing has occurred in important areas off Newfoundland and Labrador and entire species are in danger of extinction. This cannot go on. Foreign nations fishing off our coasts must become conservation conscious. Not only that but they must recognize the special interests of small inshore fishermen whose radius of operation is limited and whose income is far below that of industrial workers on both sides of the Atlantic".

About 90 per cent of the inshore catch is taken by fixed traps and gill nets, making the inshore fishermen dependent on stocks coming close to shore. However, the likelihood of them coming in good quantity has greatly lessened owing to the growing foreign effort offshore.

Fleets from a dozen foreign countries are fishing concentrations of cod in winter and spring.

The European otter-trawl-fleet began to fish the large concentrations of cod off Labrador in 1958. Earlier the fishery had been carried out almost entirely by Newfoundland fishermen in inshore waters.

Total foreign landings in 1969 were 14 times the 1958 catch. The take of inshore Labrador and Newfoundland fishermen meanwhile fell by almost 60 per cent.

'Slubby' Water

Labrador fishermen have also reported the presence of what they refer to as "slubby" water in areas where their catches are lower than usual. They have been asking whether their catch failures have been due to pollution or some other sinister cause.

However, slubby water was found by the FRB to be caused by sunlight penetrating very clear water and stimulating greater than normal growth of minute algae. Tiny jellyfish were found to foul the nets also.

FRB scientists found that low temperatures in bottom water and a lesser abundance of caplin contributed to the scarcity of cod in inshore waters. Caplin is a cod food species.

However, even when environmental conditions are more favourable, the reduced Labrador cod stock will mean catches of younger and smaller fish than in the past.

"The results of the Fisheries Research Board investigations confirm what I have been saying for some time," Mr. Davis said. "The catches of the foreign fleets are affecting inshore catches. I am more determined than ever to try to get the other nations involved to see sweet reason and protect the resource from serious overharvesting. If that happens they will suffer too."

Canada, U.S.S.R. draft agreements on Pacific fishing operations

●● Fisheries experts of Canada and the Union of Soviet Socialist Republics have negotiated two draft agreements for resolving problems associated with Canadian and Soviet fishing operations in the northeastern Pacific Ocean.

The negotiations, which concluded October 20, opened in Ottawa September 24, and were conducted by delegations headed by Dr. A.W.H. Needler, Deputy Minister of Fisheries and Forestry for Canada, and Igor Dokuchaev, Chief, Department of International Fisheries and General Supplies, Ministry of Fisheries, for the U.S.S.R. Final consideration of the draft agreements and preparation of the agreements for signing will take place at a further meeting of the delegations in Moscow at an early date.

A draft "Agreement on Co-operation in Fisheries off the Coast of Canada in the northeastern Pacific Ocean" incorporates measures for securing favourable conditions for the operations of fishing vessels and for conservation and rational utilisation of fish stocks. Specific measures include:

- abstention from trawl fisheries by vessels of the U.S.S.R. in a designated area of the high seas off the southwest coast of Vancouver Island;
- in compensation for the above, permission for Soviet vessels to fish in a defined area within the territorial waters of Canada off the southwest coast of the Queen Charlotte Islands;
- provision for Soviet vessels to conduct loading and unloading operations in a designated area off the southwest coast of the Queen Charlotte Islands and in Tasu Sound;
- provision of the necessary authority for supply vessels of the Soviet fishing fleet to call at the port of Vancouver, B.C., for supplies.

These measures will create better conditions for safe operations of the Canadian and Soviet fishermen at sea and for conservation of fish stocks.

The draft agreement on Canadian-Soviet co-operation also makes provision for the regular exchange of scientific information. The experts were unanimous in their opinion that regular contacts between scientists and specialists of the two countries, exchange of relevant scientific and fisheries data, as well as preparation for and the conduct of co-ordinated fisheries research, would be very useful and would provide the most effective and rational basis for utilization of the biological resources. They considered of particular importance the need for co-operative efforts to study the biology, distribution and stock condition of those widely distributed commercial species which migrate between inshore and offshore waters.

Safety Rules

A second draft agreement negotiated by the Canadian and Soviet fisheries experts consists of "Provisional Rules of Navigation and Fisheries Safety off the Pacific Coast of Canada". The experts believe that if the fishing vessels of the two countries strictly comply with these provisional rules, with the International Regulations for Preventing Collisions at Sea and with the provisions of good marine practice, the incidence of collisions and damage to fishing gear will be significantly diminished. They further believe that the application of the provisional rules will also be of importance for protection of life at sea.

Both delegations feel that the measures recommended will assist in strengthening the friendly relations in fisheries between the two countries.

Fish exported by container to Europe

Almost 20 tons of frozen fish delicacies were recently shipped from Montreal to Hamburg, Germany, marking the inauguration of a new concept in consolidated container operations.

The shipment was arranged by the freight-forwarding company of Kuehne and Nagel (Canada) Ltd., who announced that this was the first of a long series of refrigerated consolidated containers leaving Canada for Europe.

"In this particular instance five shipments of lobsters, eels, scallops, and salmon from different suppliers in Quebec were loaded into one 40-ft. reefer container of Atlantic Container Line and shipped to Hamburg for distribution to various consignees in Western Europe" said Mr. Harry W. Klaus, the company's Canadian container manager.

Mr. Klaus added: "This new service not only eliminates the never-ending problems of shipping refrigerated goods conventionally, but also brings the economy of containerization to exporters of smaller reefer lots. Initially consolidated reefer containers are intended to be operated to Hamburg and Rotterdam twice a month, but it is planned to expand this service to other destinations in Europe, as well as to Britain."

Appoint new members to Tuna Commission

►► The appointment of two new Commissioners to the Inter-American Tropical Tuna Commission has been announced by Fisheries and Forestry Minister Jack Davis.

They are: Leo E. Labrosse, President, Canadian Tuna Fishing Company, a Division of Atlantic Sugar Refineries Co. Ltd., of Montreal, and Robert L. Payne, Director of Development of the Canadian Fishing Co. Ltd., Vancouver. The appointments are for a period of two years.

The Inter-American Tropical Tuna Commission was established in 1950 to maintain the population of yellowfin and skipjack tuna and of other kinds of fish taken by tuna fishing vessels in the Eastern Pacific Ocean.

Mr. Labrosse was born in Montreal and graduated from Sir George Williams University with a Bachelor of Commerce degree. He has been with Atlantic Sugar Refineries Co. Ltd., for the last twenty years. In addition to being President of Canadian Tuna Fishing Company, Mr. Labrosse is also President of Atlantic Fish Processors Co. Ltd.

Mr. Payne graduated from McGill University in 1946 with a degree in Mechanical Engineering, and in 1954 he obtained the degree of Master of Science (Industrial Management) from the Massachusettes Institute of Technology. He served as Marine Superintendent of the Canadian Fishing Company Limited for ten years. Subsequently he was general manager of J.H. Todd & Sons, Ltd., for ten years, before taking up his present position.

F.A.J. Armstrong

Heads Heavy Metals Research Project

►► F.A.J. Armstrong has been appointed scientist in charge of a new heavy metals research project being undertaken by the Fisheries Research Board of Canada's Freshwater Institute at Winnipeg.

Previously responsible for developing chemical methods for detecting trace elements in water, Mr. Armstrong became involved in the Canadian mercury problem in 1969 and has played a key role in the development of a new method of determining mercury in fish tissues. Popularly known as the "FRB Procedure," the technique has received wide acceptance and is being used daily in laboratories throughout Canada and the U.S.A.

Mr. Armstrong said the main emphasis was now on learning more about the chemical behaviour of mercury in nature.

"There could be tons of mercury in our lakes and rivers, most of it released by chlor-alkali plants and pulp mills." he said. "The mercury lodges in the sediment and is released slowly into the water. Our immediate problem is to determine its rate of release. This will tell us how long it takes a body of water to rid itself of this form of pollution."

Mr. Armstrong joined the Freshwater Institute in 1967 from the Marine Biological Laboratory in Plymouth, England, where he was an oceanographic chemist. He won international recognition there for his investigations on chemical methods for analyzing sea water, notably for phosphorus and nitrogen.

Canadian scientist heads I.C.E.S. group

►► For the first time since the formation of the International Council for the Exploration of the Sea (ICES), a Canadian has been elected chairman of one of its major committees.

Dr. Arthur W. Mansfield, Acting Director of the Fisheries Research Board of Canada's Arctic Biological Station at Ste. Anne de Bellevue, P.Q., was named Chairman of the Marine Mammals Committee at the ICES annual meeting. ICES is an international body concerned with the scientific aspects of physical and biological oceanography.

Dr. J.R. Weir, Chairman of the Fisheries Research Board, said the appointment of Dr. Mansfield marks a distinguished "first" for Canada.

"Canada has been a member of ICES for only three years and was the first non-European country to be accepted for membership. The fact that a Canadian scientist has been selected to the sea mammal committee chairmanship is a fine testimonial to the respect with which our people are held in international scientific circles " Dr. Weir said.

Dr. Mansfield has done extensive research in North Atlantic and Arctic waters on the seal, whale and walrus populations and is recognized as a world authority on these animals. He lives at Choisy, P.Q.

INSPECTION BRANCH REORGANIZED IN MARITIMES

When Dr. H.L.A. Tarr retired as director of the Fisheries Research Board of Canada's Vancouver Laboratory he was paid many tributes on a distinguished career in the field of marine science and technology spanning more than 44 years. Here he receives a painting from members of his staff at the Vancouver laboratory at a dinner honoring him on his retirement. Dr. Tarr, who was also the recipient of gifts from the West coast fishing industry and other groups associated with fishery resources, will continue his research from a laboratory near his home in West Vancouver.

The Inspection Branch of the federal Department of Fisheries and Forestry in the Maritimes Region has recently been reorganized. Three inspection districts have been established in Nova Scotia and three in New Brunswick, while Prince Edward Island becomes a separate district.

J.B. Melanson of Yarmouth has been appointed Chief, Inspection District, for the southwestern part of Nova Scotia including Annapolis, Digby, Yarmouth and part of Shelburne County. W.J. Brownlee has been appointed Chief, Inspection District, for the balance of the mainland of Nova Scotia. Appointment of the Chief, Inspection District, for Cape Breton Island has yet to be announced.

In New Brunswick, K.B. Swansburg will head the inspection district with headquarters at Black's Harbour which includes the counties of Charlotte, Saint John, Queens and Albert. R.S. Rodgers of Shediac will be responsible for the area of New Brunswick from Miramichi River to the Nova Scotia border. E.R. Gaudet of Shippegan is responsible for the remaining coastal area of New Brunswick.

W.A. Murphy of Charlottetown will be in charge of the separate inspection district for Prince Edward Island.

H.A. Laventure, formerly District Inspection Officer at Shediac, N.B., has been appointed Inspection Program Specialist of the Maritimes Region under the Assistant Chief of the Branch, P.M. Winchester, of Halifax, G.H. Joudrey of Lunenburg, N.S., and G.E. Romkey of Halifax, N.S., have been appointed Area Supervisors under Mr. Brownlee with headquarters at Lunenburg and Halifax respectively. J.D. Thompson of Black's Harbour, N.B., has been appointed as Area Supervisor for field operations under Mr. Swansburg.

The new organization is designed to consolidate both laboratory and field inspection programs to provide more efficient service to the fishing industry.

Statistics

SEAFISH – Landed weight and landed value

	January to October 1970		January to October 1969	
	Landings[1] '000 lb.	Value[2] $'000	Landings[1] '000 lb.	Value[2] $'000
CANADA TOTAL	**2,334,180**	**170,941**	**2,285,671**	**148,086**
ATLANTIC COAST – Total	**2,108,930**	**111,898**	**2,119,492**	**101,699**
Cod	446,275	20,061	509,726	20,155
Haddock	45,627	4,826	77,029	6,362
Redfish	191,416	6,149	172,710	4,616
Halibut	3,259	1,488	3,379	1,385
Turbot	23,157	967	25,254	879
Other Flatfishes	254,885	12,481	224,414	8,807
Pollock, Hake, Cusk	39,534	1,516	44,254	1,549
Catfish	6,570	230	6,986	239
Other Groundfish	5,970	114	6,406	94
Herring and sardine	953,690	11,861	920,813	9,552
Mackerel	29,338	1,024	27,228	989
Swordfish	7,408	3,320	6,147	3,518
Tuna	6,087	1,305	1,192	144
Alewife	7,227	155	3,645	85
Salmon	4,876	2,889	4,307	2,277
Smelt	3,005	311	3,499	287
Other Fish	9,105	290	10,256	562
Clam and Quahaug	8,013	632	6,518	487
Scallop	11,134	11,997	11,833	10,207
Lobster	29,667	23,230	30,806	21,926
Other Shellfish	2,185	320	2,191	316
Miscellaneous items	–	[1] 4,441	–	5,090
PACIFIC COAST – Total	**225,250**	**59,043**	**166,180**	**46,387**
Pacific Cods	10,738	1,095	13,470	1,178
Halibut[3]	28,759	11,166	33,665	14,353
Soles and other flatfishes	11,327	685	10,366	617
Herring	5,460	197	3,630	201
Salmon	150,703	44,001	77,498	27,369
Other Fish	7,765	575	13,767	927
Shellfish	10,498	1,324	13,784	1,742
Miscellaneous items	–	–	–	–
BY PROVINCES				
British Columbia	225,250	59,043	166,180	46,387
Nova Scotia	520,604	43,859	595,340	44,097
New Brunswick	400,078	15,431	467,145	13,846
Prince Edward Island	82,684	10,342	38,677	8,082
Quebec	241,341	10,198	174,189	8,095
Newfoundland	864,223	32,068	844.141	27,579

1 Fish and Shellfish only.

2 Includes livers, seaweeds, tongues, scales, roes, skins, oil, seals, whales and bait worms.

3 Includes halibut landed in U.S. ports by Canadian fishermen.

PRICES PAID TO FISHERMEN – Cents per pound

Week ending October 17th	1970	1969
HALIFAX, N.S. (Offshore Prices)		
Cod Steak	5.75	5.75
Cod Market	5.5	5.5
Haddock, large	10.75	9.75
Plaice and Flounder	4.25-5.25	4.5-5.25
ST. JOHN'S, NFLD.		
Cod (steak & market)	5	3-4
Flounder (round)	5	3.5
VANCOUVER, B.C.		
Salmon		
Redspring (dressed)	45-110	65-110
Whitespring (dressed)	–	40-75
Coho	45-50	72
Chum	25	
Ling Cod (dressed, head off)	12-19	14-16
Grey Cod (dressed, head on)	10	7-9
Sole	7-11	8.5-9.5
Flounder	11	5

MID-MONTH WHOLESALE PRICES IN DOLLARS

October 1970			Montreal	Toronto
Cod fillets, Atlantic fresh, unwrapped		lb.	.468	.573
Cod fillets, Atlantic frozen, cello 5's		lb.	.360	.467
Cod fillets, smoked		lb.	.518	.607
Haddock fillets, fresh, unwrapped		lb.	.790	.860
Herring, kippered, Atlantic		lb.	.314	.367
Mackerel, frozen, round		lb.	.235	.333
Halibut, frozen, dressed		lb.	.612	.720
Silverbright, frozen, dressed		lb.	.752	.877
Coho, frozen, dressed		lb.	1.084	1.183
Whitefish, fresh		lb.	.669[1]	.717
Lake Trout, frozen		lb.	.544	.653
Lobster, canned, Fancy		Case 48-1/2's	89.990	91.507
Sardines, canned		Case 100-1/4's	11.776	11.517
Sockeye, canned, grade A		Case 48-1/2's	30.037	31.420
Pink, canned, grade A		Case 48-1/2's	20.847	21.757

[1] Dressed

FROZEN FISH STOCKS at end of October

	1970-'000 lb.	1969-'000 lb.
TOTAL – Frozen Seafish, Canada	**83,243**	**90,361**
Frozen Fish – Total	**69,515**	**75,618**
Cod, Atlantic, fillets	3,335	4,865
Cod, Atlantic, blocks	3,710	18,599
Haddock fillets	1,426	1,493
Haddock blocks	661	756
Redfish fillets	5,035	4,635
Redfish blocks	1,157	337
Flounder and Sole fillets	7,464	2,921
Flounder and Sole blocks	2,086	1,108
Halibut, Pacific, dressed and steaks	9,304	9,631
Halibut, Pacific, fillets and blocks	1,036	1,020
Turbot fillets	586	885
Turbot blocks	201	161
Pollock fillets	298	527
Pollock blocks	235	958
Other Groundfish, dressed and steaks	2,169	1,582
Other Groundfish, fillets and blocks	1,308	1,073
Salmon, Pacific, dressed and steaks	18,913	13,212
Herring, Atlantic and Pacific	728	357
All other seafish, all forms	5,375	7,017
Lobster, whole and meat	758	730
Scallops, breaded and unbreaded	1,082	1,509
All other shellfish, all forms	2,648	2,242
Frozen (Smoked) Fish – Total	**1,366**	**1,883**
Cod, Atlantic	363	728
Sea Herring, kippers	563	539
Other, all forms	440	616
Frozen for Bait and Animal Feed	**12,362**	**12,860**

SALT FISH STOCKS at end of October

		1970-'000 lb.	1969-'000 lb.
Salted and Pickled Fish, Atlantic Coast			
Wet Salted – Total		**24,716**	**35,693**
Cod		19,773	30,066
Pollock		1,720	2,718
Hake		2,421	2,205
Other		802	704
Dried Salted – Total		**8,062**	**11,052**
Cod		7,743	10,611
Pollock		76	315
Hake		206	103
Other		37	23
Boneless – Total		**716**	**588**
Cod		647	550
Other		69	38
Pickled – Total	(200 lb. barrels)	**22,329**	**14,191**
Herring		14,304	5,463
Mackerel		3,249	4,465
Alewife		4,776	4,263
Turbot		–	–
Herring bloaters	(18 lb. boxes)	99,957	123,074
Boneless Herring	(10 lb. boxes)	930	6,518

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS

	January to September	1970-$'000	1969-$'000
	TOTAL EXPORT VALUE	205,515	204,416
By Markets	United States	153,961	139,204
	Caribbean Area	11,542	13,065
	Europe	33,377	44,164
	Other Countries	6,635	7,983
By Forms	**Fresh and Frozen**	**147,584**	**138,853**
	Whole or Dressed	38,231	39,607
	Halibut, Atlantic	1,706	1,440
	Halibut, Pacific	5,409	5,850
	Salmon, Atlantic	948	1,344
	Salmon, Pacific	14,575	15,109
	Swordfish	3,568	3,689
	Herring	516	859
	Other Seafish	2,503	2,338
	Pickerel	1,853	1,827
	Whitefish	4,068	3,897
	Other Freshwater Fish, n.e.s.	3,085	3,254
	Fillets, Blocks and Slabs	66,857	58,836
	Cod fillets, Atlantic	10,023	7,379
	Cod blocks and slabs	11,973	8,905
	Haddock fillets	3,679	6,006
	Haddock blocks and slabs	167	461
	Ocean Perch fillets	10,831	8,206
	Ocean Perch blocks and slabs	1,231	1,206
	Pollock blocks and slabs	239	423
	Flatfish fillets (Plaice, Sole, Flounder)	16,227	13,651
	Flatfish blocks and slabs (Sole, Flounder)	1,673	2,846
	Pickerel fillets	1,251	1,521
	Perch fillets	3,259	3,535
	Other fillets	4,292	2,491
	Other blocks and slabs	2,012	2,206
	Fresh and Frozen Shellfish	40.736	38,504
	Lobster (in shell and meat)	25,771	23,697
	Scallops	11,608	11,001
	Crab	1,659	[1]
	Other Shellfish	1,698	3,806
	Frozen Fish and Shellfish, pre-cooked	1,760	1,906
	Cured	**18,123**	**16,659**
	Smoked	2,321	1,970
	Herring	1,080	1,141
	Other	1,241	829
	Salted, Wet and Dried	10,575	12,570
	Cod	8,983	11,302
	Other	1,592	1,268
	Pickled	5,227	2,119
	Herring	4,722	1,585
	Mackerel	209	218
	Other	296	316
	Canned	**16,609**	**31,397**
	Salmon	8,215	23,765
	Sardine	3,953	4,475
	Lobster	1,377	1,460
	Other	3,064	1,697
	Miscellaneous	**23,199**	**17,507**
	Fish Roe, Fresh, Frozen and Cured, n.e.s.	2,319	1,046
	Meal	10,877	9,234
	Oil	2,951	975
	Irish Moss and Sea Plants, n.e.s.	2,837	2,145
	Other	4,215	4,107

[1] Not available in 1969.
Included with "Other Shellfish".

FISHERIES of Canada

March - April 1971 • Vol. 23 No. 4

Department of Fisheries and Forestry, Ottawa

March - April 1971

FISHERIES of Canada

The Hon. Jack Davis, Minister
R. F. Shaw , Deputy Minister

Contents

COVER PHOTO – Whitefish served on a plank – one of the latest recipes from the Department's consumer consultants.

Published by the Department of Fisheries and Forestry
Ottawa

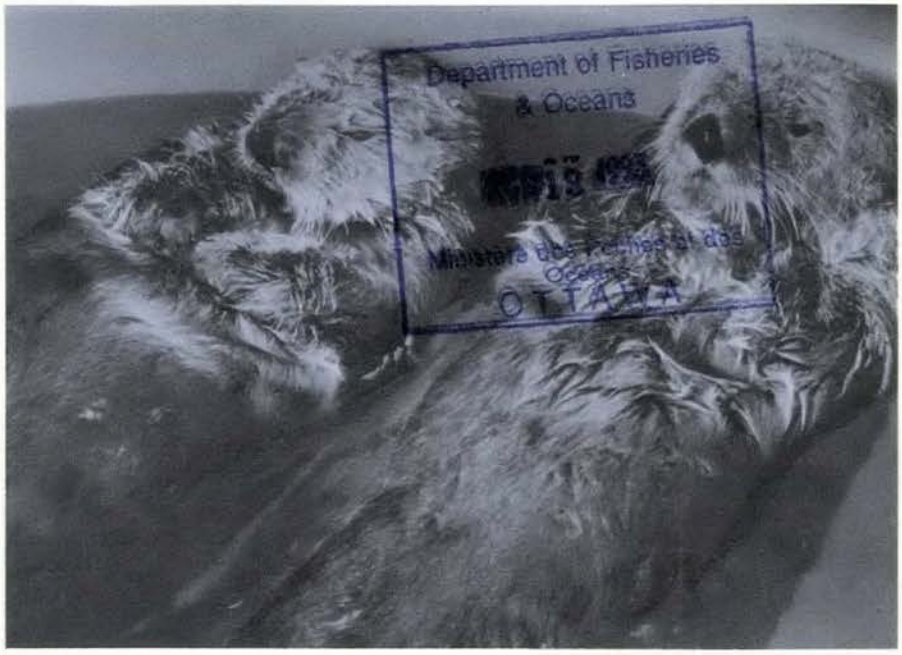
Produced by the Information and Consumer Branch of the Department of Fisheries and Forestry, Ottawa.

Editor: E. H. Hearnden
Layout: A.O. Lang

A Sea Otter Transplant to British Columbia

BY I.B. MacASKIE
Fisheries Research Board of Canada,
Ste. Anne de Bellevue

Captive sea otters aboard the Fisheries Research Board vessel *G.B. Reed*



British Columbia Fishery Regulations, dated 1970, state in part that, -

(1) No person shall take, catch or kill or attempt to take, catch or kill a sea otter.

(2) No person shall have in his possession a sea otter pelt or any portion of a sea otter.

(3) No person shall disturb or molest a sea otter.

This notice would have astonished the early fur traders. It is probably true to say there is no fur in the world that equals the quality of the sea otter (*Enhydra lutris*). In the 18th Century the animal was abundant along the North Pacific littoral that arcs from Japan to California, and they offered attractive profits for traders willing to sail uncharted waters.

The Russians first moved eastwards along the Aleutian chain, then European vessels began to explore the north-east coast of America in increasing numbers. Captain Barkley was a case in point. Off the west coast of Vancouver Island in 1787 he named Barkley Sound after himself and Francis Island after his seventeen-year-old wife. As the first white woman to visit the area she might have expected something better than a rocky outcrop to mark the occasion. However, her husband's trade with the local Indians had been highly successful, and with a hold filled to capacity with sea otter pelts valued at $30,000, he was no doubt anxious to leave quickly and return for more.

Competitive Trade

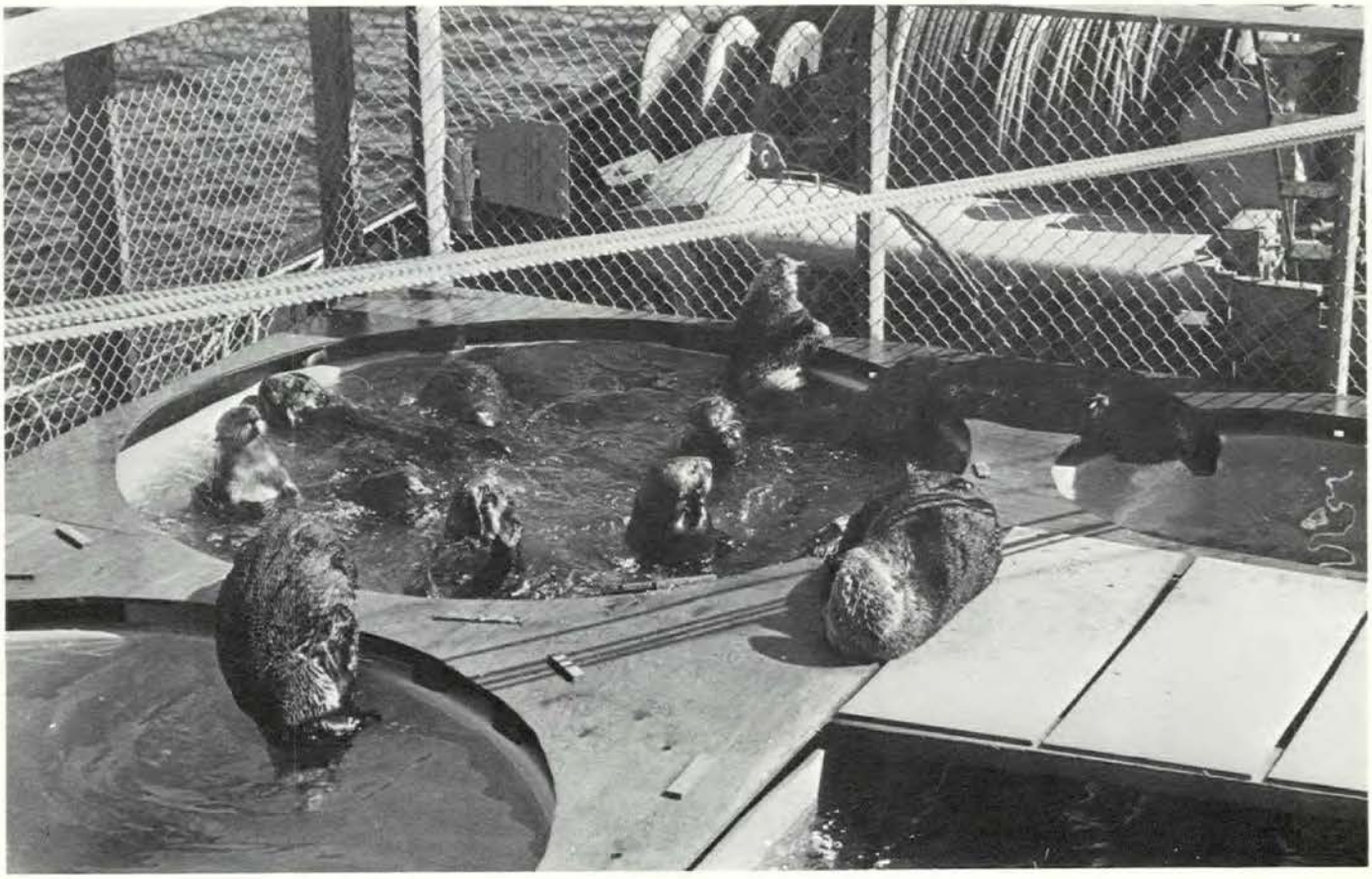
There was growing competition among such traders. Vessels sailing under the flags of Spain, England, France, Portugal and the United States ranged back and forth to collect as many pelts as possible, and their ships became a familiar sight at even the most remote coastal villages. The natives, who possessed little else the white man wanted, were initially willing to exchange their otters for the bric-a-brac of civilization, but they soon learned to bargain for articles of more use to them. Hunting pressure therefore increased, and no resource is inexhaustible.

Early in the 18th Century the total number of sea otters may have been around 150,000. By the end of the 19th Century the animal was approaching extinction, and in 1911 the remnant Alaskan populations were down to an estimated 2,000.

In that year the governments of Japan, England, Russia and the United States signed a treaty to protect another threatened species - the northern fur seal, and as an almost incidental gesture they included a clause covering sea otters. But it was too late to save those of British Columbia. They were virtually exterminated by that time and the last animal taken was in 1929.

The sea otters of the Aleutians fared better by the very nature of their remote and inhospitable surroundings. Despite 170 years of relentless hunting, enough animals remained to take advantage of belated protection, and

One of the seven fibreglass tanks on the main deck of the *G.B. Reed*



population explosions occurred at several islands along the Aleutian chain. For example, from about 100 animals at Amchitka in 1911, the numbers reached 3,000 by 1935 and the total North Pacific population is estimated in excess of 35,000. The future of the species therefore seems secure.

Transplant Experiments

There are, in fact, some areas of the Aleutians that are overpopulated and the Americans have been experimenting with transplants to former otter range in Alaska. A first attempt was made in 1951 with 35 animals from Amchitka, but all died prior to shipment. In 1955, 31 animals were taken by boat in dry cages from Amchitka to the Pribilof Islands, but all died either en route or shortly after release. Subsequent transplants to various areas followed from 1956 to 1969. Results from these were more encouraging, but it remained apparent that extremely considerate treatment of captive animals was required to reduce mortality. Improvements in methods of holding and transport were developed, with a growing reliance on aircraft to cut down travelling time.

In 1969 the first re-introduction of sea otters to Canadian waters by air was arranged by the Fish and Wildlife Branch of British Columbia. Only one of thirty animals died en route but it is not possible to tell how many ultimately survived. Flying, however, does entail a considerable degree of unavoidable manhandling, close confinement and engine noise, and the longer the flight the greater the stress for the animals. It is also expensive. Consequently, when sea otter were again offered to Canada in 1970 by the State of Alaska, the Fisheries Research Board of Canada and the B. C. Fish

(UPPER) The Fisheries Research Board vessel *G.B. Reed*, which was used to transplant the sea otters.

(LOWER) Setting a net for sea otters off Montague Island, Alaska

and Wildlife Branch decided to use an available vessel equipped to improve the environment of animals in transit.

Open fibre-glass tanks, eight feet in diameter and four feet deep, were secured to the main deck of the *G.B. Reed,* a 750-ton side-trawler used by the Biological Station at Nanaimo for research purposes. Water inlets were located in the floor of each tank and connected to sea hydrants that supplied 225 gallons per minute, with excess water overflowing the rim of each tank. Spaces between the tanks were covered with plywood to allow the animals to haul out if they wished, and a wire fence prevented escape from an enclosure of 600 square feet.

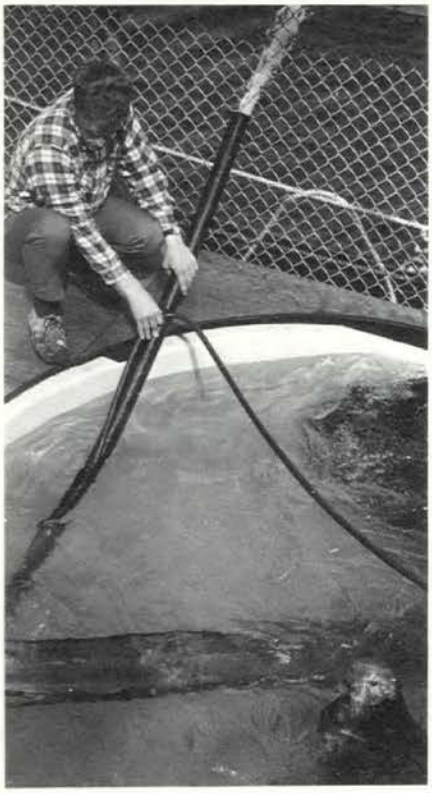
The sea otter differs from other marine mammals in having no blubber, and therefore relies for warmth upon air entrapped within its dense underfur. To maintain adequate insulation this fur must be kept scrupulously clean and except when asleep or feeding, grooming activity is the main preoccupation. The animal rolls and twists in the water to rid itself of the last vestige of foreign matter, and rubs and smooths its coat with meticulous care. As well it must. If the fur is soiled or matted for too long the otter can no more avoid chilling than a man afloat in wet clothes.

Rendezvous point

The *G.B. Reed* went north to Prince William Sound on 17 July, to rendezvous between Montague and Green Islands with representatives

(UPPER) Transferring a sea otter from the net to a carrying box

(LOWER) Removing scraps of uneaten food from a tank



Female sea otter grooming her pup.

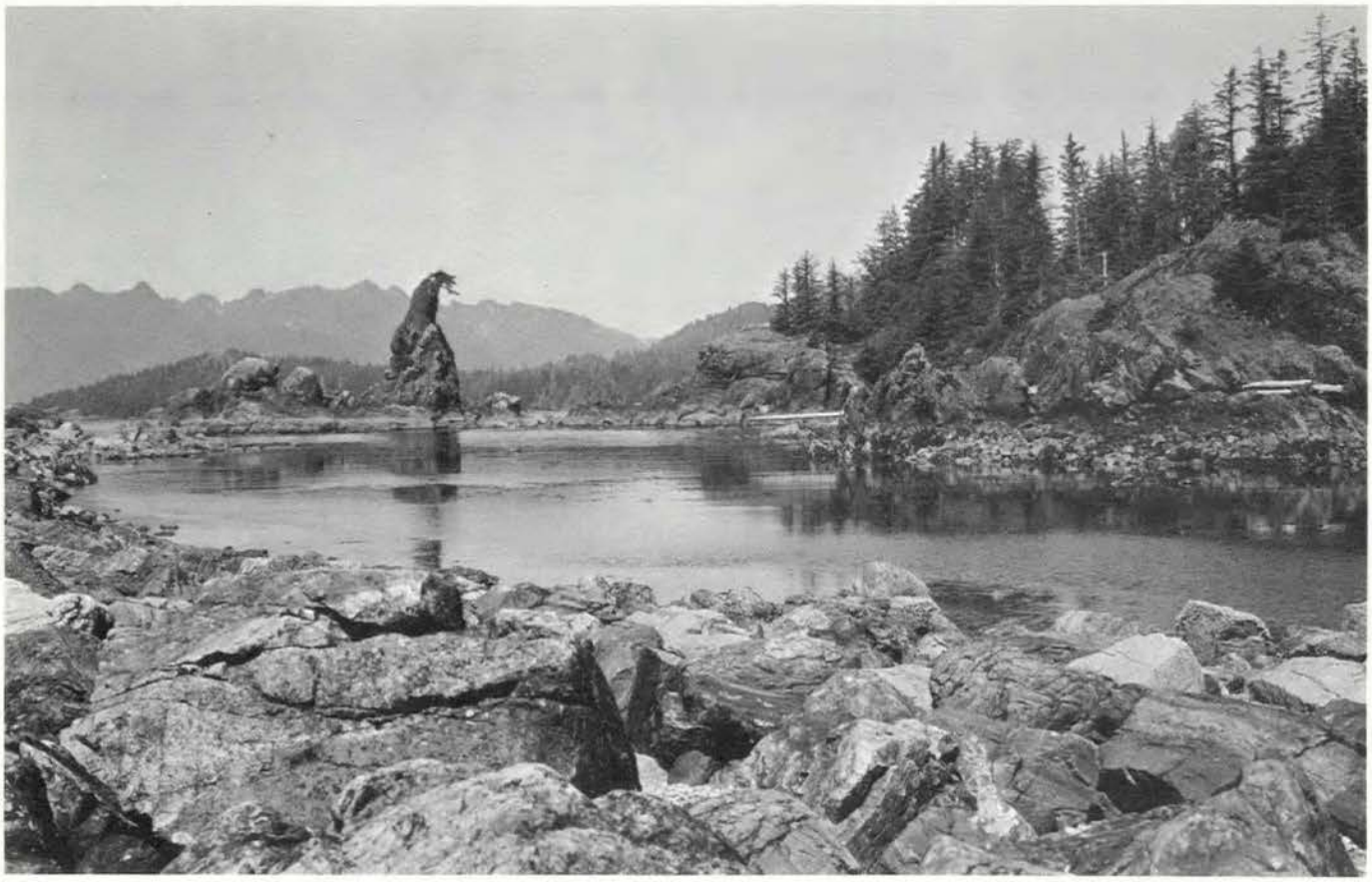
of the Department of Fish and Game, Alaska. Otters for Canada were to be taken from that vicinity, where over 300 animals had been seen during a recent air reconnaissance. They were to be caught by salmon gillnets of 8 inch nylon mesh, 50 fathoms long. The normal lead-line was replaced with rope so that the mesh could hang loosely in the water, entangling an otter but allowing it to float at the surface and breathe without difficulty.

As feeding occurs after sunrise, most animals were caught in the nets at this time or shortly before dusk. Periodic visits were made by workboats to the various sets and any entangled otter was lifted out by a three-man crew, cautiously cut free and eased into a plywood crate. There was only a hissing complaint at this process but no doubt whatsoever that a severed finger would follow careless handling.

Adult male sea otters measure up to 58 inches from snout to tail tip and weigh 100 pounds, - over three times the weight of the land or river otter *(Lutra canadensis).* The female sea otter is slightly smaller than the male and both eat approximately 20% of their body weight per day in mussels, sea-urchins, octopus and a variety of other benthic invertebrates. Fish are also an important source of food but commercial fishermen need not worry. The sea otter is poorly adapted for the capture of fast swimmers and is content with small, slow-moving species such as sculpins and lumpsuckers.

The habitat of the sea otter is confined to a narrow coastal zone in usually less than 15 fathoms, and where reefs, islands and promontories break up a shoreline. They seem reluctant to

Release area for re-introduced sea otters, Bunsby Islands, Checleset Bay, Vancouver Island.



move across bodies of deep water and are seldom seen in more than 30 fathoms. They choose to make repeated dives of about one minute to pick up whatever takes their fancy and bring it to the surface. Unlike seals that gulp their prey with swift appreciation, the sea otter floats on its back, lays the food on its chest and dines at leisure. With dextrous forepaws and crushing teeth it has no problem with most items, and by using a rock as an anvil or by hamering one shell against another it deals effectively with the larger molluscs.

Method of capture

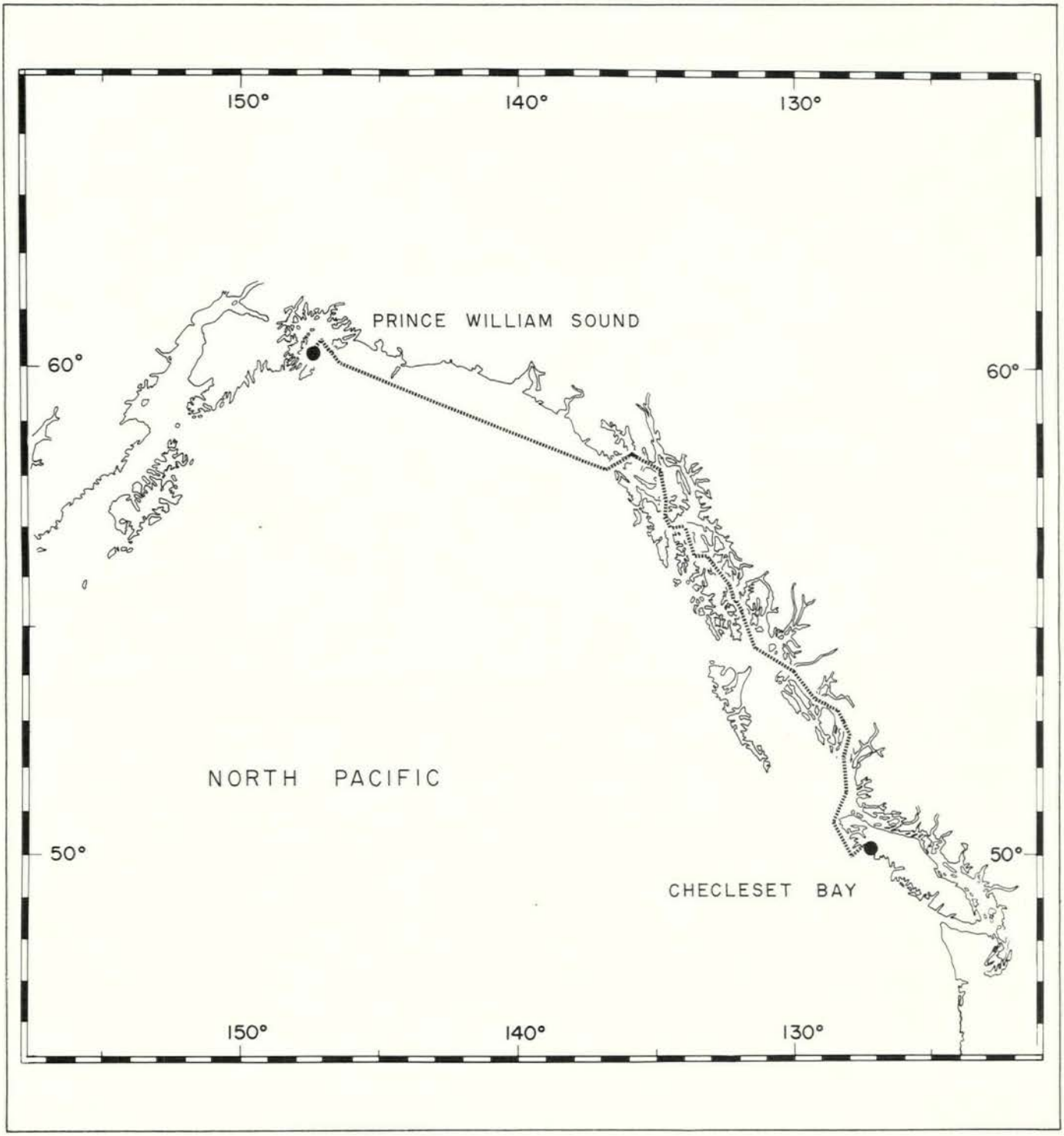
Nets were set near favoured kelp beds within two miles of the *G.B. Reed*, and captured otters were ferried back, weighed, sexed and released within the tank enclosure. A single pup was lost by drowning and forty-five animals were transferred to the ship between 18-21 July. Upon release each would rapidly examine the tanks, diving from one to another. They made only tentative efforts to escape and displayed little aggression towards each other. They soon became used to our movements around the enclosure, staring at us with more curiosity than concern.

The Fish and Wildlife Branch had provided several thousand pounds of cod fillets and squid and these were readily eaten. Vigorous grooming procedures followed, and though one or two animals shivered occasionally there seemed reason for confidence in an uneventful return to Vancouver Island.

Violent storm

Nets were pulled, workboats stowed away, and the *G.B. Reed* sailed north-

Chart showing return route of the *G.B. Reed* from Alaska to Vancouver Island, July 1970



wards along the lee shore of Montague Island before turning south for home. We had enjoyed generally fair weather while capturing the animals and the 3,000-foot mountains of Montague had stood between us and the open Pacific. Once away from their protection we ran into a violent storm. Winds gusted to 50 knots and heavy rain and rough seas disturbed the otters. They became very restless, climbing in and out of the tanks with exhausting persistence.

We gained shelter at Port Etches late at night and dropped anchor not far from Nuchek, the site of one of the first Russian trading settlements in Alaska, and where, presumably, dead otters had once been a common and pleasing sight. For us it was different. We removed three from the tanks and noticed many others shivering.

The *G.B. Reed* crossed the Gulf on 22-23 July and arrived at Cape Spencer with the number of otters reduced to thirty. Despite taking the smooth passage past the numerous islands of Southeast Alaska, the numbers were further reduced to fourteen. These appeared entirely healthy, either floating buoyantly or hauled out to dry themselves and revealing the incomparable richness of their fur.

Checleset Bay on the West Coast of Vancouver Island had been carefully chosen as the site for release. It is relatively isolated, and offers an abundance of requisite foods in 85 square miles of shallow, reef-strewn waters. With many islands to provide shelter from heavy seas, the area is considered ideal habitat. Given freedom from oil pollution or human harassment the six males and eight females set free should find the place agreeable.

It cannot be said that the voyage was an unqualified success. There are still factors contributing to the mortalities that are not fully understood, but lessons were learned that should be of value to any future transplants. Meanwhile, the small numbers brought back to Canada must be protected.

R. F. Shaw named Deputy Minister of Environment

R.F. Shaw

Dr. A.W.H. Needler

The Government's intention to appoint Robert F. Shaw, of Montreal, as Deputy Minister of Environment, was announced January 6, 1971, by Prime Minister Trudeau.

Mr. Shaw took over the responsibilities of Deputy Minister of Fisheries and Forestry from Dr. A. W. H. Needler on March 1. He will assume the title of Deputy Minister of Environment when the new department is established under the proposed government re-organization.

Dr. Needler, who retired from the Public Service a few months in advance of his 65th birthday, had served as Deputy Minister of Fisheries since 1963.

The Prime Minister expressed warm appreciation for the services Dr. Needler had provided to the fishing industry of Canada over many years, in the course of which he has become recognized as one of the outstanding figures in international efforts to manage and conserve the fisheries of the world on a rational and planned basis. Mr. Trudeau said he hoped that the government and the department would be able to call on Dr. Needler for advice and assistance, particularly in this area, in the years ahead.

Mr. Shaw, who was Deputy Commissioner-General of Expo '67, has been Vice-Principal of McGill University since 1968.

Born in Montreal, February 16, 1910, he attended schools in Montreal, Lethbridge, Calgary, Edmonton and Revelstoke, B.C., before attending McGill University where he graduated as a Civil Engineer in 1933. He began learning the construction business as a labourer in 1933 with the Foundation Company of Canada Limited. Later he held a series of executive positions with that company including posts in its design, shipbuilding and engineering branches, and became president of the company in 1962-63.

For a 20-month period in 1951-52, he was on loan to the federal Department of Defence Production as vice-president and chief engineer of the crown-owned Defence Construction (1951) Limited, and as Canadian representative on a NATO engineering team for airfield construction.

In 1963 Mr. Shaw returned to the public service as Deputy Commissioner General and Vice-President of the Canadian Corporation for the 1967 World Exhibition. In the Centennial year he was made a Companion of the Order of Canada. He is a former president of the Canadian Association for Retarded Children and of the Graduate Society of McGill University.

Major Areas Closed Off

Exclusive Fisheries Zones Proclaimed by Canada

Canada has proclaimed "fisheries closing lines" designating major areas on both its east and west coasts as exclusive Canadian fisheries zones. The areas affected are the Gulf of St. Lawrence and the Bay of Fundy on the Atlantic coast, and Queen Charlotte Sound and Dixon Entrance-Hecate Strait on the Pacific.

The closing lines came into effect March 10, following the expiration of the mandatory 60-day waiting period imposed by the amended Territorial Sea and Fishing Zones Act.

Effects of this action will be to assert Canadian jurisdiction over fisheries conservation and management in an additional 80,000 square miles of coastal waters, and to extend to these waters the effective range of Canada's anti-pollution programs. The Gulf of St. Lawrence has an area of nearly 60,000 square miles, the Bay of Fundy 3,600 square miles, and Dixon Entrance-Hecate Strait and Queen Charlotte Sound, 18,500 square miles.

Canada's territorial sea was extended to twelve miles from three miles by amendments to the Territorial Sea and Fishing Zones Act approved by Parliament June 26, 1970. Provision for the establishment of fisheries closing lines was also contained in these amendments.

The establishment of these exclusive fishing zones will enable the Canadian Government to exercise jurisdiction whereby the important living resources of these waters can be managed and protected for the benefit of Canadian fishermen. Anti-pollution provisions of the Fisheries Act will be applied within the closing line limits of the new fishing zones, thus adding new scope to Canada's efforts to preserve and improve the environment. Proposed anti-pollution provisions of the Canada Shipping Act are also intended to be applied within the fishing zones.

Along sections of Canada's Atlantic and Pacific coasts where straight baselines were established in previous years, Canada's exclusive fisheries jurisdiction extends to the outer limit of Canada's 12-mile territorial sea as measured from these straight baselines.

Fisheries closing lines are to be drawn in the following areas:

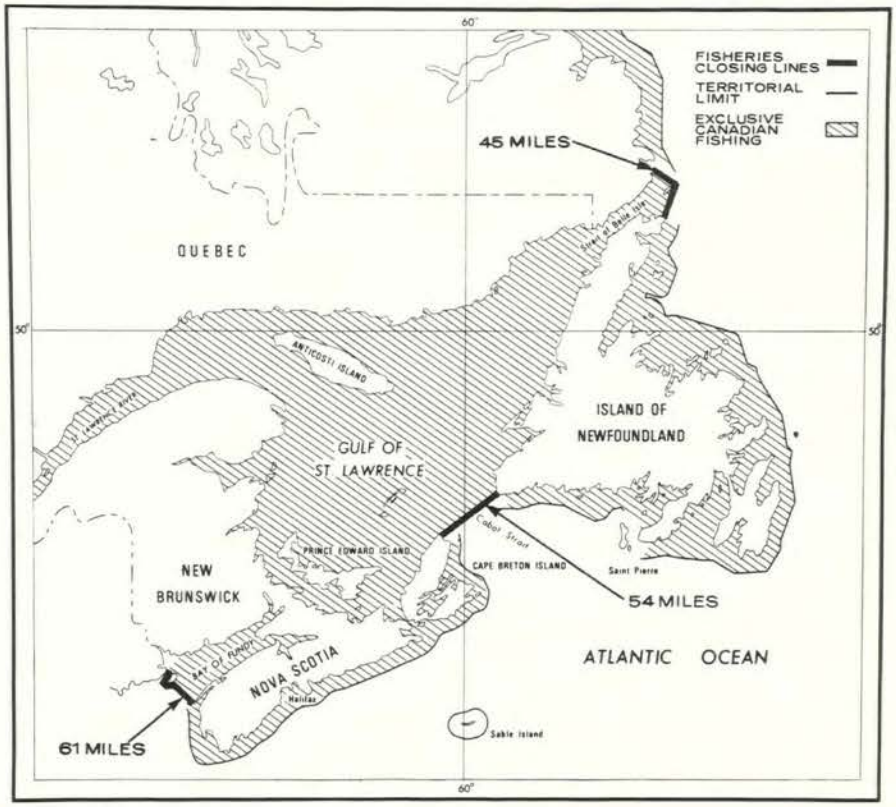
1. **Gulf of St. Lawrence**

(A) Across Cabot Strait a total distance of 54 miles extending from Money Point on Cape North, N.S., to St. Paul Island, N.S., to Cape Ray, Nfld.

(B) Across the Strait of Belle Isle a total distance of 45 miles from Eastern White Island, Nfld., to Northeast Ledge off Belle Isle, to Double Island, Labrador.

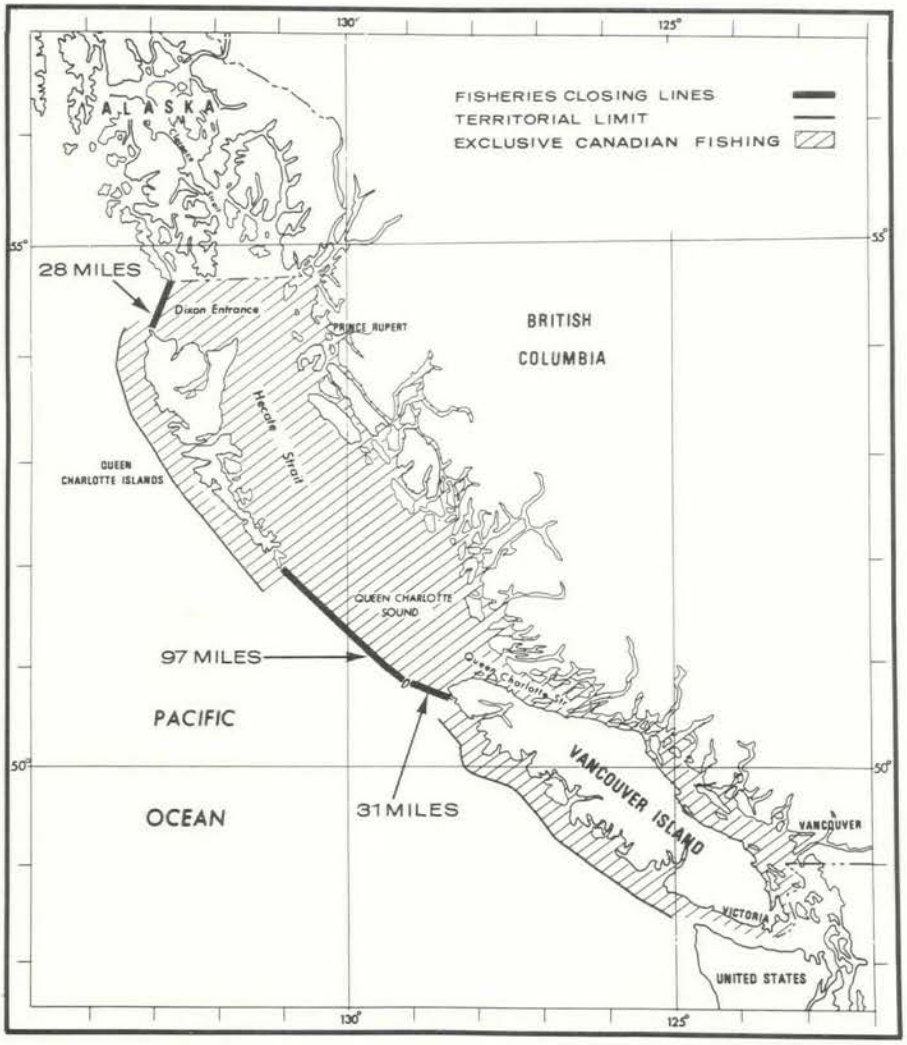
2. **Bay of Fundy**

From Whipple Point, N.S., a distance of 23 miles to Gannet Rock, then a distance of 38 miles to Yellow Ledge, Machias Seal Island and North Rock, and thence along Grand Manan Island to the Canada-



United States boundary in Grand Manan Channel.

3. **Dixon Entrance-Hecate Strait**
   Across Dixon Entrance a distance of 28 miles from Langara Island (Queen Charlotte Islands) to point A of the A-B Line off Cape Muzon, Alaska.
4. **Queen Charlotte Sound**
   From Winifred Island (Vancouver Island) to Beresford Islands, Sartine Islands and Triangle Island - a distance of 31 miles - and thence a further 97 miles to the Kerouard Islands and Kunglit Island (Queen Charlotte Island).



Bold new concept

Fisheries closing lines represent a bold new concept which is being pioneered by Canada. The concept has been developed by analogy with the system of straight headland-to-headland baselines for the measurement of territorial sea limits in areas where coasts are heavily indented or where there is a fringe of islands along the coast.

There are, however, important differences between straight baselines and fisheries closing lines. Straight baselines. on the one hand, are lines from which the breadth of the territorial sea is measured, and the areas enclosed within the baselines have the status of internal waters. The fisheries closing lines, on the other hand, relate only to fisheries jurisdiction in the area enclosed by the lines.

Accordingly, the fisheries closing lines allow Canada to separate fisheries jurisdiction from the complete sovereignty which states enjoy in their territorial and internal waters, without prejudice, however, to Canada's claims to full sovereignty over any of the areas concerned.

On July 15, 1964, Canada enacted the Territorial Sea and Fishing Zones Act which had as its main purpose the creation, beyond the then existing three-mile territorial sea, of a nine-mile contiguous fishing zone. Provision was made in the legislation to enable the Governor in Council to issue geographical co-ordinates of points from which baselines might be determined. The intention was to substitute straight baselines instead of the sinuosities of the coastline for drawing the territorial sea and fishing zone limits. The baseline principle had the effect of extending the coastal state's area of jurisdiction and fisheries control.

Subsequently, baselines and limits were established for areas of the coast of Newfoundland and Labrador, Nova Scotia, and British Columbia.

Twelve-Mile Limit

Amendments to the Territorial Sea and Fishing Zone Act approved by Parliament last June had the effect of

replacing the three-mile territorial sea and nine-mile exclusive fishing zone by a twelve-mile territorial sea. Canada thereby was following in the lead of some 50 maritime states claiming a territorial sea of 12 miles or more.

The special areas to be enclosed by fisheries closing lines are important fishing zones for Canada. The Gulf of St. Lawrence has had landings of up to 550 million pounds of fish and shellfish valued at $31 million. The Bay of Fundy's landings of 300 million pounds are worth $12 million, while the Pacific coast area contained within Dixon Entrance and Queen Charlotte Sound has landings of 180 million pounds, worth $37 million.

As indicated by the Secretary of State for External Affairs and the Minister of Fisheries and Forestry when introducing the amendments to the Territorial Sea and Fishing Zones Act in April of 1970, the Government intends to complete negotiations for the phasing out of the fishing activities of the countries which have traditionally fished in the areas to be enclosed within fisheries closing lines. These countries are the United Kingdom, Norway, Denmark, France, Portugal, Spain and Italy.

Canada earlier this year concluded an Agreement on Reciprocal Fishing Privileges with the United States, whereby the activities of United States fishermen in the areas concerned will not be affected by the promulgation of the fisheries closing lines. The United States and France also have certain treaty rights in specific areas off Canada's east coast.

Canada will in the meantime continue to work toward international action through a new Law of the Sea Conference on recognition of the special interests of coastal states relating to the continental shelf and high seas fisheries.

Scientists Urge Global Action on Pollution

The early launching of basic pollution studies in the North Sea, Baltic and Puget Sound in North America as a prelude to global action has been strongly urged by a group of marine scientists meeting in Rome.

The scientists, representing six intergovernmental agencies and the United Nations, are elaborating the scientific aspects of a world-wide program for monitoring and controlling marine pollution.

The scientists agreed that, given the existing technical know-how, the time was ripe for baseline studies of the effects of pollutants on marine life and man in the North and Baltic Seas and in Puget Sound, three areas with distinct marine characteristics. Puget Sound, lying between western Canada and the United States, is not highly polluted and offers the opportunity to study changes in water quality.

Since up to two years are required to initiate actual monitoring, action to launch the studies as soon as possible was recommended. The studies should be carried out by marine laboratories and research vessels in countries bordering the three areas including – for the North Sea and Baltic – the Federal and the Democratic Republics of Germany, Finland and the USSR. The world-wide study would be coordinated by the Intergovernmental Oceanographic Commission in Paris.

It was suggested that the studies should cover petroleum, DDT, mercury and other chemical and metallic pollutants, and their way of entry into the marine environment, including through atmospheric fall-out. A report received by the meeting estimated that 150,000 tons of lead and an equal amount of DDT found their way into the oceans each year through precipitation.

Another report submitted to the meeting noted that progress was being made in the development of devices and techniques for dealing with oil spills on the seas. One such device consists of a V-shaped boom with arms 120 meters long which aircraft can drop around a slick. It collects the spill in the apex of the V, keeping it from spreading.

At least three chemicals have been developed for dispersing spills with a minimum of toxicity, it was said. In the United Kingdom, 60 sets of a specially designed dispersal equipment have been distributed for use in dealing with spills.

The meeting, the third of its kind, brought together 20 experts in the marine sciences from Canada, France, Federal Republic of Germany, Italy, Japan, Netherlands, Norway, United Kingdom, United States and USSR, sitting in their personal capacities. Observers from other international agencies also attended.

Dr. M. Waldichuk, of the Fisheries Research Board of Canada, was re-elected chairman of the group for its coming session in 1972.

Noel Pauls Brook Spawning Channel Boosting Stock of Atlantic Salmon

BY ED QUIGLEY

For many years it has been known that the survival rate of salmon and trout from the newly deposited egg stage to the fry emergence stage is extremely low under natural conditions.

Biologists have measured this survival under varying conditions and at many different locations. All species of Atlantic salmon, Pacific salmon, and trout have been studied and the results have shown a wide range of survival rate - from less than 1% up to more than 90% of the eggs deposited. However, the average has been around 10%

In an effort to improve the survival rate, biologists of the Department of Fisheries and Forestry sought a method which would not only increase survival to the fry stage, but would also produce fry which would have greater survival to the adult stage. A natural avenue to explore was the possibility of improving spawning grounds to increase survival.

This led to the introduction of artificial spawning channels, or testing grounds for salmon management techniques.

There are several artificial spawning channels in operation in Canada today. One of these is located on Noel Pauls Brook in Central Newfoundland. This particular channel has demonstrated an impressive record of achievement in its four years of operation, particularly during the last two years.

Anticipated Yield

A yield of more than 300,000 Atlantic salmon fry is anticipated in 1971 from the Noel Pauls Brook spawning channel. Last year 260 adult Atlantic salmon spawners were transferred to the channel by a specially designed fish transfer truck. These spawners are expected to produce an estimated 350,000 fry to stock the Exploits River, of which Noel Pauls Brook is a major tributary.

The Exploits River drainage constitutes the single largest potential for Atlantic salmon on the Island of Newfoundland. Only about 20 per cent of its 4,400 square mile drainage is now accessible for salmon. Biological and engineering studies have been carried out by the Resource Development Branch of the Department of Fisheries and Forestry for several years to determine the best approach for using the remaining untapped salmon potential.

The Exploits River is basically divided into three parts by two obstructions to fish migration located on the river. Salmon accessibility currently extends inland as far as the town of Grand Falls. The present salmon development program is directed toward the establishment of sea-run salmon in the 1,400 square miles of drainage between Grand Falls and an impassable dam at the outlet of Red Indian Lake. As successful salmon populations are developed in that area, the program may be continued to include development of the significant salmon

(LEFT) Aerial view of Noel Pauls Brook salmon spawning channel, looking upstream

(UPPER) This dam near Grand Falls is one of two main obstructions to fish movements on the Exploits River, Newfoundland.

(LOWER) Tagging Atlantic salmon smolt

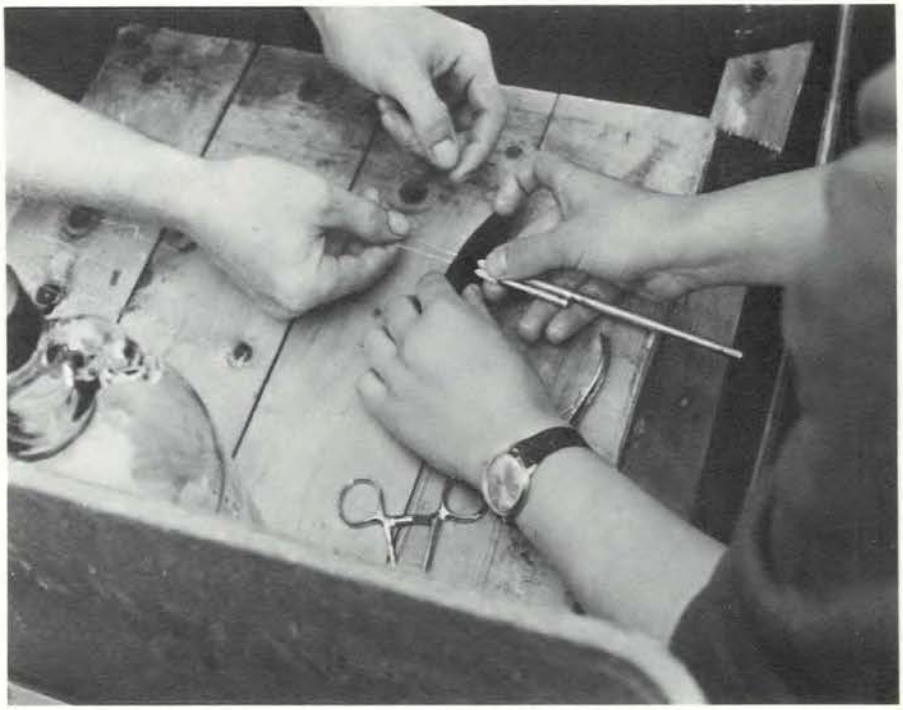
potential located above Red Indian Lake.

The Noel Pauls Brook artificial spawning channel was constructed in time to receive its first stocking with brood fish in 1967. Since that year Atlantic salmon spawners have been transferred by a specially designed tank truck to the channel site. During the three years 1967-1969 most of the transferred fish weighed from 2.5 to 3.5 pounds and were in their fifth or sixth year of life. The condition of fish in the channel was excellent and few mortalities were recorded during channel residence.

The egg to fry survival rate for naturally spawned eggs deposited in the Noel Pauls Brook channel increased from 53% in 1968 to 60% in 1969 to 71% in 1970.

The 900-foot long channel contains three holding pools in which the adults remain until spawing time which commences in mid-October and continues into November. After spawning, the spent adult salmon are released into the brook.

The Department's Resource Development Branch started development of the Exploits River system for Atlantic Salmon in 1956. During the period 1956 to 1964 Great Rattling Brook, a large tributary of the Exploits below Grand Falls and location of one of the two major barriers on the river system, was made accessible to salmon through construction of fishways and by stream clearance. At the same time an entire stock of salmon was successfully transferred into Great Rattling Brook from Rattling Brook, a Bay of



Exploits stream which was endangered by hydropower development.

While development proceeded in the lower Exploits River, further investigations were conducted to determine the possibility of developing the Exploits' tributaries above the Grand Falls obstruction but below the barrier or dam on Red Indian Lake. These investigations revealed that four additional potentially productive salmon streams could be stocked if the obstruction at Grand Falls and on certain tributaries were removed.

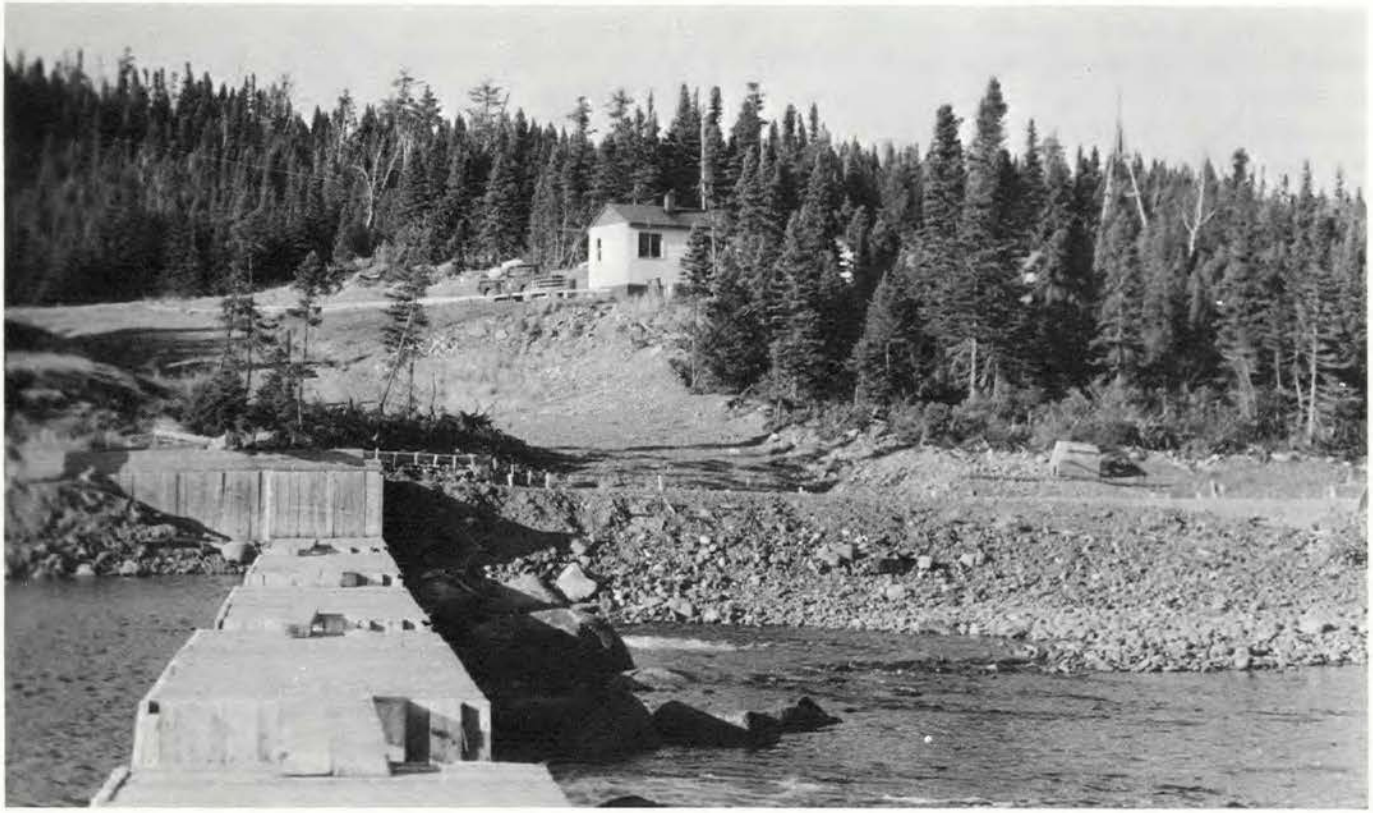
It is felt provision of fish facilities at Red Indian Lake dam would provide access for Atlantic salmon to about one-half of the Exploits River tributaries draining into Red Indian Lake.

From 1960 to 1964, Resource Development Branch personnel conducted engineering and biological investigations on a partial obstruction to adult salmon movements located near the town of Bishop's Falls and on the barrier at Grand Falls and Red Indian Lake. The engineering surveys showed that extensive fishways would be necessary to allow spawners to move above Grand Falls and that, under certain river flow conditions, passage of salmon could be difficult at Bishop's Falls.

The Noel Pauls Brook channel is one of two salmon spawning channels being operated by the Department of Fisheries and Forestry in Newfoundland. The other is located on Indian River, a productive salmon stream. Completed in 1963, the 1100-foot long channel replaces salmon nursery grounds lost to hydro development, thereby helping to preserve a valuable sports and commercial fishery.

The design of the Indian River spawning channel was fashioned after similar projects established earlier by Resource Development personnel in British Columbia.

(LOWER) Spillway dam on Noel Pauls Brook, showing the Resource Development Branch base camp in the background.



St. Pierre and Miquelon

Do Recent Developments on the Islands Pose Threat to East Coast Fishing Industry?

The following report was prepared by A. Proulx, Economics Branch, and Jean Frechet, Industrial Development Branch, of the Department of Fisheries and Forestry, following a recent visit to the islands of St. Pierre and Miquelon.

The islands of St. Pierre and Miquelon located off the south shore of Newfoundland are populated by some 5,000 persons, most of them living in the town of St. Pierre. The economy of the islands is based mainly on the fishing industry, tourism, the activity created by the port, and the recently introduced quarantine for Charolais cattle imported from France and destined for Canada and the United States.

Administration of the islands is by an executive body made up of the Governor and his staff, metropolitan Frenchmen appointed by the French government, and by a 14-member General Council elected by the people. A representative to the French National Assembly and one senator are also elected by the people of the islands. The territory can only balance its budget by grants received from the French government, which amount to a few million dollars a year.

The following notes summarize the current situation of the fishing industry and of the harbour development. Further possible developments are indicated and the effects of these developments on the Canadian fishing industry and on the main ports of the Atlantic Coast are discussed.

Fishing Industry

The fishing industry is based almost exclusively on the exploitation of groundfish. In 1969, 67 inshore boats were fishing out of St. Pierre and Miquelon - 39 out of St. Pierre and 28 out of Miquelon. These boats are dories manned by two men fishing with hand lines. These 67 boats landed 3.2 million pounds of fish - 1.8 million at St. Pierre and 1.4 million at Miquelon. The fish landed at St. Pierre is sold at the only processing plant on the islands, owned by the Société de pêche et de congélation (SPEC). Fish landed at Miquelon is usually cured by fishermen. The number of inshore fishing boats has been declining over the years; 120 in 1962, 87 in 1965, 67 in 1969 and about 60 in 1970.

In addition, three trawlers (about 120 feet long) operate out of St. Pierre and land their catch at the SPEC plant. They land between 12 and 15 million pounds a year and provide employment to approximately 45 men. There is a possibility of a fourth vessel being added to the fleet.

The SPEC plant is owned by a "société mixte" i.e. a firm in which both the state and the private industry have financial interests. In this particular case, the state owns more than 50 per cent of the share.

Table 1 – Number of Visits made by Vessels at St. Pierre 1969

	Fishing Trawler	Cargo	Oil Tanker	All Others	Total
France	3	–	–	9	12
Spain	545	–	–	–	545
Poland	20	–	–	–	20
Greece	–	2	–	–	2
Canada	25	47	58	66	196
Yugoslavia	–	6	–	–	6
Sweden	–	3	–	–	3
Panama	–	3	–	–	3
Denmark	12	13	–	–	25
Japan	7	3	–	–	10
Norway	8	4	–	–	12
Finland	–	2	–	–	2
Russia	2	1	1	2	6
Germany	107	13	–	1	121
Israel	1	–	–	–	1
United States	5	–	–	6	11
Holland	–	19	–	–	19
St. Pierre	87	–	–	–	87
Totals	**822**	**116**	**59**	**84**	**1081**

Note: Detailed figures are not available for 1968 but the total number of visits made in that year was 1,228.

The plant, which employs about 75 persons, was built a number of years ago as a warehouse and is three stories high. It is located at the entrance of the harbour, about one mile from the old port. The wharves serving the plant are completely unprotected from the east and northeast winds.

The annual output of the plant is about 4 million pounds of finished products, mostly cod, flounders and redfish frozen fillets in block or in 5-lb packages. Offal and trimmings are used in the production of fish meal. The capacity of the plant is greater than the actual volume of production but, according to the management, it would be difficult to increase the output mainly because of the scarcity of labour.

The plant production costs seem to be quite high. According to management, the current U.S. price for cod blocks (29 cents) is not sufficient to allow a profit.

Most of the production is exported to the United States. In 1969, U.S. imports from St. Pierre amounted to 3.1 million pounds of groundfish fillets and blocks - 2.2 million pounds of fillets and 0.9 million pounds of blocks.

The harbour

The harbour as it existed prior to the developments which took place during the last six or seven years and now referred to as the "old port" provides limited berthing space. The length of berths is approximately 900 feet with water depth varying from 12 to 20 feet. Access is limited, however, by the depth of the narrow entrance channel - approximately 13 feet.

Improvements to the various facilities which started in 1963 consisted essentially in the creation of a new port to the north east of the old one. The facilities at the new port consist of:

1) a southeast breakwater, 1300 feet long, providing no mooring facilities;
2) a northeast breakwater about 2,000 feet long, which includes a wharf (môle du commerce) providing 500 feet of mooring facilities at a depth of about 27 feet. Two large storage sheds are built on this wharf.
3) a wharf, called môle du frigorifique, providing in total about 1,050 feet of berthing space - 400 feet with a water depth of 23 feet, 250 feet at 20 feet and 400 feet at 18 feet. The new cold storage plant is located on this wharf.

These three facilities providing in total about 1,500 feet of berthing (about 1/10 of the space available in St. John's Harbour) are located in such a way that, combined with an old breakwater, they more or less enclose a body of water which constitutes the new harbour. That body of water is relatively small; considering that part which is at least 19 feet deep (6 meters) it provides an area of approximately 1,000 feet wide by 1,300 feet long.

The new harbour offers little protection in very bad weather when winds are from east to northeast as the swell goes in the harbour and is reflected from one pier to the other.

A 110-meter (355 feet) vessel is the longest that can enter the port; however this is hardly ever done in bad weather because of the absence of tug boats.

The total vessel tonnage that entered the port in 1968 was 964,000 tons. It increased by 12 per cent in 1969 to 1,079,000 tons.

The number of visits made by all types of vessels in 1968 was 1,228. In 1969, it declined by 12 per cent to 1,081. The details by type of vessels and by country for 1969 are given in the attached table 1, which shows that as far as fishing vessels are concerned, Spain and to a much lesser extent, Germany are the two main countries using the facilities. These two countries, plus the local vessels, account for 90 per cent of the visits made by fishing vessels at St. Pierre in 1969. For purposes of comparison, the number of entries by foreign fishing vessels in Nova Scotia ports is given in the attach-

Table 2 – Number of Entries by Foreign Fishing Vessels in Nova Scotia Ports, by Port, May 1 – December 31, 1969

	Halifax	Sydney	Yarmouth	Shelburne	Totals
Poland	73	–	5	–	78
U.S.S.R.	49	–	1	–	50
Spain	18	3	3	15	39
East Germany	9	12	–	–	21
West Germany	6	9	–	–	15
U.S.A.	5	–	5	2	12
Norway	2	5	3	2	10
Denmark	2	3	–	–	5
Faroes Isl.	3	–	–	–	3
Portugal	–	3	–	–	3
Japan	1	–	–	–	1
Greece	1	–	–	–	1
Romania	1	–	–	–	1
Bulgaria	1	–	–	–	1
	171	35	17	17	240

ed table 2, and supplementary information on the reason for entry in table 3. Table 4 shows the number of visits by foreign fishing vessels in St. John's harbour in 1969.

The Spaniards use the port mainly for taking on supplies, giving a rest to the crews, etc. They are well organized ashore, having their own recreation hall, their own doctors, priests, etc. and are well accepted by the population. Many persons speak the language perfectly. The Germans, as could be expected, are not that well accepted by the local population and use St. Pierre mainly for transhipping their herring catches in late summer and in the fall.

An interesting note is that very few fishing vessels from France (only 3 visits in 1969) use the port. There are no restrictions on the entry of foreign fishing vessels in St. Pierre.

Table 3 – Number of Entries by Foreign Fishing Vessels in Nova Scotia Ports Showing Reason for Entry, May 1 – Dec. 31, 1969

Countries	Number of Entries	Reason for Entry			
		Supplies	Repairs	Landing Seamen (medical assistance)	Refuge from Storm
Poland	78	71	3	4	–
U.S.S.R.	50	30	15	5	–
Spain	39	22	9	8	–
East Germany	21	11	6	4	–
West Germany	15	10	5	–	–
U.S.A.	12	6	4	–	2
Norway	10	6	1	–	3
Denmark	5	3	2	–	–
Faroes Isl.	3	3	–	–	–
Portugal	3	3	–	–	–
Japan	1	1	–	–	–
Greece	1	1	–	–	–
Romania	1	–	1	–	–
Bulgaria	1	–	1	–	–
Totals	**240**	**167**	**47**	**21**	**5**

Cold storage plant

As mentioned above, a large cold storage plant is being built on the "môle du frigorifique". The plant now nearing completion will be engaged in freezing and storing all kinds of products, but mainly fishery products.

The plant itself is owned by the French government but is operated by a newly-formed company, La Société frigorifique de Saint Pierre and Miquelon. This firm, with an authorized capital of one million French francs (approx. $200,000) is owned by a number of French, Dutch and British companies but is controlled with more than 50 per cent of the shares by the Compagnie des Entrepôts et Gares Frigorifiques (CEGF). The latter company, with headquarters in Paris, is part of the Rotschild group and operates a number of large cold storage plants in many European countries (France, Germany, Netherlands, Italy and Great Britain).

The plant includes three large storage rooms with a total capacity of 500,000 cubic feet (approx. 15 million pounds) and two air blast freezing tunnels of 10 to 12 metric tons per day each. Two storage rooms, one of 250,000 cubic feet and the other of 125,000 cubic feet, are being equipped and will be in operation soon, but the third one (also of 125,000 cubic feet) will be equipped later, presumably when conditions warrant it. The freezing tunnels are being equipped but will be put into operation later. A temperature of - 22° F will be maintained in the storage rooms.

The warehouse has been granted the status of "duty free", which means that no duty will be paid on goods brought in for freezing and/or storage and later shipped out of the Island.

The manager of the plant does not expect too many difficulties in attracting European vessels fishing in the Northwest Atlantic to St. Pierre for unloading their fish frozen aboard. It has not been possible, however, to find out whether arrangements have already been made with owners of foreign fishing fleets or what steps are being taken to promote the use of the facilities.

Table 4 – Number of Visits by Foreign Fishing Vessels, St. John's Harbour, 1969

	Number of Visits	Number of Vessels Involved
Portugal	293	65
Spain	211	113
Poland	60	23
France	51	26
U.S.S.R.	43	39
West Germany	17	12
Norway	16	10
Faroes Isl.	16	13
East Germany	12	12
United Kingdom	9	5
Venezuela	8	2
Romania	4	1
U.S.A.	1	1
	743	**324**

Services available

All new wharves are provided with outlets for fuel and water. Fuel purchased in Canada is in good supply and the storage facilities are adequate to meet the current demand. Water is

available from the numerous ponds on the island and although it is coloured it is in good supply.

Very little food is produced locally and practically all food supplies are imported, largely from Canada.

Facilities for repairs are limited. A slipway built a few years ago is over a hundred feet long and has a capacity of 500 tons. However, having been built at the head of the harbour, it cannot be used by vessels having a draft of more than six feet.

The facilities offered besides the slipway are limited. There are some welding and machine shop facilities available but no major repair work can be undertaken. Spare parts for mechanical repairs and for electronic equipment are in very limited supply. It is understood that skilled labour capable of doing these repairs is not available on the island.

It was reported that harbour workers are few in number and are very inefficient in handling any type of cargo.

Further Development

It was difficult to obtain precise information on what the authorities plan to do to further develop the harbour and the fishing industry. The reason given was that the preparation of the Sixth Plan (which begins in 1971) was still in progress. The local authorities had not yet finalized their plans which must be approved by the metropolitan government. Therefore, what follows has to be considered as tentative.

With regard to the fishing industry, mention was made of the possibility of building a processing plant adjacent to the cold storage plant. It would be an integrated plant with its own fleet of trawlers and marketing facilities in competition with the established firm (SPEC). This was one of the proposals put forward in 1963 or 1964 by a committee formed to study the possibilities of development of the fishery at St. Pierre. The idea was then rejected by the authorities who decided to build a new cold storage plant to serve the European fishing fleets. It remains to be seen whether the proposal will be accepted this time. One of the factors motivating against this proposal is the serious shortage of labour both for the processing plant and the fishing vessels.

It has been proposed that a new wharf will be added in the next few years. It would be one of over 600 feet in length with a depth alongside of 28 feet. It is not known where it would be located.

Services available to fishing fleets are likely to be expanded. Mention was made of the construction of a slipway capable of handling a vessel displacing 1,500 tons. This would be equivalent to a trawler of over 200 feet. Adjoining the slipway a repair shop would be built where major repairs could be undertaken. A store for parts would also be added. It is not known when these facilities would be built but presumably if these projects are approved, the construction would extend over a few years.

General Remarks

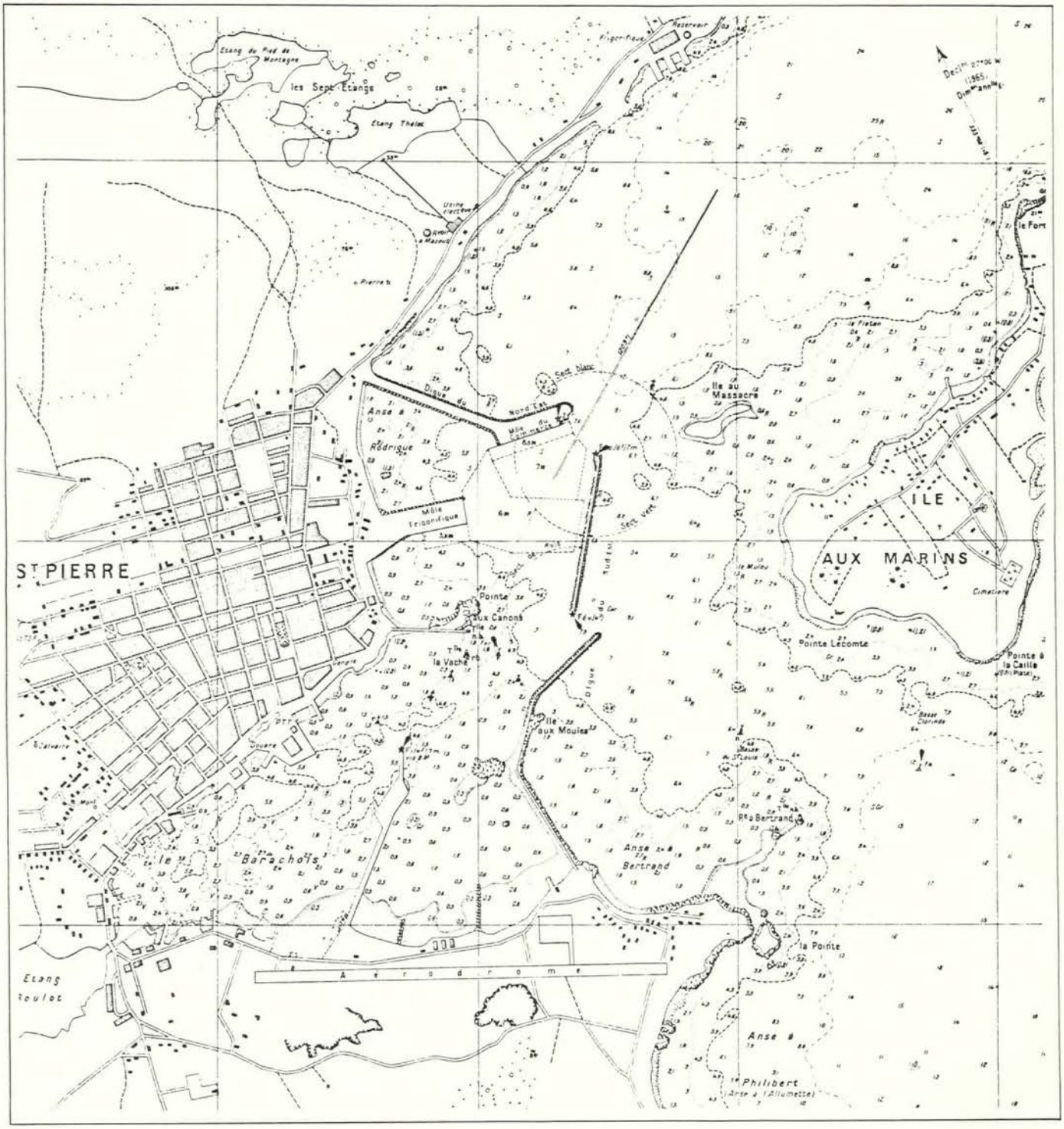
The development of harbour facilities in St. Pierre can be viewed by Canadian eyes from two angles - the effect that the use of these facilities may have on fishing operations of foreign fleets off the Canadian coast and the competition that the facilities may offer for Canadian ports, especially St. John's and Halifax, in the servicing of foreign fishing fleets.

Construction of the new wharves and breakwaters a few years ago does not appear to have resulted in a larger number of vessels visiting the port, although the vessels are of a larger size. As mentioned earlier, the number of entries of vessels (all types) in 1969 (1,081) was 12 per cent less than in the previous year. No exact figures are available on the number of entries prior to the construction of these new facilities but a source indicated that in the early sixties they varied between 1,000 and 1,200.

The existence of the cold storage plant at St. Pierre could possibly contribute to an increase of fishing intensity by foreign fleets in the Northwest Atlantic by making their operations more convenient and possibly less costly. Freezer-trawlers from Western European countries could bring their products to St. Pierre for storage and for later shipment to Europe by cargo, thus allowing them more time for fishing. This presumably would make their operations more profitable. West Germany and, to a lesser extent, the United Kingdom are the two main West European countries with freezer-trawlers operating in the ICNAF area. The others (Portugal, Spain and France) are mainly or exclusively engaged in saltfish operations although they could possibly switch gradually to "fresh" fishing.

The Eastern European countries are very well organized and with their mothership operations seem to be quite independent of shore-based installations. Whether it would be to their advantage to use the cold storage facilities for transhipment instead of transhipping at sea is impossible to say. It is worth noting here that the two main Eastern European countries fishing in Northwest Atlantic - U.S.S.R. and Poland - have agreements with the United States whereby in return for abstaining from fishing certain species in certain areas at certain times of the year they are allowed to use (except during the summer) a few areas along the mid-Atlantic coast within the 9-mile contiguous fishing zone of the United States for unloading and transferring their catch. The two governments provide for entry of a certain number of fishing and supply ships into certain ports of the other country. Under the U.S. - Polish Fisheries Agreement, signed recently, the "U.S. facilitation of entry by Polish Fisheries

The port of St. Pierre



vessels into certain U.S. ports was broadened" (Press Release, Department of State, June 13, 1970).

There is no doubt that St. Pierre offers some degree of competition to the Newfoundland and Nova Scotia ports, mainly St. John's and Halifax, in the provision of food, fuel and water to foreign fishing fleets. It is possible that the competition could increase if the facilities now in the planning stage are added. The existence of this competition should allow the fleets to obtain the best services at the best possible conditions. It does not necessarily follow, however that all the foreign fleets would divert to St. Pierre even if conditions were slightly more advantageous there. Tradition is strong and it is doubtful that the Portuguese, for example, would leave St. John's easily for St. Pierre. Moreover the areas where the fleets are fishing constitute an important consideration in their choice of ports. The fleets fishing on Georges Bank or off the Nova Scotia coast, for example, would rather go to Halifax than to St. Pierre. Finally, the size of the port of St. Pierre would not permit all the foreign vessels fishing off the Canadian Atlantic coast to be serviced at that port. In 1969, 822 visits were made to St. Pierre by fishing vessels and at times (in the summer and in the fall) the traffic was very heavy. It seems doubtful that the number of visits could be multiplied by 2 or 3 times and that circulation would still be possible in the harbour. It would appear, therefore, that there is room for more than one port for the servicing of foreign vessels fishing off the Canadian Atlantic coast.

Announce New Policy to Rehabilitate Atlantic Salmon Fishery

Under a new Atlantic Salmon policy outlined by Fisheries and Forestry Minister Jack Davis, only bona fide commercial fishermen will be allowed to take salmon in 1972 and no new entrants will be allowed into the industry until runs begin to improve. Also further restrictions on angling must be considered particularly on the Miramichi River in New Brunswick.

"Once the Atlantic salmon fishery has been stabilized, I will be in a better position to urge the federal government to spend large sums of money on hatcheries and improved river conditions for spawning", Mr. Davis said. "Rationalization of our own commercial and sports fishery, together with the elimination of the taking of Canadian salmon by foreign fishermen on the high seas are essential to the revival of this great East Coast industry.

"In order to put the Atlantic salmon fishery back on its feet", Mr. Davis said, "we must do three things. We must negotiate with the Danes with a view to reducing their take off Greenland. We must cut down on pollution in our own Canadian salmon rivers. And we must make sure that our own fishermen, both commercial and sports, let enough salmon return to our spawning grounds to build up the Atlantic salmon population once more."

The Minister added that "Canada must trim its own salmon fishery down to a manageable size. We have too many fishermen and too much gear chasing too few salmon. Few commercial fishermen can make a decent living as things stand now.

"In order to trim our fishing effort back we will have to get rid of the moonlighters. Only those commercial fishermen who earn their livelihood principally by fishing will be retained in the salmon fishery. Those who have full-time jobs in other industries are now being given twelve months' notice. Only 'bona fide' fishermen will be allowed to take Atlantic salmon commercially from 1972 onwards."

The following conditions will apply

(1) No new additional licences will be issued;
(2) Existing licences will be non-transferable, except that a current licence holder may still transfer his licence to a son or son-in-law. This, however, is a terminal transfer and cannot be handed down to another generation.
(3) A commercial salmon fisherman need not fish salmon every year, but he must renew the salmon licence annually to retain it.
(4) Beginning next year (i.e. beginning in the spring of 1972) individuals who are regularly employed in an industry other than fishing will lose their commercial salmon fishing privilege;
(5) Licence Appeal Committees will be set up in each region to review individual cases where extenuating circumstances exist.

Consideration will be given to providing compensation for gear and equipment owned by commercial fishermen who lose their licences in 1972 because they are regularly employed in another industry or occupation.

Fisheries Minister Davis is to visit Copenhagen early in June for meetings with the Danish Fisheries Minister and government in an effort to secure a reduction in the Danish high seas salmon fishery off Greenland.

Fisheries Research Pays Off

4,120-mile Salmon-packing Trip Tests 'Partial Freezing' System

A bold experiment in salmon packing, involving a new system known as "partial freezing" developed by scientists of the Fisheries Research Board of Canada, has paid handsome dividends in British Columbia.

The venture involved four chilled-brine boats owned by B.C. Packers and two owned by the Canadian Fishing Company which last summer were sent on what is believed to be the longest salmon-packing trip on record – 4,120 miles to Bristol Bay and back. The six boats packed a total of 400,000 Bristol Bay sockeye to Prince Rupert and Steveston, landing almost all in perfect condition.

The 29,000 cases of sockeye went on the market in early August, giving the two canners an early start on the selling season. Wholesale value of the pack was about $1,300,000.

Held at 25 Degrees

The fish were held in salt-reinforced seawater at 25 degrees fahrenheit, using a system developed at the Vancouver Technological Station of the Fisheries Research Board. Mainly involved in the project were the station's chief of biochemistry, Dr. Neil Tomlinson, and research engineer Stewart Roach. Although laboratory tests had been conducted earlier, there had been no opportunity for a full-scale commercial test until last summer.

The FRB scientists afterwards described the operation as "an unqualified success", stating that between 75 and 80 per cent of the pack was Grade A fish.

Mr. Roach explained that a big advantage of the system is that it can be put into operation with present RSW equipment. "Brine freezing is very efficient – in fact no other system can be loaded as fast" he said. "We can literally put the fish in as fast as they can be put aboard".

The scientists are looking forward to another large scale operation using partial freezing, and in the meantime have been working on improving the brine circulation system to give more efficient cooling.

12 Years of Research

The principle of storing and transporting salmon in refrigerated sea water has been researched and developed over a 12-year period at the Vancouver technological station.

Under the normal RSW system, fish are chilled to 31 degrees F. in storage tanks aboard the packers. This is an ideal method of rapidly chilling and holding salmon for short periods up to seven days. With the new system of "partial freezing", fish can be stored safely for up to 17 days.

Mr. Roach said the term "partial freezing" is used because fish flesh does not freeze at a fixed temperature like water. The water in the salmon's flesh (salmon is 64 per cent water) is frozen out and the remaining fluids are concentrated so that their freezing point is lowered. Thus, although the salmon become firm at 29 degrees, they are still only about two-thirds frozen even at 25 degrees. But at the lower temperature spoilage caused by bacteria practically ceases.

The big Bristol Bay salmon run off Alaska occurs every five years and in its prime is the greatest salmon run in the world. The run in 1970 was estimated at 45 million.

The season is extremely short – less than four weeks – and creates considerable problems in processing and transportation. Gillnets are the only gear allowed. Some highline gillnetters have taken up to 60,000 fish during the run, giving them an income in excess of $65,000.

Fisheries Research Board Chairman Reports on Past Year's Activities

BY DR. J.R. WEIR

During the past year the Fisheries Research Board has passed through a further stage of evolution which has seen the implementation of a number of recommendations concerning our future development, and the completion of some internal reorganization. With this accomplished, we have established a secure foundation from which to approach possibly our greatest challenge and opportunity – integration into the proposed new Ministry of the Environment.

In my report for 1969, I referred to the need to place increasing emphasis on two specific areas in our research programming, namely recreational fisheries and environmental quality. It is a pleasure to record that in the latter area a careful and detailed review of the Board's activities was conducted in association with other branches of the Department.

This is an example of unified planning, involving all services of the Department and identifying primary objectives throughout the whole spectrum of their operation, which could be extended to other program areas.

The Board, in its research programs, has also placed the highest priority on tackling problems associated with pollution and the quality of the environment. To enable us to make a more effective approach to these problems, a Pacific Environment Institute has been established in temporary facilities in West Vancouver. Construction has started on the new

Dr. J.R. Weir

Freshwater Institute in Winnipeg. Together with the recently formed Pollution Unit in Dartmouth, which will form the nucleus of an expanded operation in the future, we would seem to be in excellent position to mount concerted programs on environmental problems from coast to coast.

Establishment of the Department of the Environment was proposed in the Speech from the Throne on October 8, 1970. Under the Minister of Fisheries and Forestry, the Hon. Jack Davis, this Department will provide the focal point for the development of an overall national policy dealing with the environment and renewable resources, and embracing diverse scientific resources of which FRB is only a part. It is my expectation that we shall accept the challenges which this reorganization presents, and use every opportunity to make the Board and its staff essential participants in the exciting and stimulating events which lie ahead.

PROGRAM HIGHLIGHTS

In addition to significant advances in long-term programs, the Board was able to make important contributions to several urgent problems which arose during the year:

Environmental Research

Oil pollution, which followed the destruction of the tanker *Arrow* at Chedabucto Bay, N.S., involved Board scientists in several aspects of a joint intradepartmental approach to the problem. Investigations were concerned with the effects of oil on the ecosystem and specifically on commercially valuable species such as lobsters. A rapid method was developed for distinguishing between various bunker C oils. Studies were initiated into defining the role of micro-organisms in degrading oil under conditions of low temperature.

The submersible *Pisces I* was utilized to study the condition of the sunken oil barge *Irving Whale*, and locate sources of oil leakage.

The occurrence of high levels of mercury in fish from the Saskatchewan river in 1969 led to a greatly expanded investigation in 1970. A nation-wide survey has revealed that considerable mercury contamination exists in some freshwater and marine fishes, and marine mammals. Monitoring is continuing associated with physiological studies to determine the extent of recovery in contaminated areas subsequent to the reduction of industrial mercury losses.

Studies of the phytoplankton,

zooplankton and bottom fauna of northern waters, combined with physical oceanography, are aimed at understanding the factors controlling Arctic productivity and providing a baseline for northern pollution studies. Such work is timely because of the threat of accidental oil spills and from other industrial developments in the Arctic.

Commercial and Recreational Fisheries Research

The Atlantic herring fishery has developed explosively in recent years. It has been based partly on accumulated older fish, and as these are gradually harvested, the fishery is depending more on new recruits and the catch per unit fishing effort is decreasing. Recent research shows that a number of fairly distinct stocks are involved, distinguished by geographical distribution and migrations, spawning time, body form, rate of growth, and biochemical structure. In 1970, 80,000 herring were tagged at three locations and recoveries show extensive movements into the Gulf of St. Lawrence in spring and out in the fall. As part of an international joint survey, a submersible was used to observe herring spawning beds on Georges Bank.

Staff from several Board stations participated in various aspects of the "Hudson 70" cruise around North and South America, which was organized by the Department of Energy, Mines and Resources.

It was demonstrated that the carefully controlled addition of nutrients to a nutrient-poor lake can increase the growth of young sockeye salmon without producing blooms or other undesirable effects.

Experimental utilization of shallow pothole lakes for trout rearing on the Prairies was extended. There was for the first time some private investment in this type of aquaculture and approximately 50,000 lbs. of fish were marketed. Overall growth and yield were not as great as in 1969, possibly due to the great demand for fingerlings resulting in utilization of some of inferior quality, and to late planting time. Occurrence of "muddy odour" in fish from some lakes was more significant than in 1969.

Products and Processing Research

In 1970 the first Canadian plant for producing fish protein concentrate (FPC) was nearing completion at Canso, N.S. At the Halifax Laboratory pilot plant, production of FPC from species such as ocean perch, dogfish and flounder has been completed. These products are being examined for acceptability by the Department of National Health and Welfare. A process has been developed for producing a fish protein concentrate with improved emulsifying properties. This can be used to replace some or all of the beef in frankfurter sausages.

Although earlier research on fish preservation led to many successful commercial applications, spoilage of chilled fish has continued to plague the fishing industry. Recent experiments at sea and on shore show that rapid chilling after capture, and the use of refrigerated seawater, or adequate icing, can prevent these losses. Sockeye salmon weighing 1.8 million pounds were transported in refrigerated seawater containing 5% added salt from Bristol Bay, Alaska to Prince Rupert and Steveston. This represented the first full scale application of this method.

On the West coast the problem of waste-water disposal from fish plants has been attacked by developing methods for economically utilizing the wastes. Some plants have already adopted the techniques.

A portable fish plant, designed for use on remote northern lakes was successfully tested in field trials.

Facilities

The new wing of the Nanaimo Biological Station was officially opened by the Minister of Fisheries and Forestry in May. This was followed by a very successful and well-attended open house. Renovation of the old main laboratory building at Nanaimo has been completed.

At the Pacific Environment Institute, West Vancouver, B.C., installation of mobile laboratories and site services for the 14 mobile units purchased last year have been completed and are now occupied. The renovation of one old residence has been completed and has been occupied by the Program Head and his office staff. A freshwater supply system is now in operation. Plans and specifications have been completed for the foreshore development. Phase I includes the reclamation of 1.5 acres of land, dredging, bank riprapping and marginal wharf. Total estimated cost for this phase is $650,000.

A contract has been awarded to Trident Construction Ltd., St. Boniface, Manitoba, in the amount of $8,133,000 for the construction of the Freshwater Institute, Winnipeg, Manitoba. The estimated completion date for the Freshwater Institute is December 1972 or early 1973.

A winter works program for Manitoba has resulted in the start of construction of the first stage of an experimental rainbow trout hatchery. Also included in this program is the development of artificial ponds at Balmoral, Manitoba.

The installation of 11 new mobile laboratory units has been completed at Bedford, Nova Scotia. Also site services for these units and landscaping have been completed and all units are now occupied. An addition to the Fish Holding Laboratory, totalling 7,200 square feet, has been erected. It is expected that this facility will be complete and available for operation by late April 1971.

In August the Huntsman Marine Laboratory at St. Andrews was formally opened. The Fisheries

Research Board has been instrumental in obtaining facilities for this laboratory and is encouraging cooperation with the universities involved.

The proposed FRB/Forestry laboratory on Memorial University campus St. John's, Newfoundland, has been shelved at the preliminary stage due to lack of funds. It is anticipated that major modifications to the FRB portion of this building will be necessary to accommodate the requirements of the Department of the Environment.

Office of the Editor

The Board's continuing support of scientific publication is evidenced by the activities of the Office of the Editor. This office is responsible in the field of primary scientific publication and maintains various publication media, most important of which is the Journal of the Fisheries Research Board of Canada.

The steady flow of scientific and technical information that is the main product of FRB's research program has been maintained. In 1970, Volume 27 of the Journal comprised about 2,500 pages and included 254 articles. Articles by FRB scientists published in other journals, known as Studies, totalled 101. Two Bulletins were published, one of which was an addition to the Board's series on Canadian fishes. Another Bulletin was reprinted with a French foreword. In the documentary series, 11 Circulars were issued and 73 Technical Reports were distributed to a selected mailing list. The establishments also produced 44 Manuscript Reports. Published articles of an interpretive nature and written by Board scientists totalled 39.

Printed publications were distributed to over 100 countries through subscriptions, sales, or exchange arrangements made by the Office of the Editor, or special arrangements with Information Canada.

Board Members

At the beginning of 1970, the Board had ten members from Canadian universities, seven from the fishing industry and one from the Department of Fisheries and Forestry. The Deputy Minister of Fisheries and Forestry also attends meetings of the Board and its Executive.

Three members of the board completed terms of office in 1970. They are Dr. W.S. Hoar, Dr. Léo E. Marion and Dr. M.O. Morgan. In view of the possibilities of reorganization within the new department influencing the future structure of the Board, these three members were invited to attend the annual meeting in January, 1971.

Stiffen Penalties for Lobster Violators

Canadian lobster fishermen who ignore fishery regulations will have their licences suspended upon conviction for a first offence and for a subsequent offence face possible permanent cancellation of their fishing privilege.

Introduction of the stiffer penalties by the federal Department of Fisheries and Forestry resulted from concern expressed by the lobster industry about the seriousness of the problem. During 1970, 234 convictions were recorded for lobster fishing violations in the Maritimes and Newfoundland. Most common infractions were taking lobsters out of season and taking undersized and berried (i.e., egg-bearing) lobsters.

"Illegal lobster fishing practices endanger the lobster resource and threaten the livelihood of honest fishermen who know the value of conservation regulations," Fisheries and Forestry Minister Jack Davis said. "Unlawful activities will not be tolerated, and those responsible must be made to realize this."

Under the new policy action will be taken as follows:

- For a first conviction, suspension of personal fishing licence, or of vessel registration, or both. The length of the suspension will depend on the seriousness of the offence.
- For a second conviction, cancellation tion of personal fishing licence and fishing vessel registration.
- Suspension or cancellation of any type of commercial fishing licence will result from conviction for any illegal activity relating to lobster fishing. For example, a dragger landing lobsters illegally is liable to have its dragging licence suspended.

The new policy is effective immediately.

CANADA IN 10th SPOT

World Fish Catch Shows 2% Decline

World fishing, which has more than tripled in volume since 1945, dropped by two percent in 1969, registering the first decrease in the postwar period.

Figures released by the Food and Agriculture Organization of the United Nations estimate the total catch of marine and inland water fish last year at 63,100,000 metric tons. This is below the record 64,3000,000 tons registered in 1968 and confirms earlier reports of a slight decline in the total 1969 catch.

The figures, which include crustaceans and molluscs, but exclude whales and sport fishing, are from the new FAO Yearbook of Fishery Statistics, Catches and Landings, 1969, Volume 28. The Yearbook is based on official data and covers more than 200 countries and territories.

According to the survey, the two percent drop was entirely in the marine sector where decreased catches were reported by numerous countries principally in Latin America and western Europe. Only six of the 15 countries with catches of a million tons or more reported increases of any kind.

FAO sources attributed the decline principally to initially low catches by Peru at the start of the 1969/70 anchoveta fishing season, also to depletion of certain herring and mackerel fisheries in the North Atlantic and reduced factory-ship operations in the southeast Atlantic.

The total catch of fish from rivers, lakes ponds and other freshwater sources continued to rise, reaching 6,830,000 metric tons as compared with 6,650,000 tons in 1968.

Catches by Countries

Peru, the world's No. 1 fishing nation, caught 9,223,500 metric tons in 1969 as against 10,520,300 tons in 1968. Almost all of this involved anchoveta, which is reduced into fish meal for export as animal feed. The decline, based on the calendar year, may not be reflected in the 1969-70 fishing season, which is expected to produce a catch of more than 10 million tons.

Japan's catch, second in quantity, declined slightly to 8,623,500 tons from 8,670,400 tons in 1968. The Union of Soviet Socialist Republics increased its fish harvest from 6,082,100 tons in 1968 to 6,498,400 tons. The catch by Mainland China is unknown, but was probably around six million tons, predominantly of freshwater fish.

The United States moved up to fifth place, replacing Norway in the top 15 line-up. The U.S. catch increased slightly to 2,495,400 tons from 2,441,900 tons while that of Norway decreased to 2,481,000 from 2,481,000 from 2,804,100 tons.

Seventh was the Republic of South Africa, with 2,130,000 tons in 1969 as against 2,200,400 tons in 1968. The remaining eight nations in the million-ton category had the following catches, in diminishing order:

Most fishing took place in the Pacific Ocean, which accounted for 30,200,000 tons of the total catch. The Atlantic Ocean followed with 22,800,000 tons. The Indian Ocean, though comprising one-fifth of the earth's oceanic surface, yielded only 2,700,000 tons, less than one twenty-fifth of the world's catch.

Country	1969	1968
	metric tons	metric tons
8. India	1,605,000	1,526,000
9. Spain	1,486,200	1,503,100
10. Canada	1,408,400	1,498,700
11. Denmark	1,275,400	1,466,800
12. Thailand	1,269,600	1,088,800
13. Indonesia	1,209,000	1,159,000
14. United Kingdom	1,083,100	1,040,300
15. Chile	1,076,900	1,376,100

Set New Licensing Structure for Sports Fishermen in B.C.

Non-resident sports fishermen in tidal waters in British Columbia will pay a licence fee based on boats, not people, starting next year and all proceeds will go to build coho and spring salmon hatcheries.

Fisheries and Forestry Minister Jack Davis announced the new regulations January 29 that will see non-resident fishermen pay a licence fee from $15 to $75 for privately owned vessels depending on length.

Charter and rental boats servicing non-resident sports fishermen will be classed as commercial and pay the same licence fees as fishermen in the salmon fleet, from $100 to $400.

The only exception will be charter or rental Canadian boats under 30 feet which will not pay a licence fee. This will exempt most marina operations renting small boats on a daily or hourly basis.

The new fee structure will go into operation in 1972. It is expected there will be a $400,000 return the first year.

Here is how the licence structure works:

- Charter or rental vessels under 30 feet owned by Canadians and servicing non-residents will not pay a fee.
- Private non-resident boats under 15 ft. will pay $15; boats 15 to 29 feet, $25; 30 to 39 ft., $50 and those 40 ft. and over, $75.
- Charter or rental vessels under 30 ft. owned by non-residents will pay $100.
- Charter or rental vessels 30 ft. or over owned by Canadians or non-residents will pay $200 for vessels under 15 net tons and $400 for those over 15 tons.

The licence will be in the form of a decal which must be attached to the boat.

Licence issuing offices will be set up during summer periods at such points as Bedwell Harbour where a large number of U.S. vessels clear customs.

Structure changed

In September, 1970, it was proposed to licence non-resident fishermen in British Columbia, starting in 1971. Fees would range from $1 per day to $25 for the season. While the Sports Fish Advisory committee generally agreed on this basis, some members were concerned about the cost and difficulty of applying the daily licence.

Groups in the tourist industry were concerned that publicity brochures had been printed for 1971 stating no sport fish licence fee was required for tidal waters.

For these reasons the Minister reconsidered the licence proposal and will now bring in regulations for the new fee structure before 1972.

Issue Warning on Explosives

The Fisheries Service of the Department of Fisheries and Forestry in Newfoundland has received reports that herring seiners are using a type of explosive as a means of hunting and taking herring in Newfoundland waters. The Department is taking a very serious view of these reports.

All seiner operators who may have been using this unlawful practice of taking and hunting of herring have been instructed to cease immediately. Those found continuing the practice will be subject to immediate prosecution.

Section 58 of the Fisheries Act reads as follows: "Every person who hunts or kills fish or marine animals of any kind, other than porpoises, whales, walruses, sea lions and hair seals, by means of rockets, explosive materials or explosive projectiles or shells, is liable to a penalty of not less than $100 and costs, or to imprisonment for not less than three months, or both, and not more than $500 and costs or to imprisonment for six months or both."

LAST MONTH'S COVER PHOTO – AN APOLOGY

The inadvertent use of an outdated photograph of the front cover of the February, 1971, issue of FISHERIES OF CANADA has created some confusion in certain fishing areas.

The photo, which depicted fish being packed for air shipment at a northern Saskatchewan lake, showed the use of fish boxes constructed of galvanized metal. Under the current Fish Inspection Regulations, of course, containers made of galvanized material are not permitted.

We regret any misunderstanding that publication of this cover photo may have caused.

CANADA-USSR FISHING AGREEMENTS SIGNED IN MOSCOW

Agreements on co-operation in fisheries in the northeastern Pacific Ocean off the coast of Canada and on provisional rules of navigation and fisheries safety in that area were signed in Moscow on January 22 on behalf of the Governments of Canada and the USSR. Shown signing the documents at the Soviet Ministry of Fisheries are (left) Dr. A.W.H. Needler, the recently-retired Deputy Minister of Fisheries and Forestry of Canada, and Mr. V.M. Kamentsev, First Deputy Minister of Fisheries of the USSR. (Photo by Novosti Press Agency).

Study Prospects for Use of FPC on U.S. Market

Favorable prospects for using various forms of fish protein concentrate (FPC) as an additive in foods for the U.S. market have been indicated in a study by Cornell University researchers.

The U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) says the study showed the present market potential for protein ingredients in 16 major food product categories to be about 3.1 billion pounds of protein annually. Dairy products, baked goods, pet foods, and processed meat products account for 86 percent of this potential, and a substantial increase in demand for protein ingredients is seen in this decade.

Philip M. Roedel, Director of NOAA's National Marine Fisheries Service, sponsors of the study, said: "This work shows that the use of fish protein concentrate to fill at least part of the growing U.S. demand for protein is a realistic possibility, especially if certain desirable characteristics, such as solubility for use in beverages, can be developed in the product." He said that current regulations prohibit the use of FPC in manufactured foods so modification of the rule will be necessary before the valuable protein concentrate can be used to full advantage.

Mr. Roedel added that FPC is now best known as a nearly white, odorless, and tasteless powder made from whole fish, and containing about 80 percent high-quality animal protein. The remainder is largely calcium, phosphorus, and other nutritionally important minerals. He said that a demonstration plant which could produce up to 7-1/2 tons of FPC on a 24-hour basis is scheduled to begin operations in Aberdeen, Wash., early in 1971. (In Canada, the Cardinal Proteins FPC plant at Canso, N.S., is due to go into production this year).

In August 1970, the U.S. Food and Drug Administration approved the use of herring and menhaden in producing FPC. Previously only hake and "hake-like fishes" were approved.

Statistics

CANADA EXPORT VALUE OF FISHERY PRODUCTS

	January to December	1970 $'000	1969 $'000
	TOTAL EXPORT VALUE	280,022	279,140
By Markets	United States	202,316	188,326
	Caribbean Area	17,212	18,422
	Europe	49,016	61,811
	Other Countries	11,478	10,581
By Forms	**Fresh and Frozen**	**195,212**	**189,438**
	Whole or Dressed	**52,343**	**56,795**
	Halibut, Atlantic	1,947	1,653
	Halibut, Pacific	6,457	8,058
	Salmon, Atlantic	1,429	1,646
	Salmon, Pacific	21,487	23,169
	Swordfish	4,862	5,306
	Herring	866	1,035
	Other Seafish	3,771	3,761
	Pickerel	2,500	2,497
	Whitefish	5,110	5,221
	Other Freshwater Fish, n.e.s.	3,904	4,449
	Fillets, Blocks and Slabs	**91,797**	**82,926**
	Cod fillets, Atlantic	12,609	10,302
	Cod blocks and slabs	14,766	12,543
	Haddock fillets	4,361	7,192
	Haddock blocks and slabs	213	489
	Ocean Perch fillets	17,057	12,940
	Ocean Perch blocks and slabs	2,235	1,750
	Pollock blocks and slabs	307	565
	Flatfish fillets (Plaice, Soles, Flounder)	21,987	19,552
	Flatfish blocks and slabs (Sole, Flounder)	3,271	3,489
	Pickerel fillets	1,917	2,334
	Perch fillets	4,397	5,111
	Other fillets	5,869	3,629
	Other blocks and slabs	2,808	3,030
	Fresh and Frozen Shellfish	**49,009**	**47,069**
	Lobster (in shell and meat)	29,614	27,822
	Scallops	14,742	14,233
	Crab	2,374	[1]
	Other Shellfish	2,279	5,014
	Frozen Fish and Shellfish, pre-cooked	**2,063**	**2,648**
	Cured	**25,759**	**25,248**
	Smoked	**2,859**	**2,629**
	Herring	1,366	1,517
	Other	1,493	1,112
	Salted, Wet and Dried	**16,286**	**19,671**
	Cod	14,055	17,922
	Other	2,231	1,749
	Pickled	**6,614**	**2,948**
	Herring	5,793	2,200
	Mackerel	359	381
	Other	462	367
	Canned	**27,175**	**40,315**
	Salmon	14,088	29,767
	Sardine	5,766	5,893
	Lobster	1,837	1,879
	Other	5,484	2,776
	Miscellaneous	**31,876**	**24,139**
	Fish Roe, Fresh, Frozen and Cured, n.e.s.	4,161	2,258
	Meal	14,234	12,153
	Oil	3,715	1,585
	Irish Moss and Sea Plants, n.e.s.	4,054	2,820
	Other	5,712	5,323

[1] Not available in 1969. Included with "Other Shellfish".

FROZEN FISH – Cumulative Production and Stocks

	PRODUCTION		STOCKS	
	January 1971	1970	End Jan. 1971	1970
	'000 lb.		'000 lb.	
TOTAL – Frozen Seafish, Canada	**15,303**	**20,631**	**63,796**	**53,273**
Frozen Fish – Total	**12,276**	**16,273**	**50,350**	**39,646**
Cod, Atlantic, fillets	1,690	2,887	1,506	2,829
Cod, Atlantic, blocks	2,306	1,632	1,241	4,508
Haddock fillets	315	323	1,001	808
Haddock blocks	261	96	267	392
Redfish fillets	1,200	2,141	2,892	2,655
Redfish blocks	106	260	57	264
Flounder and Sole fillets	2,028	3,487	7,042	2,163
Flounder and Sole blocks	580	468	523	385
Halibut, Pacific, dressed and steaks	1	1	7,714	5,524
Halibut, Pacific, fillets and blocks	1	1	512	682
Turbot fillets	2	9	43	30
Turbot blocks	1	5	77	18
Pollock fillets	99	324	82	193
Pollock blocks	24	216	68	290
Other Groundfish, dressed and steaks	111	211	1,430	974
Other Groundfish, fillets and blocks	211	356	1,070	976
Salmon, Pacific, dressed and steaks	1	1	15,652	6,498
Herring, Atlantic and Pacific	924	103	1,412	349
All other seafish, all forms	2,257	3,583	4,279	6,625
Lobster, whole and meat	1	1	582	559
Scallops, breaded and unbreaded	76	106	586	915
All other shellfish, all forms	86	66	2,314	2,009
Frozen (Smoked) Fish – Total	**188**	**263**	**973**	**1,172**
Cod, Atlantic	93	190	247	453
Sea Herring, kippers	1	16	440	382
Other, all forms	95	57	286	337
Frozen for Bait and Animal Feed	**2,839**	**4,095**	**12,473**	**12,455**

SALTED AND PICKLED FISH, ATLANTIC COAST – Cumulative Production and Stocks

		January 1971	1970	End of January 1971	1970
Wet Salted – Total	('000 lb.)	**229**	**148**	**9,603**	**10,267**
Cod	"	163	65	7,426	8,083
Pollock	"	1	79	857	1,339
Hake	"	7	1	858	611
Other	"	59	4	462	234
Dried Salted – Total	('000 lb.)	**xxx**	**xxx**	**2,655**	**6,011**
Cod	"	xxx	xxx	2,146	5,136
Pollock	"	xxx	xxx	162	485
Hake	"	xxx	xxx	285	332
Other	"	xxx	xxx	62	58
Boneless – Total	('000 lb.)	**xxx**	**xxx**	**735**	**582**
Cod	"	xxx	xxx	680	505
Other	"	xxx	xxx	55	77
Pickled – Total	(200 lb. barrels)	**26,821**	**29,531**	**50,807**	**31,610**
Herring	"	26,782	29,531	42,777	26,775
Mackerel	"	–	–	4,325	2,736
Alewife	"	–	–	3,705	2,100
Turbot	"	39	1	1	1
Herring Bloaters	(18 lb. boxes)	3,418	–	73,376	58,082
Boneless Herring	(10 lb. boxes)	3,545	–	1,421	2,711

1 Confidential.

SEA FISHERIES: Landings and Landed Values

	Cumulative Landings, January 1971		Cumulative Landings, January 1970	
	Quantity[1] '000 lb.	Value[2] $'000	Quantity[1] '000 lb.	Value[2] $'000
CANADA TOTAL	**154,521**	**4,066**	**180,851**	**4,426**
ATLANTIC COAST – Total	**153,290**	**3,952**	**178,143**	**4,221**
Cod	14,261	745	17,754	818
Haddock	2,614	280	2,155	220
Redfish	4,728	171	9,283	273
Halibut	107	69	146	71
Turbot	73	3	81	3
Other Flatfishes	10,629	548	15,654	779
Pollock, Hake, Cusk	578	20	1,774	52
Catfish	211	8	255	9
Other Groundfish	337	6	432	11
Herring and sardine	118,611	1,473	129,240	1,387
Mackerel	1	0	–	–
Swordfish	–	–	18	15
Tuna	–	–	5	3
Alewife	–	–	–	–
Salmon	–	–	–	–
Smelt	405	56	648	78
Other Fish	39	8	79	9
Clam and Quahaug	211	23	191	17
Scallop	87	100	72	76
Lobster	368	410	319	324
Crab	–	–	12	1
Shrimp	22	3	1	0
Other Shellfish	8	0	24	2
Miscellaneous items	–	29	–	73
PACIFIC COAST – Total	**1,231**	**114**	**2,708**	**205**
Pacific Cods	313	29	469	42
Halibut[3]	–	–	–	–
Soles and other flatfishes	201	13	153	10
Herring	38	3	781	17
Salmon	–	–	–	–
Other Fish	52	1	36	1
Shellfish	627	68	1,269	135
Miscellaneous items	–	–	–	–
BY PROVINCES				
British Columbia	1,231	114	2,708	205
Nova Scotia	38,106	1,751	31,057	1,674
New Brunswick	2,639	106	1,656	111
Prince Edward Island	1,102	29	2,982	69
Quebec	159	31	44	73
Newfoundland	111,284	2,035	142,404	2,294

1 Fish and Shellfish only.

2 Includes livers, seaweeds, tongues, scales, roes, skins, oil, seals, whales and bait worms.

3 Includes Halibut landed in U.S. ports by Canadian fishermen.

PRICES PAID TO FISHERMEN– Cents per pound

Week ending January 16	1971	1970
HALIFAX, N.S. (Offshore Prices)		
Cod Steak	6	5.75
Cod Market	5.75	5.5
Haddock, large	11.25	9.75
Plaice and Flounder	5.25-6	4.5-5.25
ST. JOHN'S, NFLD.		
Cod (steak & market)	–	6
VANCOUVER, B.C.		
Gray Cod (dressed, head on)	10	9
Sole	10	9.5
Flounder	6	6
PRINCE RUPERT, B.C.		
Ling Cod (dressed, head off)	–	4
Grey Cod (dressed, head on)	–	4.5-7
Sole	–	5

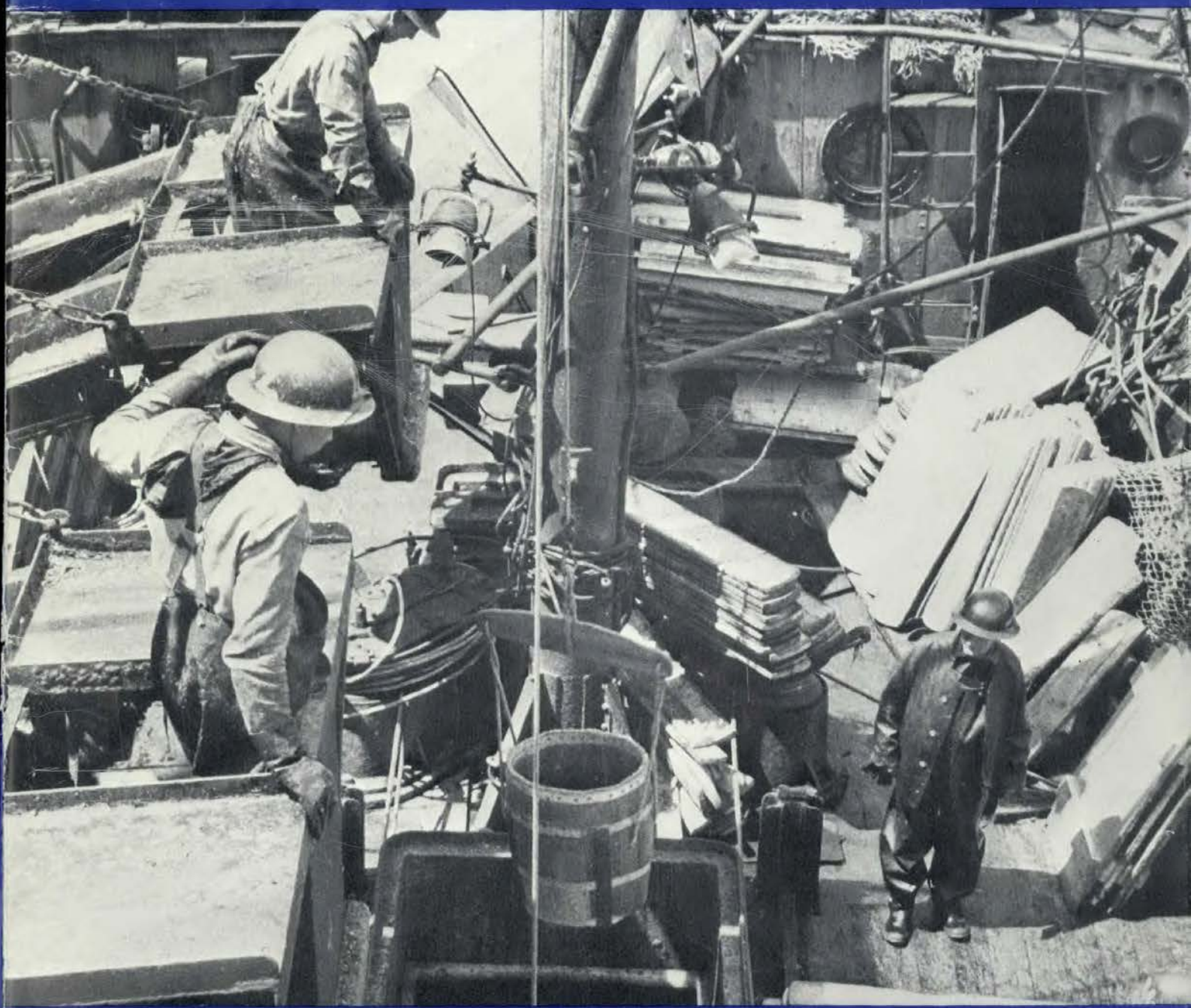
MID-MONTH WHOLESALE PRICES

January 1971		Montreal	Toronto
Cod fillets, Atlantic fresh, unwrapped	lb.	.496	.630
Cod fillets, Atlantic frozen, cello 5's	lb.	.390	.500
Cod fillets, smoked	lb.	.532	.653
Haddock fillets, fresh, unwrapped	lb.	.810	.860
Herring, kippered, Atlantic	lb.	.322	.367
Mackerel, frozen, round	lb.	.235	.333
Lobster, canned, Fancy	Case 48-1/2's	88.457	91.507
Sardines, canned	Case 100-1/4's	11.736	11.827
Halibut, frozen, dressed	lb.	.614	.720
Silverbright, frozen, dressed	lb.	.760	.877
Coho, frozen, dressed	lb.	1.074	1.200
Sockeye, canned, grade A	Case 48-1/2's	29.847	31.420
Pink, canned, grade A	Case 48-1/2's	20.727	21.840
Whitefish, fresh	lb.	.669[1]	.733
Lake Trout, frozen	lb.	.546	.653

[1] Dressed

FISHERIES of Canada

May-June 1971 • Vol.23 No.5



Department of the Environment, Ottawa

May - June 1971

FISHERIES of Canada

The Hon. Jack Davis, Minister
R. F. Shaw, Deputy Minister

Contents

COVER PHOTO – An East Coast trawler unloading at Halifax, N.S.

Published by the Fisheries Service,
Department of the Environment, Canada

Produced by the Information and Consumer Branch of the Department of the Environment, Ottawa.

Editor: E. H. Hearnden
Layout: G. J. Guillet

High Price of Scallop Landings Conceals Decline in Offshore Stocks

By J. F. Caddy and E. I. Lord
Fisheries Research Board of Canada
Biological Station, St. Andrews, N.B.

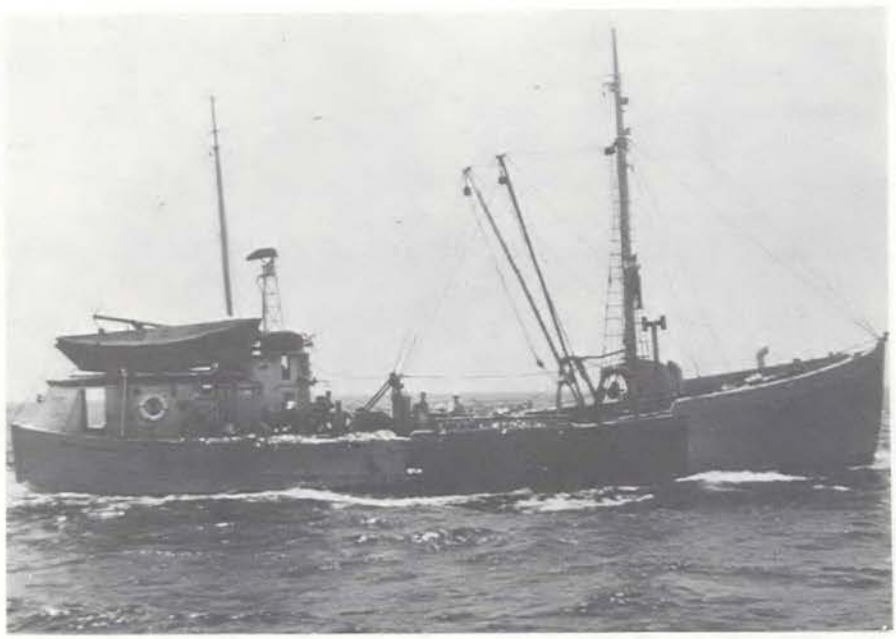
The scallop fishery is one of Canada's most valuable fisheries. In recent years, the landed value has averaged about $13 million per year, making it third only to cod and lobster in total landed value on the east coast. About 80% of our scallops are exported to the United States. Although there are inshore fisheries in the Bay of Fundy and the Gulf of St. Lawrence, 50-90% of Canada's landings come from international waters on Georges Bank, the largest single scallop resource in the world.

Value of Canadian scallop landings from Georges Bank and from all other inshore and offshore grounds combined

Year	Georges	Other
	(millions of dollars)	
1960	2.0	0.1
1961	2.9	0.2
1962	4.2	0.3
1963	5.0	1.2
1964	5.8	1.4
1965	5.6	5.2
1966	4.4	3.0
1967	6.4	1.4
1968	9.1	4.3
1969	8.5	3.5
1970	9.7	4.3

The total value of Canadian landings has remained at an unprecedented high over the last 3 years due to a sharp increase in price paid for the catch. Evidence from catch statistics and research studies shows that in fact, scallop abundance on Georges Bank has been going down over the last 10 years.

An offshore scallop boat



Historical perspectives

What have been the fortunes of the Canadian offshore scallop fishery during the 15 years of its life? To answer this question, we must first and foremost consider the abundance of Georges Bank scallops since only on this Bank have scallops been found in large enough numbers, and on the sustained basis necessary to support year-round fishing by a fleet of eighty 60- to 100-ft offshore scallop boats.

Before 1957, the Georges Bank scallop grounds were fished almost exclusively by the U.S. whose landings had increased steadily by about 1 million pounds a year over the previous 12 years. In the 4 years after 1958, when Canadian participation in the fishery was getting under way, total landings from the Bank shot up by almost 100%, so that in the peak year of 1962, 34 million pounds of scallop meats were landed from Georges. During this same period, Canadian landings from Georges increased by almost 300%. The decline in total landings that followed 1962 was even more rapid than the previous increase. By 1965, landings had dropped back to the level reached in 1952, and there was a further slow decline between 1967 and 1969. The decline in total landings immediately following 1962 was not evident from the figures for Canadian landings, since Canada's share in the total catch con-

tinued to increase from 4-37% between 1956 and 1962. By 1969, Canada was taking 79% of the catch from the Bank.

The recent decline in U.S. participation in the Georges Bank scallop fishery and changeover of many U.S. scallopers to flounder fishing have occurred despite the high price paid for scallops in the U.S. Present U.S. demand for scallops exceeds supply, and in addition to encouraging increased U.S. imports of scallops from overseas, high market prices in the U.S. have led to a flourishing fishery for the Florida calico scallop, formerly considered unprofitable because of its small size. The main reason for the withdrawal of the U.S. scallop fleet from Georges Bank since 1962 has been the decline in scallop abundance on Georges over the last 8 years, the lower working costs of Canadian fishermen and the higher proportion of time they spend on the fishing grounds than their U.S. counterparts have enabled Canadians to make a living even under these less favourable circumstances.

Around 1960-63, when landings were at an unprecedented high, two opposing viewpoints were put forward to explain the increase in total landings. One suggested that populations of scallops on the Bank had previously been underfished by the U.S. offshore fleet, and the other suggested that the high in landings marked the recruitment of an unusually abundant year-class to the fishery. We now know that the second explanation was correct, and that 1959 marked the first appearance in the drags of an unusually high abundance of 3-year-old scallops. This year-class, which formed the basis of the fishery for the next 4 years, was heavily exploited. In 1962, U.S. biologists estimated that 50% of commercial-sized scallops on the Bank were being caught each year. There is no evidence for appreciable recruitment of young scallops to the fishery in the years immediately after 1959, so that by 1962 when Canadian landings had

Fig. 1. Total Georges Bank landings, and Canadian landings of scallop meats from Georges and other offshore grounds.

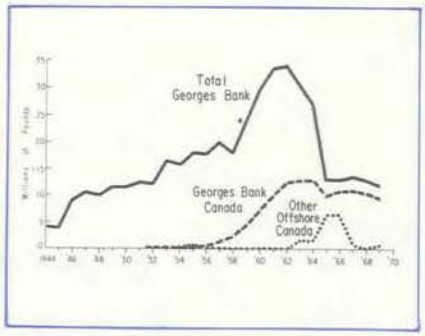
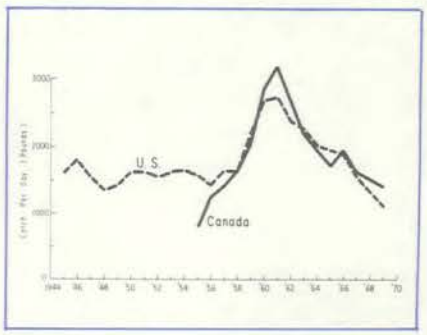


Fig. 2. Catch (pounds of meats) per day for the U.S. and Canadian fleets since 1945.



just reached 12 million pounds a year, the abundance of scallops on Georges was already declining fast. This decline might have been even more rapid if some of the fishing pressure had not been directed in 1965-66 to a newly discovered, dense bed of scallops off the Virginia coast, in an area which has not produced appreciable catches before or since that time. Following 1966, when this area was almost fished out, the Canadian offshore fleet returned to Georges Bank to find that catch per tow was down to one quarter of that made in 1961. By 1969, there was only one fifth as many scallops on Georges Bank as in 1961.

Although scallop drags are inefficient and selective tools for sampling scallops, changes in catch per day fished are generally accepted as reflecting fluctuations in abundance of scallops. It is clear from changes in catch per unit of fishing effort (Fig. 2) that there was an unprecedented abundance of commercial-sized scallops on the Bank in 1960 and 1961.

Despite the unusual size of this recruitment, it set the pace for Canadian investment in the offshore scallop industry, and most Canadian offshore scallopers fishing today (Fig. 3) were built after 1962, when scallop abundance on their principal fishing ground was declining.

The total number of vessels fishing scallops on Georges Bank since 1954 has remained fairly steady at 80-97 (Fig. 4). However, the larger, more modern Canadian vessels with bigger crews making longer trips must exert more fishing pressure on the scallop stocks than previously.

The number of days spent fishing for scallops on Georges Bank has fluctuated in a similar way to total fleet size, except in 1965 and 1966 when part of the fleet fished most of the year off Virginia. Whereas the U.S. fleet withdrew most of its effort from the Georges Bank scallop fishery after 1964, the Canadian fleet more than doubled its efforts on Georges between 1961 and 1969, despite an overall decline in catch per day. Although total landings were the same in 1969 as in 1952, it required almost 2,000 more fishing days to achieve the same catch in 1969, this with more efficient gear

Fig. 3. Year of launching of 48 Canadian offshore scallopers fishing regularly on Georges Bank in 1970.

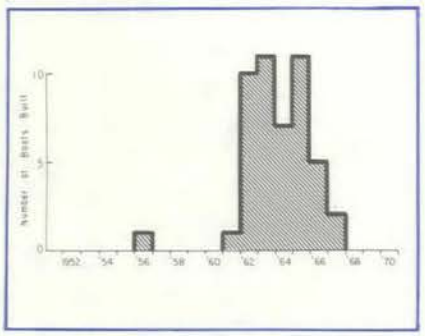


Fig. 4. Total number of vessels and number in the Canadian offshore fleet fishing regularly for scallops on the Bank since 1951

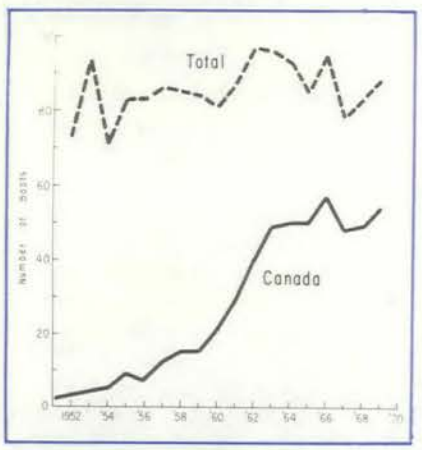
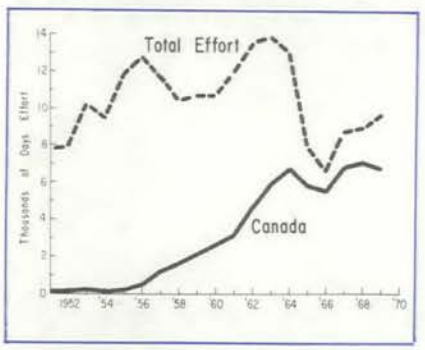


Fig. 5. Days spent fishing scallops on Georges Bank by the U.S. and Canada and days fished by the Canadian fleet since 1951.



and larger boats than in 1952! (Fig. 5).

To sustain Canadian landings from Georges Bank at 10-13 million pounds per year, the Canadian fleet has been obliged since 1961 to work more days per year and to drag more hours per day. Dragging an average of 7-8 hours per day in 1961, it was possible to pile the decks high with scallops and spend the rest of the day shucking the catch. In 1969, 15 hours' dragging per day were required to provide enough scallops for shucking (Fig. 6).

If these increases in daily effort apply to the whole Georges fleet, the total hours spent dragging went from 90 to 144 thousand per year between 1961 and 1969. Total landings in the same period declined from 33.7 to 12 million pounds per year!

Because a gradually increasing proportion of the day has been occupied by dragging since 1961, catch per day underestimated the decline in abundance that actually occurred. Since 1961, we have had a better measure of abundance, namely the catch per hour that the drags spend on bottom. From this measure it is clear that whereas catch/day was halved between 1961 and 1969, catch per hour went down to one fifth of its initial value in the same period (Fig. 7).

From the log records kept by fishermen, we know that the fleet has had to extend its operating area from the extremely productive Northern Peak and Edge of the Bank (which yielded over 70% of Canadian landings between 1960 and 1963) and search the less productive parts of the Bank looking for unfished pockets of scallops (Fig. 8).

Although the decline in abundance of scallops has been compensated for by an increase in landed price of from 25¢ to over $1.09/lb in 1970 (Fig. 9), the future of the industry looked bleak early in 1969.

Causes for optimism?

In November 1969, approximately

Fig. 6. Average number of hours dragged per day by the Canadian Georges Bank fleet since 1961.

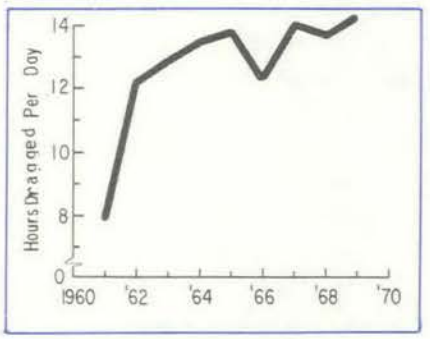


Fig. 7. Changes in two measures of catch per unit of effort (Canadian fleet) in the Georges Bank scallop fishery since 1961.

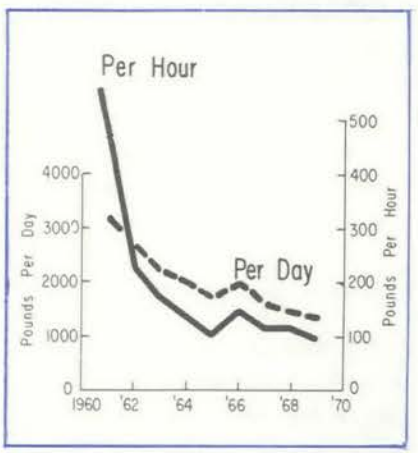
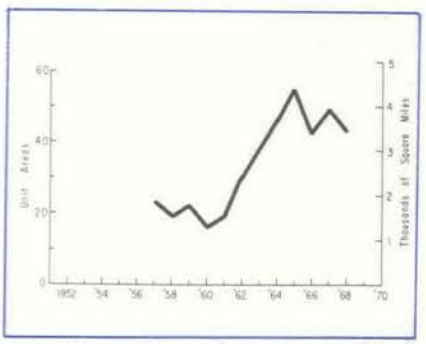


Fig. 8. Number of 80 sq mile unit areas on Georges Bank fished by the Canadian fleet since 1957.



10 years after the entry of the last good year-class into the fishery, there were again reports of "silver-dollar sized" scallops being caught on the Northern Edge of Georges Bank. Could this be a return to conditions of abundance? A Fisheries Research Board cruise to the area in June 1970 cast doubt on this hypothesis. Experimental fishing and bottom photography on the Northern Edge suggest that the area where recruits are abundant is strictly limited. Photographs in this area showed that scallops were very plentiful (up to 10/sq yd in places) but that 90% of them were under 4 inches in diameter (Fig. 10).

Although an area of young scallops like this would have been avoided by fishermen in the early 1960's, higher prices and low abundance of large scallops have induced some boats to take on extra hands for the tedious job of shucking small scallops from within these brood areas.

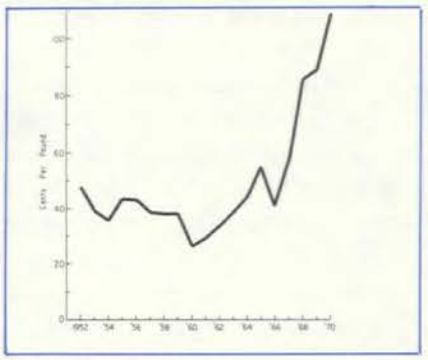
Although there are no regulations preventing the fishing of small scallops, research results suggest this is a short-sighted practice that will seriously reduce landings in 1971 and '72 when these small scallops would have grown to more valuable sizes.

Meat yields increase with age

The most profitable size and age at which to harvest scallops depend in part on the rate of growth of the adductor muscles or "meats", the only part of the animal utilized in North America.

Meat weight continues to increase significantly even after the 6th year when shell growth has slowed down (Fig. 11). The most rapid growth occurs during the first 4 years, when the scallop is less than 4 inches long. During this period meat weight more than doubles in a year. From the 4th to 7th year (shell 4-5 inches), meat weights increase about a third per year. About 80 3-inch scallops must be shucked to make a pound of meats,

Fig. 9. Average landed price per pound for scallops in Canada since 1952.

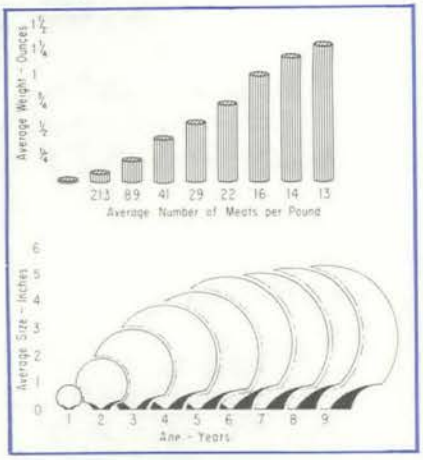


and only 40 4-inch scallops. There is not only an increase in meat yield with age but also a saving in the laborious job of shucking!

Whether or not it actually pays to leave small scallops on the grounds to grow larger depends on whether the growth in weight of the survivors is greater than the loss in weight to the population due to death from natural causes. All available data suggest that mortality of commercial-sized scallops from natural causes is rather low on Georges Bank. Merrill and Posgay, two U.S. investigators who spent many years studying Georges Bank scallop populations, estimated that mortality due to natural causes was approximately 10%. If so, growth outweighs loss by death from causes other than fishing up until scallops are 7 years old, or 5 inches long. It may be impractical to avoid fishing scallops until they are 5 inches long, especially since recruitment is irregular and a good year-class may have to support the fishery for several years. It is, however, unwise to fish scallops before they reach 4 inches in length, since their meat yield is still

Fig. 10. Underwater photograph of a dense population of young scallops (2-4 inches diameter), northern edge of Georges, June, 1970. (Total area in photo – 14 sq. feet).

Fig. 11. Average growth in shell size and meat weight for scallops from the Northern Edge of Georges Bank.



increasing by more than 100% per year.

What sizes of scallops were fished in 1970?

In the early 1960's, observers on commercial scallop boats measured scallops rejected by fishermen as too small to shuck, and estimated that few scallops smaller than 3 3/4 to 4 inches in diameter were retained. From Fig. 11, we would expect that in 1961 landed meats averaged less than 40 to the pound. A survey in July-August 1970 by the Inspection Branch of the Canadian Fisheries Service revealed that although meat sizes landed at Yarmouth averaged only 26 to the pound, catches landed at Riverport and Lunenburg averaged 43 and 49 to the pound respectively. Some boats at Riverport and Lunenburg landed catches with over 60 meats per pound. An appreciable fraction of these catches must have been 3 -year scallops under 3 inches in length. Whereas the Yarmouth fleet largely avoided areas of small scallops in 1970, some boats from Riverport and Lunenburg fished within these areas.

There are many examples in other scallop fisheries where years of exceptional recruitment were separated by many years when recruitment was poor. This has occurred in Mutsu Bay, Japan, off Queensland in Australia, and closer to home in the bay scallop fishery of Massachusetts. The longest established Canadian fishery off Digby in the Bay of Fundy has had years of high recruitment separated by 9 or 10 years of poor to average recruitment ever since the fishery began in the 1920's. In the Gulf of St. Lawrence, scallop populations also fluctuate widely in abundance. Thus, the timing of Canada's entry to the Georges Bank fishery just before the period of unusual high abundance in 1959-60 stimulated over-investment and, subsequently, overfishing when abundance of scallops returned to normal. The fleet size that the Georges Bank fishery can sustain must be determined by the years of poor to average abundance if the fishermen are to be assured of a continuing livelihood.

The Georges Bank scallop fishery: past and future

Average daily catches by the U.S. fleet of 80 vessels remained remarkably steady at around 1,600-1,800 lb/day during the 14 years between 1945 and 1959 (Fig. 2). The grounds remained productive at this level of harvesting, suggesting that the sustainable yield available to the combined Canadian and U.S. fleets lies somewhere between 12 and 20 million lb of meats per year. Any further sustained increase in landings will only be achieved by allowing small scallops to attain their full productivity, and finding markets for the two thirds of the soft parts of the scallops now discarded at sea. To protect their livelihood, Canadian and U.S. fishermen must establish common guidelines for the conservation of this valuable resource.

Acknowledgments

The authors would like to thank J. A. Posgay, National Oceanic and Atmospheric Administration, Woods Hole, Massachusetts, for providing advice and statistics on the U.S. Georges Bank scallop fishery.

A REVIEW OF CANADA'S FISHERIES IN 1970

Exports of Canadian fishery products in 1970 amounted to $278 million, with the United States the principal customer.

Favourable market conditions brought high prices for key products of Canada's fishing industry in 1970, increasing gross earnings of fishermen by 13 per cent above the previous season, although the total catch was virtually unchanged. Industry landings totalled 2.72 billion pounds for which fishermen received $205 million. Canada has approximately 65,000 commercial fishermen.

Marketed value of the 1970 production is estimated to have surpassed $400 million for the first time. This doubled the 1960 value total. Fishermen's earnings also doubled in the same period, although the total catch only increased by about one-third.

Exports in 1970 were unchanged at $278 million. Principal customer was the United States which regularly buys more than two-thirds of all Canadian fishery exports. European and Caribbean countries are the other important markets.

The Atlantic catch by Canadian fishermen in 1970 was 2.37 billion pounds valued at $132 million. British Columbia's landings of 239 million pounds, one-tenth of the east coast figure, were worth $59 million to fishermen. Freshwater fisheries centred in Prairie and northern lakes and the Great Lakes contributed an estimated 105 million pounds and $13.5 million to the national totals.

Provinces producing the heaviest fishery catches were Newfoundland, 981 million pounds, Nova Scotia, 591 million pounds, New Brunswick, 444 million pounds, and Quebec 257 million pounds, while Prince Edward Island doubled its normal catch to 101 million pounds. In value, British Columbia led all provinces with $59 million, followed by Nova Scotia, $56 million, Newfoundland, $36 million, New Brunswick, $18 million, and Quebec and P.E.I., $11 million.

Record Earnings in B.C.

British Columbia salmon fishermen had record earnings of $45 million on landings of 154 million pounds. Pinks made up one-third of the catch, chums 24 per cent, coho 17 per cent and sockeye 16 per cent. Gill-netters accounted for 42 per cent of the salmon catch, seiners 37 per cent and trollers, 21 per cent. The troll fleet were high earners with $17 million, followed closely by gill-netters with $16 million and seiners, $12 million.

The Pacific salmon pack of 1,420,000 cases was eight per cent above the 1965-69 average annual pack. Export prices for canned pink salmon were unchanged from the previous year but ten per cent gains were recorded in prices for other salmon species.

Atlantic lobster was the industry's second most valuable product, earning fishermen a record $30 million on a reduced catch of 36.6 million pounds. A downward trend has been evident in lobster landings which averaged 44 million pounds in the early 1960's and less than 38 million pounds between 1966 and 1970. Improved prices have increased returns to fishermen despite the lower catches.

Canadian pair seine netting off the East Coast.

Catches of cod fell sharply in 1970, but better prices maintained landed value at $22 million, about the same as the previous season, and it remained the third largest money earner among Canadian fishery products. Cod landings of 483 million pounds compared with 540 million in 1969.

Scallops rose to fourth place among Canada's value species as fishermen received $14 million for a reduced catch of 13 million pounds. Pacific halibut, which suffered declines in both landings and prices, slipped to sixth place at $11 million on a catch of 30 million pounds.

Landings of Atlantic herring, for the third successive year, surpassed one billion pounds and rose to fifth place in landed value, $13 million. The catch declined marginally to 1.07 billion pounds. The Pacific herring fishery, closed since 1968 except for food production, yielded less than nine million pounds.

Protection officers check the mesh size aboard a Canadian fishing vessel to ensure compliance with international regulations.

Government measures

Government measures were taken during the year to deal with two major problems affecting the fisheries, pollution of the aquatic environment and heavy fishing pressure on stocks by both Canadian and foreign fleets.

The new Canada Water Act, the Arctic Waters Pollution Prevention Act, the amended Fisheries Act and other related legislation passed in June, 1970, enabled the federal Government to take a leading role in combatting pollution of Canadian

waters.

Amendments to the Territorial Sea and Fishing Zones Act, also passed in June, made possible late in the year the establishment of "fisheries closing lines" in designated areas. Planned effect of this measure is to reserve these areas – the Gulf of St. Lawrence, the Bay of Fundy, and Dixon Entrance, Hecate Strait and Queen Charlotte Sound – exclusively for fisheries management by Canada.

Bilateral agreements for fisheries resource protection purposes were reached with the United States and the U.S.S.R. Reciprocal fishing privileges affecting certain areas were negotiated with the U.S. Two draft agreements negotiated with the U.S.S.R. restricted the operation of Soviet fishing vessels in a major fishing area off the Pacific coast in return for port and fishing privileges within Canadian territorial waters.

The Canadian Saltfish Corporation was established under legislation approved by Parliament early in the year. Newfoundland agreed to participate in its operation as sole buyer and marketing agency for salt fish, and entry was under consideration by another province.

In the continuing process of rationalizing fishing effort, government restriction was placed upon the growth of the Atlantic herring fleet. In cooperation with 15 other countries, Canada refrained from fishing haddock in specified Atlantic areas for a two-month period and agreed to a catch quota set by the International Commission for the Northwest Atlantic Fisheries.

Assistance Program Set for Swordfish Industry

A joint program of assistance to fishermen and firms affected by mercury contamination which has wiped out the markets for swordfish, has been announced by Hon. Jack Davis, Federal Minister of Fisheries, and Hon. Benoit Comeau, Nova Scotia Minister of Fisheries.

The federal and provincial governments will share equally in a plan for conversion to other fisheries based on the current value of swordfishing gear and equipment which has been rendered obsolete by the closure of this fishery. It is expected that about 50 boats will be eligible for this assistance, and remuneration will total approximately $365,000.

The federal Department of the Environment will assume the full cost of purchasing stocks of swordfish that were caught and in storage when the swordfish ban was announced. Total cost of such compensation is expected to amount to about $160,000.

The federal department will also assume the cost of purchasing frozen mackerel intended for use as swordfish bait provided that the present holder makes every effort to dispose of this product for other fisheries.

In addition to the direct grants mentioned above the ministers agreed to additional assistance measures, as follows:

1. the federal Department of the Environment will provide technical advice and assistance in the conversion of vessels to other types of fishing;
2. the Fishermen's Loan Board of Nova Scotia will grant loans for the remaining costs of vessel conversions;
3. retraining courses for fishermen will be available through the Department of Manpower and Immigration in accordance with its established policies and practices.

Mr. Davis explained that the provision of federal monies for the above programs is subject to Treasury Board approval.

Environment Canada

Its Organization and Objectives

Environment Canada, a national Department of the Environment, came into being June 11, 1971, with the proclamation of the Government Organization Act, 1970. On the same date, the Hon. Jack Davis, former Minister of Fisheries and Forestry, was sworn in as Minister of the Environment and Minister of Fisheries.

Plans for formation of a new deparment to be concerned with "the environment and the husbanding of renewable resources, with a mandate for the protection of the biosphere" were unfolded October 8, 1970, in the Throne Speech opening a new Parliamentary session. The bill was introduced in the House of Commons December 9, considered in detail by the Standing Committee on Fisheries and Forestry, and passed May 26, 1971. Approval by the Senate followed soon after.

Originating with the former Department of Fisheries and Forestry, the new department will include the following elements:

- the Canadian Meteorological Service from the Ministry of Transport;
- the Air Pollution Control Division from the Department of National Health and Welfare;
- the Public Health Engineering Division from the Department of National Health and Welfare.
- the Water Sector from the Department of Energy, Mines and Resources;
- the Canada Land Inventory from the Department of Regional Economic Expansion;
- the Canadian Wildlife Service from the Department of Indian Affairs and Northern Development.

Responsible for the management of the new organization is R.F. Shaw, Deputy Minister.

Reporting to Mr. Shaw are Jean Lupien, Senior Assistant Deputy Minister; W.E. Armstrong, Assistant Deputy Minister, Finance and Administration; and A.T. Davidson, who is Assistant Deputy Minister, Policy Planning and Research.

Advice and direction from outside the government will be provided directly to the Minister and Deputy Minister by an Environmental Advisory Council, and several councils advisory to the resource services. The work of these various bodies will be co-ordinated by a permanent secretary, Dr. R.R. Logie.

The Environmental Council will be selected from public groups and organizations, and will include prominent Canadians from industry, the universities, and the scientific community. The Council will consult with the Minister on environmental matters and the rationalization of long and short-term programs. It will also assist in the co-ordination of efforts of private and public groups toward the resolution of environmental problems. Finally, it is hoped the Council will provide a sounding board to consider proposed departmental programs, and to reflect the impact of departmental operations.

The Advisory Councils to the resource services will be created to report to the Minister on specific areas of responsibility. A Forestry Advisory Council was established in 1970 and a Fisheries Advisory Council has been proposed. More such councils will be formed in time to advise on problems relative to air, water and land resources. These advisory bodies will propose programs, assess impact, and provide links with organizations outside the government.

Providing overall co-ordination of programs is the Policy Planning and Research Service under Mr. Davidson. This organization is divided into three functions: policy planning, intergovernmental affairs; and research co-ordination.

THE SERVICES

There are six organizations at the Services level of structure, each headed by an Assistant Deputy Minister. They include:

- Fisheries Service, Dr. J.R. Weir;
- Lands, Forests and Wildlife Service, Dr. M.L. Prebble;
- Water Management Service, L.E. Edgeworth;
- Atmospheric Environment Service, J.R.H. Noble;
- Finance and Administration Service, W.E. Armstrong;
- Environmental Protection Service, K.C. Lucas.

The **Fisheries Service** will be made up of the former Fisheries Service of the Department of Fisheries and Forestry and the Fisheries Research Board. The Fisheries Research Board will continue to operate and will have as its chairman, the Assistant Deputy

Minister for the new Fisheries Service. The bringing together under one head of the operational side of the fisheries mission with the research operation will combine these two inter-dependent functions into an effective operational element both directly associated with the same mission.

The **Lands, Forests and Wildlife Service** has, as its base, the Forestry Service. To this have been added the Canadian Wildlife Service, formerly with the Department of Indian Affairs and Northern Development, and the Canada Land Inventory, formerly with the Department of Regional Economic Expansion. The task of this service is research, surveys, and consultative services to provincial and industry groups with respect to management operations and land-use planning.

The **Water Management Service** is made up of Water Planning and Operations Branch, Marine Sciences Branch and Inland Waters Branch, including Canada Centre for Inland Waters, Burlington, and Bedford Institute of Oceanography, transferred from the Department of Energy, Mines and Resources. It will continue to have responsibility for water management in Canada and will develop the means to implement major portions of the Canada Water Act.

The **Atmospheric Environment Service** includes the functions already carried out by the Canadian Meteorological Service, formerly of the Ministry of Transport.

The service intends to involve itself further in research into atmospheric processes affecting the environment, and means to the practical application of this knowledge. The organization, which represents Canada's interests in world meteorological circles, will continue to provide weather information and related services to other federal departments and to the public.

Another area of interest is the gathering of data and information concerning ice in navigable waters during freeze-up and break-up periods. This information is used by shipping companies, utilities using hydro-electric dams, and flood control agencies.

The **Finance and Administration Service** is responsible for all aspects of administration across the Department, including the functions associated with finance, personnel, computer sciences, information and publicity, facilities planning and emergency measures.

The **Environmental Protection Service** originated as the Environmental Quality Directorate of the Department of Fisheries and Forestry. It now includes the Air Pollution Control Division and part of the Public Health Engineering Division, both transferred from the Environmental Health Directorate of the Department of National Health and Welfare. The Service carries responsibility for several environmental control functions including public health engineering, the proposed Clean Air Act, codes and regulations, crisis management, and such inspection as is necessary to enforce regulations not specifically allocated to one of the missions.

FISHERIES MINISTER TITLE RETAINED IN DEPARTMENTAL RE-ORGANIZATION

Hon. Jack Davis
Minister

The unique importance of fisheries in the fabric of Canadian industry has been recognized by designation of the Hon. Jack Davis as "Minister of Fisheries of Canada" as well as "Minister of the Environment".

Historically, the fisheries first attracted Europeans to Canadian shores and led to permanent settlement. Economically and socially, the industry is a dominant source of employment in coastal and inland lake regions and of abundant food supplies for home and world markets. In value, Canada's seafood exports are second largest in the world.

Exclusive federal jurisdiction over "sea coast and inland fisheries" was clearly established in the British North America Act. Delegation of administrative authority has been made over the years to various provinces, but direct federal fisheries management

continues in five provinces and the Northwest and Yukon Territories.

Federal fisheries administration was exercised over half a century by the old Department of Marine and Fisheries and, for a few years' interval, the Department of Naval Service. A Department of Fisheries created in 1930 was merged in 1968 to form the Department of Fisheries and Forestry. In the Department of the Environment, fisheries responsibilities command continuing priority.

Dr. J.R. Weir
Asst. Deputy Minister, Fisheries

Fisheries Minister Davis emphasizes the close links binding the interests of the fisheries with the broader aims of the Department of the Environment:

"The biggest single problem the fisheries have faced over the years, in addition to the depletion of stocks through over-fishing, has been the effects of pollution. . . From now on I expect this problem, if not tackled properly, will be problem No. 1. But we intend to tackle it and we can do so more effectively in the context of the Department which is concerned with the quality of water and air."

The 6 Goals of Environment Canada

The following six goals have been set by Environment Canada:

Carry on established resource programs and services:

Federal responsibilities are mandatory by statutes and historic precedents for management and/or research in specific resource areas – fisheries, water, forestry, migratory birds, wildlife – and for atmospheric research and weather forecasting, These responsibilities and services are crucial in the interests of the resources themselves and of the environment of which they are vital elements.

Continued high levels of performance in serving the needs of these resource areas will be expected as Environment Canada moves to attack the broader problems affecting the environment. Capability to uphold and improve resource mission services must be maintained.

Clean up and Control Pollution:

Primary emphasis will be given to rolling back the more serious instances of air, water and land pollution already existing, preventing the development of new environmental hazards, and to developing a capability to respond effectively to pollution crises. Specific programs will be undertaken to implement the proposed Clean Air Act, to speed up water quality management by means of both controls and incentives, and to ensure the most effective use of raw and waste materials. Pollution is to be controlled for the benefit of man and all other living things.

Assess and control the environmental impact of major developments

The focus here is on major changes in land and water use, usually related to major industrial enterprises, river diversions, the construction of dams, the building of oil and gas pipelines, etc. Such changes may be the result of private initiative or of government efforts to accelerate development in under-developed regions. The requirement is to ensure that the cost and benefits of all consequences to the environment are taken into account before commitments are made and plans completed. Development plans should include provision for minimizing adverse effects on the environment and maximizing beneficial effects. An improved mechanism for consultation and co-ordination of government efforts is needed.

Initiate long-term environmental programs:

A fundamental requirement is to gain acceptance for a concept of development planning which fully recognizes environmental factors. This is a truly long-term task to which many people and groups will contribute. The challenge to the Department is to provide leadership and support in pursuing this goal.

In the shorter term, there is an urgent need to continue and build upon basic and comprehensive studies in areas of primary environmental concern, e.g. the atmosphere; the continental shelves; the Great Lakes, the Coastal waters and other water bodies that are subject to intensive human use; and ecologically vulnerable areas in the Arctic and sub-Arctic.

Promote and support international environmental initiatives:

Environmental problems ignore national boundaries and their solution often demands effective international cooperation. Just as Canada can afford no pollution havens within its borders, so in this era of multi-national corporations it is in Canada's interest to work toward world standards of pollution control. In research and data collection international cooperation is essential, particularly in respect of air and the oceans, and in support of missions concerned with fish and migratory birds. International cooperation in the development of environmental technology will be of continuing importance.

Develop an environmental information and education program:

Informed public opinion is ultimately the most potent instrument for influencing the behaviour of individuals, organizations and governments, all of whom must change their ways if they want a cleaner environment. People need facts upon which to base judgments and action. They will look to Environment Canada as a primary source of facts about the environment and the causes, costs and cures of pollution.

For maximum effectiveness, information programs must provide an adequate base for public participation in dialogue and decision-making relating to the environment.

Advisory Committee to Report on Atlantic Seal Hunt

Appointment of a Special Advisory Committee on Atlantic Seals, composed of scientists and executive members of international humane societies, has been announced by Fisheries Minister Jack Davis to study and report to him on all aspects of sealing in the Northwest Atlantic and the Canadian Arctic.

The committee will study not only humane methods of harvesting but will recommend measures to ensure the maintenance of the seal herd in the future.

The Atlantic seal hunt has been under continuing study for the past few years, and many significant changes and improvements have been introduced, including the establishment of an overall quota this year for the first time in history.

It is expected that the quota may be sharply reduced for next season after the Special Committee has completed its studies.

The Special Commitee's terms of reference are: to investigate all aspects of the hunting of seals in the Northwest Atlantic and Arctic Oceans and in particular to investigate the economic, sociological, ecological and humanitarian aspects of the seal hunt and to recommend to the Minister of Fisheries any changes in the present regulations which may be considered necessary.

Immediate objective

The immediate specific objective is to recommend changes in quotas and seal hunting regulations for consideration by the Minister for implementation for the 1972 seal hunting season.

The long range objective is to observe various phases of seal hunting, both in the Gulf, Front, and other areas; to accurately evaluate the size and composition of the seal herd using such methods as may be considered necessary and desirable to produced accurate statistics; to examine the present method of gathering statistics and to establish the validity or otherwise of these statistics and to recommend new systems if necessary; to study methods used to take and kill seals in all regions by Canadians, Norwegians, and Danes (Greenland); in the case of the Canadian fishery to recommend changes in these methods, if considered necessary.

Mr. Davis stated that the Special Committee would be provided with all the necessary means to enable its members to observe any phase of the seal hunt in any region of the Northwest Atlantic and the Arctic where seals are killed.

The Minister indicated that the closing lines recently imposed by Canada to protect its fisheries will be applied to the protection of seals within those lines in Canadian waters, particularly the Gulf of St. Lawrence.

Hunting by means of aircraft was banned at the start of the 1970 season, and other measures to ensure the enforcement of more humane regulations have been implemented progressively.

Lands Bumper Catches Using Midwater Trawl

Members of the Special Advisory Committee are: Chairman, Professor Keith Ronald, Dean of the College of Biological Science, University of Guelph, Guelph, Ont; T.I. (Tom) Hughes, Director, Ontario Humane Society, Toronto; Trevor H. Scott, International Society for the Protection of Animals, London England; Dr. H. Rowsell, Canadian Council of Animal Care, University of Ottawa, Ottawa; Kjell Henriksen, North Sydney, N.S., Canadian member of the International Commission for the Northwest Atlantic Fisheries, and Professor H.D. Fisher, Department of Zoology, University of British Columbia, Vancouver.

Two fishing trips by a Canadian stern trawler earlier this year indicate a major breakthrough in Canadian east coast fishing operations.

The *Cape Argos,* of Lunenburg, Nova Scotia, caught 410,000 pounds of fish, mostly cod, in seven and one-half days of fishing using a midwater trawl. It was the first time that large quantities of groundfish, usually caught by bottom trawls, had been taken in midwater.

What makes the catches more significant is the fact that on the first trip, while the *Cape Argos* was making single hauls of up to 40,000 pounds, ten Canadian and eight Portuguese bottom trawlers fishing the same grounds were unable to make profitable catches and had to leave the area.

All the catches were made on Sydney Bight, off the northern coast of Cape Breton.

Joint project

The two trips made by the *Cape Argos* were part of a joint project undertaken by the federal Government, the Government of Nova Scotia, and the fishing industry. The vessel, a 150-foot stern ramp trawler, with 1,250 horsepower engines, is owned by National Sea Products Ltd. of Lunenburg, and skippered by Captain Morris Nowe of the same port.

The project is under the supervision of W. W. Johnson, Fishing Operations Chief of the Industrial Development Branch of the Canadian Fisheries Service.

On the first trip, three and one-half days of midwater fishing time were possible between March 10 and March 20. Of 210,000 pounds of fish caught in that time, 5,000 pounds were haddock and another 5,000 pounds were redfish; all the rest were cod. On the second trip, between March 22 and March 31, the 200,000-pounds catch in four fishing days was nearly all cod. On that voyage the *Cape Argos* used both bottom and midwater trawls, with the latter accounting for the major part of the catch, 185,000 pounds.

New techniques

New gear-handling techniques made it possible for Captain Nowe to make quick changeovers from bottom to midwater trawling and back, which normally take 45 minutes or more each way. By using a special trawl reel the changeover can take place within a few minutes.

The midwater catches of cod were made in water from 20 to 70 fathoms off bottom, with the vessel fishing in water from 70 to 160 fathoms deep.

Market Outlook for Frozen Groundfish

The Minister of Fisheries, Hon. Jack Davis, and the Minister of Industry, Trade and Commerce, Hon. Jean-Luc Pepin, issued the following communique May 5:

Government officials of Canada, Denmark, Iceland and Norway met in Olso on April 27, 1971, to review the international market outlook for frozen groundfish. This was the sixth meeting of a series of consultations among the major North Atlantic suppliers of groundfish which was begun in Copenhagen in March 1969.

Officials noted that the strengthening of the market observed at the time of the last meeting in October 1970 has continued. Production in the early part of 1971 has been somewhat below the level for the same period last year. Stocks remain low.

On the basis of present information the representatives of the participating countries were of the opinion that strong and stable market conditions will continue in both Europe and North America throughout 1971.

Officials agreed to maintain and improve arrangements for the exchange of statistical information promptly and on a continuing basis. They will keep production and market conditions under review and to this end plan to have further consultations.

PRODUCTIVITY OF STRAIT OF GEORGIA

BY T.R. PARSONS

Fisheries Research Board of Canada Biological Station, Nanaimo, B.C.

The Strait of Georgia covers an area of approximately 2000 square miles between the mainland of British Columbia and Vancouver Island (Fig. 1). The area offers a mild climate for marine life; This is in contrast to the much harsher marine climates found on Canada's eastern and arctic coasts.

As a result of this difference, the diversity of plants and animals present in the Strait of Georgia is much greater than is found elsewhere along Canada's shoreline. Several physical factors combine to produce this effect.

Firstly, the area is an inland sea, geographically protected from ocean storms which batter the west coast of Vancouver Island; secondly, the latitude of the Strait, extending below the 49th parallel, assures more equable weather conditions than are found farther north. Finally, although the area is a marine habitat, its productivity is heavily predominated by the flow of freshwater from the Fraser River - this overlayering of sea water with brackish water imparts a stability to the waters of the Strait which assures the abundant production of food organisms for larger animals.

Five-year Study

The productivity of the Strait of Georgia has recently been the subject of a five year study carried out by the Fisheries Research Board. The effect

Fig. 1. Strait of Georgia

of the Fraser River flow on the productivity of the area was one of several subjects which received particular attention during this study.

Every year approximately 400 million young salmon (mostly pink, sockeye and chum) migrate from the Fraser River to start a new life in the sea. These young fish do not feed extensively during the course of their passage down the river, but when they arrive in their new marine environment they require abundant supplies of food organisms (zooplankton) in order to survive.

Generally this food supply is present in the form of a small shrimplike creature which can grow in large quantities (several tons per acre) under the influence of the Fraser River 'plume'. This 'plume' is illustrated in an air photograph (Fig. 2) which shows the light coloured Fraser River water extending out across the Strait over the darker salt water. The most productive

region in the Strait of Georgia is found in an approximate 500 square mile area surrounding the 'plume'.

Besides young salmon, the Strait of Georgia is also a nursery area for many other species of commercially important fish, some of which remain in the Strait as adults. An indication of total adult stocks of resident fish is given in Table I; among these fish, the coho and chinook salmon must be considered as most important for the sports fisherman and commercial trollers, while herring, cod and flatfish are important to the commercial fisherman.

Productive area

The large tidal exchange throughout the Strait is instrumental in causing a rim of particularly high production along the shoreline of the whole region. This results either in the growth of large seaweed beds (particularly kelp, fucus and eel grass) or, in shallower waters, in the production of abundant quantities of microscopic plants (phytoplankton) which in turn support commercially exploitable beds of oysters, clams and other molluscs.

Nutrient salts, such as nitrates and phosphates, which occur naturally in sea water, are the primary requirement for the production of plants and animals in the Strait of Georgia. It is of interest, in fact, to note that according to current definitions of eutrophication, based on phosphate content, seawater is naturally eutrophic even when compared with unnaturally eutrophic lakes, such as Lake Erie. The principal difference between the two waters is not in the total productivity, but in the fact that marine environments have evolved with abundant animal populations which keep the plant populations under some form of control. However, on certain occasions, as in other seas, natural blooms of algae occur in the Strait of Georgia which may attract sufficient attention to be reported in the local press.

Fig. 2. Fraser River 'plume' – courtesy of B.C. Aerial Surveys.

The Fraser River does not contribute any appreciable quantity of nitrates or phosphates to the Strait of Georgia, even if one includes the quantity of nutrients contained in domestic sewage from Vancouver. However, organic material from the land which is carried into the Strait during periods of heavy run off, may contribute, through a complicated cycle, to the total productivity of the area.

This is a natural process and at the present time, apart from the results of fishing on certain commercial species and very local effects of pollution, such as harbors and industrial outfalls, the general basis for organic production in the Strait of Georgia appears to have been unaffected by man's activities. It will be a monument to our presnet generation if future scientists can still endorse this current appraisal.

Table I

Estimates of the total biomass of resident fishes in the Strait of Georgia that are harvested by the commercial fishery.

Species	Weight in units of 1000 tons
Herring	71
Lingcod	18
Cod	3-6
Flatfish	2-4
Rockfish	0.5-1
Dogfish	20
Coho salmon	1.3
Chinook salmon	0.8
Miscellaneous	2-4

Overfishing the Sea

Editors note: The following article is based on remarks made by Dr. A.W. May at an "Environment Teach-in" held at Memorial University last year. Dr. May is a research scientist at the St. John's Biological Station of the Fisheries Research Board.

BY DR. A.W. MAY

Fisheries Research Board
Biological Station, St. John's, Nfld.

This is not a scientifically precise nor a complete treatment of the complexities of overfishing. It is intended to be a general statement, including some of the broad consequences, for the non-technical reader. Illustrative examples are drawn from the northwest Atlantic fisheries.

The first warnings that some species of marine fish might be overexploited were sounded in the early years of the present century. As with any new scientific pronouncement this caused a certain amount of controversy among fisheries scientists themselves. Some believed that the sea was so vast, and its resources so huge, that the depredations of man were but a small and insignificant factor in the ecology of animal communities in the open sea. It could be argued, for example, that natural fluctuations (variations in survival of young fish) might be of a far greater magnitude than numbers removed by fishing, and that fishing was at the mercy of uncontrollable natural laws and in itself had little or no effect.

This might be worth an argument 50 years ago, but not any more; the modern argument concerns how much can be removed annually without causing catastrophic declines in the numbers of a species present in the sea. Natural fluctuations, of course still go on, related to changes in oceanic climate, available food, predators, etc. But man can now in a very short time cause changes approximating those which may occur naturally over a similar time scale.

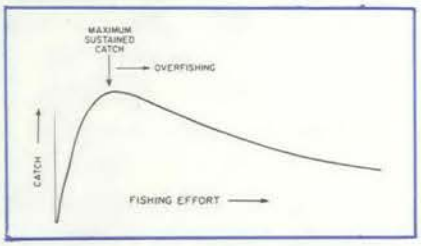
The technological explosion of the 20th Century has, perhaps, produced a smaller bang in the fishing industry than, for example, in aerospace or information processing. We don't yet have shipboard computers to advise on where and when to fish and to control operations of the ship and gear, but we may not be far away from such systems. In 20 or 30 years, however, marine fisheries in general have moved from a relatively primitive form of hunting, tied fairly closely to the shore because of the necessity to land catches frequently, to an efficient self-contained harvesting-processing system backed up by sophisticated fish detection equipment, improved gear, and ships big enough to stay at sea for months at a time.

While the word harvest is often used in connection with fisheries, it is not a harvest in the true sense in that we reap, but do not sow. This being the case, we should only remove from a given fishery in a given year the maximum amount that the fish stock is capable of replacing by the next year through addition of new individuals and increase in size of those remaining. If more than this amount is removed the fish stock is overfished, and we are not using it efficiently. On the other hand if less than this amount, which we may call the "maximum sustained catch" is removed, we are not using the resource to its maximum capacity, and are in a sense allowing it to go to waste (Fig. 1).

The maximum sustained catch from a fishery depends on the amounts that are added each year through birth and growth and the amount lost through natural causes (predators, disease). These amounts will vary from one species to another and from one area to another. If survival of young fish is variable from year to year, and a knowledge of relative survival is available, advantage can be taken of this knowledge to obtain the maximum catch from each age group of fish entering the fishery. Fisheries management therefore requires substantial and continuing input of biological data from the various fish stocks. In general, yield from a fishery will increase with fishing effort to a maximum and will then decline, since removals are too great to be balanced by the natural tendency of the species to increase (Fig. 1). If removals are sufficiently great the reproductive potential of the species may be impaired.

This can lead to a situation whereby the more we fish the less we catch, and the reverse is, of course, true – a

Fig. 1. A possible form of the relation between amount of fishing and the resultant long-term stable catch.



greater catch could be obtained with less fishing effort. The economic implications of this are obvious. Less effort means less cost; the greater catch resulting means greater returns per unit of effort, however that unit is measured (ships, men, gear, time fished, etc.). A recent study by the International Commission for the Northwest Atlantic Fisheries concluded that a reduction of 10 to 20% in total North Atlantic effort on cod and haddock stocks would result in a reduction of 50 to 100 million dollars in costs, and a possible slight improvement in catches.

Why is this not done as a matter of course? The reasons are varied, but perhaps the most important is that many nations have now developed large and expensive fishing fleets, variously subsidized, and of not much use to any other activity except fishing. Most countries agree that fishing effort on certain species should be reduced, but the mechanics of reduction are as yet elusive, involving as they do, besides biological and economic problems the political questions of historic rights, freedom of the seas, etc. Additionally, precise calculations of yield that can be produced from given fisheries require substantially more biological data than are presently available from these fisheries.

The world catch of fish and shellfish (including fresh-water fisheries) now stands at about 65 million tons annually, double the level of 10 years ago, and is increasing at 3 to 4 million tons a year. The northwest Atlantic portion of the world catch is almost 4 million tons, of which about one-third is taken by Canada. Yield from the northwest Atlantic can be increased, but not by more fishing on the familiar species, e.g. the cod stocks now yield almost 2 million tons annually – half the total catch of all species fished by all countries, and are not likely to produce more. It is estimated, for example, that each year 40 to 50% of all the cod in the Labrador-Newfoundland area big enough to be caught, are caught. A further 15 to 20% die of natural causes. Few renewable resources are productive enough to withstand such exploitation without any input by man toward increasing productivity.

To sum up, we have reached the point where, through increased fishing combined with improved searching and fishing techniques, we are able to quickly reduce a fish stock so that it is not being used rationally, either in a biological or economic sense. The increased productivity resulting from technological advances is offset by increasing competition for the available annual yield. Long-term stable production may be sacrificed for short-term gains. As in many other human activities the problem of controlling our fishing capability is at least as important as improving that capability. Unless and until we can increase productivity in the sea the only sensible course is to determine the natural laws governing production, and use them to our best long-term advantage.

New Directors for FRB Stations

The appointment by the Public Service Commission of new directors of Fisheries Research Board of Canada laboratories in Vancouver and Halifax has been announced by Dr. J.R. Weir, Chairman of the Board.

Dr. W.E. Razzell, 40, of Vancouver, succeeds Dr. H.L.A. Tarr, who retired in November 1970 as Director of the Vancouver laboratory.

In the other appointment Dr. E.G. Bligh, 41, Assistant Director of the Research Board's Freshwater Institute in Winnipeg, becomes Director of the Halifax laboratory. The position was formerly occupied by Dr. D.R. Idler.

Dr. Razzell was born in St. Boniface, Man., and received his Ph. D. from the University of Illinois in 1956. Following graduation he was employed for five years with the British Columbia Research Council in Vancouver, and served subsequently as Director of Laboratories with the Syntex Institute for Molecular Biology in Palo Alto, California. He later became Associate Professor of Microbiology at the University of British Columbia, and before joining MacMillan Bloedel Research Ltd. in 1970, was Professor and Chairman of Microbiology at the University of Alberta in Edmonton. Dr. Razzell is married, with three children.

Dr. Bligh, a native of Lakeville, N.S., obtained his Ph.D. from McGill University in Montreal, and joined the Fisheries Research Board as a scientist at the Halifax Laboratory in 1956. In 1962 he was transferred to Ottawa as Associate Editor of Scientific

Dr. W.E. Razzell

Dr. E.G. Bligh

Publications and Technological Consultant to the Chairman of the Board. He was appointed Scientific Leader of the Technological Section of the Freshwater Institute in Winnipeg in 1966, and became Assistant Director of the Institute in 1968.

In addition to holding an honorary professorship with the University of Manitoba, Dr. Bligh has received international recognition as co-ordinator of the multi-discipline group assigned to the problem of mercury pollution. He is married, with three daughters.

Both appointments will be effective by the end of July, 1971.

Canada Develops New Sonar Unit

A Canadian – developed advanced sonar unit which places Canada among world leaders in fish finding equipment has been announced.

The unit, which shows locations and quantities of fish, provides a picture of the underwater situation similar to that of a high quality radar set. It scans a 360-degree area to a range of 6,400 feet and provides a completely new picture every two seconds.

During trials of the new equipment groundfish were detected three fathoms off bottom in 55 fathoms of water and at a range of 3,000 feet. In another test a small, dispersed school of herring was clearly shown in mid-water at a distance of 3,200 feet from the fishing vessel.

The unit also detects navigational buoys and shoals, providing for safer passage through dangerous channels of water.

Another feature of the new sonar is that the system can be adapted for use as a net sounder, so that it can provide a fishing skipper with a measurement of the net depth, its height above bottom, its width when being towed and the depth of the net opening. In addition, fish can be seen entering the net at any point in the net opening; existing net sounders can monitor no more than about six per cent of a large net opening.

The new sonar, called LSS-30, was developed by C-Tech Limited, Cornwall, Ontario, in co-operation with the Industrial Development Branch of the Canadian Fisheries Service. The project was under the direction of L. W. Proctor, electronics engineer of the Branch's Vessel and Engineering Division.

Statistics

CANADA EXPORT VALUE OF FISHERY PRODUCTS

	January to March	1971 $'000	1970 $'000
	TOTAL EXPORT VALUE	**58,195**	**62,072**
By Markets	United States	35,998	41,577
	Caribbean Area	4,469	5,650
	Europe	14,786	13,412
	Other Countries	2,942	1,433
By Forms	**Fresh and Frozen**	**35,910**	**40,372**
	Whole or Dressed	**11,050**	**11,591**
	Halibut, Atlantic	417	671
	Halibut, Pacific	1,070	1,655
	Salmon, Atlantic	37	37
	Salmon, Pacific	5,102	4,891
	Swordfish	22	150
	Herring	241	59
	Other Seafish	1,459	923
	Pickerel	407	466
	Whitefish	1,450	1,562
	Other Freshwater Fish, n.e.s.	845	1,177
	Fillets, Blocks and Slabs	**15,245**	**18,681**
	Cod fillets, Atlantic	2,680	3,847
	Cod blocks and slabs	2,625	3,517
	Haddock fillets	1,104	1,086
	Haddock blocks and slabs	128	77
	Ocean Perch fillets	1,826	2,411
	Ocean Perch blocks and slabs	263	187
	Pollock blocks and slabs	10	97
	Flatfish fillets (Plaice, Sole, Flounder)	3,289	4,362
	Flatfish blocks and slabs (Sole, Flounder)	624	444
	Pickerel fillets	197	328
	Perch fillets	424	602
	Other fillets	1,403	1,091
	Other blocks and slabs	672	632
	Fresh and Frozen Shellfish	**9,235**	**9,368**
	Lobster (in shell and meat)	6,669	6,625
	Scallops	1,682	1,966
	Crab	354	579
	Other Shellfish	530	198
	Frozen Fish and Shellfish, pre-cooked	**380**	**732**
	Cured	**7,293**	**6,892**
	Smoked	**495**	**632**
	Herring	271	283
	Other	224	349
	Salted, Wet and Dried	**4,621**	**4,832**
	Cod	3,773	4,194
	Other	848	638
	Pickled	**2,177**	**1,428**
	Herring	2,019	1,184
	Mackerel	99	108
	Other	59	136
	Canned	**9,577**	**8,574**
	Salmon	6,275	4,971
	Sardine	1,668	2,300
	Lobster	271	245
	Other	1,363	1,058
	Miscellaneous	**5,415**	**6,234**
	Fish Roe, Fresh, Frozen and Cured, n.e.s.	321	36
	Meal	3,528	3,683
	Oil	379	691
	Irish Moss and Sea Plants, n.e.s.	475	1,091
	Other	712	733

FROZEN FISH – Cumulative Production and Stocks

	PRODUCTION January to April 1971	PRODUCTION 1970	STOCKS End of April 1971	STOCKS 1970
	Quant. '000 lb.		Quant. '000 lb.	
TOTAL – Frozen Seafish, Canada	**95,261**	**91,897**	**47,744**	**38,631**
Frozen Fish – Total	**76,361**	**70,974**	**35,167**	**25,759**
Cod, Atlantic, fillets	9,980	1	2,100	3,327
Cod, Atlantic, blocks	15,021	10,466	906	1,694
Haddock fillets	3,978	1	1,938	1,096
Haddock blocks	2,607	821	1,263	483
Redfish fillest	5,022	5,963	1,267	772
Redfish blocks	657	797	78	22
Flounder and Sole fillets	9,252	14,685	3,390	2,445
Flounder and Sole blocks	3,543	2,120	553	1,066
Halibut, Pacific, dressed and steaks	1	488	3,465	1,713
Halibut, Pacific, fillets and blocks	1	1	315	113
Turbot fillets	41	311	36	36
Turbot blocks	308	63	102	35
Pollock fillets	523	745	89	150
Pollock blocks	1	462	1	189
Other Groundfish, dressed and steaks	1,022	623	1,078	841
Other Groundfish, fillets and blocks	2,043	18,180	1,165	863
Salmon, Pacific, dressed and steaks	514	438	7,910	1,350
Herring, Atlantic and Pacific	7,907	3,153	1,588	1,150
All other seafish, all forms	12,042	9,428	4,933	5,375
Lobster, whole and meat	33	6	409	340
Scallops, breaded and unbreaded	1,117	1,409	363	479
All other shellfish, all forms	751	816	2,219	2,220
Frozen (Smoked) Fish – Total	**1,265**	**1,032**	**1,111**	**987**
Cod, Atlantic	785	762	443	417
Sea Herring, kippers	1	1	245	296
Other, all forms	480	270	423	274
Frozen for Bait and Animal Feed	**17,635**	**19,891**	**11,466**	**11,885**

1 Confidential, included in "Other".

SALTED AND PICKLED FISH, ATLANTIC COAST – Cumulative Production and Stocks

		PRODUCTION January to April 1971	PRODUCTION 1970	STOCKS End of April 1971	STOCKS 1970
WET SALTED – TOTAL	('000 lb.)	**2,363**	**2,321**	**2,751**	**2,050**
Cod	"	1,728	1,454	1,724	1,287
Pollock	"	270	479	488	336
Hake	"	103	124	347	160
Other	"	262	264	192	267
DRIED SALTED – TOTAL	('000 lb.)	xxx	xxx	**666**	**896**
Cod	"	xxx	xxx	286	612
Pollock	"	xxx	xxx	147	149
Hake	"	xxx	xxx	210	116
Other	"	xxx	xxx	23	19
BONNELESS – TOTAL	('000 lb.)	xxx	xxx	**584**	**285**
Cod	"	xxx	xxx	438	219
Other	"	xxx	xxx	146	66
PICKED – TOTAL	(200 lb. barrels)	**143,776**	**78,397**	**34,916**	**13,590**
Herring	"	143,699	78,397	31,045	12,689
Mackerel	"	2	–	2,126	378
Alewife	"	–	–	1,745	523
Turbot	"	77	2	–	–
HERRING BLOATERS	(18 lb. boxes)	15,116	2	35,704	2
BONELESS HERRING	(10 lb. boxes)	21,702	15,084	1,466	2

1 Production figures represent the quantity of fish put to salt during the period (expressed as wet salted).
2 Confidential

SEA FISHERIES: Landings and Landed Values

	Cumulative Landings, January to April 1971 Qant. [1] '000 lb.	Val. [2] $'000	Cumulative Landings, January to April 1970 Quant. [1] '000 lb.	Val. [2] $'000
CANADA TOTAL	**612,598**	**24,996**	**645,692**	**25,597**
ATLANTIC COAST – TOTAL	**581,835**	**22,959**	**622,633**	**23,266**
Cod	89,330	4,652	94,507	4,298
Haddock	24,589	2,597	17,875	1,790
Redfish	23,289	821	26,958	792
Halibut	1,025	537	1,473	732
Turbot	960	43	1,186	47
Other Flatfishes	53,866	2,781	71,217	3,498
Pollock, Hake, Cusk	5,408	210	8,016	279
Catfish	1,684	62	1,641	56
Other Groundfish	1,245	20	1,398	27
Herring and sardine	370,083	4,819	386,440	4,247
Mackerel	1	Ø	–	–
Swordfish	–	–	80	76
Tuna	–	–	15	10
Alewife	399	14	166	8
Salmon	–	–	–	–
Smelt	1,983	245	2,573	268
Other Fish	265	43	280	27
Clam and Quahaug	2,069	185	1,588	135
Scallop	1,580	1,819	2,184	2,303
Lobster	2,756	3,185	2,956	2,991
Crab	484	39	803	90
Shrimp	721	133	1,106	215
Other Shellfish	98	4	171	11
Miscellaneous items	–	750	–	1,366
PACIFIC COAST – TOTAL	**30,763**	**2,037**	**23,059**	**2,331**
Pacific Cods	4,325	433	4,034	387
Halibut[3]	594	196	990	371
Soles and other flatfishes	2,001	128	4,608	271
Herring	18,339	412	5,768	148
Salmon	697	396	699	420
Other Fish	566	27	1,159	79
Shellfish	4,241	445	5,801	655
Miscellaneous items	–	–	–	–
BY PROVINCES				
British Columbia	30,763	2,037	23,059	2,331
Nova Scotia	199,965	12,612	142,023	11,808
New Brunswick	10,043	599	19,140	876
Prince Edward Island	7,840	240	18,065	384
Quebec	9,685	501	20,169	525
Newfoundland	354,302	9,007	423,236	9,673

1 Fish and Shellfish only.

2 Includes livers, seaweeds, tongues, scales, roes, skins, oil, seals, whales and bait worms.

3 Includes Halibut landed in U.S. ports by Canadian fishermen.

PRICES PAID TO FISHERMEN– Cents per pound

Week ending April 17	1971	1970
HALIFAX, N.S. (Offshore Prices)		
Cod Steak	6	–
Cod Market	5.75	–
Haddock, large	11.25	–
Plaice and Flounder	5.25-6	–
ST. JOHN'S, NFLD.		
Cod (steak & market)	6	5
Flounder (round)	–	4
VANCOUVER, B.C.		
Salmon		
Redspring (dressed)	40-91	54-100
Whitespring (dressed)	30-60	30-65
Halibut (medium)	35-36.6	41-41.5
Ling Cod (dressed, head off)	16-20	12-14
Grey Cod (dressed, head on)	10	9
Sole	10	9.5
Flounder	6	–

MID-MONTH WHOLESALE PRICES IN DOLLARS

April 1971			Montreal	Toronto
Cod fillets, Atlantic fresh, unwrapped		lb.	.500	.670
Cod fillets, Atlantic frozen, cello 5's		lb.	.415	.517
Cod fillets, smoked		lb.	.540	.680
Haddock fillets, fresh, unwrapped		lb.	.806	.880
Herring, kippered, Atlantic		lb.	.322	.407
Mackerel, frozen, round		lb.	.232	.300
Lobster, canned, Fancy	Case 48-1/2's		89.210	92.107
Sardines, canned	Case 100-1/4's		11.781	11.827
Halibut, frozen, dressed		lb.	.610	.720
Silverbright, frozen, dressed		lb.	.745	.860
Coho, frozen, dressed		lb.	1.048	1.167
Sockeye, canned, grade A	Case 48-1/2's		30.127	31.420
Pink, canned, grade A	Case 48-1/2's		21.283	21.840
Whitefish, fresh		lb.	.698[1]	.767
Lake Trout, frozen		lb.	.546	.653

[1] Dressed