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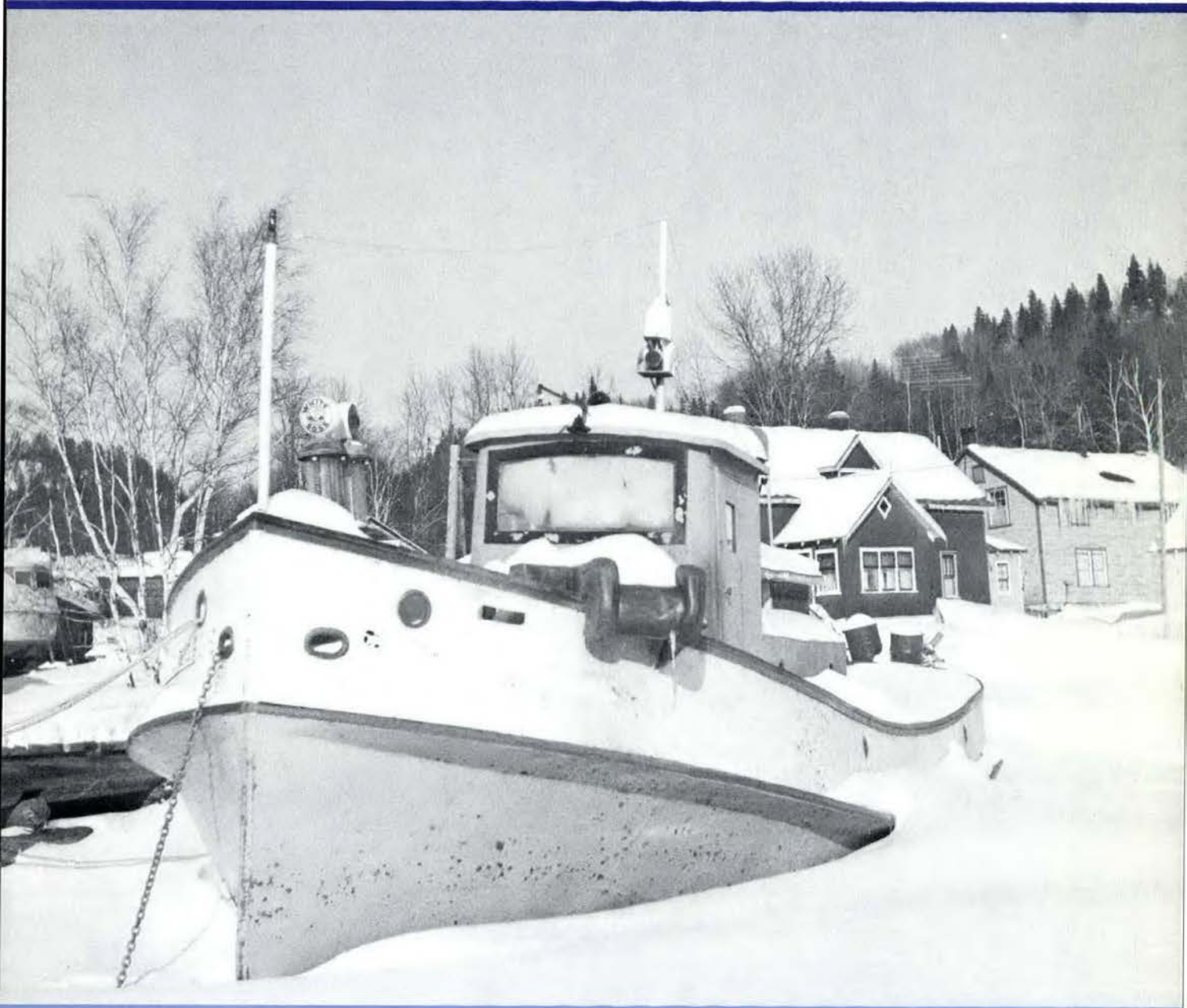

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Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
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Editor
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January 1968

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COVER PHOTOGRAPH - Ice-bound and blanketed with snow, the fishing fleet at McDairmid, Ont. on Lake Nipigon hibernates until the arrival of spring.

Superchilled Fish Fillets Shipped in Test Project

By G.J. Gillespie

A PROJECT designed to get ocean-fresh fish on the dinner plates of consumers hundreds of miles from the Atlantic Ocean has been undertaken jointly by the federal Department of Fisheries and the Canadian fishing industry in co-operation with the research division of Canadian National Railways.

It involved shipping superchilled fish fillets in mechanically refrigerated railway cars, rather than by the conventional method of packing fresh fish in ice.

The first commercial carload shipment of fish by this method – more than 15,000 pounds of cod and haddock fillets – rolled away from a Lunenburg (N.S.) fish plant aboard a CNR fast freight on October 25. In slightly less than 72 hours the shipment arrived at Windsor, Ontario. From there it was transferred, factory-fresh, to refrigerated trucks for distribution to retail markets. While the Detroit area itself absorbed most of the October shipment, other portions of it reached retail outlets in Cincinnatti, Indianapolis, Toledo and as far south as Louisville, Kentucky. The fillets were all of top quality on arrival at their destinations.

CO-OPERATIVE PLANNING

The October project enscribed a new chapter in the story of fish processing and handling that may well herald a notable expansion of the Canadian fresh fish market. The initial commercial shipment was a sequel to a test superchilled shipment of 1,000 pounds of fillets and 500 pounds of scallops made more than a year ago to Vancouver from Lunenburg, The test satisfied all those involved that fresh fish can be moved from coast-to-coast to reach the consumer as a top-quality product.

This new development in fish handling is a splendid example of co-operative planning. In conjunction with the fishing industry, the federal

Shipment of superchilled fillets from Lunenburg is checked by Cy Reid, of National Sea Products Ltd. (left) and Dr. C.M. Blackwood, Assistant Regional Director, Department of Fisheries Maritimes Region.

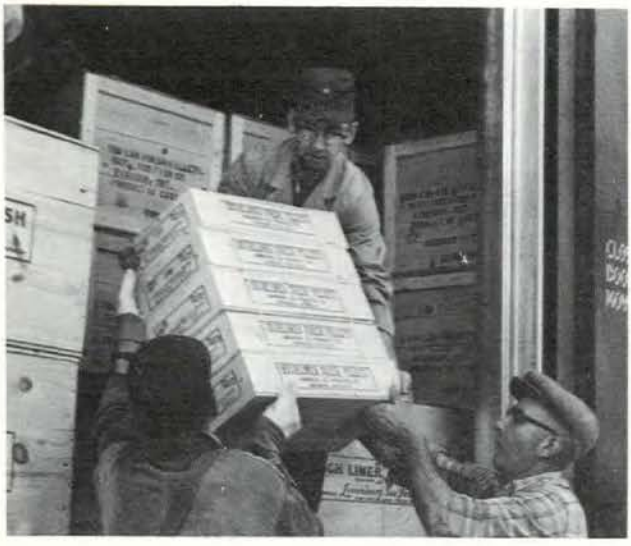
Department of Fisheries successfully conducted superchilling experiments in its Halifax fish inspection laboratory. These experiments led to the test shipment of more than a year ago. As a result of this shipment, the Department has received many inquiries from other countries regarding this application of the superchilling process.

While a few words can explain the whole program generally, considerable technology is involved. The October venture began at the Lunenburg plant where polyethylene trays, each containing about six pounds of fillets, were placed in racks and the fillets chilled in a refrigerated high velocity air stream to just above the freezing point.

Fish quality experts measured the rate of chilling to ensure that the fillets were removed from trays when the temperature of the fillets reached 29°F. Fillets were then packed in specially constructed fillet boxes and later moved into the refrigerated railway car which had a thermostatically-controlled temperature of 29°. For comparison purposes some of the boxes were iced. Also for the same reason, about 900 pounds of non-superchilled fresh fish were iced in regular containers and also shipped in the car.

ADDED SHELF LIFE

The new shipping method has obvious advantages. Fish distributors and retailers can be assured of a longer period in which to dispose of their fish because the superchilling process gives the product added shelf-life; for the consumer, there is the assurance that when purchased the fish will be in good condition.



Boxes of superchilled cod and haddock fillets being loaded into a refrigerated railway car at Lunenburg for fast shipment to Windsor, Ont.

The process also simplified things for the railway by eliminating problems created by melting ice and the need for renewing ice supplies in the cars at points along the route. To the fish plant, the new process does away with the use of ice to refrigerate individual fish boxes.

There were two main objectives in the new shipping venture. One was to establish costs at the plant level, and the other to demonstrate to the processing industry that carload lots of top quality fish can be distributed to distant markets by the superchilled method.

Fish distributors in the various U.S. centres to which the fish were shipped expressed keen interest in the new method of shipment. The dealers agreed that the method would assist in getting better quality fish to the consumer.

While in the United States, Department of Fisheries representatives and their associates in the experiment met with various fish distributing agencies to discuss problems relating to the handling and distribution of fish. There was general agreement that superchilling was a desirable practice, but certain modifications were recommended in packaging techniques.

Meanwhile, planning is going ahead for a shipment of superchilled fish from Lunenburg to the Montreal market. The primary purpose is to further determine distribution problems and to assess the reaction of both retailers and consumers. This project is planned for early February. Around the same time, it is also planned to ship a quantity of superchilled fish to the Ottawa market to assess the results there.

Dr. C.M. Blackwood, Assistant Regional Director of the Department of Fisheries in the Maritimes, directed the superchilling investigation. Paul Winchester of the Department's Maritimes Region Inspection Service, supervised the original planning along with Dr. Blackwood and Cy Reid, National Sea Products fish quality expert. John Lamont, R.J. Tingley and R. Hickey, of the CNR Research Division, also took part in the project. Mr. Winchester, Mr. Reid, Mr. Hickey and Fishery Officer John James accompanied the fish shipment through to Windsor and the United States.

Lake Trout Population In Lake Superior Returning to Normal

AFTER coming close to extinction a few years ago as a result of depredations by the sea lamprey, lake trout in Lake Superior are now approaching the population level that existed in pre-lamprey days.

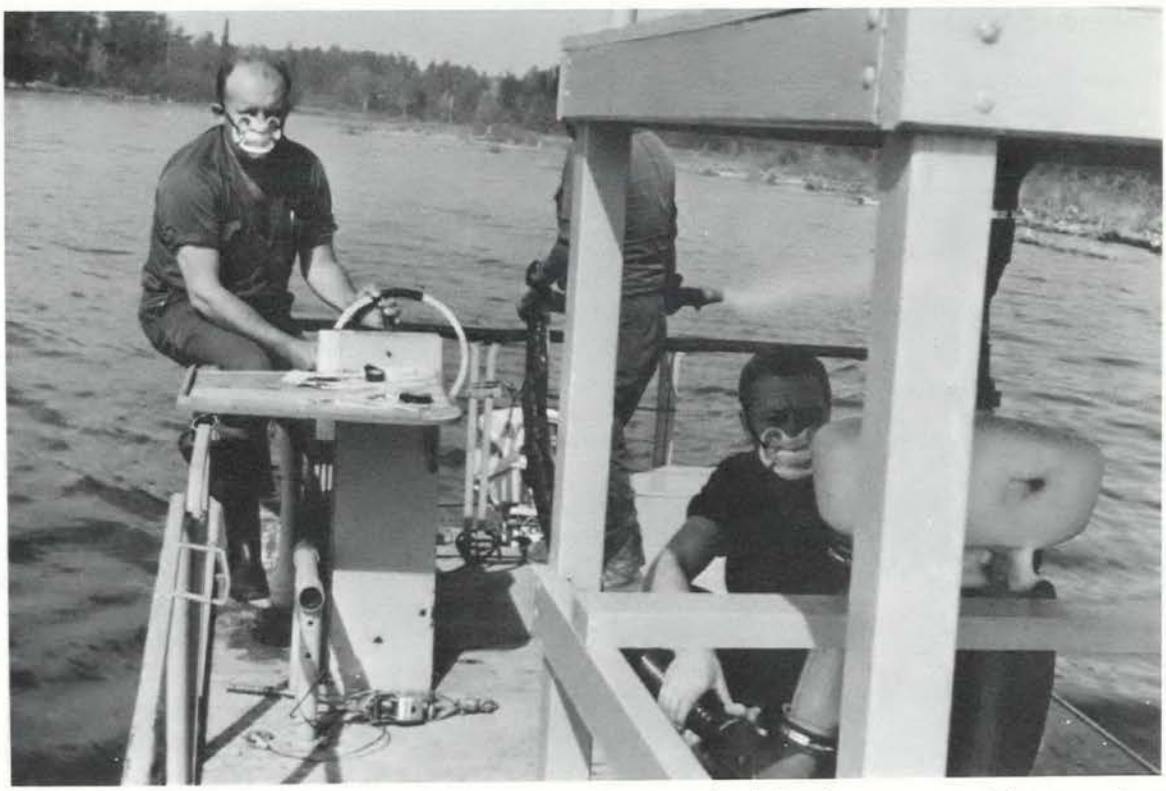
This encouraging news was reported to the Great Lakes Fishery Commission at its meeting November 28-29 at Ann Arbor, Michigan. Some natural spawning of lake trout has begun, although a high proportion of the fish are planted stock. In 1967, some 3,031,000 lake trout were planted in Lake Superior and total plantings since 1958 amount to more than 19 million. The scarring rate from lamprey attacks has dropped considerably in recent years, it was reported.

Although welcoming the spectacular success of Michigan's coho planting program in the Great Lakes, the Commission recommended that Michigan refrain from a major expansion of coho planting until results of natural spawning are assessed and the effects of large numbers of coho on other desirable species is determined.

Commissioners from Canada expressed concern at a possible large-scale introduction of coho salmon into Lake Huron because of a potential threat to its splake program.

Splake, a cross between the brook and lake trout, was introduced into Lake Huron five years ago and major plantings are planned for 1969-70. Canadian authorities fear that large numbers of adult coho would feed on the young splake, thereby negating the money and effort involved in establishing the new species.

The Commission has asked Michigan and Ontario representatives to develop a joint plan for



Granular Bayer 73 is sprayed from a pontoon barge to check for the presence of lampreys in estuarial areas of Lake Superior.

the expansion of the coho program on Lake Huron which would take into consideration the interests of both the state and province.

Of the 12 streams tributary to Lake Superior scheduled for treatment in 1967, three streams were not treated since no sea lampreys were found in pre-treatment surveys.

Three treatments on the estuarine and lacustrine areas of the Sable, Batchawana and Chippewa Rivers, utilized extensive quantities of granular Bayer 73. Many more sea lampreys were found in the lake with the granular Bayluscide than had been found previously with TFM.

A progress report on sea lamprey control prepared by the Department of Fisheries of Canada summarizing activities for the 1967 field season from June 10 – November 17, revealed that on Lake Superior 383 sea lampreys were collected at electrical barriers compared to 381 for the same period in 1966. This is the first time since 1963 that the catch of lampreys from the Canadian barriers has not declined.

Nine barriers were operated on Lake Huron in 1967. The catch of 6,764 lampreys is greater than that of 1966; although more barriers were operating, more lampreys were taken at five of the six barriers for comparable periods in 1966 and 1967.

Re-establishment surveys conducted on 19 streams tributary to Lake Superior indicated that

Dead lampreys at edge of stream attest to effectiveness of lampricide treatment.

Pumping equipment used to treat lamprey spawning streams with lampricide. The location is a section of the Chippewa River.

lamprey had become re-established in nine, including the Nipigon. Surveys showed the establishment of a population of sea lamprey, including transformed animals, in Corbett Creek, a small tributary to the Kaministikwia. This stream was treated with lampricide in September. No lampreys were found in preliminary surveys of 23 larger northshore streams between Terrace Bay and the Pigeon River.

On Lake Huron, re-establishment surveys were conducted on three streams, resulting in collections of sea lampreys from all three.

Of the 12 streams scheduled for treatment in Lake Huron, 11 were completed. The upper sections of the Echo River had to be postponed again because of low water levels.

Trawling for adult lampreys in the St. Marys River has resulted in a catch of 838 sea lampreys, of which 565 have been tagged and 245 have been recaptured. The average catch per hour in 1967 has been 3.2 animals, compared to 7.4 per hour in 1966.

In response to the offer of a reward, inaugurated in July, 1967, for the return of adult sea lampreys taken in commercial gear, 1,469 preserved specimens have been received. Fourteen were from Lake Ontario; the others were from Lake Huron. A laboratory examination of over 700 animals has demonstrated a shift in sex ratio from 180 males per 100 females early in the season to two males per 100 females later in the season; there is no apparent explanation at present for this shift.

Abnormal Water Temperatures Affect Herring Fisheries

By S.N. TIBBO and L.M. LAUZIER

Fisheries Research Board of Canada Biological Station, St. Andrews, N. B.

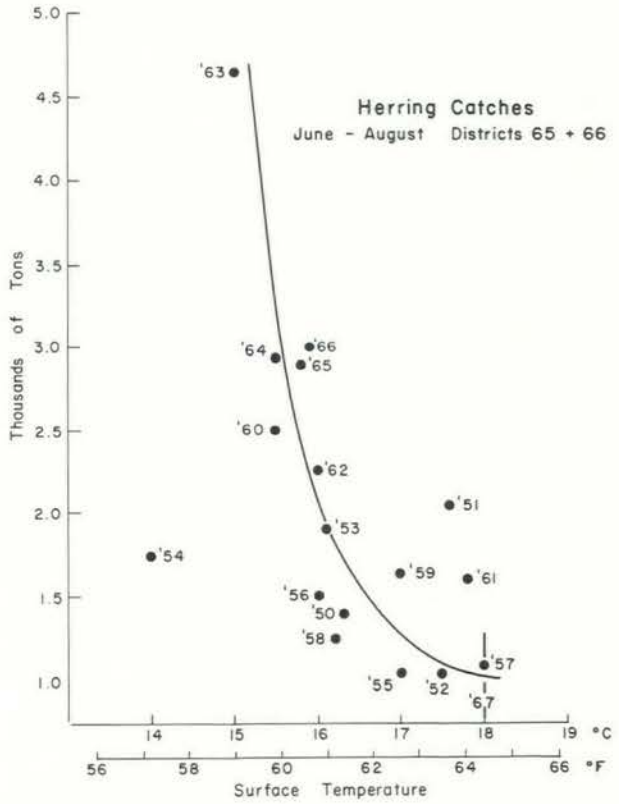
HERRING fisheries in eastern Canada have been developing rapidly in recent years. Since 1965, six new processing plants designed especially for the reduction of herring to meal and oil have been built in southwest Nova Scotia and northern New Brunswick. These plants have a combined capacity of more than 4,000 tons of raw fish daily and fishermen have been expanding their efforts to meet the demand.

Landings of herring at eastern Canadian ports in 1966 amounted to 244,000 tons, an increase of 30% over landings in 1965. The most spectacular increases occurred in the Bay of Fundy where landings in 1966 were 50% higher than in 1965 and almost three times what they were in 1963. Landings have also increased substantially in the Chaleur Bay area of the Gulf of St. Lawrence.

During August, 1967, there was a great deal of concern about herring fisheries in these two areas. Catches were far less than anticipated and the question of over expansion of the fishery was raised. This prompted a special study of the situation by scientists of the Fisheries Research Board of Canada's Biological Station at St. Andrews, N.B., who are trying to determine the cause of the partial failure of these herring fisheries, or more precisely to relate the success or failure of fisheries to changes in the environment.

It is now clear that water temperature conditions at the end of July and in August were abnormal in both the Chaleur Bay and Bay of Fundy areas, and it is suspected that the small catches of herring were a result of these conditions.

Last year weather conditions along the Atlantic seaboard were very unusual. In the Nova Scotia coastal region during July, fog persisted to such a degree that Halifax experienced an all-time record-low in the number of hours of bright sunshine. The occurrence of fog is associated with low water temperatures along the coast. Extreme conditions



Relationship between surface temperatures and herring landings in Chaleur Bay, N.B.

were observed in the Bay of Fundy where average temperatures for July-August (51.1°F) were the lowest for that period since 1923. The Gulf of St. Lawrence area enjoyed normal amounts of sunshine and this, together with light winds, resulted in above average temperatures in the upper water layers and presumably increased stratification.

Observations at the entrance to Chaleur Bay show that only three times in the last 30 years have temperatures been as high as they were last year. In the southern half of Chaleur Bay, average surface temperatures during July-August are between 60.8°F and 62.6°F, but this year there was a relatively large body of 68.0°F water covering much of the Bay. Similar conditions existed in other parts of the Gulf of St. Lawrence. At Magdalen Islands, for example, August temperatures in 1967, with an average of 67.0°F, were the highest on record (37 years). However this large body of warm surface waters did not penetrate into Northumberland Strait.

A survey of temperature conditions in the southern Chaleur Bay on August 3, 1967, showed that there was a large body of warm water, 13 to 23 feet thick, occupying most of the southern half of the Bay from Grande Anse to Miscou Island. Surface temperatures at 10 locations varied from 65.7 to 68.4°F. Temperatures were 67.5°F or higher at 9 of the 10 locations. Laboratory experiments at St. Andrews have shown that temperatures of this order of magnitude are lethal for herring and it must be expected that they would avoid such conditions by remaining in deeper and cooler waters where fishermen are not accustomed to setting their nets. This probably accounted for the small catches by drift nets in Chaleur Bay last year.

A second survey on August 12-14 indicated either cooling of the surface layer or regression of the body of warm waters. On the average, the surface temperatures were 4.0°F cooler than on August 3. As observed during a third survey on August 26, the surface temperatures decreased by 0.7°F during the last 12-14 days down to an average temperature of 62.6°F. From August 3 to 26, the surface layer, while cooling, deepened from an average depth of 18 to 34 feet.

Long-term records of fish landings by commercial fishermen indicate that there is a relationship between water temperatures and catches of herring. Herring landings during the summer months in the southern part of Chaleur Bay throughout the 1950 to 1966 period varied from 1 to 4.5 thousand tons. The smallest catches were made in 1955, 1952 and 1957, the years when temperatures were high. The largest catch was made in 1963 when temperatures were unusually low (Fig. 1).

The general pattern of herring landings in the Bay of Fundy parallels that of the Chaleur Bay area. Periods of high temperature conditions are associated with low catches and vice versa. The average annual catch during the summer months throughout the 1947 to 1951 period when temperatures were above normal was 20 thousand tons, whereas during the 1961 to 1965 period when temperatures were below normal, the average catch was 40 thousand tons. The catch in 1956, however, was the second lowest since 1940 and this was a year of near record low temperatures. The catch to the middle of July in 1967 was also low and temperatures for this period were the lowest since 1923.

OFFSHORE CONCENTRATIONS

A research vessel cruise near the entrance to the Bay of Fundy during the last week of July showed that there were large concentrations of herring farther offshore and in deeper water than fishermen usually set their nets. Surface temperatures where these concentrations were located ranged from 46.6 to 49.1°F and bottom temperatures from 42.6 to 43.2°F. How such temperature conditions affect movements of herring is unknown, but their activity is undoubtedly lessened as temperatures decrease. There is little doubt, therefore, that temperatures affect the distribution and hence the catches of herring in all areas. The relationship, however, is exceedingly complex and must be studied in far greater detail before it is completely understood.

Records at the St. Andrews Station contain a great deal of information on relationships between water temperatures and catches of fish of the Canadian Atlantic coast. For example, small catches of lobsters in the early 1940s were associated with unusually low temperature conditions. As temperatures increased, catches of lobsters also increased and both were high in the mid 1950s. Since then both temperature and catch have declined steadily. High temperatures in the mid 1950s are believed to be responsible for an invasion of green crabs in the Bay of Fundy area with disastrous effect on the soft shelled clams. An unusual occurrence of capelin in the Bay of Fundy in 1965 was coincident

'Care of Fish' Booklet in Big Demand

The Department of Fisheries' recently-produced booklet, "The Care of Fish in Retail Stores", has received an enthusiastic response from retailers and food distributors in Canada.

A country-wide distribution of the booklet was made to individual store owners and managers, executives of supermarket chains and others in the food distribution or retailing industry through the co-operation of the Canadian Federation of Retail Grocers and the Retail Merchants Association of Canada.

This resulted in numerous requests for bulk quantities from wholesalers, supermarkets and co-operatives in all regions of Canada. The vice-president of Sackville, N.B., firm of wholesalers wrote: "We think this is a well-prepared presentation and information that all supermarkets should know and use".

From the food merchandising manager of a group of co-operatives in the Prairie provinces came the comment: "This is a very interesting and informative booklet and certainly should help the sale of fish", while the meat manager of a Toronto-based supermarket chain wrote: "This booklet contains a great deal of useful information that will help sell more fish to our customers by better informing our sales personnel on what quality a fish is, how to display it and how to care for fresh and frozen fish."

The 24-page booklet, which is distributed free of charge, will be featured in Department of Fisheries' advertisements appearing in fisheries magazines and other trade periodicals over the next few months. The advertisements include a coupon for requesting copies of "The Care of Fish in Retail Stores".

The publication may be obtained from the information and Consumer Service, Department of Fisheries, Ottawa, or from any of the Department's regional headquarters. At present only the English version is available. A French-language edition under the title "Traiter avec soin" is expected to be ready shortly.

Continued from previous page

with low water temperatures during the first quarter of that year.

Other examples include wide variations in distribution and catches of cod, haddock, swordfish and tuna that appear to be related to variations in water temperatures. Cod seem to prefer lower temperatures than haddock. Swordfish are seldom found in areas where surface temperatures are less than 60°F. The sport fishery for bluefin tuna in southwest Nova Scotia declined to a very low level during periods of high temperatures and now, with lower temperatures, appears to be on an upward trend.

New Spawning Channel

The first artificial spawning channel designed by the federal Department of Fisheries exclusively for chum salmon has been completed on the Big Qualicum River on Vancouver Island.

The channel is 3,400 feet long with an average width of 40 feet. It contains 18 small holding pools and has a capacity of 15,000 chum salmon. The early arrivals are already in the channel with the peak of the run expected during the first half of December.

This $175,000 channel was designed by Departmental engineers and built in a period of five months.

The requirements for chum salmon spawning are specific and as a result the channel is different from the other channels already in use. The water depth is relatively shallow – between nine and ten inches. The slope is two feet in one thousand feet with a six-inch drop every 170 feet.

This latest spawning channel is another step towards total utilization of all spawning areas in the valley of the Big Qualicum River.

A down-river view of the newly-excavated Noel Paul Brook spawning channel, showing observation chamber (left foreground) designed to observe spawning habits of Atlantic salmon.

Expect Yield of 250,000 Atlantic Salmon From Noel Paul Brook Spawning Channel

BY C.H. BURSEY

A controlled flow spawning channel located on Noel Paul Brook, a major tributary of the Exploits River, Newfoundland, is expected to yield a quarter-million Atlantic Salmon fry in 1968.

More than 200 adult Atlantic salmon spawners were transferred to the channel this year, and it is expected that these will produce some 250,000 fry next year to stock the river.

The Exploits River, largest on the Island of Newfoundland, has been accessible to Atlantic salmon and sea trout in the past for about only 20% of its area due to an impassable obstruction located near the town of Grand Falls. During the past several years, engineering and biological surveys have been conducted by the federal Department of Fisheries to determine the feasibility of making upstream areas, which comprise the other 80% of the river system (about 3,000 sq. miles) available for fish production.

These studies have been additionally complicated by the presence of two large industrial concerns on the river, and the fact that the river receives domestic wastes from the towns of Grand Falls and Windsor and several smaller municipalities. The studies have indicated that the Exploits River system, which now supports a spawning population of Atlantic salmon in the order of some 2,000 adults could, if access were provided to the area

between Grand Falls and Red Indian Lake, support a spawning population of at least four times as large as that which is now produced.

If this area were successfully developed in the next few years, the next stage would envisage similar development for an equally large area above Red Indian Lake.

Existing fish populations in the Exploits River, however, are inadequate to populate upstream areas with any degree of efficiency except over a period of years. To offset this it was decided to introduce management techniques that should greatly accelerate utilization of now barren areas by anadromous fishes. It was to this end that the controlled flow spawning channel was completed on Noel Paul Brook late in 1966.

If this method of population establishment shows success on a reasonable scale, engineering work will then be conducted at the Grand Falls obstruction with a view of constructing a fishway so that resulting adult runs will have access beyond Grand Falls when they return on their spawning migration.

Adult spawners being released in Noel Paul Brook controlled flow spawning channel from the specially-designed fish transfer truck.

Centennial Honors

Representatives of the federal Department of Fisheries and the Fisheries Research Board of Canada were among the Canadians receiving the 1967 Centennial Medal.

Department personnel in the different regions receiving the medal were: British Columbia – C.H. Clay, R.S. Bolton, Josephine Rigg and W.R. Hourston, all of Vancouver, and L.J. Gelley, Smithers; Quebec – C. Journault and L. Morin, Quebec City; Maritimes – S. Dudka, New Glasgow; A.W. Fralick, Lunenburg; Mary C. Sullivan, Newcastle; A.P. Fitzgerald and R.E.S. Homans, Halifax; Newfoundland – Capt. A. Fiander, H.C. Macdonald and H.R. Bradley, St. John's; W. Willis, Fogo, and A.J. Starkes, Nipper's Harbour; Central Region – C. MacEwan, Winnipeg. At Ottawa headquarters fisheries department recipients were: Dr. R.R. Logie, S.V. Ozere, J.N. Lewis, A.W. Abbott, G.H. Mitchell; Dr. W.M. Sprules and H.V. Dempsey.

Fisheries Research Board recipients were: H.Y. Brownrigg and Dr. Carl Medcof, St. Andrews, N.B.; Capt. W. Barbour and Allister M. Fleming, St. John's, Nfld.; Dr. Dan Quayle and Miss Ethel Robinson, Nanaimo, B.C.; A.W. Lantz, Winnipeg, Man.; Charles H. Castell, Halifax, N.S.; Dr. Ronald Trites, Dartmouth, N.S.; Stewart W. Roach, Vancouver, B.C.; Gerald Hart, Ste. Anne de Bellevue, Que.; and L.M. Morin, Ottawa.

Research Vessel Conference

Notification has been received that the Second FAO Technical Conference on Fishery Research Craft at the Pacific Science Center, Seattle, Washington, has been postponed until May 19-25, 1968. The conference was originally planned for December 11-15, 1967.

Theme for the conference is "Modern Fishery Research Craft", with emphasis on unusual, advanced and integrated craft. The U.S. Bureau of Commercial Fisheries is co-sponsor.

International North Pacific Fisheries Commission Meets in Tokyo

The International North Pacific Fisheries Commission concluded its fourteenth annual meeting at Tokyo, Japan, on November 10, 1967. The final plenary session of the Commission marked the conclusion of three weeks of study and discussion of various aspects of international co-operation for the conservation of high seas fisheries resources in the North Pacific Ocean.

The Commission operates under the terms of the International Convention for the High Seas Fisheries of the North Pacific Ocean, which was signed by Canada, Japan and the United States in 1952. The Convention provides for several kinds of action designed to ensure the maximum sustained productivity of the fishery resources of the North Pacific Ocean.

Under the provisions of the Convention, Canada abstains from exploiting salmon in the eastern Bering Sea, and Japan abstains from fishing for salmon in the eastern North Pacific and Bering Sea east of 175° west longitude. Japan also abstains from fishing halibut in the northeastern Pacific south of the Aleutian Islands and the Alaska Peninsula and from fishing for herring off most parts of the British Columbia coast. The Commission recommended no changes in the abstention provisions of the Convention at this year's meeting. At the same time the Commission adopted a resolution recommending the governments of the contracting parties to give full consideration to the conservation needs of salmon stocks in the areas of intermingling when preparing fishing regulations for future operations.

HALIBUT REGULATIONS

One of the principal tasks on the Commission's agenda was to develop a set of halibut fishing regulations for the halibut fishery of the eastern Bering Sea in 1968. The Commission has been performing this function since 1963, when line fishing for halibut in that area first became open to fishermen from all three countries. For 1968, the Commission agreed to recommend regulations the same as those in effect in 1967. The Commission recommended that an extensive area in the southeastern Bering Sea which is a nursery ground for young halibut be closed to halibut fishing completely.

Canadian and United States representatives stated that their governments intend to require their fishermen to release all halibut taken by trawl nets in any part of the Bering Sea. The Japanese representative stated that within a part of this area, Japan would undertake to prohibit all trawl fishing by Japanese fishing vessels and expressed the intention of his government to apply a minimum size limit of 66 centimeters (26 inches) for halibut to Japanese fishing operations throughout the Bering Sea. The Commission was assisted by a consultant from the scientific staff of the International Pacific Halibut Commission.

In the Gulf of Alaska, the Commission's studies were focused on the effects on the halibut stocks of the expanding trawl fisheries for other species. Groundfish catch statistics were exchanged, and studied by the scientists of the three nations. The Commission approved a number of recommendations by its Gulf of Alaska Groundfish Committee for further research in this field.

In its consideration of groundfish research, the Commission agreed to conduct joint study and research on groundfish resources other than halibut in the northeast Pacific for the purpose of determining the need for joint conservation measures.

KING CRAB RESEARCH

As a result of the consideration of king crab research, the Commission recommended that research on the king crab resources of the eastern Bering Sea be continued and further strengthened. In connection with the bilateral arrangement between Japan and the United States, the Commission clarified its responsibilities with respect to the research program on king crab resources of the eastern Bering Sea.

The Commissioners reviewed the progress during the years of the Commission's program for publication of scientific reports written by scientists of

Single Tow Nets 121,000 Pounds of Pollock

A 121,000-pound haul of pollock in one short tow, made by a typical Nova Scotia 100-foot scallop dragger converted to midwater trawling, was the spectacular culmination recently of a five-month project carried out jointly by the Federal and Nova Scotia governments and the fishing industry. Such a single haul of demersal fish has never before been made on Canada's east coast by a vessel of this size.

The huge drag, one of four which loaded the vessel with 207,000 pounds of pollock, was made by the *Lady Anna*, skippered by Captain Guy D'Entremont of West Pubnico, N.S. The first drag yielded 40,000 pounds, the second 16,000, the third 30,000, while the fourth was the 121,000-pound haul. The length of the drags varied from 20 minutes to two hours.

The vessel was chartered by the two governments and converted to midwater trawling for herring under the direction of W.W. Johnson, of the Industrial Development Service of the federal Department of Fisheries, who supervised the project. The pollock catches were a surprise development in the *Lady Anna's* successful herring trawling program.

Midwater trawling for herring has been successfully carried out by very large German vessels and the net used by the *Lady Anna* is as large as those used by the Europeans, although the vessel is considerably smaller. The *Lady Anna* is powered by a 765 horsepower diesel engine. Special deck machinery was installed for the project, and modifications to the superstructure were necessary to accommodate the midwater trawl, which is shot and towed over the stern although the codend is emptied over the starboard side.

The success of the *Lady Anna* constitutes an important breakthrough in the Atlantic herring fishery, which at present is undergoing a rapid expansion.

While fishing for herring in the Bay of Fundy and on Georges Bank, the vessel made numerous single hauls of from 40 to 50 tons of spawning herring. Good tows also were made on non-spawning herring on Jeffrey's Ledge off New England. A few hauls produced catches of spawning herring estimated at more than 125 tons, but these were too heavy for the trawl and broke the net, so that the fish escaped. Until this year, herring had never been taken in commercial quantities by midwater trawl off Canada's east coast by Canadian vessels. Most of the heavier tows were of no more than 3 minutes' trawling time.

The net used is a 1400-mesh German midwater trawl, 300 feet long and 70 feet wide. Its opening is spread by two hydrofoil otter boards, each of which weighs about 1400 pounds. The vertical opening varies, with the speed of the boat, from 36 to 70 feet but the opening, for catching fish, is usually about 48 feet.

During the second week of November, while fishing on the eastern edge of Stellwagen Bank, the *Lady Anna* made her record 207,000-pound catch in 13 hours total fishing time, and four hours actual dragging time. The catches were made in from 32 to 34 fathoms of water, with the fish being taken from one to 15 fathoms off the sea bed.

In the previous week, the *Lady Anna* had come across the pollock accidentally while trawling for herring. The first haul was so heavy it broke the codend of the net. The next two drags yielded 93,000 pounds, and the third and last tow of the trip another 5000 pounds. On several occasions while fishing for herring the *Lady Anna* has been loaded to capacity in a single day's fishing.

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the three countries. A number of major papers resulting from the Commission's research were published in English and Japanese versions in the INPFC Bulletin, including a nine-part comprehensive report on North Pacific Salmon.

Kenjiro Nishimura, vice-president, Nippon Reizo Kabushiki Kaisha, was chairman of the Commission at the 1967 annual meeting. Officers elected for 1968 are Edward W. Allen of the United States, chairman; S.V. Ozere of Canada as vice-chairman; and Kenjiro Nishimura of Japan, secretary. Other members of the Commission are: James C. Cameron, Carl E. Giske, and Donovan F. Miller for Canada; Yoshio Ohkawara, Shinji Miyoshi and Kenkichi Nakabe for Japan; and Clarence F. Pautzke, Roger Kent and Fred P. McGinnis for the United States. The Commission agreed that its next annual meeting would be held in Seattle, Washington, beginning November 4, 1968.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May - Oct. 1966		May - Oct. 1967	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	1,708,932	119,280	1,630,763	113,131
ATLANTIC COAST - Total	1,382,442	67,043	1,417,151	69,646
Cod	424,393	18,699	423,820	18,602
Haddock	57,175	4,018	52,192	3,170
Pollock, Hake, Cusk, etc.	48,532	1,734	46,942	1,615
Rosefish	134,040	3,744	132,462	3,458
Catfish	3,499	117	3,241	104
Halibut	2,617	900	2,561	952
Plaice & Other Flatfish	175,401	5,646	177,669	5,712
Herring & Sardines	421,041	4,782	467,793	5,041
Mackerel	24,467	829	23,646	886
Alewives	8,067	141	6,501	104
Salmon	5,188	2,530	6,154	3,314
Smelts	799	68	497	50
Swordfish	6,251	2,661	6,508	2,653
Other Fish	13,052	445	10,861	435
Lobsters	28,150	15,339	28,104	17,515
Clams & Quahaugs	3,840	218	4,169	272
Scallops	11,456	4,503	8,690	4,891
Other Shellfish	14,474	669	15,341	872
PACIFIC COAST - Total	326,490	52,237	213,612	43,485
Pacific Cods	18,000	1,623	9,439	774
Halibut (1)	30,829	11,046	23,977	6,065
Soles & Other Flatfish	7,704	488	5,555	368
Herring	101,537	1,689	32,607	551
Salmon	152,481	36,212	128,662	34,474
Other Fish	8,195	364	5,151	285
Shellfish	7,744	815	8,221	968
BY PROVINCES				
British Columbia	326,490	52,237	213,612	43,485
Nova Scotia	490,587	26,901	492,858	27,540
New Brunswick	269,785	8,855	268,872	8,700
Prince Edward Island	51,337	5,648	39,853	6,581
Quebec	112,869	5,909	161,473	6,644
Newfoundland	457,864	19,730	454,095	20,181

(1) - Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES - OCTOBER 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.380	.457
Cod fillets, Atl, frozen, cello 5's	lb.	.328	.383
Cod fillets, smoked	lb.	.425	.473
Haddock fillets, fresh, unwrapped	lb.	.486	.593
Herring, kippered, Atl.	lb.	.257	.337
Mackerel, frozen, round	lb.	.185	.267
Lobsters, canned, Fancy	Case 48-½ s	-	66.987
Sardines, canned	Case 100-¼ s	9.695	9.600
Halibut, frozen, dressed	lb.	.513	.530
Silverbright, frozen, dressed	lb.	.625	.647
Coho, frozen, dressed	lb.	.866	.937
Sockeye, canned, grade A	Case 48-½ s	27.347	28.233
Pink, canned, grade A	Case 48-½ s	16.837	17.650
Whitefish, fresh	lb.	.438 1/	.443
Lake trout, frozen	lb.	.442	.523

1/ - Dressed

PRICES PER CWT. PAID TO FISHERMEN

(Week ending Oct. 14th)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	5	4
Yarmouth		
Haddock	8	-
Black's Harbour		
Sardines		
Vancouver		
Ling Cod	10-16	10
Gray Cod	5-7	7.5
Soles	6-8	6.5-8.5
Salmon (Rdspg)	23-75	35-55

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF OCTOBER

	1966 '000 lbs	1967 '000 lbs
TOTAL - Frozen Fish, Canada	115,661	108,791
Frozen - Fresh, Sea Fish - Total	85,904	76,812
Cod, Atlantic, Fillets & Blocks	21,920	7,889
Haddock, fillets & blocks	4,551	6,128
Rosefish, fillets & blocks	8,245	10,775
Flatfish, (excl. halibut), fillets & blocks	6,295	11,043
Halibut, Pacific, dressed & steaks	9,771	11,473
Other Groundfish, dressed & steaks	2,874	1,995
Other Groundfish, fillets & blocks	9,177	5,520
Salmon, Pacific, dressed & steaks	11,244	10,377
Herring, Atlantic & Pacific	451	934
All Other Sea Fish, all forms	7,728	7,964
Shellfish	3,648	2,714
Frozen - Fresh, Inland Fish - Total	8,982	10,964
Perch, round or dressed	480	2,009
Pickerel, (Yellow & Blue) fillets	937	1,551
Sauger, round or dressed	(1)	906
Tullibee, round or dressed	259	203
Whitefish, round or dressed	2,197	1,555
Whitefish, fillets	381	292
Other, all forms	4,728	4,448
Frozen - Smoked Fish - Total	1,620	1,574
Cod Atlantic	895	462
Sea Herring, kippers	446	718
Other, all forms	279	394
Frozen for Bait and Animal Feed	19,155	19,441

(1)- Confidential, included with 'Other'

SALTED FISH STOCKS AS AT END OF OCTOBER

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		28,086	49,941
Cod		24,227	44,058
Other		3,859	5,883
Dried - salted - Total		17,858	15,419
Cod		16,766	14,925
Other		1,092	494
Boneless - Total		746	1,423
Cod		666	1,337
Other		80	86
Pickled - Total	(barrels)	18,947	21,794
Herring	"	5,328	7,741
Mackerel	"	6,380	11,709
Alewives	"	6,966	2,344
Turbot	"	273	-
Bloaters	(18 lb. boxes)	149,232	248,968
Boneless Herring	(10 lb. boxes)	5,192	(1)

(1) - Confidential

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - JULY

(Value in Thousands of Dollars)

		1966 $'000		1967 $'000
Total Exports		54,971		54,851
By Markets:				
United States		44,382		42,856
Caribbean Area		3,804		4,706
Europe		6,000		6,280
Other Countries		785		1,009
By Forms:				
Fresh and Frozen		42,921		40,900
Whole or Dressed	11,757		9,252	
Salmon, Pacific	3,738		2,828	
Halibut, Pacific	2,203		1,194	
Cod, Haddock, Pollock, etc.	116		72	
Swordfish	1,150		1,073	
Other Seafish	1,833		1,885	
Whitefish	905		833	
Pickerel	638		453	
Other Freshwater Fish, n.o.p.	1,174		914	
Fillets	18,264		16,324	
Cod, Atlantic	5,657		4,685	
Haddock	1,990		2,247	
Rosefish, Hake, Pollock, etc.	2,006		1,290	
Flatfish	4,288		3,757	
Pickerel	659		490	
Other	3,664		3,855	
Shellfish	12,834		15,201	
Lobster (Alive & Meat)	10,222		12,148	
Other	2,612		3,053	
Frozen Fish & Shellfish, pre-cooked		66		123
Cured		4,815		4,823
Smoked	380		276	
Herring	184		81	
Other	196		195	
Salted, Wet & Dried	4,011		3,979	
Cod	3,547		3,206	
Other	464		773	
Pickled	424		568	
Herring	343		391	
Mackerel	13		117	
Other	68		60	
Canned		2,568		4,917
Salmon	431		2,973	
Sardines	918		1,331	
Lobsters	924		379	
Other	295		234	
Miscellaneous		4,667		4,211
Meal	3,021		2,294	
Oil	111		414	
Other	1,535		1,503	

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DEPARTMENT OF FISHERIES

Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister

Ottawa, Canada

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- Atlantic Spider Crab Has a New Image
- Costs, Earnings Study of Nfld. Vessels

Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
(formerly Trade News)

Editor
E. H. HEARNDEN

February 1968

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COVER PHOTOGRAPH - A pair of Atlantic salmon trapped in an observation chamber of the Noel Paul Brook spawning channel, constructed to boost the salmon population of the Exploits River system in Newfoundland.

Employ West Coast Techniques For Nfld. Spawning Channel

By R.N. Wadden

RISING IN the high country of north-central Newfoundland, Indian River is a lazy serpentine stream familiar to travellers on the Trans-Canada Highway which it borders on its descent to the Atlantic near Springdale in Hall's Bay. Its dusky shallow waters are home to a moderate population of small, but spunky, Atlantic salmon which annually run a gauntlet of coastal fishing nets, waterfalls and angling rods to reach their upstream spawning grounds.

The river (also known locally as Indian Brook) is currently the testing ground for a salmon management technique unique on the Atlantic coast although almost commonplace along the continent's western shore. A controlled flow spawning channel, the first to be established anywhere for Atlantic salmon, is entering its fifth year of operation on Indian River with a modest record of achievement but, in the view of fisheries personnel who tend it, considerable promise for future success and adaptation to other Atlantic salmon waterways.

Completed in 1963, the channel was constructed by the federal Department of Fisheries to take the place of several miles of natural spawning grounds lost when the head waters were diverted to the Birchy Lake-Grand Lake system for hydro-electric purposes.

Indian River was regarded as one of the best salmon rivers on the north-east coast of Newfoundland, maintaining an annual run of 500 to 2000

Entrance to the site of the controlled flow spawning channel for Atlantic salmon at Indian River, Nfld., constructed and operated by the Resource Development Service of the federal Department of Fisheries.

fish. Commercial fishermen in Hall's Bay yearly caught a comparable quantity attempting to reach the river, while anglers captured 200-500 of those which escaped the commercial nets. Clearly, extraordinary measures were needed to provide an alternate spawning area for this important stream.

V.R. Taylor, Chief of the Resource Development Branch, Newfoundland Region, and his staff attempted to solve the problem by adapting the artificial spawning channel techniques pioneered on the Pacific coast. The fact that this was the first project of its kind for Atlantic salmon aroused considerable interest, and its progress has since been followed attentively by salmon management specialists and conservationists.

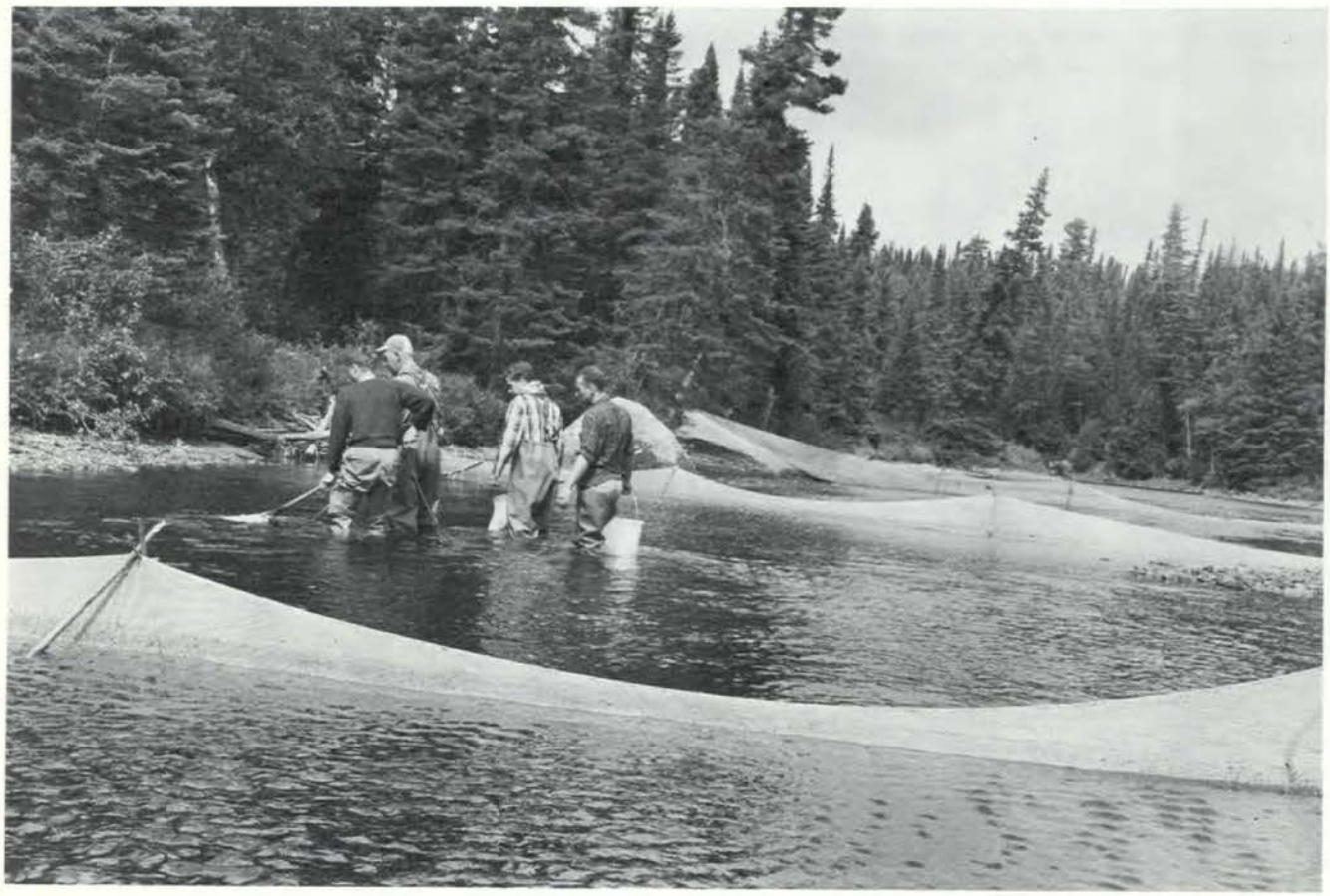
FOLLOWS B.C. PATTERN

Patterned closely after Pacific salmon spawning channels, the Indian River channel is designed to provide 10,000 square feet of spawning area, capable of accommodating about 300 to 400 adult salmon. The site is located eight miles downstream from the head waters diversion dam, and is accessible from the Baie Verte Highway, one-half mile or so from its junction with the Trans-Canada Highway.

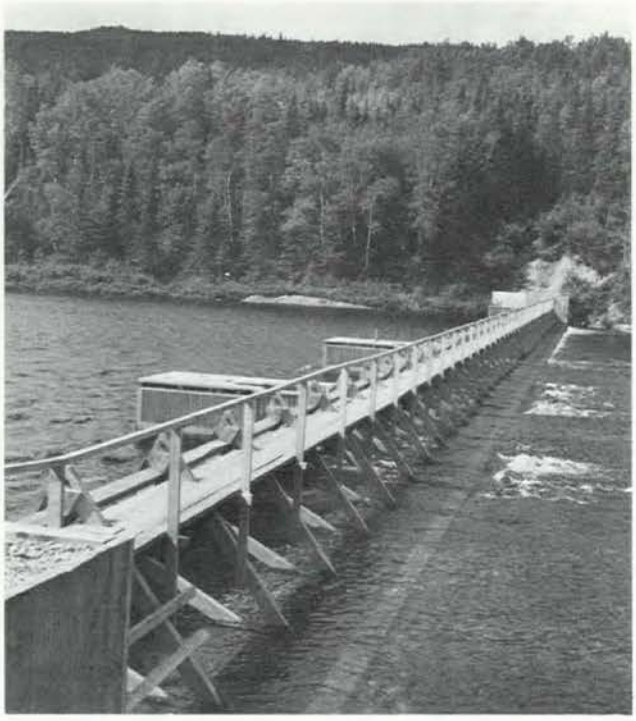
Channel-bound salmon travel 30 miles up the main stream from Hall's Bay. They first have to ascend a Department of Fisheries' fishway at Indian Falls, two miles from the sea; about ten miles further upstream they are halted at a counting fence erected by the Department in 1966 to enumerate adult salmon migrating to spawning grounds, and smolts venturing toward the ocean.

Lithe, graceful white birches rise protectively on the river bank alongside the man-made channel which runs parallel to the stream. Salmon are directed by a diversion fence into the channel entrance where a trap structure confines newcomers until they can be examined, measured and scale-sampled before being released into the channel.

Water level in the channel is controlled by an intake control system. A constant head of water is



Electrofishing to enumerate the salmon and trout population in Indian River tributary. One man holds charging device, two hold dipnets while the fourth carries a pail in which the captured fish are held.



Salmon counting fence at Indian River, Nfld.,

maintained by an intake control dam, while a control valve regulates the flow of water which is fed into the channel through an underground pipe leading into a diffusion chamber. This screen-topped structure spreads or diffuses energy of the water to maintain an even distribution of flow.

Uniformly graded, the Indian River channel drops approximately 1½ feet along its 1100 feet length. Averaging 15 feet in width, the channel contains five holding pools, each three to five feet deep in which the fish expectantly lurk prior to spawning, which takes place in late October or early November in the shallow, gravel-bottomed areas of briskly flowing water.

In 1963, the first year of operation at the Indian River site, 113 salmon entered the channel and spawned successfully, depositing 185,000 eggs. Surviving in the spring were 46,000 fry (as the hatched eggs are called). The survival rate of 25% was much lower than anticipated as a result of flood conditions which led to wide-spread silting in the channel. In 1964, 284 salmon spawned, depositing 515,000 eggs. Again, silting brought about by highway construction nearby resulted in heavy mortality, and egg-to-fry survival amounted to just 33% with production of 168,000 fry.

About two thirds of the channel gravel was removed, cleaned and washed, and the rest of the gravel was cleaned in advance of the 1965 spawning season. Results were encouraging, as 142 salmon spawned, 268,000 eggs were deposited, and 150,000 survived to the fry stage, for a rate of survival of 56%. This success was maintained in 1966 when 40-45% of the 220,000 eggs deposited survived the long cold winter in the redds. Comparative egg-to-fry survival under natural spawning conditions would normally be considerably less than this.

Extremely low water levels hindered escapement of salmon into Indian River in the summer of 1967. By early October, however, 150 salmon had entered the spawning channel and over 300 had passed through the downstream counting fence.

GRILSE PREDOMINATE

Grilse (salmon returning to the river after just one year at sea and weighing usually less than six pounds) make up the greater part of the Indian River salmon population. Indeed, only seven of the 685 fish entering the spawning channel in the 1963-66 period were identified as "salmon" (i.e. six pounds or larger). Another notable fact: 60-80% of the run in this period were female.

Kelts (salmon which have completed spawning) are tagged before release from the channel in order

Biologist retrieving salmon in entrance trap for examination prior to release in spawning channel.

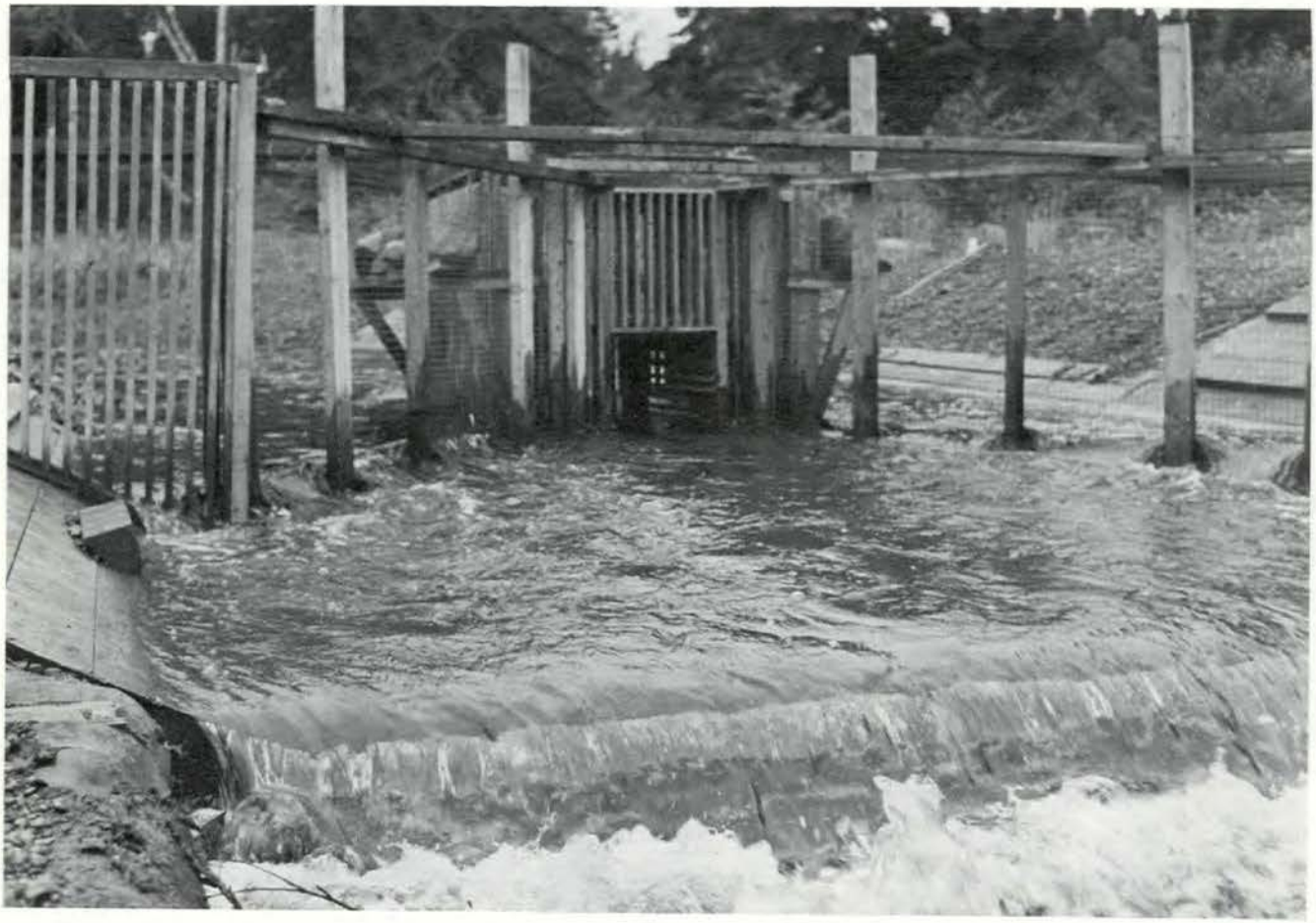
Measuring grilse taken from channel entrance trap. Dorsal fin tag identifies grilse returning to Indian River after 10 months in Atlantic.

to disclose their destiny. Kelt tagging returns in 1965 revealed that 49% of tagged fish were captured by the commercial fishery and only 1.9% made it back to Indian River. In 1966, 31% fell victim to commercial fishermen, and again 1.9% reached the river.

Smolts (young salmon which take on a silvery sheen as they prepare for seaward migration) are also enumerated by means of a fyke net smolt count on the upper Indian River, and also at the counting fence. Constructed in 1966, the 330-foot long structure contains three counting traps installed to count adult salmon migrating upstream, and is adaptable also for counting of downstream smolts.

FRY – MARKING PROGRAM

The Resource Development Branch inaugurated in 1965 a fry-marking program to assess the contribution which the artificial spawning channel was making to the total smolt and adult salmon runs in Indian River. The fry are marked by removal of the dorsal fin.

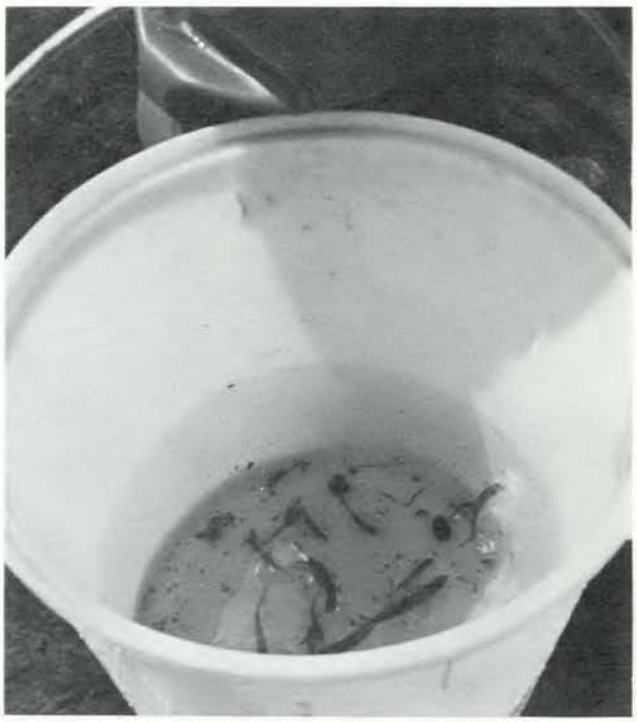


Trap at entrance to Indian River spawning channel.

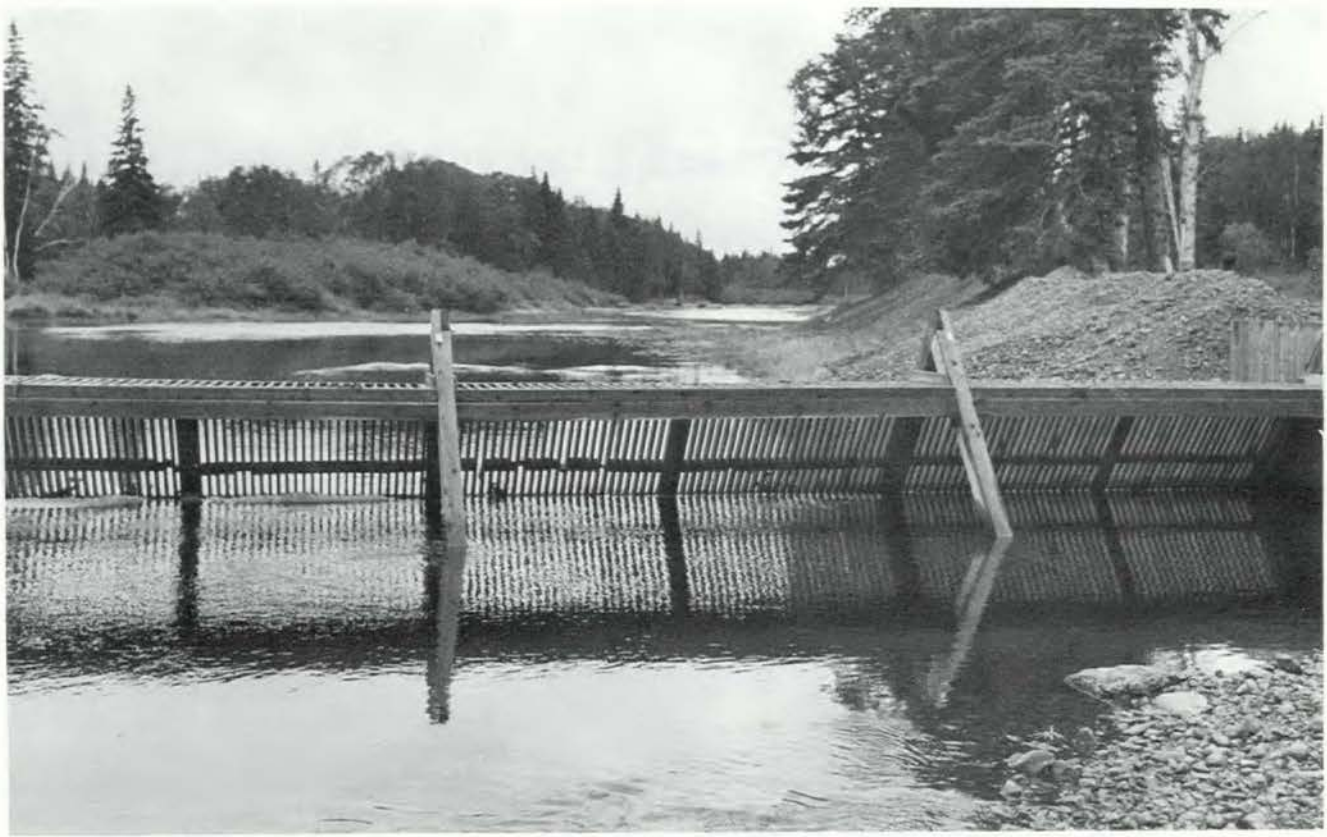
Electrofishing studies are being conducted to trace the distribution of fry in the river, and to determine the best areas in which fry may be introduced for the production of parr (the next stage in the baby salmon's many-staged development from egg to adult.) The studies to date have indicated that fry move no more than two to two-and-a-half miles downstream from the channel. It is now proposed to distribute fry into suitable rearing areas in an effort to improve survival to the smolt stage.

Biologists, engineers and technicians of the Resource Development Branch all have played a part in the endeavour to make a success of the Indian River Channel project. Technical staff operate from comfortable living quarters on the site throughout eight or nine months of the year.

The real test of achievement at Indian River will come within the next four or five years when channel-produced fry have developed into adult salmon. If they return and spawn successfully in the channel where they had their origin, success may well have been attained in the world's first man-made Atlantic salmon spawning channel.



Salmon parr and young trout captured by electrofishing.



Diversion fence directs Indian River salmon toward controlled flow spawning channel beyond right bank.

The Fisheries Research Board of Canada's latest vessel "Caligus".

New Research Vessel Stresses Versatility

The MV *Caligus*, the latest addition to the fleet of research vessels operated by Fisheries Research Board of Canada, was recently christened in a short ceremony at Nanaimo, B.C.

Based on Nanaimo, the $120,000 steel-hulled vessel will be used chiefly to catch young salmon for tagging purposes. She has an overall length of 56 feet with a gross tonnage of 41.36.

Primarily designed as a drum seiner, the *Caligus* is extremely versatile, as she can also fish by trawling, two-boat trawling, gillnetting, trolling and long lining. She can stay at sea for up to four days with a crew of four.

As there will often be a lapse of time before the *Caligus* can reach the tagging barge where the young fish will be tagged, facilities had to be provided on board to keep the fish alive and in good condition. These take the form of live fish tanks fitted with a circulating sea water system. The fish will be unloaded on the barge by hydraulic or air pressure.

The name chosen for this vessel is particularly suitable. The caligus is a species of copepod or minute saltwater crustacean. It is a rugged, agile little animal which manages to survive in the sea in spite of many obstacles, and has been the subject of extensive investigation in the past by the biological staff at Nanaimo.

The *Caligus* was christened by Mrs Eve Wardropper, an employee of FRB for many years. She started her career in 1927 when she was employed as a typist by Dr. W.A. Clemens at the Nanaimo station. In latter years she managed the library there until her retirement in August, 1967.

Now a 'Queen'

Spider Crab Has a New Image

By W. J. Lever

UNTIL JUST two years ago the Spider Crab *(Chionoecetes opilio)* was regarded by Atlantic coast fishermen as little more than a pest. It fouled nets, ate lobster and trawl bait and generally made a nuisance of itself.

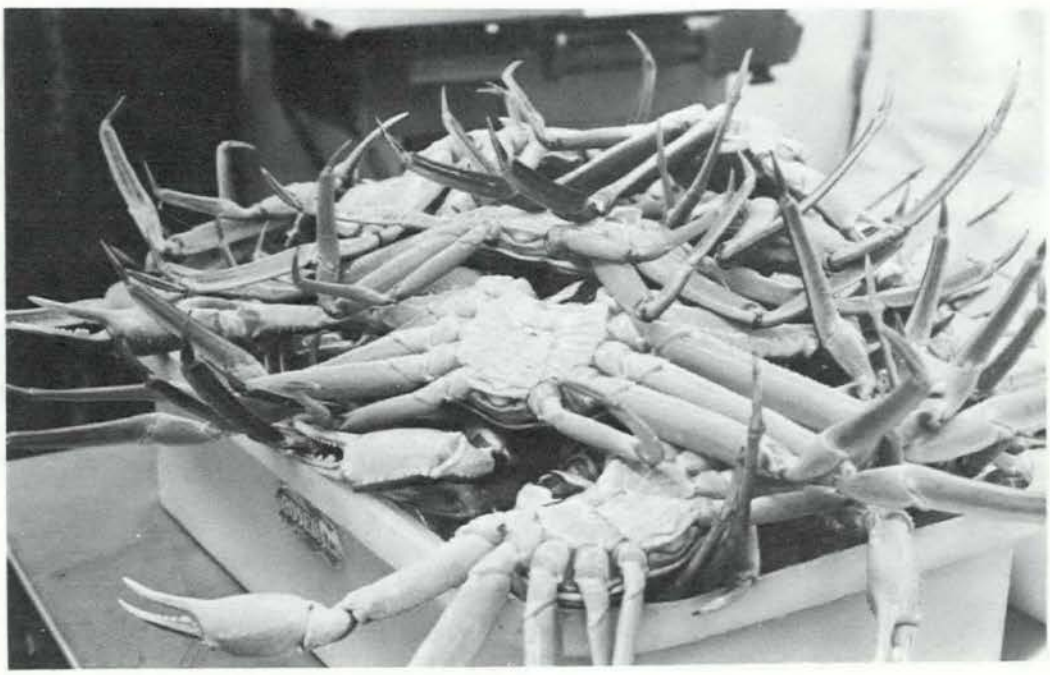
However, over the past two years there has been a considerable change of opinion as to the value of this long-legged, sinister-looking crustacean, now known as the Queen Crab.

1965 might well be regarded as "The Year of the Queen Crab" in the Maritimes. It was late in that year that the Industrial Development Service of the federal Department of Fisheries, in co-operation with the Fisheries Department of Nova Scotia and the industry, conducted crab explorations. Utilizing three vessels – the 86-foot wooden side dragger *St. Eloi*, the 54-foot Danish seiner *Stella Maris*, and the 48-foot Danish seiner *Unique* – the explorations indicated that Spider Crabs, or Queen Crabs, were abundant in the Gulf of St. Lawrence particularly in deep, cold water where the bottom was muddy.

Many questions arose during these explorations, particularly dealing with the best method of catching, holding and processing Queen Crabs.

Consequently, further investigations were undertaken by the Industrial Development Service, this time in conjunction with the provincial departments of fisheries of the three Maritime Provinces.

Following these studies, officials of the various fishery agencies were convinced that the Atlantic Queen Crab held great potential. For the fourth



A pile of Queen crabs ready for experimental processing.

Live Atlantic Queen crabs in a holding tank at the Department of Fisheries inspection laboratory at Halifax, N.S.

project, Pacific coast specialists were consulted and new equipment for catching and processing crabs was designed and constructed. It was felt that perhaps crabs caught in traps were more suitable for processing than those caught by dragging. Tests and trials revealed that traps provided an advantage in selecting crabs of commercial size and that properly designed traps retained very few undersized crabs. The experiments showed that females were consistently small and that practically no females were landed.

Halifax inspection laboratory staff working with Queen crabs.

CONSULTATION WITH INDUSTRY

In addition to recommending designs for crab traps, "Project Number 4" also recommended designs for deck equipment, as well as holding tanks, plant equipment and processing methods. Since the release of this report in February, 1967, technicians and advisers from the Department have been in the field consulting with industry on modifications to vessel and plant equipment, and advising on improvements in processing techniques to increase the yield more economically.

As a result of studies and recommendations, the Atlantic Queen Crab is now regarded with considerable enthusiasm both by industry and government. In two years, the Queen Crab has progressed from being known as a "nuisance" crustacean, to the point where 1½ million pounds, valued at almost $100,000, were landed in 1967.

Because of the rapid growth of this fishery, the industry became involved with a multitude of problems – problems in keeping the crabs alive aboard ship in hot weather, problems in landing, holding,

Extracting meat from crab legs.

cooking, shucking, canning, freezing, packing, marketing and a score of others.

The problems faced by industry also became the problems of the federal Department of Fisheries, prompting still another series of investigations.

RESEARCH AT HALIFAX

The objective of a research and development program, now being conducted in the federal Department's Fish Inspection Laboratory at Halifax, is to establish a code of practice for the processing of the Queen Crab. Crab specialists from the Pacific Coast are being retained by the Industrial Development Service of the Department as technical advisers.

A recent announcement by the federal Department said the further investigations would involve efforts to determine the best processing procedures for vessel and plant handling of live crabs, cooking, shucking, packaging, and many other tests to ensure the production of a quality product with minimal production costs. It was stated that the Queen Crab would be processed for fresh, frozen and heat-processed packs to evaluate product quality during storage, and added that departmental engineers would also be engaged on plant layout and equipment design as part of the long range development activity.

Already hundreds of pounds of Atlantic Queen Crab have been cooked, cleaned, shucked, packed fresh and iced, canned, frozen, tested and tasted to determine quality standards. When present investigations are concluded this fishery will have been brought another step closer to being an advanced, lucrative business.

There are now more than a dozen crab-fishing vessels operating from various ports in the Maritimes, and there is every indication that this fleet will grow.

The producers, joined together as the Atlantic Crab Association, are enthusiastic about this new fishery. Optimistic predictions have been made that it could develop into a multi-million dollar industry within a few years.

Many who have tasted Atlantic Queen Crab say that it is eye appealing and succulent, and it is quite within the realm of possibility that, in the near future, Atlantic Queen Crab will be topping the gourmet lists of seafood connoisseurs.

Indian Fishermen Attend Lectures

A significant role was played by the federal Department of Fisheries during a recent 4-week technical training course for Indian fishermen held in Vancouver. Sponsored by the Indian Commissioner's office of the Indian Affairs Branch, this course is expected to serve as a model for a new program of education for Indians in the fishing industry of British Columbia.

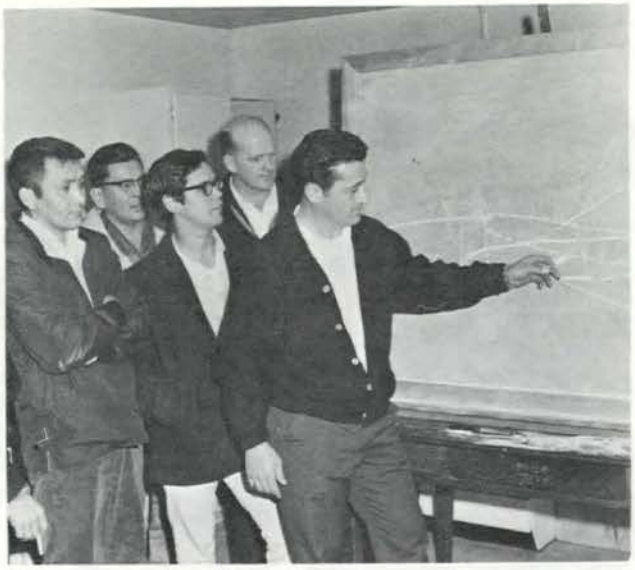
A series of five lectures were presented by Departmental personnel covering information and consumer services, conservation and protection, resource development, fish inspection, and economics.

The day-by-day role of the Information and Consumer Branches was explained to the class and how through the extensive use of printed material and films, the work of the Department is explained to the general public. One of the highlights was the showing of the new film "North Pacific" which demonstrated to the class some of the work being done to protect and improve the resource. In discussing the work of conservation and protection, the organization and functions of the Department at Ottawa was given in detail and then a more personal approach was taken by describing the organization on the Pacific coast.

The work of the Resource Development Branch was explained in the third lecture and the example used was the Skeena River. Construction and purpose of modern spawning channels was explained with the new channels at Fulton Creek and Pinkut serving as examples as to how it is hoped to improve the sockeye fishing on the Skeena River.

The fourth lecture in the series was devoted to inspection. Emphasis was placed on the methods of preserving fish and also the correct way to ice the individual fishing vessel.

The last lecture in the series was on the subject of economics. This covered the history of statistics, the introduction of the sales slip program in 1951; how the information gained is processed; how statistical maps are accumulated and used. The class was told of the studies done on income; the



Indian fishermen on a technical training course in Vancouver receive blackboard instruction in fishing techniques.

average earnings of the various sections of the fishing industry such as longlining, gillnetting and seining. Reviewed were the major articles on economics and of the information which is available to the fisherman and how the individual can use it.

Following the formal part of each of the lectures, a lively discussion period took place. The 16 fishermen on the course were from all sections of the province from the Fraser River in the south to the Skeena River in the north and included gillnet fishermen, seiners and trollers.

The course was organized by Indian Affairs fisheries specialist, Tom Rothery, a former Fisheries Department protection officer at Campbell River. The Indian Affairs Branch has already begun plans for future courses which will be available to groups of 15 or more Indian fishermen anywhere in the province.

Marine Aquiculture

A conference on Marine Aquiculture is to be held May 23 and 24 at Oregon State University Marine Science Centre, Newport, Oregon. Invited participants will present formal papers on eight topics: fish culture, shellfish culture, behaviour, genetics, nutrition, disease, economics and engineering.

Further information may be obtained from William J. McNeil, Oregon State University, Marine Science Centre, Newport, Oregon, 97365.

Survey Includes Longliners, Trawlers

Compare Costs, Earnings Of Newfoundland Vessels

BY JOHN PROSKIE

THIS PRELIMINARY report contains brief operational and financial summaries of 14 fishing vessels operating out of Newfoundland ports during 1966. Records were obtained for samples of 38-foot longliners and steel side trawlers ranging in length from 120 to 133 feet.

The 38-foot longliners were built in 1966 with financial assistance in the form of grants from the federal and provincial governments. These boats are powered with 63 h.p. diesel engines and equipped with depth sounders and radio telephones.

Three of the 120-foot and five of the 130-foot steel trawlers were built with the help of federal grants. One of the larger trawlers was built in Europe and received no federal grant. All of the trawlers were equipped with depth sounders, radiotelephones, radar and loran, and decca navigators. Only one of the 130-foot trawlers was equipped with a fish finder. The 120-foot trawlers were powered with diesel engines ranging from 650 to 825 h.p. per vessel and the 130-footers from 680 to 770 h.p. per vessel.

The accompanying report is a condensed version of Costs and Earnings of Selected Fishing Enterprises, Newfoundland, 1966 (Preliminary Report) prepared by John Proskie of the Economic Services of the federal Department of Fisheries, Ottawa.

The 38-foot longliners were one year old and the steel trawlers three years old on the average. The oldest was built in 1960 and the more recent in 1965.

The 14 vessels included in this report were manned by 135 fishermen. The total landings by these vessels were 55,727,132 lb. of fish with a landed value of $1,620,950.57. Out of the total landings, cod accounted for 22.3 per cent, flounders for 32.6 per cent, redfish for 33.9 per cent and 8.9 per cent was rejected fish (various species). The remainder was made up of small quantities of haddock, pollock, hake, halibut, wolffish, turbot, skate wings, squid and livers. The 38-foot longliners reported no landings of rejected fish (poor quality and not suitable for processing for human food). However, the trawlers reported landings of 4,907,126 lb. of rejected fish.

Of the total landings by 120-foot trawlers, 12.7 per cent was classified as "rejected fish" of little or no value to the buyers. The figure for

TABLE 1 – DESCRIPTION OF NEWFOUNDLAND VESSELS STUDIED, 1966

Type of Vessel	Vessels in Sample	Design	Hull	Averages per Vessel			
				Age	LOA	Gross Tonnage	Power
	no.			yrs.	ft.	tons	B.H.P.
Longliners	5	Conventional	Wooden	1	38	15	63
Otter trawlers	3	"	Steel	3	120	283	767
Otter trawlers	6	"	Steel	3	130	310	737

TABLE 2 – TOTAL LANDINGS AND LANDED VALUES OF REJECTED FISH BY SPECIES, NEWFOUNDLAND TRAWLERS, 1966

Three 120-foot Steel Side Trawlers

Species	lb.	$	Price per lb. in cents
Cod – round	134,715	18.00	0.01
Cod – gutted head on	31,725	–	–
Haddock – gutted head on	185	–	–
Pollock – round	10	–	–
Greysole	139,725	–	–
Flounders – round	253,810	–	–
Redfish – round	1,665,407	1,798.01	0.11
Catfish – gutted head on	1	–	–
TOTALS	2,225,578	1,816.01	0.08

Six 130-foot Steel Side Trawlers

Cod – round	621,689	70.00	0.01
Cod – gutted head on	12,817	–	–
Haddock – round	3,229	15.00	0.46
Pollock – round	3,566	–	–
Halibut – gutted head on	6,383	–	–
Halibut – gutted head off	1,311	–	–
Greysole – round	35,060	48.19	0.14
Flounders – round	1,450,553	942.87	0.07
Redfish – round	608,993	880.50	0.14
Redfish – gutted head on	723	–	–
Catfish – round	224	–	–
TOTALS	2,744,548	1,?56.56	0.07

the 130-foot trawlers was 7.4 per cent. Further details are shown in Table 2.

As will be shown later the large quantities of rejected fish landed by trawlers have an effect on earnings of the crew and vessel owners. Also, this phase has been reviewed, so that when comparisons are made in terms of output efficiency, this must be interpreted in the light of quality which is reflected in value of output. With these qualifications certain results of the fishing activities such as average landings and landed values per vessel are detailed in Table 3. These are related to size of crew, number of trips, days at sea, days fished and hours of fishing when available.

The 38-foot longliners were launched in May and began fishing in June. These vessels could have fished longer if the fish plant was opened. With a relatively short season, the average longliner spent 77 days at sea and had an average landing of 168,456 pounds of fish valued at $6,300 per vessel. The longliners caught 17.3 per cent of their landings on grounds located from 6 to 15 miles N. to N.W. of Long Point, Twillingate, 61.4 per cent on grounds from 6 to 15 miles N.E. of Long Point, and 21.3 per cent on grounds off Battle Harbour and Batteau on the Labrador Coast.

The average 120-foot trawler made 27 trips with 251 days at sea and an average landing of 5,855,148 lb. of fish valued at $151,375. The average 130-foot trawler made 28 trips in 276 days at sea with an average landing of 6,219,902 lb., valued at $189,221 per vessel.

The comparative operational efficiency is illustrated further by data in Table 4. In this com-

TABLE 3 – AVERAGE OPERATIONAL PERFORMANCE OF NEWFOUNDLAND VESSELS, 1966

Type of Vessel	Averages per Vessel							
	LOA	Men in Crew	Trips	Days		Hours Fished	Landings	Landed Value
				at Sea	Fished			
	ft.	no.	no.	no.	no.	no.	lb.	$
Longliners	38	2.8	77	77	77	(1)	168,456	6,300
Otter trawlers	120	12.5	27	251	198	2,536	5,855,148	151,375
Otter trawlers	130	13.9	28	276	198	2,615	6,219,902	189,221

NOTE: (1) – information not available

TABLE 4 – OPERATIONAL EFFICIENCY OF NEWFOUNDLAND VESSELS, 1966

Type of Vessel	1966 Averages						
	LOA	Landings per			Landed Values per		
		Man	Trip	Day at Sea	Man	Trip	Day at Sea
	ft.	lb.	lb.	lb.	$	$	$
Longliners	38	60,163	2,199	2,199	2,250	82	82
Trawlers	120	467,166	219,568	23,358	12,078	5,677	604
Trawlers	130	446,939	220,825	22,509	13,597	6,718	685

parison, the average 120-foot steel side trawler had the best performance in output per man and per day at sea in terms of quantity of landings. However, in terms of landed values the average 130-foot trawler had the best performance. The reason for this is due principally to the quantity of rejected fish landed with little or no value, as indicated in Table 5.

TABLE 5 – AVERAGE LANDINGS OF REJECTED FISH, NEWFOUNDLAND TRAWLERS, 1966

Size of Trawler	Average Landings of Rejected Fish per		
	Man	Trip	Trawler
	lb.	lb.	lb.
120-foot	59,191	27,820	741,859
130-foot	32,869	16,240	457,425

The higher average landings of rejected fish by 120-foot trawlers had the effect of reducing the landed value per man, per trip and per vessel. The species-mix of the landings also has an effect on landed values. In 1966 for the 120-foot trawlers cod accounted for 19.3% (22.6%) 130-foot trawler percentages are in brackets; haddock 0.6% (1.6%), flounders for 10.3% (43.7%), redfish for 56.6% (24.0%) and rejected fish 12.7% (7.4%).

The average vessel rate of output per hour of fishing and rate of output per man-day at sea are detailed in Table 6.

The average rate of vessel output per hour of fishing was almost equal for the two size classes of trawlers – 2,309 lb. for 120-footers and 2,379 lb. for 130-footers. However, in terms of value there was considerable difference – $60 for 120-footers and $72 for 130-footers. Again this difference is due mainly to the large landings of rejected fish by the 120-footers, and also the species-mix of

TABLE 6 – AVERAGE RATE OF OUTPUT, NEWFOUNDLAND VESSELS, 1966

Type of Vessel	1966 Averages per Vessel					
	LOA	Men in Crew	Vessel Output per Hour of Fishing		Average Output per Man-day at Sea	
	ft.	no.	lb.	$	lb.	$
Longliners	38	2.8	(1)	(1)	783	29
Trawlers	120	12.5	2,309	60	1,857	48
Trawlers	130	13.9	2,379	72	1,621	49

NOTE: (1) – Information not available.

TABLE 7 – RELATIONSHIP BETWEEN CAPITAL AND OUTPUT, NEWFOUNDLAND VESSELS, 1966

Type of Vessel	LOA	Averages per Man			Ratio of Landed Value per man to	
		Investment		Landed Value of Fish	Total Investment	Net Investment
		Total	Net			
	ft.	$	$	$	%	%
Longliners	38	4,286	2,387	2,250	52.5	94.3
Trawlers	120	44,386	22,193	12,078	27.2	54.4
Trawlers	130	37,209	20,569	13,597	36.5	66.1

higher priced species favours the 130-footers. The average landings per man-day at sea was 1,857 lb. for 120-footers and 1,621 lb. for 130-footers, but the values were almost equal-$48 for the former and $49 for the latter. The average 38-foot longliner recorded a landing of 783 lb., valued at $29 per man-day at sea.

The relationship between capital and output is another important measure. In the case of owners, the important relationship is between net investment and output. Governments that make grants and advance loans on fishing vessels are also interested in the ratio of landed value per man to total capital employed per man. These ratios are shown in Table 7.

The ratio of average landed value per man to average net investment per man in 1966 shows that for every $100 invested, the 38-foot longliner

TABLE 8 – AVERAGE NET RETURNS TO LABOUR, NEWFOUNDLAND VESSELS, 1966

Item	Longliners	Steel Side Trawlers	Steel Side Trawlers
LOA in feet	38	120	130
Men in crew	2.8	12.5	13.9
Days at sea	77	251	276
Crew Category	Average Net Earnings Per Man Per Season[1]		
	$	$	$
Captain	1,736	10,856	14,840
Mate		6,665	7,564
Boatswain		4,660	4,861
First engineer		5,426	6,214
Second engineer		4,893	5,372
Thrid engineer			4,322
Fourth engineer			4,241
Cook		4,808	5,063
First icer		4,004	4,549
Second icer		4,004	4,498
Third Hand			4,330
Deckhand	1,736	3,859	4,189

NOTE: [1]job site earnings.

TABLE 9 – AVERAGE NET RETURNS PER MAN PER DAYS AT SEA, NEWFOUNDLAND VESSELS, 1966

Item	Longliners	Steel Side Trawlers	Steel Side Trawlers
LOA in feet	38	120	130
Men in crew	2.8	12.5	13.9
Days at sea	77	251	276
Crew Category	Average Net Earnings Per Man Per Day at Sea		
Captain	22.55	43.25	53.77
Mate		26.55	27.41
Boatswain		18.57	17.61
First engineer		21.62	22.51
Second engineer		19.49	19.46
Third engineer			15.66
Fourth engineer			15.37
Cook		19.16	18.34
First icer		15.95	16.48
Second icer		15.95	16.30
Third hand			15.69
Deckhand	22.55	15.37	15.18

produced $94.30 ($52.50 for total investment) of fish. The ratios for the 120-foot steel side trawlers were $54.40 ($27.20) and for 130-footers $66.10 ($36.50). As has been pointed out before, landings of large quantities of rejected fish depressed the landed values and therefore the ratios discussed here. In this case the effect on 120-footers was much greater.

Average net earnings per man per season in 1966 by crew category are detailed in Table 8.

The highest average basic net cash crew share per man per season (or take home-pay excluding commissions and wages) was recorded by 130-foot trawlers at $4,189 per man. Deckhands on the 120-footers recorded an average net earning of $3,859. The 38-foot longliners reported average deckhand earnings at $1,736.

The captains on the 130-foot trawlers averaged $14,840 per man per season, and on 120-footers the average was $10,856 per captain. Other specialized crew members on these vessels also did better than the average deckhand.

The average net earnings per day at sea for the various crew members are shown in Table 9.

The average deckhand on the 38-foot longliners had a net earning of $22.55 per day at sea. For the 120-foot trawlers the figure was $15.37 and for the 130-footers $15.18.

The vessel owners have had a difficult time to retain permanent crews and quite frequently vessels had to sail to fishing grounds without a full complement of men. In part this situation is due to the turnover of crews.

The reasons for the turnover on particular vessels was obtained for 245 men. These were as follows:

Reasons for leaving vessel	Number Reporting	Percentage Distribution %
1. Quit	48	19.6
2. Did not show up	40	16.3
3. Became fish plant worker	33	13.5
4. Left for other work	6	2.4
5. Went with another vessel owner	19	7.8
6. Went back to inshore fishing	9	3.7
7. Vessel transferred to another province	13	5.3
8. Sickness	5	2.0
9. Deceased	1	0.4
10. Laid off (fired)	10	4.1
11. Transferred to another vessel – same owner	61	24.9
TOTAL	245	100.0

Out of 245 men who left particular vessels, 61 were transferred to other vessels owned by the same company. Therefore this cannot be considered as a critical turnover. Perhaps, one of the most serious situations for the vessel owner is caused when the crew member "does not show up" and the vessel must sail undermanned. This and other reasons given for leaving particular vessels resulted in an average crew of 121 men manning the nine trawlers, while the requirement for a normal crew, fully manned, was 138 men.

The vessel owners have taken steps to hold crews, especially the specialized members by offering incentives in the lay arrangements.

TABLE 10 – NUMBER OF MEN IN CREW PER TRIP, NEWFOUNDLAND TRAWLERS, 1966

Item	120-foot		130-foot	
Number of trawlers	3		6	
	no.	%	no.	%
Number of trips made with				
eleven-man crew	4	5.0		
twelve-man "	35	43.7	10	5.9
thirteen-man "	35	43.7	53	31.4
fourteen-man "	6	7.6	63	37.4
fifteen-man "			35	20.7
sixteen-man "			8	4.7
Total Trips	80	100.0	169	100.0

TABLE 11 – TURNOVER OF MEN, NEWFOUNDLAND TRAWLERS, 1966

Trawler	Normal Crew	Range in Men per Trip	Total Men Employed
		(120-foot trawlers)	
1	14	11 – 14	20
2	14	11 – 13	38
3	14	10 – 14	26
		(130-foot trawlers)	
4	16	13 – 16	53
5	16	12 – 16	41
6	16	13 – 15	31
7	16	12 – 15	61
8	16	13 – 16	57
9	16	12 – 14	34

The review of the lay arrangements and the statement of duties for the various crew members (job sites) shows that the rate of remuneration is based on qualifications, responsibilities and the experience required to carry out the tasks. Also incentives have been introduced to hold crews by ensuring a more stable income. Other incentives in the form of commission to the captains encourage the production of quality and larger fish. However, as has been mentioned before, the trawler landings include a high proportion of rejected fish.

The average value of capital employed (investment from all sources as well as the net investment by owner in vessel, gear and deck equipment) is shown in Table 12 and this is related to the net earnings of the boat (profit per enterprise). No account is taken of opportunity cost (income foregone that might have been earned on owner's net worth in the best alternative types of investment). Only interest that is paid or payable is taken into account.

The data indicate that only the 38-foot longliners were profitable on the average. Both classes of trawlers studied operated at a loss. This loss in the main may be attributable to the large quantities of rejected fish that have been landed. For the average 120-foot trawler rejected fish accounted for 12.7 per cent of the total landings and the average loss per trawler was $30,174 or 10.8 per

TABLE 12 – AVERAGE NET RETURNS TO CAPITAL, NEWFOUNDLAND VESSELS, 1966

Type of Vessel	Averages per Vessel						
	LOA	Total Capital Cost	Boat Construction Assistance		Rented Equipment	Net Investment by Owner[1]	Net[2] Profit
			Federal	Provincial			
	ft.	$	$	$	$	$	$
Longliners	38	12,000	2,953	2,363	–	6,684	942
Otter trawlers	120	556,303	272,151	–	6,000	278,152	-30,174
Otter trawlers	130	517,824	218,790	–	12,776	286,258	-11,518

NOTE: [1]Private net worth plus borrowed capital to finance the asset.

[2]Book profit before income taxes, taking into account operating revenue and expenditures on the balance sheet; in other words, profit/loss statement.

TABLE 13 – RELATIONSHIPS BETWEEN PRODUCTION AND EXPENDITURES
NEWFOUNDLAND VESSELS, 1966

Type of Vessel	Average		Vessels			Averages per Vessel				
	LOA	Size of Crew	Total	Reporting		Gross Receipts	Per Cent of Gross Receipts for			
				Profit	Loss		Total Cash Expense	Net Crew Earnings	Depre-ciation	Total
	ft.	no.	no.	no.	no.	$	%	%	%	%
Longliners	38	2.8	5	5	–	6,546	8.0	74.3	3.4	85.7
Otter trawlers	120	12.5	3	–	3	151,375	65.0	41.5	13.5	120.0
Otter trawlers	130	13.9	6	–	6	189,221	54.0	41.3*	10.9	106.2

cent on the average net investment by owners. For the 130-foot trawlers rejected fish accounted for 7.4 per cent of total landings and the average loss per trawler was $11,518 or 4.0 per cent on the net investment by owners. On the average the 38-foot longliners reported a profit of $942 per vessel or 14.1 per cent on the average net investment.

The data in Table 13 show what proportion of gross receipts goes to total cash expenditures, net crew earnings, and depreciation. For example, for every $100 worth of fish landed by the 38-foot longliners, $8.00 went to pay for the total cash expenditures, $74.30 to the crew, and $3.40 to cover depreciation charges. The total cost of these three items of expense was $85.70, which left a profit of $14.30 to the owners of the longliners.

The steel trawlers in this respect made a poor showing. For the 120-foot trawlers it cost $120 for the three major items of expense for every $100 worth of fish landed. For the 130-foot trawlers the figure was $106.20. As has been pointed out before, landing large quantities of rejected fish is the principal cause for the unfavourable financial results for the trawlers. In this case, perhaps, it would be more profitable to catch and land smaller quantities of fish but fish of good quality, which could save expenditures on gear and other equipment as well as unloading charges. Insufficient and improper icing may be another factor in landing large quantities of rejected fish.

For 120-foot trawlers, which had an average landing of 5,855,148 lb. of fish of which 12.7 per cent was rejected, the expenditure for ice was $4,131 per vessel. The 130-foot trawlers had an average landing of 6,219,902 lb. of fish of which 7.4 per cent was rejected; the expenditure for ice was $6,336 per vessel. Undermanning of the trawlers may be another factor.

Fisheries Conference

A fisheries conference that will range beyond fishing interests and involve the manufacturers and suppliers of various construction materials used in the building of vessels is to be held at the Queen Elizabeth Hotel in Montreal next October 1-3. This conference will be sponsored by the Federal-Provincial Atlantic Fisheries Committee.

Traditional and newer materials used or contemplated for use in the structure of the hulls, decks and superstructures of fishing vessels will be considered. These will include wood, steel, plastic, aluminum and concrete. Boatbuilders, vessel owners and operators, naval architects, manufacturers, fabricators, government specialists and others will examine the advantages of the various products. They will discuss raw materials and their application to design, construction, quality control, vessel operation and maintenance, and their comparative economics.

As in previous fisheries conferences sponsored by the Federal-Provincial Atlantic Fisheries Committee, the conference on fishing vessel construction materials will have an international flavour. Interest has already been shown by fishing, shipbuilding and manufacturing interests in several fishing countries as well as across Canada, and world experts will be among the thirty or more specialists who will present papers. About 400 people are expected to attend the conference.

News Roundup

World Fish Catch

The 1966 world catch of fish and shellfish reached 56.8 million metric tons, up 6 percent from the 1965 total of 53.3 million metric tons according to the latest statistics issued by the Food and Agriculture Organization of the United Nations.

Peru, Japan, Communist China and the Soviet Union accounted for most of the increase, with Peru catching 8,789,000 metric tons, Japan, 7,077,000 Communist China, 5,785,000 and USSR catching 5,349,000 metric tons. Their combined catch of 27 million tons represented 47 percent of the world total.

Canada comes tenth in the list of fish producing nations with a catch of 1,348,000 metric tons, up 86,500 metric tons from her 1965 total. The catch by United States fishermen was 2,514,600 metric tons, the lowest in 20 years.

Shorter Sealing Season

The sealing season in the "Front" area on Canada's east coast will be shortened by fifteen days in 1968, and in the Gulf of St. Lawrence by eleven days, federal Fisheries Minister H.J. Robichaud has announced.

On the "Front" – the Labrador and eastern Newfoundland coastline – the taking of harp and hooded seals by both Canada and Norway will, by international agreement, commence on March 22, ten days later than in 1967, and will close on April 25, five days earlier than last season. The new dates were agreed upon following consultation and an exchange of letters with the Norwegian Government. Norway has been for some years the only country besides Canada to take part in sealing at the "Front".

Discussions on seal conservation measures were initiated at the annual meeting of the International Commission for the Northwest Atlantic Fisheries at Boston, Mass., in June 1967, and were followed by a meeting of interested countries at Hamburg, Germany, in October.

In the Gulf of St. Lawrence, where Canada is the sole participant in sealing, the 1968 season will open March 18 (as compared with March 7 in 1967) and will close, as last season, on April 25.

Shortening of the season for the "Front" is intended to reduce harvesting pressure on the stocks of both young and old seals which, according to scientific evidence, have previously been overcropped. The delayed opening in the Gulf will bring that season into conformity with the altered seal-hunting season for the "Front".

Warning Issued

A stern warning to trawler owners responsible for destroying fishermen's cod gill-nets in east coast Newfoundland waters has been issued by federal Fisheries Minister H.J. Robichaud.

The Minister's warning arose from several incidents in the Baccalieu area in early October when trawlers caused heavy destruction to cod gill-nets, most of which had been properly marked. These incidents were thoroughly investigated by officers of the Department of Fisheries, and the evidence obtained indicated that trawlers had knowingly destroyed the gear.

Three companies operating large trawlers were involved. Two of them have recognized their obligations and have made payment for loss of gear to the people concerned. Mr. Robichaud said he deplored the fact that the third company had not seen fit to pay for the gear its vessels had destroyed.

The Minister stated that he had seriously considered suspending the licences of the trawlers involved. However, he said, he decided instead to issue a stern warning to their owners that future incidents of this kind will not be tolerated, and will result in the suspension of the licence of any trawler responsible. One of the principal reasons for not suspending licences in the present case was the effect which reduced landings would have on employment in the processing plants at this time of year, Mr. Robichaud said. Also, consideration was given to the fact that some of the owners concerned recognized their obligations and recompensed fishermen for loss of gear.

Mr. Robichaud gave definite assurance that in the event of future incidents there would be immediate suspension of the licences of any trawlers involved in destroying gear set by inshore fishermen.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May - Nov. 1966		May - Nov. 1967	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	1,843,233	124,590	1,786,212	118,534
ATLANTIC COAST - Total	1,476,038	71,404	1,566,669	74,552
Cod	443,806	19,586	445,821	19,606
Haddock	62,853	4,437	57,044	3,512
Pollock, Hake, Cusk, etc.	52,523	1,863	50,527	1,729
Rosefish	153,519	4,282	152,329	3,959
Catfish	3,823	127	3,614	116
Halibut	2,760	972	2,681	1,001
Plaice & Other Flatfish	201,393	6,477	198,326	6,391
Herring & Sardines	434,590	4,943	538,565	5,733
Mackerel	25,485	888	24,686	940
Alewives	8,067	141	6,501	104
Salmon	5,198	2,537	6,183	3,333
Smelts	1,518	128	892	85
Swordfish	6,270	2,667	7,139	2,905
Other Fish	13,135	447	10,673	386
Lobsters	28,640	15,712	28,642	17,917
Clams & Quahaugs	4,007	231	4,460	293
Scallops	12,752	5,131	9,419	5,415
Other Shellfish	15,699	835	19,167	1,127
PACIFIC COAST - Total	367,195	53,186	219,543	43,982
Pacific Cods	18,707	1,689	10,915	892
Halibut (1)	30,829	11,046	24,158	6,111
Soles & Other Flatfish	8,563	541	6,210	405
Herring	137,456	2,281	32,631	553
Salmon	152,557	36,242	129,099	34,555
Other Fish	9,587	417	6,822	332
Shellfish	9,496	970	9,708	1,134
BY PROVINCES				
British Columbia	367,195	53,186	219,543	43,982
Nova Scotia	521,092	29,011	542,877	29,760
New Brunswick	280,970	9,578	296,584	9,400
Prince Edward Island	55,201	5,857	43,062	6,793
Quebec	123,425	6,189	179,362	7,060
Newfoundland	495,350	20,769	504,784	21,539

(1) - Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES - NOVEMBER 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.384	.457
Cod fillets, Atl, frozen, cello 5's	lb.	.342	.383
Cod fillets, smoked	lb.	.430	.473
Haddock fillets, fresh, unwrapped	lb.	.492	.593
Herring, kippered, Atl.	lb.	.259	.337
Mackerel, frozen, round	lb.	.190	.267
Lobsters, canned, Fancy	Case 48-½s	-	66.987
Sardines, canned	Case 100-¼s	9.695	9.600
Halibut, frozen, dressed	lb.	.516	.530
Silverbright, frozen, dressed	lb.	.624	.647
Coho, frozen, dressed	lb.	.874	.937
Sockeye, canned, grade A	Case 48-½s	27.347	28.233
Pink, canned, grade A	Case 48-½s	16.837	17.650
Whitefish, fresh	lb.	.450 1/	.477
Lake trout, frozen	lb.	.442	.523

1/ Dressed

PRICES PER CWT. PAID TO FISHERMEN

(Week ending Nov. 18th)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	5	4
Yarmouth		
Haddock	-	-
Black's Harbour		
Sardines	-	-
Vancouver		
Ling Cod	12-16	6-12
Gray Cod	7.5	7.5
Soles	6-9.5	6-9.5
Salmon (Rdspg)	-	-

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF NOVEMBER

	1966 '000 lbs	1967 '000 lbs
TOTAL - Frozen Fish, Canada	109,077	97,330
Frozen - Fresh, Sea Fish - Total	81,586	69,852
Cod, Atlantic, Fillets & Blocks	20,287	8,588
Haddock, fillets & blocks	3,791	5,724
Rosefish, fillets & blocks	9,001	9,964
Flatfish, (excl. halibut), fillets & blocks	8,137	10,267
Halibut, Pacific, dressed & steaks	9,680	9,548
Other Groundfish, dressed & steaks	2,830	1,928
Other Groundfish, fillets & blocks	7,992	4,927
Salmon, Pacific, dressed & steaks	9,355	7,705
Herring, Atlantic & Pacific	456	675
All Other Sea Fish, all forms	6,725	7,957
Shellfish	3,332	2,569
Frozen - Fresh, Inland Fish - Total	8,975	11,500
Perch, round or dressed	318	2,570
Pickerel, (Yellow & Blue) fillets	1,068	1,673
Sauger, round or dressed	799	740
Tullibee, round or dressed	219	190
Whitefish, round or dressed	1,998	1,473
Whitefish, fillets	361	270
Other, all forms	4,212	4,584
Frozen - Smoked Fish - Total	1,463	1,571
Cod Atlantic	751	468
Sea Herring, kippers	423	635
Other, all forms	289	468
Frozen for Bait and Animal Feed	17,053	14,407

SALTED FISH STOCKS AS AT END OF NOVEMBER

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		23,178	33,348
Cod		20,221	28,037
Other		2,957	5,311
Dried - salted - Total		17,774	23,193
Cod		16,665	22,026
Other		1,109	1,167
Boneless - Total		626	1,446
Cod		549	1,317
Other		77	129
Pickled - Total	(barrels)	16,967	23,381
Herring	"	6,645	7,494
Mackerel	"	5,529	12,530
Alewives	"	4,793	3,357
Turbot	"	-	(1)
Bloaters	(18 lb. boxes)	127,210	205,674
Boneless Herring	(10 lb. boxes)	4,717	(1)

(1) - Confidential

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - AUGUST

(Value in Thousands of Dollars)

		1966 $'000		1967 $'000
Total Exports		78,710		77,752
By Markets:				
United States		61,098		57,521
Caribbean Area		6,188		6,301
Europe		9,720		12,050
Other Countries		1,704		1,880
By Forms:				
Fresh and Frozen		59,940		56,068
Whole or Dressed	18,258		14,746	
Salmon, Pacific	6,028		4,462	
Halibut, Pacific	2,963		1,616	
Cod, Haddock, Pollock, etc.	169		110	
Swordfish	2,050		1,996	
Other Seafish	2,907		3,156	
Whitefish	1,466		1,395	
Pickerel	992		650	
Other Freshwater Fish, n.o.p.	1,683		1,361	
Fillets	25,888		23,013	
Cod, Atlantic	8,038		6,868	
Haddock	2,516		2,935	
Rosefish, Hake, Pollock, etc.	3,431		2,184	
Flatfish	5,500		4,995	
Pickerel	1,107		698	
Other	5,296		5,333	
Shellfish	15,626		18,149	
Lobster (Alive & Meat)	12,132		14,084	
Other	3,494		4,065	
Frozen Fish & Shellfish, pre-cooked	168		160	
Cured		6,916		6,706
Smoked	794		463	
Herring	554		204	
Other	240		259	
Salted, Wet & Dried	5,442		5,364	
Cod	4,562		4,437	
Other	880		927	
Pickled	680		879	
Herring	497		552	
Mackerel	69		160	
Other	114		167	
Canned		5,346		8,499
Salmon	1,725		5,290	
Sardines	1,630		1,737	
Lobsters	1,371		945	
Other	620		527	
Miscellaneous		6,508		6,479
Meal	4,001		3,076	
Oil	143		554	
Other	2,364		2,849	

Current Reading

MODERN DEEP-SEA TRAWLING GEAR by John Garner. Fishing News (Books) Ltd., London, Eng. Price $6.50 mailed.

This volume sets out the fundamental principles and practical details of the design and operation of deep sea trawls.

It is quite comprehensive in its scope and is particularly notable for its full and detailed design of various trawls. The figures cover the evolution of trawl gear from its inception to its present stages of design for the equipment of stern trawling vessels from 2,000 to 3,000 tons.

There are seven chapters outlining in detail first the empirical development of trawl gear; next the design and operation of the side trawl gear; then the design and operation of stern trawl gear. After this comes a comparison of side trawl gear with stern trawl gear. Next, consideration is given to the materials, mesh size and the theory of netting. Chapter six deals with trawling specifications followed by the latest methods of improving existing trawl gear designs.

The author, John Garner, writes with authority as his life's work has been in trawling, net-making and the practical design of fishing nets and trawls for many different kinds of fishing. He has written two books and has contributed many articles to fishery journals.

CENTENNIAL COOK BOOK. Produced by the Women's Auxiliary to the United Fishermen and Allied Workers Union. Available from: W.A. Cookbook Committee, 138 East Cordova Street, Vancouver 4, B.C. Price $2.50.

This second edition of the Women's Auxiliary Cook Book is dedicated to the pioneer women of Canada, especially those of British Columbia. Revised and considerably expanded, it contains 515 favourite recipes gathered from women close to the fishing industry.

As one might expect, the book opens with a chapter on fish. Good advice is given on the buying, home freezing, home canning, and storing of the product as well as detailed instructions on how to prepare and cook it. Fish fanciers will appreciate the many fine seafood recipes found in this chapter and interspersed throughout the book's other fourteen chapters.

While fish is of paramount interest, this is not solely or even primarily a fish cook book. Pies, cakes, pickles, preserves, soups, salads, and foreign dishes are some of the other topics dealt with. Thoroughly Canadian in content, it would make a fine gift for both the novice and experienced cook.

PHYSICAL LIMNOLOGY OF SAGINAW BAY, LAKE HURON by Alfred M. Beeton, Stanford H. Smith and Frank H. Hooper. (Technical Report No. 12, Great Lakes Fishery Commission).

Bays are among the most productive environments of the Great Lakes. They were the first areas of the Great Lakes affected by human activities that altered their productivity and usefulness as a natural resource. The serious decline in abundance of the more desirable commercial species of fish in Saginaw Bay appears to be largely the result of man's activities.

Less is known about the bays than about the Great Lakes proper, and techniques for studying them are poorly developed. This study of Saginaw Bay provided an opportunity to test techniques previously used to evaluate the circulation of marine estuaries by applying them to the study of water exchange of a freshwater bay with the main body of the lake.

Growing concern over the decline of the more valuable fish species led to a co-operative limnological survey of Saginaw Bay by the Michigan Department of Conservation and the U.S. Bureau of Commercial Fisheries in 1956. Data collected in this survey by the Bureau and the Michigan Department, and independently by the Dow Chemical Company in 1956, are analyzed in this report to (1) extend information on physical and chemical conditions in Saginaw Bay, (2) investigate the relationship between air and water temperatures, and (3) determine the applicability in fresh water of techniques used to evaluate circulation in marine estuaries.

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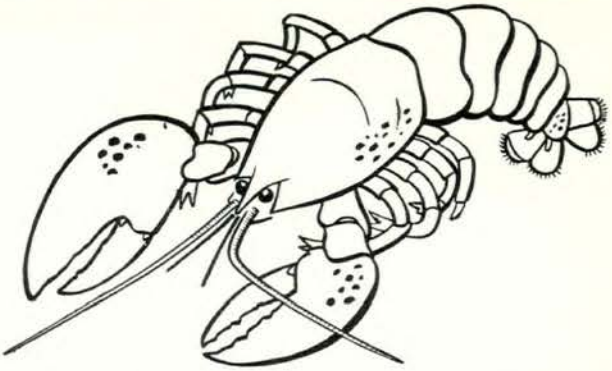
Band those claws!

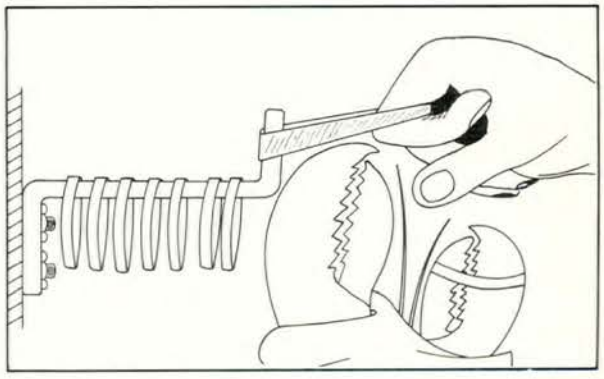


MORE THAN half of Canada's lobster catch is marketed alive. If these lobsters are to reach distant markets in the United States, Canada and Europe in good condition they must be handled very carefully from the moment they are caught. Unfortunately millions of lobsters die each year during storage and shipment. Such losses mean lower prices to fishermen.

To keep lobsters from injuring each other, their claws must be banded promptly – preferably as soon as they are taken from the traps. This can be done quickly and easily with banding pliers. Another way is to fasten one end of a short metal rod at some convenient spot on the boat. The other end of the rod is bent at a right angle to aid in stretching the rubber bands. Suitable bands (1/2" x 7/8") that are put on carefully will remain in place for several months.

Specially-made pliers (shown above) simplify the job of banding lobster claws.

The small cost of the bands (about $1.60 per 1,000) and banding pliers is soon repaid many times by the better survival of the lobsters. It is false economy to band only the heavy crusher claw. The sharp-pointed pincer claw often punctures delicate areas causing lobsters to gradually weaken and die.



A simple device for banding lobsters.

Some fishermen and dealers keep the claws closed by inserting a wooden or plastic plug at the base of the thumb. This works reasonably well for short periods. Gradually, however, the plug wounds become infected, the shell erodes, the claw meat darkens and goes off-flavour. Plugged lobsters are more susceptible to blood disease that sometimes causes heavy losses in storage. Some European countries will not import plugged lobsters. For these reasons it is better to band the claws.

(Prepared by the St. Andrews , N.B., Biological Station of the Fisheries Research Board of Canada).

DEPARTMENT OF FISHERIES
Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister
Ottawa, Canada

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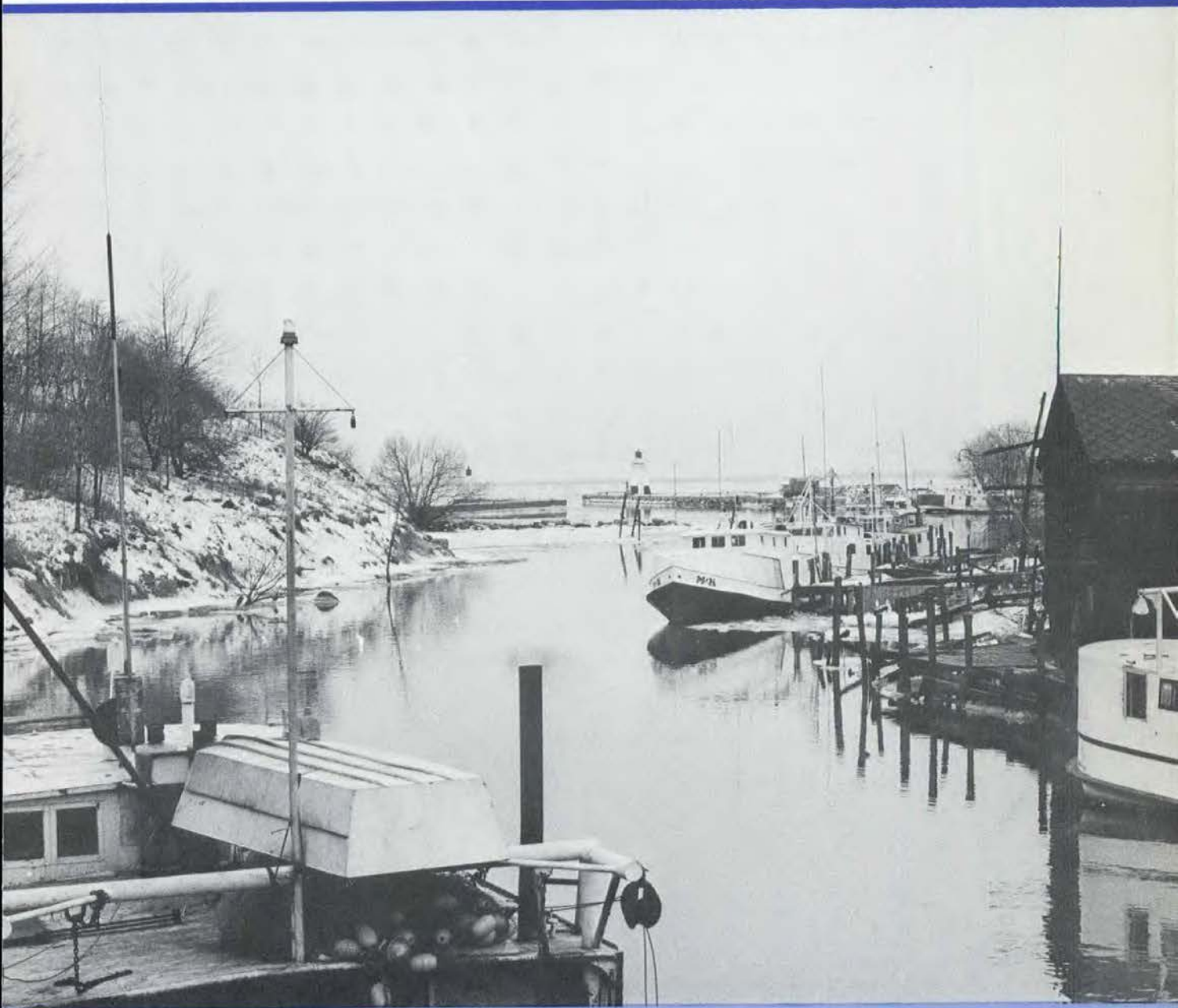

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★ Will Atlantic Lobster Breed in B.C.?
★ Nfld. Pollution Laboratory Expanded

Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
(formerly Trade News)

Editor
E. H. HEARNDEN

March, 1968

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COVER PHOTOGRAPH - A view of the harbour at Port Dover, Ontario, looking towards Lake Erie. Ice conditions in the lake are such that smelt trawlers are able to operate periodically through the winter (this photograph was taken in February this year). Total catch of the commercial fishery in Lake Erie (Canadian and U.S.) in 1967 is estimated at about 48 million pounds, a decline of about 6 million pounds over the 1966 landings although about average for the past five-year period.

The Department of Fisheries patrol vessel "Chebucto" in the Bay of Fundy.

Chebucto – A Year of Service

By W.J. LEVER

HAVING completed her first year of service, it can be said that the 179-foot, 188-ton Department of Fisheries patrol vessel *Chebucto* has truly lived up to her role of "multi-purpose vessel". During this time she has engaged in both inshore and offshore protection work, search and rescue, carrying supplies, and has taken her share of "lumps" from the stormy waters of the North Atlantic.

Christened by Mrs. H.J. Robichaud, wife of the federal Minister of Fisheries, at Pictou, N.S., in May, 1966, the *Chebucto* did not come into active service until some ten months later.

The name "Chebucto" in original Micmac Indian was "Shubukto", meaning "the place of the big water", and referred to the area that is now Halifax. It was therefore appropriate that the new vessel was so named, as Halifax is her home port.

On her first trial run to the fishing banks late in February of last year, the *Chebucto's* log reads:

"Moderate southwest winds changing to south gales – snow and rain. Checking dragger operations on Emerald Bank. One engine in operation. Winds gale force. Hove to in deep water between Emerald

and Sambro Banks (approximately 75 miles from Halifax). Winds gusting to 75 miles per hour. Vessel riding well. Some damage to spare cabins. Following storm, continue general patrol duty regarding 12-mile limit on return to Halifax."

It was in this storm that the side trawler *Cape Bonnie* foundered near the mouth of Halifax Harbour with the loss of 18 lives; the *Iceland II* of Cape Breton with 10 drowned, and the *Polly and Robbie* disappeared in the howler with 7 missing off Newfoundland.

The *Chebucto* "rode well" in that violent storm recorded Captain L.C. King, of Dartmouth, in his log. A soft-spoken, reticent man, it was enough for him when asked how he liked the *Chebucto*, to answer, "She is a good ship".

In general inshore and offshore protection operations, special assignments and search and rescue emergencies, the *Chebucto* has already navigated nearly 15,000 nautical miles in 1,500 hours, averaging 10 knots while on patrol at sea. In that time she has sailed waters from Gaspe through the Gulf of St. Lawrence to Orphan and Bradelle Banks; the Northumberland Strait to Milne Bank; the Atlantic to Curdo, Misaine, Middle, Banquereau, Sable, Emerald, Sambro, LeHave, Roseway, Brown's and George's Banks, and the waters of the Bay of Fundy through Grand Manan Bank.

Many times while on routine patrol, or berthed after a lengthy voyage, the patrol vessel has had to quickly slip her lines following calls on distress frequency 2182 Kcs, or by direction from the Marine Search and Rescue Co-ordination Centre through

Captain L.C. King, master of the "Chebucto".

A Soviet fishing trawler to port of the "Chebucto". on George's Bank in slight fog.

regional headquarters. In many instances, the *Chebucto* has been on Department assignments, but a "MAYDAY" call takes priority over everything.

A typical instance occurred in August, when on an assignment for the International Commission for North Atlantic Fisheries, the *Chebucto* had to interrupt her mission to answer a Search and Rescue request. The log reads:

August 22: "On I.C.N.A.F. patrol to check dragger operations. Light Southwesterly winds, fog and rain showers. 1835 hours received S & R call to proceed to assist dragger *Victoria* in George's Bank area. Disabled because of engine breakdown. 2300 hours took *Victoria* in tow and proceeded toward Shelburne. Relinquished tow 0330 hours to Coastguard cutter *Rapid* and returned to assigned patrol southward to George's Bank."

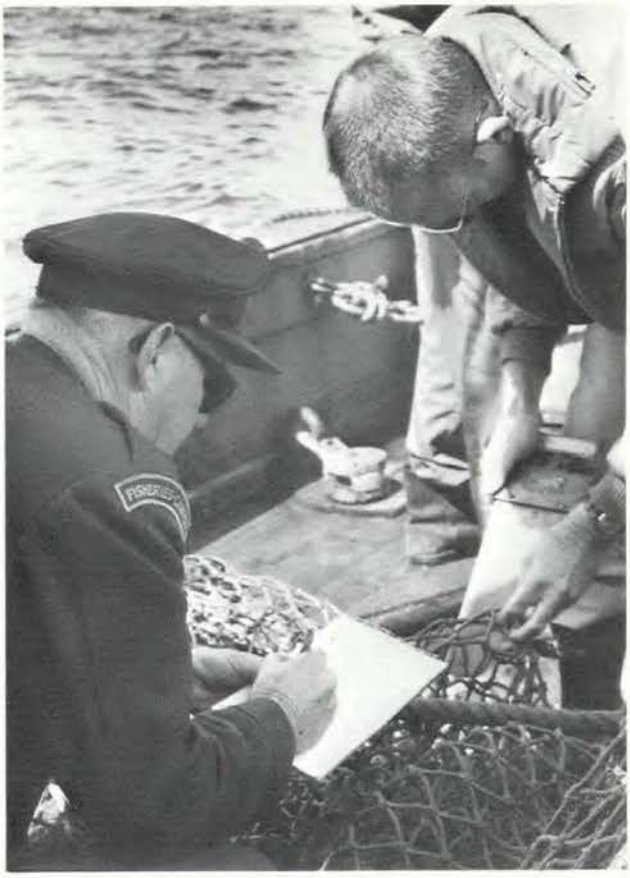
On August 20, a joint Canadian-United States team of federal fishery officials boarded the *Chebucto* to carry out offshore inspections of each other's fishing vessels under International Commission for Northwest Atlantic Fisheries regulations. The team came in contact with its first vessel on George's Bank – the *Gladys Pauline* out of Lockeport. A boarding was made, under rough conditions, and an inspection of net mesh size and cod ends proved to be satisfactory.

During this I.C.N.A.F. survey, the *Chebucto's* efforts were harassed by extreme foggy conditions.

Nova Scotia wooden trawler "Gladys Pauline" hove to on George's Bank to undergo inspection by joint Canadian-U.S. ICNAF inspection team.

A number of Soviet fishing vessels were observed in the area, and late in the afternoon of August 23, the *Chebucto* rendezvoused with the U.S. Coast Guard vessel *Vigilant* for transfer of the international team.

The group continued its inspection of U.S.



Canadian Fisheries Officer D.A. MacKinnon and U.S. Inspector G. Schneider measure mesh size of net aboard Canadian dragger "Gladys Pauline".

Joint ICNAF team being transferred from "Chebucto" to USCG "Vigilant."

USCG "Vigilant" astern of "Chebucto"

Crew of "Chebucto" watch departure of Queen Mother from Campobello Island.

fishing vessels at sea, as well as in the ports of New Bedford, Gloucester, Woods Hole and Boston.

In other activities during her first year, the *Chebucto* escorted the Royal Yacht *Britannia* in the Passamaquoddy Bay area carrying members of the press and government officials who accompanied the Queen Mother while in the area.

But in day-to-day operations the *Chebucto* was usually engaged in endless patrols checking dragger and trawler operations on the various fishing grounds, investigating reports of foreign trawlers fishing inside limits, watching seismic surveys by oil companies operating in-and-around Sable Island and in the Gulf of St. Lawrence and carrying bait in Newfoundland.

Looking over bow of "Chebucto" proceeding up Passamaquoddy Bay toward St. Andrews.

Scientists Look for Answer

Will Atlantic Lobsters Breed in B.C. Waters?

By R.J. Ghelardi and C.T. Shoop
Fisheries Research Board of Canada
Biological Station, Nanaimo, B.C.

INTRODUCING exotic species is an old game, one that has been played with many strategies, varying degrees of success and failure. There have been numerous attempts to transplant the Atlantic lobster *(Homarus americanus)* to the Pacific coast: nine in Canada, at least 13 in the United States, but none was successful in establishing a reproducing population. Ours, perhaps the 23rd hand in the game, is being played in the expectation that we will be able to find out if and why this can or can't be done.

The failure of previous lobster colonists is theoretically attributable to many simple and complex causes. We have chosen to begin by investigating three of the simplest. There may have been something wrong with the way that the animals were handled thereby injuring, weakening, or making them otherwise unsuitable immigrants; the methods chosen for making the introduction may have been unsatisfactory (e.g. too few spread over too large an area); the places they were put into may have been unsuitable (presence of pollution, inimical physical and biological conditions, etc.).

A decision regarding the latter was made in 1964 when T.H. Butler, head of the Crustacea investigation at the Nanaimo Biological Station, British Columbia, and Dr. D.G. Wilder, in charge of lobster studies at St. Andrews Biological Station, New Brunswick, chose Fatty Basin, in Useless Inlet, on the wild west coast of Vancouver Island as a site for the initial transplant (Fig. 1).

Fatty Basin has some unique qualities. It enjoys a splendid isolation and consequently low frequency of human interference; oceanographic conditions (salinity, temperature, dissolved oxygen, tidal flow and circulation) did not seem unlike those experienced by lobsters in their natural east coast habitat; two restricted entrances (Fig. 1) might reduce the opportunity for lobsters to leave and make it easier to observe emigration and immigration. The physical oceanographic characteristics of the Basin have been studied by R. Herlinveux, Pacific Oceanographic Group, Biological Station, Nanaimo. Dr. Dave Scarrett, from the Fisheries Research Board Station at St. Andrews, visited and confirmed its suitability as a lobster habitat in a series of diving observations in 1966.

In May, 1965, a crew from the Nanaimo Station began construction of a field camp, laboratory, holding pound and other facilities on a small island inside Fatty Basin (Fig. 2). The camp and laboratory were in operation only two months later in spite of the fact that every piece of equipment had to be transported 25 miles by boat from Port Alberni, the closest source of supply.

Biological work also started in 1965 and emphasized learning as much as possible about the habitat and the plants and animals in it before the lobsters arrived, how to handle and ship lobsters, and methods of making the introduction. We have used two approaches to the latter; introducing adult lobsters, hatching, rearing larvae and introducing juvenile (VI to VIII) stages.

The first shipment of adult lobsters arrived in June, 1965. Twenty-two were put into cages at the bottom of Fatty Basin and fed weekly by divers. The animals survived and grew in increments roughly equal to those observed on the east coast, thus demonstrating the general suitability of the physical characteristics (temperature, salinity, oxygen, forest

pollution) of the Basin bottom. Later 104 (February, 1966), 1,131 (August, 1966), and 4,297 (October, 1967) lobsters were released in the Basin free to forage for themselves.

The last two shipments were treated in a special way. We were concerned with the possibility of introducing a pest parasite, *Gaffkya homari*, a micro organism causing fatal blood disease in lobsters that might, perhaps, also prove harmful to local crustacea such as crabs. Dr. Jim Stewart of the Fisheries Research Board of Canada Research Laboratory, Halifax, Nova Scotia, suggested that quarantining each lobster in individual isolation on the east coast before shipping would reduce or eliminate this possibility. His work had shown that, given certain temperatures and sufficient time, any lobster with the organism in its blood would develop the disease and die. Individual quarantine under the proper conditions would thus eliminate badly infected animals from shipments and prevent them from wounding each other, the most likely method of disease transmission. It would also remove any that were weak or sick from any cause whatsoever, ensuring that the immigrants that arrived on the west coast were those best fitted to colonize a new habitat.

QUARANTINE STATION

In summer, 1966, a quarantine station was set up at the Fisheries Research Board Oyster Hatchery in Ellerslie, Malpeque Bay, Prince Edward Island. Ellerslie was chosen because of its proximity to good lobster grounds but, most important, because we hoped to make use of the Board and Department of Fisheries facilities there and to take advantage of the advice and help of Roy Drinnan, the scientist in charge of the oyster hatchery, his assistant George Hendersen, and A.O. England (Department of

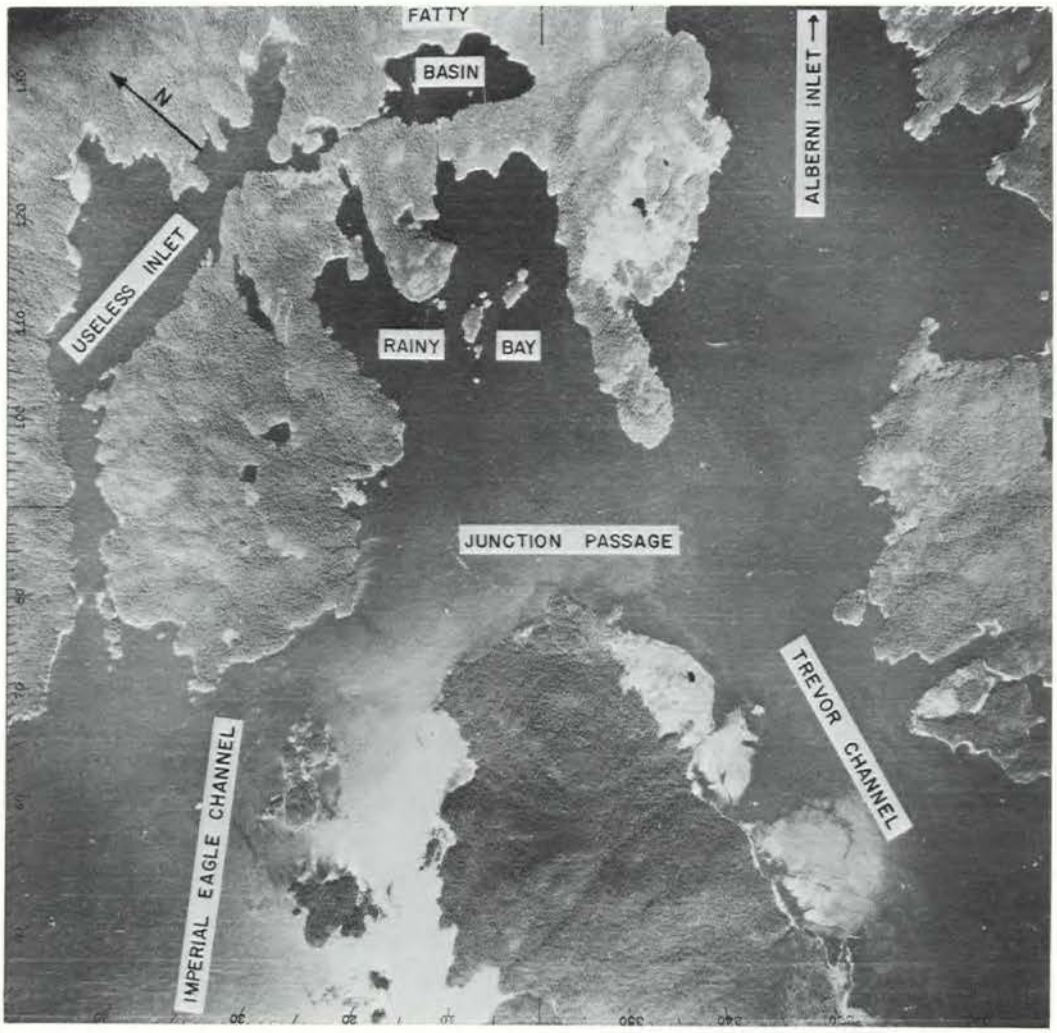


Fig. 1. Aerial photograph of Fatty Basin area. Note two restricted entrances.

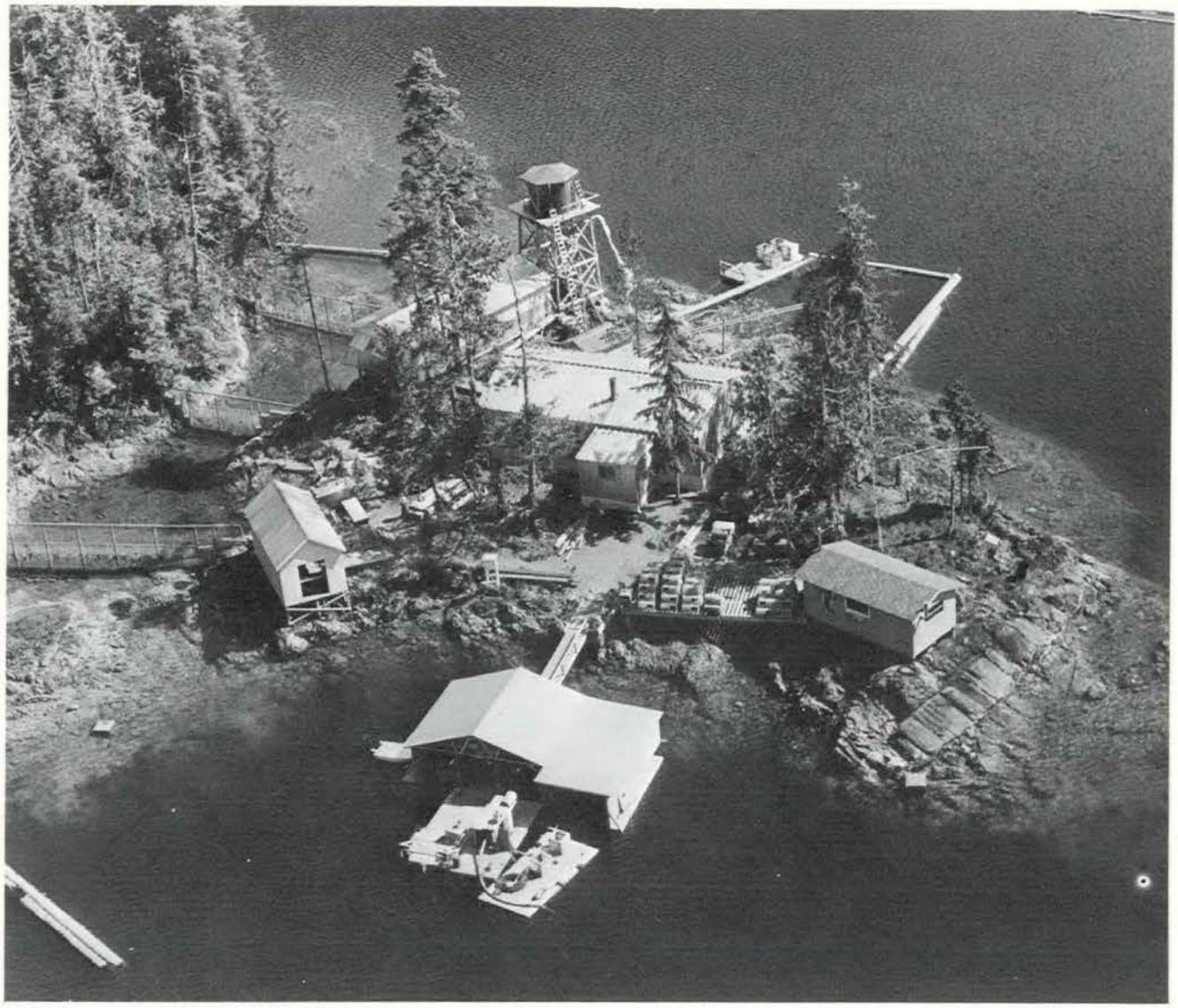


Fig. 2. **Aerial photograph of field camp, hatchery, holding pounds at Fatty Basin.**

Fisheries). It proved to be a good choice. Without the enthusiastic participation of these men and the members of their staffs, many aspects of the quarantine would have been exceedingly difficult, perhaps impossible, to carry out.

The quarantine was achieved by putting each lobster into a tube 8 inches long by 4 inches in diameter, designed for the purpose (Fig. 3). Lobsters are usually brought to the sorting tables on the docks at Tignish and Ebbsfleet within four to six hours after they are caught by Prince Edward Island fishermen. Our lobsters were bought there and each lobster was put into its isolation tube, packed into wooden crates, then transported to Malpeque Bay to be moored on the surface for quarantine periods lasting as long as 24 days.

The quarantine paid dividends. So far, *Gaffkya* has not been found in any lobsters that arrived on this coast after being quarantined. The vigorous, pugnacious animals that were put into Fatty Basin – the result of rigorous selection and elimination of weak and injured – were obviously those best suited for use in an introduction.

All of the lobsters were shipped in insulated styrofoam cases wherein humidity was high, and temperature held relatively low and constant by ice packs. Movement from Prince Edward Island to the west coast of Vancouver Island was accomplished

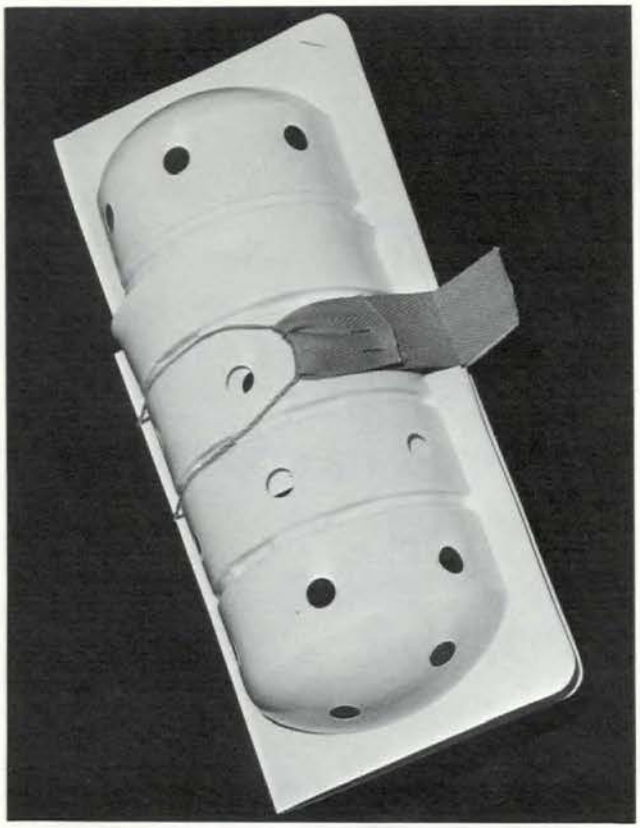


Fig. 3. **Tube used to quarantine and ship individual lobsters.**

entirely by air freight. Frequently the animals were back in the water on the Pacific coast within 24, and rarely more than 30, hours after they had been removed from the Atlantic. These methods helped further ensure their good condition.

Shipping mortality, both in 1966 and 1967, was comfortingly low:

	1966	1967
No. shipped	1,488	4,795
No. dead on arrival	17	232
Per cent dead on arrival	1	5

The increase in shipping mortality in 1967 reflects the fact that, as our experience and ability to recognize even moderately weak lobsters increased, more borderline animals were eliminated after arrival at Fatty Basin. Most of the shipping mortalities, both in 1966 and 1967, resulted from unsuccessful attempts to moult within the confines of the quarantine shipping tubes.

We have just started to gather statistics on survival, mortality, emigration and growth. First crude estimates indicate that as many as 1,000 (80%) of the 1,251 animals introduced in March (104) and August (1,131 plus 16 'escapes') 1966 were still alive in December; our worst guess is that only 438 (35%) survived. The true figure is probably somewhere between and will be determined by more refined methods of sampling and better statistics. It is still too soon to make any guesses about the larger 1967 transplant.

We think that only 55 (4%) of the animals that disappeared during the interval March, 1966 to March, 1967, walked or swam out of the two entrances. The rest presumably died and were, perhaps, eaten by predators or even other lobsters. But these figures, like those on survival, are only first, rough indications and should not be interpreted too literally.

The differences between the number shipped (1,488) (4,795) and introduced (1,251) (4,297) in 1966 and 1967 respectively (less those dead on arrival) represent animals that were lost from the holding pound. Most of these were eaten by a new lobster predator: mink, coon, or otter – possibly all three. There is also good evidence to show that at least one of these – most likely mink – dives to depths of 25 or 30 feet within the Basin to remove and eat lobsters weighing as much as three pounds (mink, average weight, 1 to 1-½ lb).

Growth in the Pacific seems normal. Male

Fig. 4. **Yearling lobster raised from Stage IV larva at Fatty Basin.**

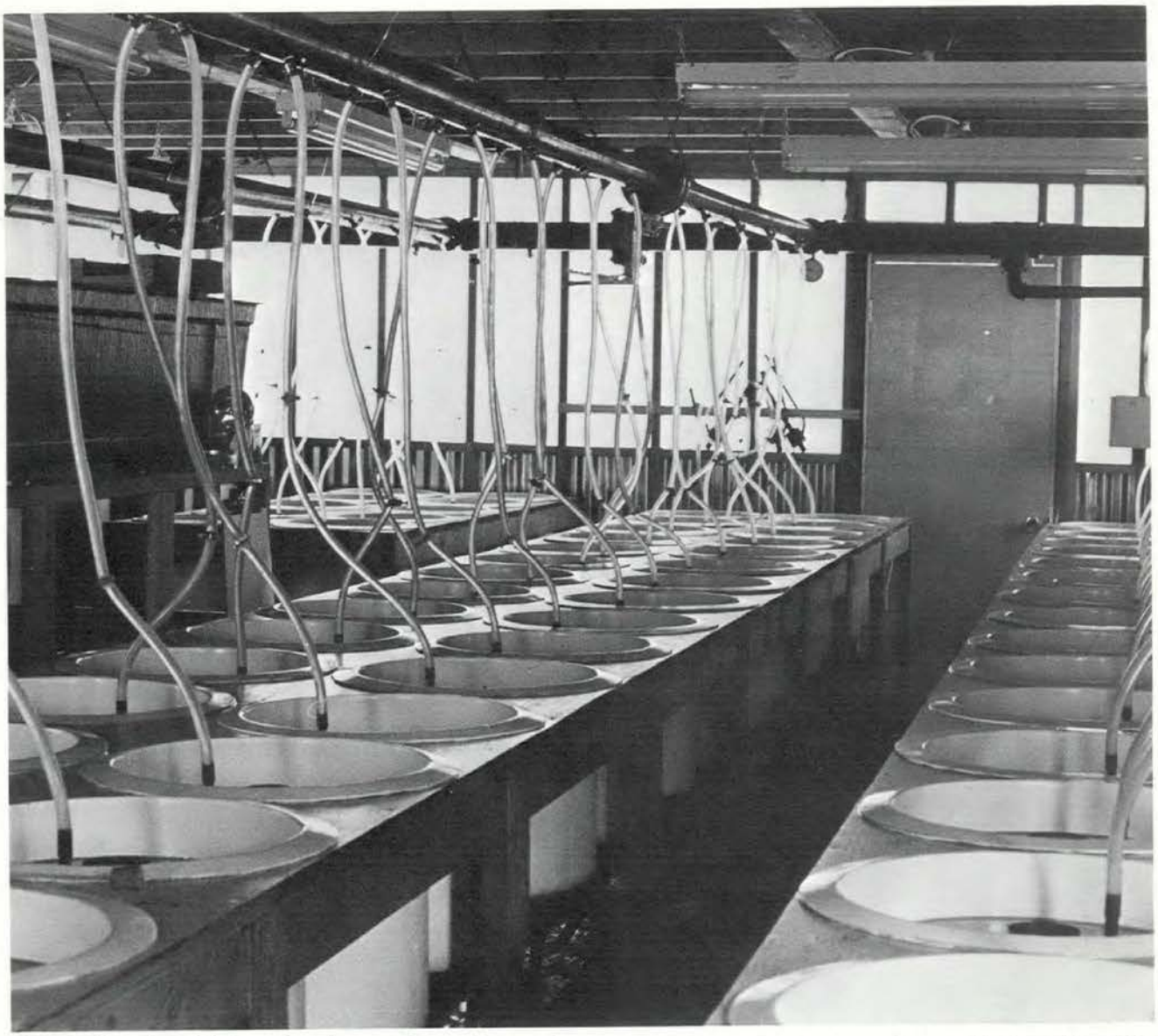


Fig. 5 **Interior of lobster hatchery at Fatty Basin showing rearing tanks in foreground, partial view of hatching tanks upper left.**

lobsters gained, on the average, 68% in weight and 18% in carapace length after being free in the Basin for 8 to 12 months; females showed a gain of 43% in weight and 13% in carapace length during this same period. These values compare favourably to those given for east coast lobsters in their native habitat.

LARVAL STUDIES

Larval studies began in June, 1966, with some Stage IV lobsters hatched and raised in the Massachusetts State Lobster Hatchery (Martha's Vineyard) and shipped by Director John Hughes. A number of these have lived and grown successfully for over a year in pens moored at the surface of Fatty Basin. The animal shown in Figure 4 is now in its second year of growth and appears normal in all respects.

We have also hatched and reared lobsters through the fourth larval and into the Xth and later juvenile stages from berried females in a hatchery at Fatty Basin (Fig. 5, 6). The hatchery is an exact replica of the methods and plant operated by Mr. Hughes on Martha's Vineyard and was built with his expert advice and in consultation with Peter Ryan,

an engineer with the Department of Fisheries, Vancouver, who has worked closely with us on all aspects of the lobster project. Brood stock consisted of berried females from the offshore lobster fishery, sent by John Hughes, and another lot from the inshore fishery on Prince Edward Island shipped by Joe Walsh of St. Andrews. A female extruded eggs at Fatty Basin in the fall of 1966 which she hatched in the hatchery in May, 1967; several of her progeny are still alive in surface float pens, seven months after hatching.

Results of the hatchery operation demonstrated that physical conditions (temperature, salinity, etc.) in the Pacific are satisfactory for normal embryonic development, hatching, larval survival and growth. The hatchery also provided several thousand juvenile stage (VI to VIII) lobsters which were planted at another location to evaluate use of young, rather than adult, animals for a large introduction.

Now that a reasonably large number of individuals has been introduced, it will be possible to get more precise statistics on adult lobster survival, mortality, mating frequency and fecundity as well as hatching, larval survival and growth in the natural Pacific habitat. These statistics will provide a basis for deciding whether it is biologically possible and economically feasible to establish a reproducing population of east coast lobsters in the Pacific.

Fig. 6. **Closeup of rearing tank with lobster larvae.**

Current Reading

STABILITY AND TRIM OF FISHING VESSELS by J. Anthony Hind. Fishing News (Books) Ltd., London, Eng. Price $5.00 mailed.

The purpose of this book is to help masters and mates know how to load their vessels to secure stability and seakindliness.

There is no easy way to acquire that knowledge. It means study and hard work. Author Hind states the problems simply and provides working examples, illustrated by appropriate figures and sketches,

Some basic understanding of mathematics aids full comprehension and to that end, the appropriate symbols and signs are explained beforehand.

The author is well equipped for his task as he is an experienced naval architect with practical knowledge as a designer of fishing vessels. He has been concerned with the design of many specialized ship types, both large and small, and is well-known for his numerous technical articles in the shipping press.

AUTOMATIC UNDERWATER PHOTOGRAPHIC EQUIPMENT FOR FISHERIES RESEARCH by P.J.G. Carrothers. (Bulletin No. 159 of the Fisheries Research Board of Canada. Price $2.00).

The conduct of biological research with marine species often requires observations of the species in their natural habitat at depths and over periods of time which preclude direct visual study, even with diving equipment. Under such circumstances, two expedients for indirect observation are available, namely television and photography.

This book describes the necessary equipment and methods of operation for underwater observations by photography. It deals with two types of observation: those which are carried out at the sea floor, and those carried out with the camera moving, e.g. mounted on a unit of towed fishing gear. There are numerous charts, diagrams and photographs. ✔

Quality Control Stressed at Lectures

A week-long course for Indian fishermen of the Kenora-Fort Frances area was held in Kenora, Ontario, during January. It was sponsored by the Department of Indian Affairs and Northern Development, Education Division, under C.R. Scharf, Regional Superintendent, Toronto and E.G. Clyde, Vocational Counsellor, Kenora. Fish quality control was stressed and required two of the five days of lectures to be covered in depth. Senior Fishery Officer C.D. Barrett, Central Region, Winnipeg, represented the federal Department of Fisheries as the instructor during this portion of the course.

By a special tape recording, the fishermen were welcomed on behalf of the Department of Fisheries by H.V. Dempsey, Director of the Inspection Service, Ottawa. He briefly outlined what quality control really means in terms of being a good or a poor fisherman, and stressed the advantages in improving and maintaining a high quality product.

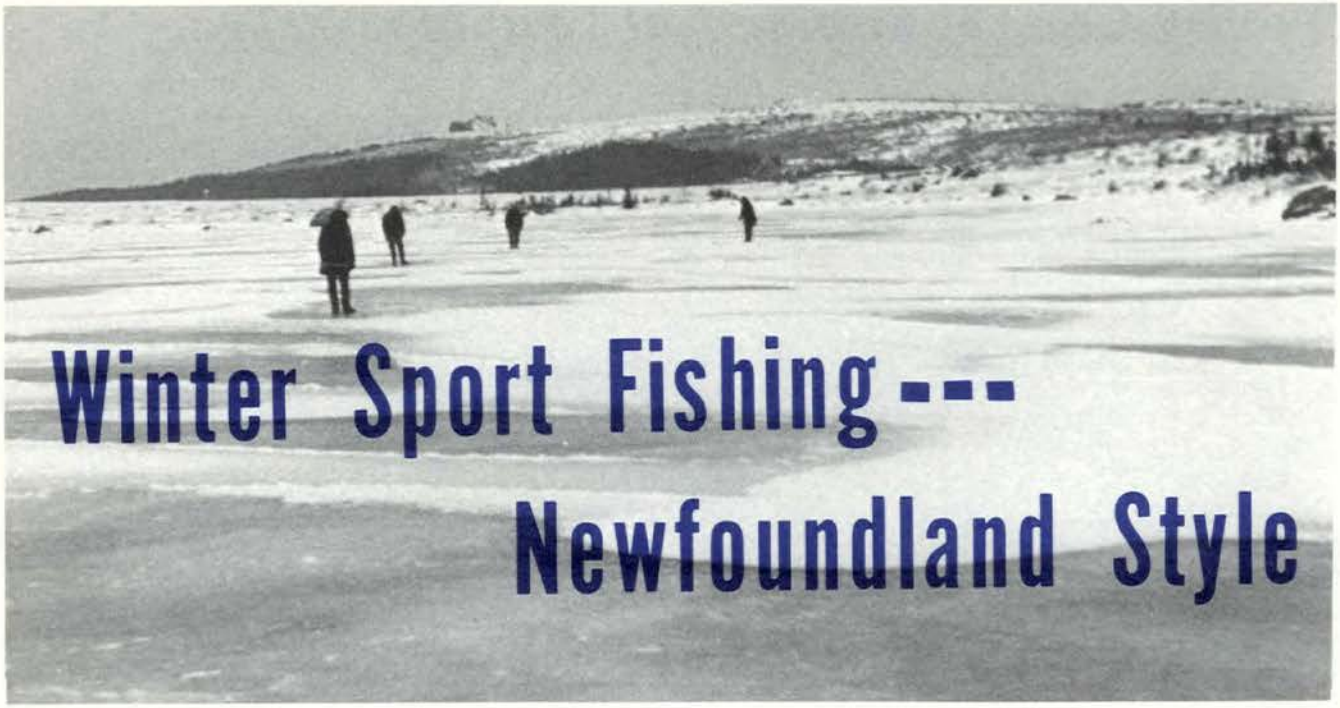
During the lectures that followed, Senior Officer Barrett used diagrams, films and visual aids to point out how deterioration started when the fish was pulled from the water, and, often accelerated through poor handling by the fisherman.

Courses that are given to native fishermen in the Central Region, are carried out at the request and with the co-operation of the Department of Indian Affairs and the Ontario Department of Lands and Forests. It is reported that more interest and a better understanding of fish handling resulted from a similar course given last year to Indian fishermen in the Patricia Region.

Judging by the number of questions, ranging from regulations and inspection methods to quality control, that were answered by the instructor, the fishermen who attended the course will show a renewed interest in their fishing methods and equipment.

Other lectures during the week dealt with marketing, fishing operations and the care of equipment.

A group of fishermen attending a special training course for Indian fishermen at Kenora, Ont. Foreground is William Morriseau, Ontario Department of Lands and Forests; centre, E.G. Clyde, Vocational Counsellor, Department of Indian Affairs, Kenora; rear, Senior Fishery Officer C.D. Barrett, representing Department of Fisheries of Canada and P.C. Clarkin, Superintendent of Schools, Department of Indian Affairs, Kenora.



Winter Sport Fishing --- Newfoundland Style

Ice fishermen on opening day of angling season stand watch over their fishing holes on a frozen pond near St. John's, Newfoundland.

BY CHARLES BURSEY

Most popular lakes and ponds in Newfoundland boasted anglers during the opening day of the season and in many instances quota-filled creels indicated the success of the day. The hungry trout without their summer diet of flies and other insects found the bait worms most palatable.

With weather conditions near perfect, hundreds of ardent Newfoundland anglers made a beeline for their favourite fishing haunts on January 15 – opening day of the 1968 angling season.

Armed with ice drills and axes and a tub of "red wigglers", the enthusiastic sport fishermen pushed holes through the seven-inch ice to fish for the native speckled brook trout.

The bait worms (one newspaper advertisement claimed trout could "smell them 25 yards") were plucked from the earth late last September and nourished during the early winter by spent tea leaves in large tubs stored in basements.

Regulations require that anglers may fish only one line through one hole in the ice at any one time and enforcement of this restriction demands constant attention by federal Fishery Officers who maintain regular patrols of all inland waters in Newfoundland.

Many anglers, anxious to obtain their quota and return to the warmth of their homes, are apt to cut

Angler waits patiently at ice hole.

more than one hole and operate several lines at a time. But frequently this results in his fishing equipment, together with his catch, being confiscated by a vigilant Fishery Officer and a possible court appearance.

While the angling season in Newfoundland opens officially on January 15, fishing on scheduled rivers is not permitted until May 24 and rainbow trout may not be taken until June 1.

A day of fishing through the ice begins shortly after daylight when anglers, armed with hook and line, bait worms, an ample supply of food and potions of body warmth, travel by car, dog-team, and in more recent times, snowmobiles, to lakes and ponds. A hastily constructed shelter of spruce or fir boughs ensures protection from the biting winter winds.

After a hole has been punched through the ice, enabling access to the domain of the trout, the angler secures his hook and line to a short stick, attaches a bobber and baits the hook. In most instances the waiting period is brief and a submerging bobber indicates a strike. This process is continued throughout the day, or until such time as the angler has secured his bag limit of 24 trout, or ten pounds plus one trout, whichever is the lesser. Lunch, consisting of smoked capelin, bottled moose meat, or rabbit, is helped down by switchels of black tea. The angler does not abandon his fishhole during lunch, but continues constant vigil on the corkfilled bobber.

The appearance of snow vehicles in recent years has made it increasingly difficult for Fishery Officers to observe the anglers, since the motor powered sleds enable fishermen to travel farther afield. The acquisition of a number of snowmobiles by the Conservation and Protection Branch of the Department is expected to correct this situation.

A happy angler with the first catch of the season.

Ice fishing equipment – and day's catch of trout.

Pollution Laboratory Expanded in Newfoundland

By R.N. Wadden

THREATENING the health and survival of many forms of wildlife, the pollution of natural waters is widely recognized as one of the major problems of the present era. Having introduced 100 years ago the first Canadian legislation directed toward pollution control, the federal Department of Fisheries is vitally concerned in programs for the abatement and, where possible, the prevention of pollution hazards to fish.

Technical sections within the Resource Development Service are responsible for this phase of the department's activities on the Atlantic and Pacific coasts. The Resource Development Service does the investigation and makes recommendations on pollution matters, while the department's Conservation and Protection Service has responsibility for the enforcement of regulations and sections of legislation dealing with pollution.

In Newfoundland, perhaps the area in Canada least subject to pollution, constant vigilance has to be maintained on waterways to protect aquatic life from the hazards of industrial and domestic wastes. As a developing region, the easternmost province has an opportunity to prevent some pollution problems before they can take root, and in this direction steady progress is being made as preventive measures are incorporated in the planning of many new industrial enterprises. Finding means of reducing or eliminating existing pollution remains, however, the foremost problem in that province as elsewhere.

MINING WASTES

During 1967, through the efforts of the Resource Development Branch of the Newfoundland Region, Department of Fisheries, agreement was reached with three mining companies either to impound their wastes in "safe" areas or to disperse them so as to render them harmless to fish life. Encouraging success was also reported in negotiations with other active or potential sources of pollution.

To keep tabs on water quality, the branch's Pollution Unit maintains a continuing program of water sample analysis in critical areas. In view of the increasing volume of this work, an extension was required at the unit's Field Headquarters Laboratory near the central Newfoundland town of Bishop's Falls. The extension, providing facilities for the conduct of bio-assay tests to supplement other chemical and biological procedures, was completed

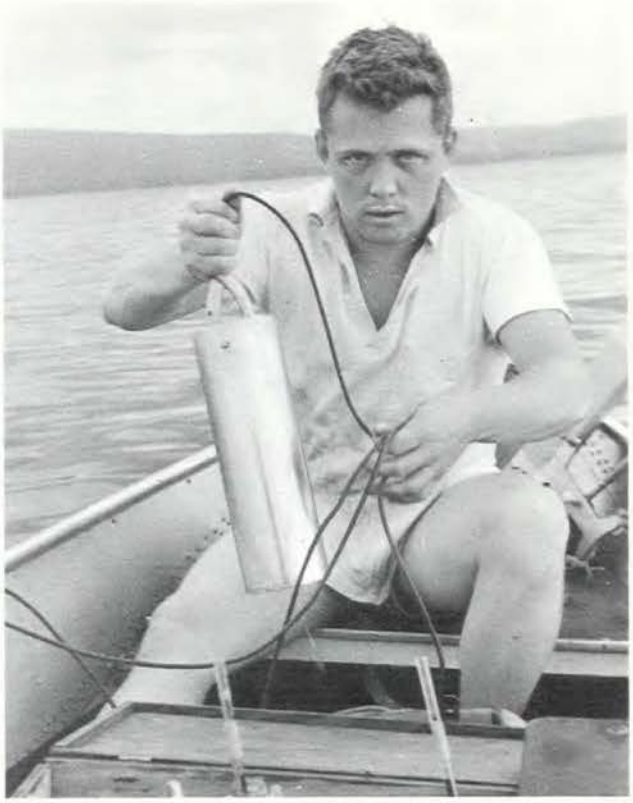
Department of Fisheries technician conducting Winkler method water pollution test, Wigwam Point, Bay of Exploits, Nfld.

way, Newfoundland's largest, is slated for a major salmon management development. Experimental work has already begun at Noel Paul Brook to determine the salmon rearing potential of the upper Exploits watershed, but success in this direction can only be short-lived unless control of existing industrial and domestic pollution in the lower river is achieved. Accordingly, efforts of the Pollution Unit based in the central Newfoundland hub have been concentrated on assessing the pollution problem attributed to nearby mine, pulp mill and domestic wastes.

For many years tailings from a base metals mine at Buchans have been disposed of at the rate of approximately 260,000 tons annually via Buchans Brook which flows into Red Indian Lake which in turn feeds into the Exploits River. Water samples from the lake and river have been taken by Fisheries fieldmen since 1961 to measure the effects of these mine wastes and other pollutants upon fish life. Copper and zinc concentrations, as revealed by these samplings, have in the majority of cases been at undesirable levels, exceeding the values of 0.4 – 0.5 ILL (Incipient Lethal Level) which previous investigations have shown as sufficient to disturb adult salmon migration and to cause fish to return downstream.

A step toward alleviation of this problem was taken in 1966 when the mining company undertook partial impoundment of the waste in an area 1700 feet west of the Buchans mill. This resulted in a substantial temporary improvement over the former method of waste disposal, but is not a full solution since harmful wastes from the area would eventually reach Buchans Brook and flow on into the Exploits. Further discussions between this Department, provincial authorities, and the company are required to formulate a plan for fully effective impoundment of solid mine tailings.

Checking data on bio-assay experiments at the Pollution Unit, Bishop's Falls.



Pollution test cylinder ready for release in the Exploits river.

A second major pollution source affecting the Exploits is the pulp and paper mill at Grand Falls which discharges wastes at the rate of approximately 67,000,000 U.S. gallons per day, including 360,000 U.S. gallons per day of sulphite waste liquor. The latter by-product of the paper-making industry can be detrimental to fish life in several ways: it depletes river water of oxygen without which fish, like humans, cannot live; and it may create in the water an acid condition which is very harmful to fish.

The towns of Grand Falls, Windsor and Bishop's Falls, containing a combined population of 15,000 also discharge their domestic wastes directly into the Exploits. Regular water sampling is conducted

Field headquarters of the Resource Development Pollution Unit, Bishop's Falls, overlooks the Trans-Canada Highway close to Exploits River Bridge, Nfld.

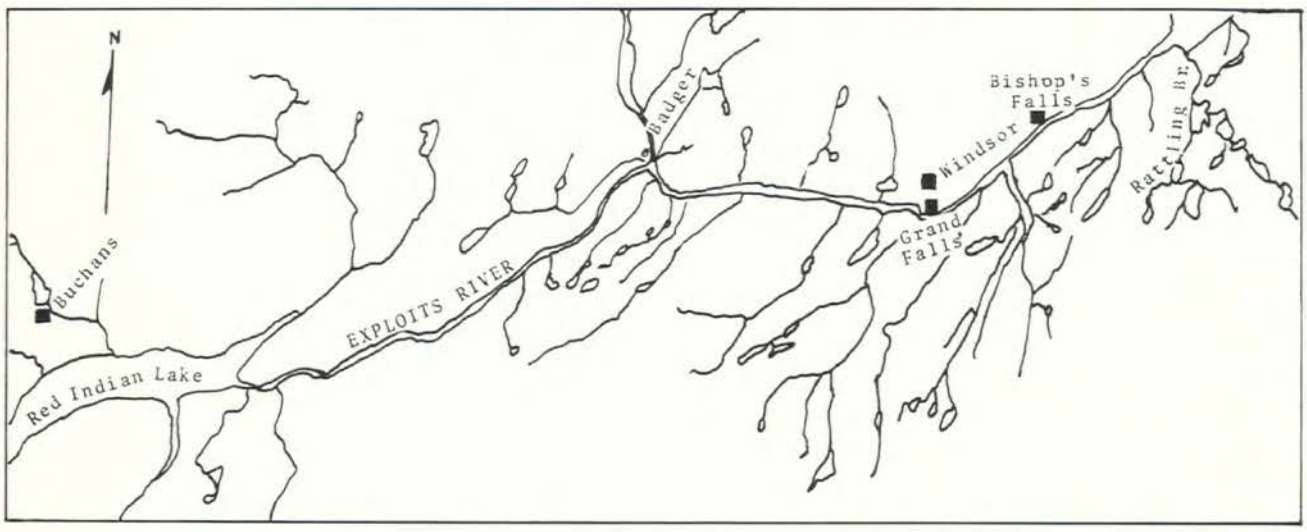
prior to the 1967 season. In its first year of operation, the expanded laboratory carried out many hundreds of water analyses, bio-assays and related tests. Data from these investigations are tabulated and incorporated in project reports during the winter months at Branch Headquarters in St. John's.

Situated on the Trans-Canada Highway within a few hundred yards of the Sir Robert Bond Bridge spanning the Exploits River, the field laboratory is also a "halfway house" for Fisheries Department personnel travelling between the east coast capital and the many development projects in the central, west coast, northeast and southwest regions of the island. A newly built highway leading to the southwest coast area of Bay d'Espoir joins the transinsular route near the lab site.

In addition to laboratory facilities, the Bishop's Falls headquarters is equipped with cookhouse and trailer living quarters for field staff, also small and medium powered craft for use in river and lake water sampling.

SALMON PROJECT PLANNED

Location of the pollution lab on the bank of the Exploits River is appropriate since this water-



The Exploits River watershed area between Red Indian Lake and the river mouth

to measure the extent to which the paper mill wastes and domestic wastes are harmful to fish populations through the reduction of oxygen levels.

Addition of bio-assay facilities at the Bishop's Falls field laboratory has enabled the field staff to observe the effects which varying concentrations of river pollutants have upon fish. Supplementing these tests are experiments involving the use of apparatus to test the "avoidance reaction" of fish to polluted water. In these tests, polluted water is injected into one end of a glasslined cylinder, and clear water at the other; the purpose being to observe to what extent fish placed inside the cylinder will avoid the pollutants.

In addition to laboratory work at Bishop's Falls and sampling in the Exploits River area, the Pollution Unit is called upon to investigate pollution problems arising from the establishment or expansion of industrial projects in other parts of the province, including base metals mines on the northeast coast of Newfoundland, iron ore mines in Labrador, and proposed pulp mills in east and west coast locations.

During 1967, the unit also was engaged in investigations in Labrador to determine the effects upon fish life of DDT stream treatment for blackfly control.

Lobster Fishing Licences in Maritimes

Under a new regulation announced last month, all lobster fishing boats in the Maritimes Provinces and Newfoundland must be registered with the federal Department of Fisheries as the various lobster fishing seasons open for fishing in 1968.

Boatowners will pay a $3.00 registration fee and each will be issued a set of serially numbered licence plates. These plates – made of aluminum and obtainable at any local fisheries office in Atlantic coastal areas – must be displayed prominently on the boat. In most cases, the plates will likely be displayed on the sides of the cuddy or wheelhouse.

In addition to the registration fee, the boat operator must also pay $2.00 for a lobster fishing licence. Each helper on his boat will be required to pay a $1.00 licence fee. The licences may be obtained from fisheries officers in the field.

Fisheries Minister H.J. Robichaud explained that the new fishing vessel registration plan does not conflict in any way with the registration of fishing boats with the federal Department of Transport. He described the measure as being a step in a program of limiting the fishing effort in the lobster fishery. Last fall the minister announced a program on trap limitation in all lobster fishing districts in the Maritimes for 1968. Quebec has had trap limitations for some time. Because individual Newfoundland fishermen operate on a more limited scale, a trap limit for that province in not being considered at present.

In connection with trap limitation, Mr. Robichaud reiterated that each trap used in fishing must be marked with a metal tag. This tag, supplied by the Department of Fisheries, will be serially numbered and also will bear the number of the lobster fishing district and the year of issue.

Although lobster fishing has been going on in the Bay of Fundy and in south and western Nova Scotia since last fall, the first lobster fishing district to open in 1968 will be District No. 3. Opening March 1, this area embraces Bay of Fundy waters off the Nova Scotia counties of Annapolis, Kings, Hants, Colchester and Cumberland, and the New Brunswick counties of Albert and Westmorland.

Mr. Robichaud has emphasized that the new system will aid both the fishermen and the department. Through registration, the minister added, the department will have an accurate inventory of types of lobster fishing boats and the types of gear and the number of persons engaged in the fishery. It is all part and parcel of an overall plan for more efficient management of the fishery which will eventually be manifested by increased dollar returns to bona fide lobster fishermen.

Co-operation

And $9,000

Save Salmon

Close-up of the log jam at the upper end of Judd slough, a salmon spawning area on the Squamish River, B.C.

The co-operation of three levels of government in a project costing $9,000 has saved the valuable spawn from six to eight thousand chum salmon and also removed the threat of flooding from a group of houses situated on low-lying land near Squamish, B.C. The Squamish River flows into Howe Sound some 40 miles north and east of Vancouver and is a major spawning river for chum, coho, and chinook salmon.

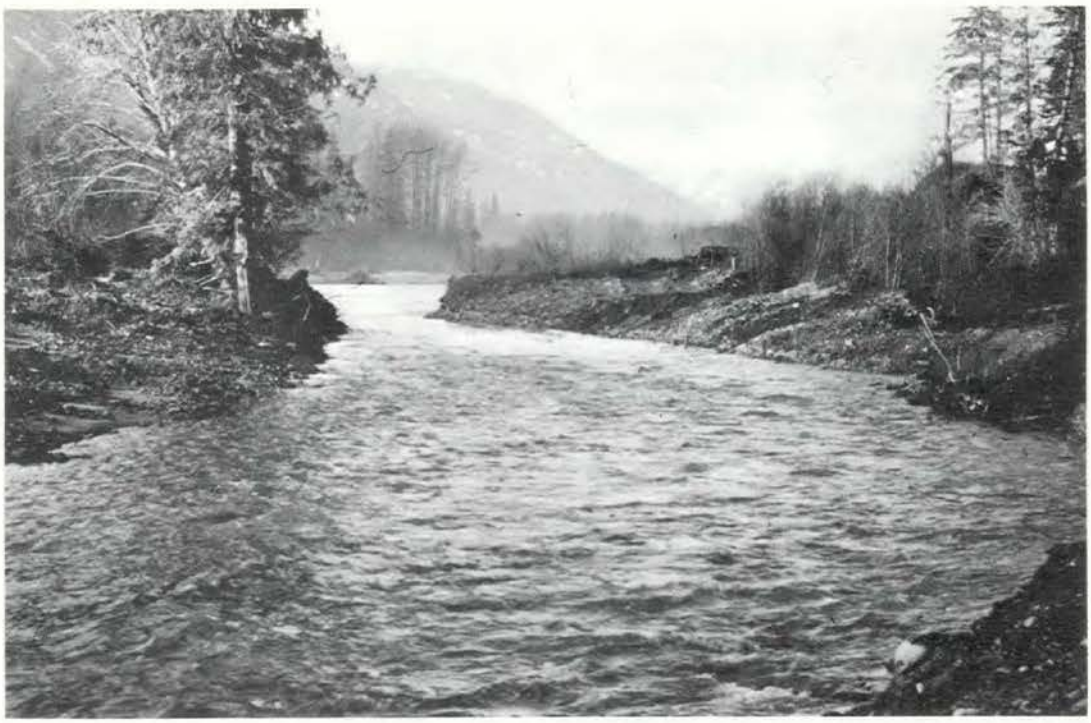
Judd slough, a mile and quarter stretch of slow flowing water cuts across a bend in the Squamish River near Brackendale located approximately one mile below the confluence of the Cheakamus and Squamish Rivers. An extreme flood occurred during the latter part of October, 1967, causing a log jam approximately 200 yards long and 15 feet high to form at the end of Judd slough. This jam seriously restricted the flow of water from 100 cfs, which is the absolute minimum in order to protect the salmon eggs already in the gravel, to an estimated flow of less than 2 cfs.

Dumping rip rap around the culverts installed between the Squamish River and Judd slough.

Immediate action was necessary to save the valuable spawn deposited in the gravel during late 1967 and this required the co-operation of the local council, the provincial Department of Highways, and the federal Department of Fisheries. After inspection by Department engineers, it was recommended that two 60-foot culverts, each 36" in diameter, be installed in order to maintain a minimum flow of water from the Squamish River through Judd slough.

In order to protect the banks of the river, a substantial area was protected with heavy rip rap. The Squamish Indian band allowed the use of the road through the Brackendale Reserve and because of the emergency, the provincial Department of Highways gave permission to use 500 yards of rock from a provincial gravel pit. The projected plan was speedily approved by the reeve and council of the District of Squamish.

Prior to 1958, Judd slough was completely cut off from the Squamish River by log jams located near its upper end. There was sufficient seepage of water, however, for the fisheries requirements. In 1958 the river flooded and removed the log jams which were the controlling factor governing the dis-



The completed project with Squamish River in the background.

charge of water into Judd slough. A gravel dyke was constructed in 1959 by the Department of Highways for flood control purposes and in 1960 during periods of low water the dyke was breached in order to maintain the minimum discharge of 100 cfs over the salmon spawning beds.

In the fall of 1966 the source of water to Judd slough was entirely cut off again as a result of shifting of gravel beds. As a result of installing the two 60-foot culverts and protecting the banks of the Squamish River upstream with heavy rip rap, a more stable condition has been established which will both protect the valuable salmon spawning areas and also prevent flooding to the houses situated on the adjoining low ground.

I.P.S.F.C. Appointment

The reappointment of A.J. (Joe) Whitmore as Commissioner of the International Pacific Salmon Fisheries Commission has been announced by Fisheries Minister H.J. Robichaud. Mr. Whitmore will replace Senator Tom Reid who announced his retirement from the Commission at its meeting in Bellingham in December.

Mr. Robichaud, in announcing Mr. Whitmore's reappointment, paid tribute to Senator Reid who had served on the Salmon Commission for more than 30 years, being appointed as one of the original members when the Convention between Canada and the United States for the conservation, preservation and extension of sockeye salmon of the Fraser River was signed in 1937.

During his service extending over a quarter of a century the Senator was the recognized champion of the Fraser River salmon fishermen and the unrelenting adversary of any projects which would endanger the salmon resources for which the Commission was responsible.

Mr. Whitmore, who retired from the Department of Fisheries in 1960, after 43 years' service, 13 of which were as Area Director in Vancouver, had previously served on the Commission in association with his Departmental responsibilities and subsequent to his retirement.

The other Canadian members of the Commission are W.R. Hourston, Vancouver, and Richard A. Nelson, New Westminster.

News Roundup

Seal Hunt Test

In continued efforts to find more humane ways for the taking of young seals off the Atlantic coast, federal Department of Fisheries officers will test the use of a 410-gauge shotgun during the hunting season which opens this month.

The shotgun, which has some change from the ordinary gun, will use a reduced charge of powder and shot. It will be fired at close range without damage to the pelts. The reduced charges will be a safety measure for humans at the hunt.

The tests will be strictly supervised and will be carried out by selected fishery officers and by a representative of the Ontario Humane Society. Also to be tested is a low-cost mechanical instrument which will not require a charge to activate the bolt.

Fisheries Minister H.J. Robichaud stated that the Department intended to look into the possibility of using another device which may be specially made for the purpose of killing seals humanely.

The decision to make the tests followed a meeting by the Department with representatives of the Ontario Humane Society, the Canadian Wildlife Service, the Defence Research Board and the National Research Council.

Albacore Visit

A large school of albacore made an unexpected visit to the waters of Ucluelet harbour on the west coast of Vancouver Island during mid-December. This tropical water fish has never been known to be so far north during the winter months although there have been unconfirmed reports of albacore sighted off the west coast of Vancouver Island during March by off-shore fishermen.

Capt. J.H. Thompson of the "Comox Post" displays the albacore landed in December off Ucluelet, B.C.

One explanation for this unprecedented event was a 100 mile-an-hour gale which hit the Queen Charlottes a week before the albacore were seen.

Mrs. Jimmy McKay jigging for cod near the beach was suddenly surrounded by a school of albacore estimated to average close to 50 pounds. She managed to get one of them ashore using a pipe pole. The fish, weighing an estimated 50-55 pounds was photographed by Fisheries personnel and identified by W.E. Barraclough, of the Fisheries Research Board of Canada Biological Station at Nanaimo.

Title Changes

Changes in the titles of the research organizations at the Bedford Institute of Oceanography at Dartmouth, N.S., have been announced by Dr. W.L. Ford and Dr. L.M. Dickie, the Directors of the laboratories of the Department of Energy, Mines and Resources and the Fisheries Research Board of Canada at the Institute.

The laboratory which contains various components of the Marine Sciences Branch of the Department of Energy, Mines and Resources will have the title "Atlantic Oceanographic Laboratory" and be

under the direction of Dr. Ford. The Fisheries Research Board activities will use the title "Marine Ecology Laboratory" and be under the direction of Dr. Dickie.

At the same time the Institute as a whole will be known as "Bedford Institute" rather than the "Bedford Institute of Oceanography" and will include all present and future research activities carried out at the Dartmouth complex.

These changes in titles have been made in order to reflect the considerable expansion in marine research which has been taking place progressively during the past several years at the Institute and now include extensive programs in all areas of marine research from applied survey operations such as hydrography to aquatic fundamental research in biology.

In addition to the two research laboratories, the headquarters of the International Commission for the Northwest Atlantic Fisheries will continue to be located in the Institute.

Central Region Staff Conference

Department of Fisheries personnel in the Central Region met recently at Winnipeg for their annual staff conference. Shown in this group are: Back row (left to right): R.M . Bond, Chief, Inspection Service, Ottawa; R. N. Gordon, Director, Central Region; A. M. Walters, District Officer, Winnipeg; R. F. Shaw, Officer-in-Charge, Winnipeg; G. R. Douglas, District Officer, Toronto; S. Kirwan, Bacteriologist, Winnipeg; Fishery Officer J. Semchuk, Winnipeg; K. Ostavar, Chief, Fish Inspection Laboratory, Winnipeg; H. A. Nordlund, Officer-in-Charge, Prince Albert, Saskatchewan; C. D. Mader, District Officer, Hay River, N.W.T., Fishery Officer C. M. Oliver, Prince Albert, Saskatchewan. Centre row: Fishery Officer E. L. Ball, Winnipeg; Fishery Officer M. B. Howe, Officer-in-Charge Inspections, Hay River, N.W.T.; E. W. Garrett, Emergency Planning Officer, Winnipeg; Technical Officer W. Kozak, Winnipeg; Fishery Officer E. Burke, Winnipeg; Technical Officer T. E. Walker, Winnipeg; J. R. Peters, Fishery Officer, Winnipeg; Technical Officer S. E. Stephansson, Winnipeg; Front row: Senior Officer C. D. Barrett, Winnipeg; Fishery Officer A. D. Olson, Winnipeg; C. R. Whitney, Officer-in-Charge, Edmonton, Alberta; J. M. Cullen, Officer-in-Charge, Port Arthur, Ontario; M. E. Bogart, Officer-in-Charge, Lynn Lake.

B.C. Herring Spawning Again Low in 1967

In 1967 Pacific herring spawned in 108 localities in British Columbia, producing 94.7 miles of spawn. This is 10 miles greater than that recorded in 1966 when herring spawn deposition dropped to the lowest level on record, but is well below the 25-year average (1940-64) of 199 miles.

D.N. Outram, of the Fisheries Research Board of Canada's Biological Station at Nanaimo, B.C., reports *(Circular No. 83, FRB Nanaimo)* that in 1966-67 both the total catch and the total amount of spawn deposited were low. The low level of spawn deposition prevailed despite intensive efforts to restrict fishing and increase spawning escapement.

Regulatory measures included an early closure of the fishing season in some sub-districts to protect spawning stocks; an early closure of the season in other sub-districts to minimize the catch of either immature herring or adult herring, when the abundance of the latter appeared low on the fishing grounds; closure of the lower and middle east coast subdistricts of Vancouver Island to all herring fishing until mid-September, 1967; and prohibition of the use of lights to attract herring.

During the 1966-67 season, 132,900 tons of herring were caught compared to 181,000 tons in the previous season. Typical of the overall lack of spawning is production in the lower east and lower west coast sub-districts of Vancouver Island. The 1967 spawning of 5.3 miles in the former and 3.0 miles in the latter region were only about one-fifth of the 25-year average.

Pacific herring deposit eggs that adhere to seaweeds and seagrasses growing primarily within the intertidal zone. Comprehensive surveys covering all known herring spawning localities are carried out each spring by personnel of the federal Department of Fisheries. Reports of these surveys are subsequently submitted to the FRB biological station at Nanaimo for analysis. From length, width and intensity measurements of individual spawning grounds, a spawning index is derived indicating the number of statutory miles of spawn of a standard intensity of medium deposited by each population and for the coast as a whole.

Canada's representatives on the International North Pacific Fisheries Commission photographed during one of the sessions of the 14th annual meeting held in Tokyo in November. Shown, left to right are Commissioners Carl E. Giske, Donovan F. Miller, S.V. Ozere, and James C. Cameron.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-Dec. 1966		May-Dec. 1967	
	(1) '000 lbs	(2) $'000	(1) '000 lbs	(2) $'000
CANADA - TOTAL	2,034,335	140,476	1,928,746	132,208
ATLANTIC COAST - Total	1,599,545	83,760	1,707,138	88,060
Cod	458,912	20,298	461,733	20,345
Haddock	66,514	4,709	60,581	3,758
Pollock, Hake, Cusk, etc.	57,070	2,028	52,309	1,785
Rosefish	165,411	4,628	161,529	4,193
Catfish	3,886	129	3,776	121
Halibut	2,854	1,017	2,767	1,041
Plaice & Other Flatfish	224,313	7,347	213,295	6,893
Herring & Sardines	490,076	5,523	625,331	6,662
Mackerel	25,743	901	24,724	944
Alewives	8,067	141	6,501	104
Salmon	5,209	2,542	6,202	3,343
Smelts	1,989	175	1,373	131
Swordfish	7,260	3,109	7,915	3,220
Other Fish	13,425	479	10,962	400
Lobsters	34,736	19,911	33,539	21,993
Clams & Quahaugs	4,132	240	4,639	307
Scallops	14,101	5,803	10,563	6,266
Other Shellfish	15,847	857	19,399	1,167
Misc. Items	-	3,923	-	5,387
PACIFIC COAST - Total	434,790	56,716	221,608	44,148
Pacific Cods	19,284	1,741	11,336	932
Halibut (3)	31,360	11,235	24,158	6,111
Soles & Other Flatfish	8,861	562	6,353	414
Herring	189,064	3,134	32,702	555
Salmon	162,185	38,347	129,103	34,556
Other Fish	10,244	460	7,218	345
Shellfish	13,792	1,226	10,738	1,232
Misc. Items	-	11	-	3
BY PROVINCES				
British Columbia	434,790	56,716	221,608	44,148
Nova Scotia	560,181	38,232	576,238	38,973
New Brunswick	314,208	10,390	327,202	10,201
Prince Edward Island	57,158	6,450	43,298	8,138
Quebec	128,345	6,424	184,656	7,249
Newfoundland	539,653	22,264	575,744	23,499

(1) Fish & Shellfish only. (2) All Products. - Includes livers, seaweeds, tongues, scales, roes, skins, oil, seals, whales, bait worms. (3) Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES - DEC. 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.388	.463
Cod fillets, Atl, frozen, cello 5's	lb.	.345	.383
Cod fillets, smoked	lb.	.430	.473
Haddock fillets, fresh, unwrapped	lb.	.498	.600
Herring, kippered, Atl.	lb.	.259	.337
Mackerel, frozen, round	lb.	.190	.267
Lobsters, canned, Fancy	Case 48-½ s	-	67.320
Sardines, canned	Case 100-¼ s	9.695	9.600
Halibut, frozen, dressed	lb.	.518	.523
Silverbright, frozen, dressed	lb.	.622	.647
Coho, frozen, dressed	lb.	.876	.937
Sockeye, canned, grade A	Case 48-½ s	27.347	28.233
Pink, canned, grade A	Case 48-½ s	16.837	17.650
Whitefish, fresh	lb.	.450 (1)	.493
Lake trout, frozen	lb.	.444	.523

(1) - Dressed.

PRICES PER CWT. PAID TO FISHERMEN

(Week ending Dec. 16th)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	5	4
Yarmouth		
Haddock	7.5	-
Black's Harbour		
Sardines	-	2
Vancouver		
Ling Cod	10-16	6-12
Gray Cod	7-7.5	7.5
Soles	6-7.5	8.5
Salmon (Rdspg)		

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF DECEMBER

		1966 '000 lbs	1967 '000 lbs
TOTAL - Frozen Fish, Canada		93,938	83,753
Frozen - Fresh, Sea Fish - Total		68,415	56,309
Cod, Atlantic, Fillets & Blocks		13,062	6,534
Haddock, fillets & blocks		3,812	4,613
Rosefish, fillets & blocks		7,464	6,880
Flatfish, (excl. halibut), fillets & blocks		8,327	9,223
Halibut, Pacific, dressed & steaks		8,502	8,724
Other Groundfish, dressed & steaks		2,427	1,500
Other Groundfish, fillets & blocks		6,729	4,026
Salmon, Pacific, dressed & steaks		8,509	6,076
Herring, Atlantic & Pacific		536	695
All Other Sea Fish, all forms		5,695	5,774
Shellfish		3,352	2,264
Frozen - Fresh, Inland Fish - Total		8,669	11,156
Perch, round or dressed		285	2,557
Pickerel, (Yellow & Blue) fillets		1,373	1,522
Sauger, round or dressed		(1)	742
Tullibee, round or dressed		288	178
Whitefish, round or dressed		1,794	1,224
Whitefish, fillets		314	195
Other, all forms		4,615	4,738
Frozen - Smoked Fish - Total		1,376	1,382
Cod Atlantic		689	365
Sea Herring, kippers		380	627
Other, all forms		307	390
Frozen for Bait and Animal Feed		15,478	14,906

(1) - Confidential, included with "Other".

SALTED FISH STOCKS AS AT END OF DECEMBER

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		20,052	28,953
Cod		17,887	24,647
Other		2,165	4,306
Dried - salted - Total		15,651	24,177
Cod		14,029	22,564
Other		1,622	1,613
Boneless - Total		642	1,522
Cod		570	1,399
Other		72	123
Pickled - Total	(barrels)	26,691	21,196
Herring	"	18,255	8,285
Mackerel	"	4,393	9,564
Alewives	"	4,043	3,347
Turbot	"	-	(1)
Bloaters	(18 lb. boxes)	79,447	192,434
Boneless Herring	(10 lb. boxes)	(1)	(1)

(1) - Confidential.

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - SEPTEMBER

(Value in Thousands of Dollars)

		1966 $'000		1967 $'000
Total Exports		99,230		100,093
By Markets:				
United States		73,894		71,628
Caribbean Area		7,684		8,079
Europe		14,643		17,231
Other Countries		3,009		3,155
By Forms:				
Fresh and Frozen		73,129		70,003
Whole or Dressed	23,865		19,788	
Salmon, Pacific	7,630		6,481	
Halibut, Pacific	3,714		1,966	
Cod, Haddock, Pollock, etc.	188		156	
Swordfish	2,756		2,752	
Other Seafish	3,687		3,989	
Whitefish	2,109		1,809	
Pickerel	1,449		876	
Other Freshwater Fish, n.o.p.	2,332		1,759	
Fillets, Blocks and Slabs	31,582		29,979	
Cod, Atlantic	9,544		8,746	
Haddock	3,252		3,584	
Rosefish, Hake, Pollock, etc.	4,389		3,592	
Flatfish	6,289		6,153	
Pickerel	1,521		867	
Other	6,587		7,037	
Shellfish	17,447		20,046	
Lobster (Alive & Meat)	13,212		15,039	
Other	4,235		5,007	
Frozen Fish & Shellfish, pre-cooked	235		190	
ured		8,450		9,081
Smoked	875		612	
Herring	587		319	
Other	288		293	
Salted, Wet & Dried	6,458		7,102	
Cod	5,336		5,937	
Other	1,122		1,165	
Pickled	1,117		1,367	
Herring	767		825	
Mackerel	211		310	
Other	139		232	
Canned		8,958		12,012
Salmon	4,352		7,790	
Sardines	2,135		2,369	
Lobsters	1,666		1,169	
Other	805		684	
Miscellaneous		8,693		8,997
Meal	4,868		3,908	
Oil	268		607	
Other	3,557		4,482	

Fish 'Schooling' Puzzles Scientists

The tendency of pelagic, or open sea, fish to gather in schools was noted by the earliest mariners. They attributed it to mystical causes.

Centuries later the school question remains only partly explained. Yet all agree on its importance to the world's fishing industry. Without the tendency to school, fish would be extremely difficult – perhaps prohibitively uneconomical – to catch.

Research into schooling behavior is relatively recent. In 1927 an American scientist, A. E. Parr, laid down pioneering concepts of schooling behavior. He divided fish into occasional and full-time schoolers.

Four years later another American, W.C. Allee, evolved elaborate groupings of more than 50 categories of schooling fish and their habits. At that time two main types of fish groupings were generally recognized: one based on a common response to environment, and the other on mutual attraction among the species.

In 1946 the question was reopened: when is a group of fish a school and when is it an aggregation? In schools, the individual fish are usually oriented the same way, uniformly spaced and swimming at the same speed.

Differences of interpretation have been given to the terms "school" and "aggregation." One specialist suggested that a school is an extreme form of the aggregating tendency, based on mutual attraction. It is generally agreed that a school represents a mutual attraction of fish.

ANSWERS STILL AT SEA

Research into schooling behavior is underway in various countries – the United Kingdom, the Soviet Union and the United States. Dr. Evelyn Shaw of New York's American Museum of Natural History has induced acquarium fish to swim with a "school" painted on a revolving screen around a glass tank.

Scientists are also studying the "geometry" of schools, their physiology, and communication among fish. How are changes in direction, speed, and position in one fish communicated to another? How do fish maintain the integrity of the school? What primeval instincts draw and keep fish together?

Participants in a recent FAO conference on fish behavior at Bergen, Norway, agreed that man still needs to know a lot about fish. Better knowledge of schooling behavior, for instance, could make future fishing much easier and help feed a protein-hungry world.

The participants recommended that FAO set up a working party to conduct direct investigations on schooling fish, in the oceans, under natural conditions. That, they said, is the only way to solve the ancient mystery of what makes fish band together in the sea.

FRB Appointments

Appointments of assistant directors at three Fisheries Research Board of Canada establishments have been announced by FRB Chairman Dr. F. Ronald Hayes.

Dr. J.E. Stewart has been appointed assistant director of the Halifax Laboratory. A native of Anyox, B.C., he is a graduate of the University of British Columbia and received his doctorate at the State University of Iowa. He joined the FRB at Halifax in 1958.

Dr. E. Graham Bligh, who has been appointed assistant director of the Freshwater Institute at Winnipeg, Man., is a native of Lakeville, N.B. and graduated from Acadia University in 1951. He joined the FRB on graduation and earned his doctorate at McGill University in 1957.

Appointed assistant director of the Biological Station at St. Andrews, N.B., Dr. F.D. McCracken is a native of Roblin, Ont. A graduate of Queens University, he obtained his doctorate at the University of Toronto. He has been associated with the FRB since 1946.

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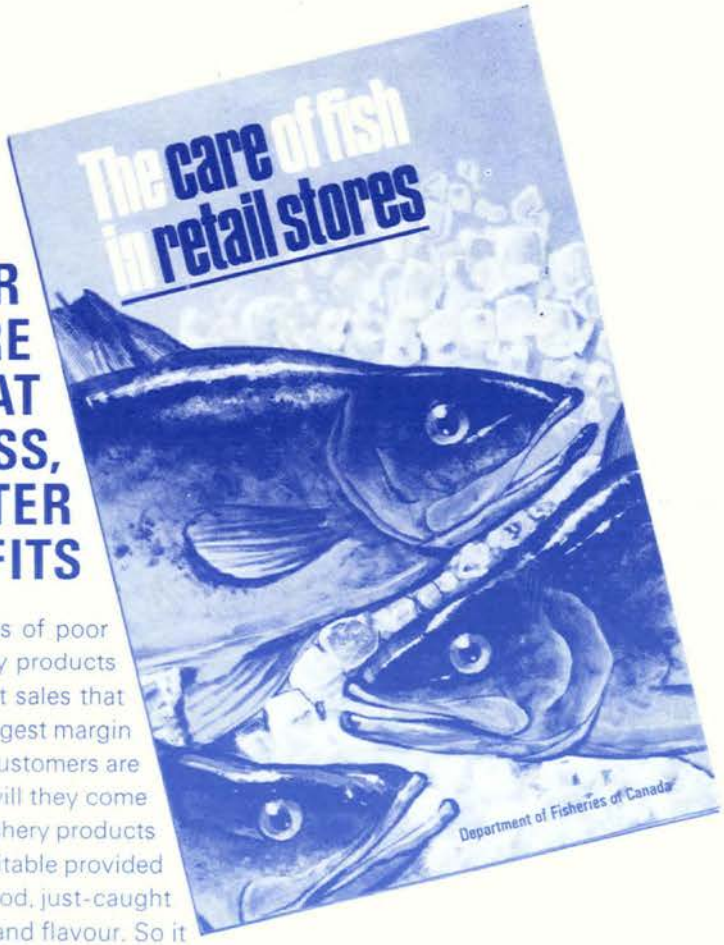

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Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister

Ottawa, Canada

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In This Issue

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- Mactaquac Salmon Rearing Station
- Use of Fish for Animal Feed

Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
(formerly Trade News)

Editor
E. H. HEARNDEN

April 1968

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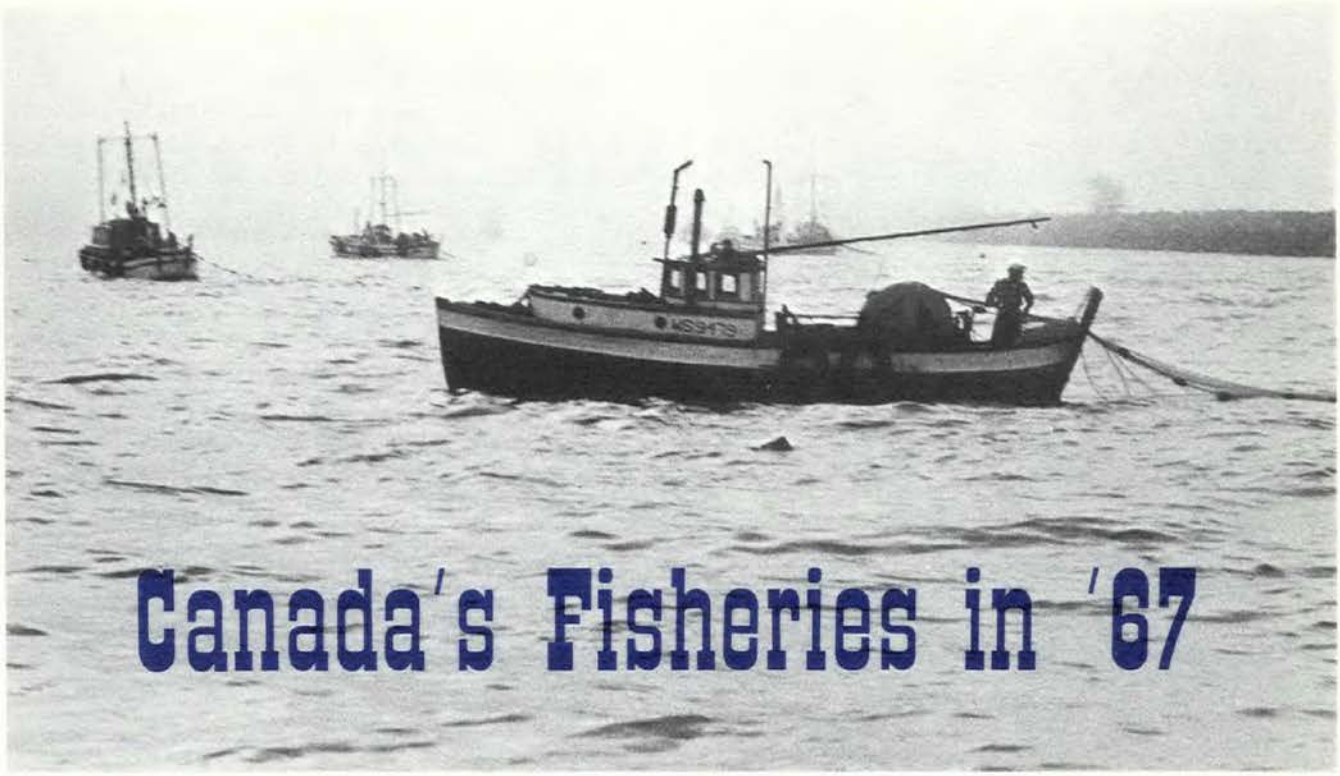
COVER PHOTOGRAPH - A "seeing's believing" example of the spectacular catches of herring and pollock being made off Nova Scotia and Newfoundland by the experimental mid-water trawler "Lady Anna". For other pictures and story see pages 14-16.



Canada's Fisheries in '67

Prepared by the Economic Services of the federal Department of Fisheries, Ottawa

THE UPWARD TREND of the past several years in the total output and value of the primary and secondary sectors of Canada's fishing industry encountered a reversal in 1967. The results in some fisheries were better than in 1966 but some major fisheries were affected by production or marketing problems.

The year was a particularly difficult one for the groundfish industry of the Atlantic Coast and the reduction industry. The fresh and frozen sector of the Atlantic groundfish fishery, in addition to the problems created by falling yields on the offshore grounds, had serious marketing difficulties. The reduction industry was faced with the low levels of world prices of meal and oils and, in addition, fishing for its main raw material – herring – was closed for the last three months of the year on the Pacific Coast as a conservation measure.

PRIMARY PRODUCTION

The volume of fish and shellfish landed by commercial fishermen in 1967 is estimated at 2,471 million pounds, a decline of 4.5 per cent compared with 1966. The increase in landings on the Atlantic Coast was not large enough to offset the sharp drop registered on the Pacific Coast and the small decline in the freshwater fisheries. The value of landings totalled approximately $165 million, $11 million less than the all-time high of 1966.

On the Atlantic Coast, total landings increased from 1,894 million pounds in 1966 to 2,032 million pounds in 1967 mainly because of the large expansion in the herring fishery. The value to fishermen, however, was just slightly above the 1966 record of $100 million. In spite of the addition of new and larger vessels, the total volume of groundfish landed (at 1,135 million pounds) was 68 million pounds less than in 1966. The decline was particularly evident in the landings by large trawlers (70 feet and over) which were down by 40 million pounds or 7.4 per cent. The situation is largely explained by poor market prices which curtailed fishing for some species, scarcity of resources on the grounds and a shortage of crew members for side-trawlers.

Weak market conditions continued during the year for groundfish fillets and blocks although the market strengthened slightly at the end of the year. As a result, prices to fishermen for groundfish were somewhat lower than in 1966. The value to fishermen declined by approximately 8 per cent, from $51.4 to $47.1 million.

The only major fishery which experienced an

increase in 1967 on the Atlantic Coast was the herring fishery. The expansion which began a few years ago continued during the year. A total of 763 million pounds of herring valued to fishermen at $8.2 million was landed, an increase of nearly 40 per cent in volume and of 32 per cent in value. Of the quantity landed in 1967, approximately 500 million pounds (65 per cent) were used for reduction compared with 260 million pounds or 48 per cent in 1966. The increase in landings was particularly large in Nova Scotia and Newfoundland.

LOBSTER CATCH DOWN

Lobster landings at 35 million pounds were down by approximately 6 per cent due mainly to a late start because of ice and weather conditions in some areas of Newfoundland and a poor catch in Northumberland Strait. The value of the catch, however, at $23.3 million, was higher by 6 per cent as higher prices more than compensated for the lower catch.

On a provincial basis, total landings increased appreciably in Newfoundland, Quebec and New Brunswick while they decreased in Prince Edward Island. In Nova Scotia landings were approximately the same as in 1966. The picture is somewhat different, however, on the basis of value to fishermen. Three provinces—Newfoundland, Quebec and Prince Edward Island—showed an increase in value while Nova Scotia and New Brunswick registered a decline.

Total landings in British Columbia dropped sharply from 575 million pounds in 1966 to 320 million pounds in 1967. The value of landings amounted to $49.0 million compared with the record high of $60.6 million reached in 1966. Despite this drop, the 1967 landed value exceeded the 1961-65 average.

The salmon catch in 1967 declined 18 per cent from 162 to 133 million pounds. Due to the large percentage of higher priced sockeye taken in 1967, however, the landed value of all salmon totalled $36 million, only 7 per cent below the record year of 1966.

Landings of halibut by Canadian fishermen at Canadian and U.S. ports totalled 26 million pounds, a decline of nearly 6 million pounds from 1966. This drop in production was mainly the result of jurisdictional labour disputes centred in the Prince Rupert area. The landing pattern of halibut also changed and landings in Vancouver nearly doubled (5.5 and 10.6 million pounds in 1966 and 1967, respectively) while those at Prince Rupert dropped from 18.2 to 9.0 million pounds. The landed price for halibut in 1967 was down sharply from the high levels of 1966. The average price reported in 1967 was 25 cents compared with more than 35 cents in 1966.

Herring landings in B.C. for the year totalled only 116 million pounds valued at $1.8 million, about one-quarter of the average production of the past ten years. As a conservation measure, the herring fishing for reduction purposes was closed in October for the balance of the year. This is the period of the year when most of the herring is caught in British Columbia.

After several years of increasing groundfish (bottom) landings, the catch fell sharply in 1967. While this drop was partly the result of market and production conditions, the jurisdictional labour dispute and a strike directly affected groundfish landings early in the year.

Reports on the freshwater fisheries in 1967 are still fragmentary at the time of writing and it is necessary to rely only on the data available for Ontario and Great Slave Lake. In Ontario, the results of the first nine months indicate that the total quantity landed was approximately the same as in 1966. A decline of 4 million pounds in smelt landings was offset by an increase of 2.5 million pounds of yellow perch and smaller increases in less important species. A substantial increase is noted in the value to fishermen mainly as a result of higher prices paid to fishermen for smelts and yellow perch. The results of the winter season 1966-67 in Great Slave Lake were better than those of the previous winter season. Landings of all species excluding whitefish were appreciably higher and so were the prices paid to fishermen. The volume of landings during the summer season shows little change from the 1966 summer season although the level of prices obtained by fishermen was generally lower.

PRODUCTION AND MARKETING

The value of products of the secondary industry in 1967 is estimated at approximately $325 million, a decline of about 7 per cent compared with 1966 but well over the 1960-1965 average of $260 million.

Based on the figures of the first nine months, Canadian exports will likely exceed the 1966 figure of $219 million by $12 million or 5.5 per cent. The

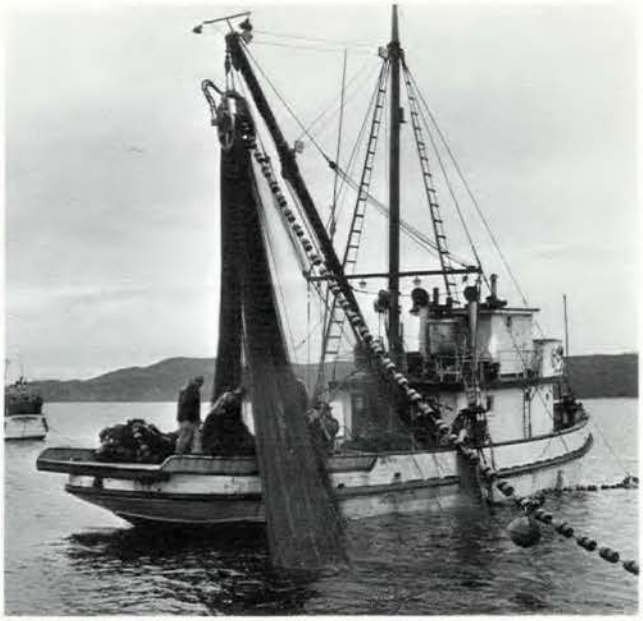
proportion of sales of Canadian fishery products to foreign countries which for a number of years has been approximately 70 per cent was maintained in 1967. Exports to the United States will likely be down by some 2 per cent, those to European countries will increase substantially and those to the Caribbean area will be at about the same level as in 1966.

Among the many types of products prepared by the industry, there are five major ones which, grouped together, account for about 60 per cent of the total value of output. These are groundfish fillets and blocks, salted cod and lobster in shell and meat on the Atlantic Coast, canned salmon on the Pacific Coast and fish meal on both coasts. A short review of the production and marketing situation of those products follows.

The 1967 output of frozen groundfish fillets and blocks dropped to 220 million pounds from the all-time high of 247 million pounds in 1966 as the result of a lack of supply and of the weak market conditions in the United States where most of the Canadian production is sold. As a result of an over-supply situation which began to develop in that country during the summer of 1966, weak market conditions prevailed during the balance of that year and throughout 1967. However, the market improved to some extent toward the end of the year. All types of groundfish fillets and blocks were affected but in varying degrees. Cod blocks was the product most affected. The wholesale price of cod blocks at Boston which was firm at approximately 29 cents (U.S.) in the first part of 1966 began to drop in July of that year and reached a low point of 21 cents (U.S.) in March 1967. The price began to move up in May and at the end of the year it was reported at approximately 26 cents (U.S.).

U.S. imports of groundfish fillets and blocks (including flounders) during the first ten months of the year totalled 276 million pounds compared with 301 million pounds during the corresponding period of 1966. Imports from Canada at 172 million pounds were some 5 million pounds less than in the preceding year and those from other supplying countries dropped by approximately 20 million pounds. Canada's share of the market increased from 59 to 62 per cent. Canadian exports to the United Kingdom at 4.5 million pounds were about the same as in 1966.

The downward trend of the past several years was reversed in 1967 as the production of salted cod increased by more than 20 per cent. As a result of



Atlantic coast herring fishery continued to expand in 1967. Total landings amounted to 763 million pounds, up nearly 40 per cent over 1966, representing a value to fishermen of $8.2 million.

the market difficulties in the frozen sector of the groundfish industry, prices paid to fishermen for fresh fish were somewhat reduced. Many inshore fishermen in Newfoundland returned to the traditional practice of salting encouraged by higher prices for that product. In Newfoundland, 60 per cent of the cod landings were used for salted fish production, compared with 45 per cent in 1966 and 1965 and 54 per cent in 1964.

The market for Canadian salted cod was good during the year although difficulties appeared in the last month of 1967 in the Jamaican market as a result of the devaluation of the pound sterling and of the price ceiling in effect in that country. Canadian exports of salted cod during the first nine months of the year totalled 39.5 million pounds valued at $11.6 million. Compared with 1966 these figures represent a decrease of 4 per cent in weight and an increase of 9 per cent in value. The main markets for salted cod are Jamaica, the United States and Puerto Rico which together account for approximately 68 per cent of the Canadian exports of that product.

Most of the lobsters landed in Canada are marketed in the shell although a large proportion is sold as fresh and frozen meat. Of the 35 million pounds landed in 1967, approximately 13.6 million pounds were exported in the shell and 12.2 million

Lobster landings at 35 million pounds in 1967 were down by about six per cent over the previous year. However, value of the catch – $23.3 million – was six per cent higher than in 1966.

pounds (round weight) as meat. Almost all (97 per cent) of these exports went to the United States. The production of lobster meat and of canned lobster was approximately the same as in 1966. The market for the lobster products was good during 1967.

The canned salmon pack in British Columbia totalled 1,466,000 cases in 1967, which is just slightly higher than the average of the preceding five years. The sockeye pack of 559,000 cases was the largest since 1958. As a result of the good run of pinks to the Fraser River, the pink salmon pack reached 650,000 cases which was somewhat above average for the odd year cycle. The pack of coho and chum was down and totalled 139,000 and 95,000 cases, respectively. The market for canned sockeye salmon has softened somewhat as a result of the above average pack and there could be a larger carry-over into the new pack year than was reported a year ago.

The prospects for the 1968 sockeye production are not optimistic and the industry is not anticipating any major problem in disposing of the 1967 sockeye pack. The 1967 canned salmon pack is mostly sold or committed and prices remained at about the same level as in 1966. An increase of 75 per cent in Canadian export sales was recorded during the first ten months of 1967 as compared to the corresponding period of 1966. The most important single export market for Canadian canned salmon, especially sockeye and pink, has been traditionally the United Kingdom. Sales to that market during the period under review amounted to nearly 19 million pounds valued at more than $16 million, representing 60 per cent of the value of Canadian exports of that product.

FISH MEAL

Production of fish meal at about 100,000 short tons was the same as in the previous two years. Herring meal production increased appreciably on the Atlantic Coast, from 26,000 tons in 1966 to 49,000 tons last year; on the Pacific Coast, however, as a result of the curtailment of herring fishing activities, production dropped sharply from 27,000 tons to 10,000 tons. Groundfish or "whitefish" meal production on the Atlantic Coast totalled 38,000 tons compared with 43,000 tons in 1966.

Canadian exports of fish meal during the first nine months of the year amounted to 41,000 short tons valued at $6.4 million. The corresponding figures for 1966 were 42,740 short tons and $7.7 million. As in previous years, about 75 per cent of Canadian exports went to the United States and most of the rest to the United Kingdom. The world market for fish meal and oil was generally weak in 1967. The 1967 decline in price of fish meal was due mainly to a surplus of that commodity in Norway and Peru and to a mild European winter and lower livestock prices in the United States and Western Europe. U.S. prices of imported "whitefish" meal (f.o.b. Gloucester) which varied between $(U.S.)150 to $(U.S.)160 a ton during the second half of 1966, dropped gradually during 1967 and reached a low point of $(U.S.)123 in October. A dramatic rise in Norwegian fish oil production and to a lesser extent in Peruvian production in the latter of 1966 and in 1967 resulted in a drastic drop in oil prices. For example, the price of menhaden oil at New York which was reported at 9 and 10 cents (U.S. funds) throughout 1966 dropped to 7 - 7¼ cents in April 1967 to 6 cents in August and remained at that low level for the balance of the year.

FISHERMEN, FISHING VESSELS

No complete information is available yet on the number of fishermen and of fishing vessels engaged in commercial fishing in 1967. Indications are, however, that there were fewer fishermen than in

1966. A succession of rather poor fishing seasons compelled inshore fishermen in Newfoundland to avail of alternative employment opportunities where such opportunities existed. On the other hand, the expanding offshore fleet provided jobs for a larger number of men, not enough however to compensate for the decline in the inshore fishery.

The number of large groundfish trawlers (100 feet and over) which have been licensed by the Department of Fisheries during the current fiscal year from April 1, 1967 up to December 31, 1967 to operate out of Atlantic Coast ports totalled 148 representing a gross tonnage of 58,939 tons. The breakdown by provinces for the current year and the preceding four years is as follows:

	1963-64	1964-65	1965-66	1966-67	1967-68
Nova Scotia					
number	53	55	61	69	67
gross tonnage	16,240	17,237	18,736	23,554	23,995
Newfoundland					
number	32	41	49	50	65
gross tonnage	8,187	12,556	15,175	17,185	27,434
New Brunswick					
number	3	4	4	2	5
gross tonnage	992	1,324	1,324	571	1,595
Quebec					
number	1	2	2	5	7
gross tonnage	248	560	560	2,567	3,867
Prince Edward Island					
number	–	–	–	2	4
gross tonnage	–	–	–	1,004	2,048
TOTAL Atlantic Coast					
number	89	102	116	128	148
gross tonnage	25,674	31,677	35,795	44,881	58,939

On the Pacific Coast, 230 new commercial fishing vessels valued at $10.9 million were completed in 1967. Included are two large tuna seiners valued at $5 million which will operate out of east coast ports. Of the remaining vessels, 144 valued at $2.2 million were gillnet or gillnet-troll combination vessels and 73 valued at $1.96 million were troll or troll combination vessels. At the end of 1967, there were 111 commercial fishing vessels under construction compared with 133 at the same time the previous year.

The Department of Fisheries continued to provide to the provinces and the industry technical and financial assistance in experimental fishing and production techniques. More than 100 projects of this type were in progress during the year, either being carried out independently by the Department or in co-operation with the provincial fisheries authorities and the industry. One of these projects concerns the development of marine plants and the plant operated by the Department in Prince Edward Island is concentrating its efforts on Irish Moss from which carrageenin is extracted. The Department is also interested in the development of fish protein concentrate as a source of food protein and sponsored a conference to study the various aspects of the production and utilization of that commodity.

Reference was made earlier to the expansion of the offshore fishing fleet on the Atlantic Coast. Some expansion took place also in shore establishments. Several new herring reduction plants began to operate during the year. A new tuna canning plant – the first one for the Atlantic Coast – began production in New Brunswick in 1967. The plant will be served by a fleet of five seiners costing about $2.5 million each. The vessels, of 1,440 gross tons, will each have a capacity of 1,000 tons of tuna and will be fishing in the South Pacific and in the Gulf of Guinea off the west coast of Africa. A new shipyard to build and service ships of the offshore fishing fleet was opened at Marystown on the Burin Peninsula of Newfoundland.

The government financial assistance for the construction of new fishing vessels was lowered during the year. As part of the government's effort to cut expenditures, it was announced early in December that the subsidy for the construction of steel fishing trawlers measuring 75 feet and over was being reduced from 50 per cent to 35 per cent of the approved cost.

During the year, the government issued a list of geographical co-ordinates establishing the baseline from which the 12-mile fishing limits are to be calculated. The co-ordinates refer to the areas off the coast of Labrador and parts of Newfoundland. Other lists of co-ordinates covering other coastal areas are to be issued later.

Details of the trade agreements reached under the Kennedy Round of GATT negotiations were released at the end of June. Extensive tariff cuts have been agreed on by many countries in the field of fisheries. Canada obtained valuable concessions by way of reductions and removal of duties on our exports of fish. For our part, free entry is provided for fresh, frozen, pickled and dried fish and for shrimp. The duties on most prepared and canned fish including sardines, anchovies, herring, salmon, oysters, clams, lobsters and crabs will be reduced by 50 per cent. The Canadian tariff reductions will be introduced in stages extending over a period of five years, the first stage implemented January 1, 1968.

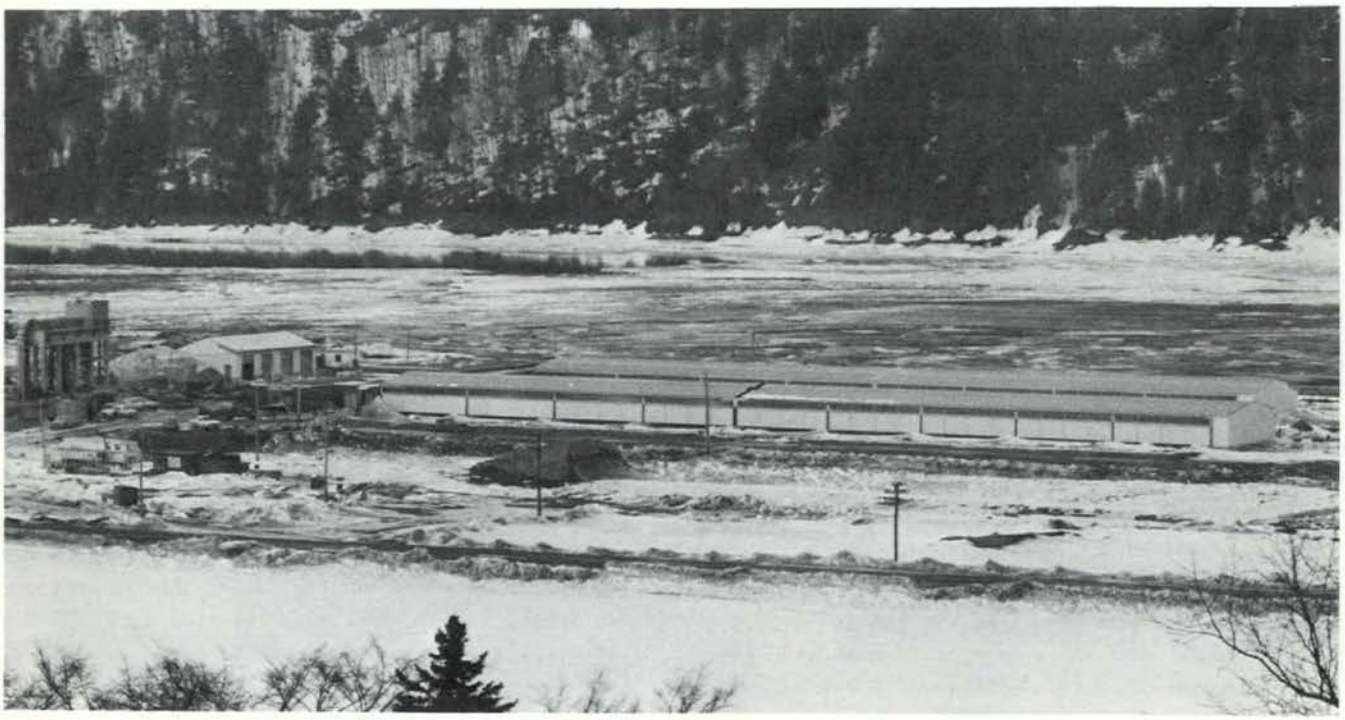
Capacity 500,000 Smolt a Year

Atlantic Salmon Rearing Station In Operation at Mactaquac

By G. J. Gillespie

While not yet in full operation, the world's largest Atlantic salmon rearing station has commenced to function on the St. John River in New Brunswick near the new 600,000 kilowatt Mactaquac hydro-electric power station. The facilities are being developed under the aegis of the Resource Development Service of the federal Department of Fisheries.

Already the first of future generations of Atlantic salmon which will be hatched in the Mactaquac station have emerged from egg to the alevin stage and are thriving in plastic tanks prior to being released to the rearing ponds housed in the two buildings of large warehouse proportions. There they will be raised to the smolt or sea-going stage



A view of the federal Department of Fisheries' Mactaquac Atlantic salmon rearing station, with the St. John River in the background.

Salmon rearing ponds in one of the buildings in the almost-completed Mactaquac station.

when they will be able to leave at leisure on their downstream journey to meet the sea in the Bay of Fundy. At present there are more than 300,000 baby salmon being reared at the station which has a capacity to produce more than a half million smolt.

On its 13-acre site not far upriver from a village of native Maliseet Indians, the hatchery is technology's answer to the upstream blockade to salmon posed by the construction of the Mactaquac power dam. Studies by federal Department of Fisheries engineers and biologists showed that salmon stocks in the St. John River could not be saved by the installation of a fishway or fishways at the dam. This conclusion was based on three premises:

1. The Mactaquac dam—the largest hydro development in the Maritime Provinces—has a headpond 60 miles in length. Salmon would have difficulty finding their way upstream through such a stretch of comparatively still water. In addition, they would also have to negotiate the headponds behind the power dams at Beechwood on the St. John and on the Tobique, a tributary of the St. John.

2. Smolt descending the river from the Tobique, which is the main spawning tributary, would encounter similar difficulties.

3. The mortalities of smolt would be heavy due to the hazard imposed by the three sets of power house turbines at Tobique, Beechwood and Mactaquac. It was concluded that losses suffered at these three sites, combined with the other problems could eventually eliminate the St. John salmon run.

The obvious answer, to the fisheries experts, was the installation of fish collection facilities and erection of a hatchery to raise smolt below the dam site. That is what was done.

Hatching of eggs under controlled conditions is

about 10 times more efficient than under natural conditions, so the program calls for the trapping of about a thousand of the best fish for breeding stock. The total salmon run in the St. John has been estimated as being between 10,000 and 20,000 fish. The hatchery requirements are being guaged on those figures so that a half million smolt can be produced annually to perpetuate the adults required.

The salmon trapped at the dam site but not used for reproduction purposes are transported by trucks above the dam and released into the river. That leaves two angling sites relatively unimpaired. They are on the river stretch between Hartland and the Beechwood dam and on the Tobique river above the power dam headpond.

Salmon released in the Hartland-Mactaquac stretch of water can, if they successfully run the gauntlet of anglers, ascend the Beechwood lift (an electrically-operated elevator-like apparatus which carries the fish over the dam) and then make their way up the Tobique dam fishway and enter the angling fishery in the waters beyond. The survivors will eventually spawn there. The smolt resulting from this spawning will assist the Mactaquac hatchery effort, but only to a limited degree as the downstream mortality imposed by three sets of turbines will be heavy.

Alex Baxter, left, officer-in-charge of the Mactaquac rearing station, watches as Fishery Protection Officer Donald Jenkins, Fredericton, examines thermometer in tray holding recently-hatched salmon.

SELECTIVE BREEDING

The brood stock collection phase of the Mactaquac breeding program began last June and continued through the fall salmon run in October. The best salmon and grilse (the latter being a salmon with a sea life of one year and weighing from three to six pounds), as determined by their general health, lengths and weights, were selected from each day's catch for the brood stock. Excess or unwanted fish were transferred upstream for the anglers and to assure a natural spawning stock for the St. John River system.

A goal of 100 spring run salmon, 600 summer run and 300 fall run is considered sufficient to ensure ample salmon and grilse for the taking of 210 lots of eggs from the proper age groups. The proportion of salmon and grilse, and the possible sex ratios, as well as the proportion of fish per section of the run (i.e. spring, summer or fall) were taken into consideration in establishing this goal.

In this selective breeding program the numbers of males and females for each age group are taken into consideration. For the most part, one male of a particular age will be crossed with one female of the same age, but in a few cases, due to the lack of males, some males will be used more than once. Individual egg lots from individual females will be kept separate and followed as closely as practicable throughout the entire life cycle of the offspring to determine which crosses yield the best possible growth and return to the river. Lengths and weights of all spawners will be recorded as a reference, or starting point from which the success of the selective breeding program in future years can be determined.

The initial program comprised 215 lots of eggs (215 breedings) for the hatchery, allowing 25 per cent of the total from the spring run, 50 per cent from the summer and 25 per cent from the fall portion of the run. Excess males and females from the St. John

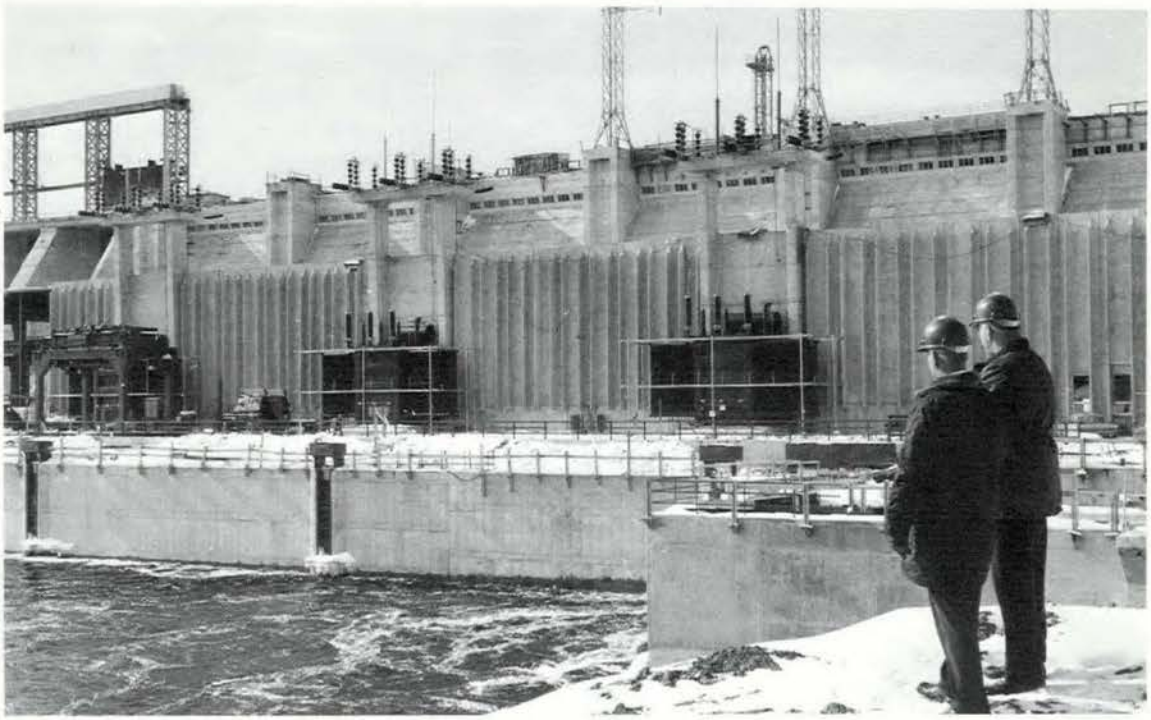
River not used in the Mactaquac program will be spawned in the ratio of three females to two males, and the eggs used to supplement other Maritime salmon stocks.

The pattern of this breeding program will continue for the first three or four years at the hatchery, until it is possible to evaluate the success of the various crossings and proportions of the crossings. At such time the program will become progressively more selective in order to utilize the age groups that yield the best growth and return to the fullest advantage.

Baby salmon now in the hatchery will remain there about two years before heading seaward. Department of Fisheries biologists in charge of the program expect the first returns of hatchery-produced adults from the sea in 1971.

While the Mactaquac dam is a hydro-electric power operation of great magnitude, the hatchery project is also one of giant proportions. It is revolutionary in the field of fish culture practices and has excited the imaginations of fisheries scientists and sport fishermen throughout the world.

Close-up view of the salmon trapping facilities at Mactaquac hydro-electric dam.



A section of the huge Mactaquac hydro-electric power development with fish trapping facilities shown in front of dam at lower right.

Study Protein Value of Freshwater Fish Meal

Farming and fishing are two industries that are usually not looked upon as having much in common, especially in the raising and marketing of poultry and livestock. However, the use of high protein fish meals as a supplement in poultry and animal feeds is well known to the feed manufacturer. The possibility of the fisherman in the freshwater areas of Canada making a contribution to the farmer seeking to realize bigger profits on his livestock and poultry is a matter that scientists at the Fisheries Research Board of Canada's Freshwater Institute, Winnipeg, have been looking into.

A world market for fish meal in commercial quantities exists and is becoming more competitive. The present supply in Canada comes from marine fish from the Atlantic and Pacific provinces. The small fish meal plants with a limited production that exist close to the freshwater fishing areas are not significant in supplying the overall demand.

Research is being carried on to study the comparative protein values of marine fish meal versus freshwater fish meal. Also being considered is the possibility of greater utilization of certain species of freshwater fish, having little commercial value, for manufacture of fish meals suitable for the feeding of poultry and animals. This study has been initiated through the Freshwater Institute at Winnipeg by Dr. E. Graham Bligh, Scientific Leader of the Technological Section and A.W. Lantz, Food Research Technologist.

Working with Professors B.E. March and Jacob Biely, of the University of British Columbia, they prepared meals from Lake Michigan alewife, sheepshead from Lake Erie, maria and tulibee from Lake Winnipeg. The meals were produced under commerical production conditions and in quantities to be compared with similar fish meals made from Pacific herring and Atlantic scrap from the filleting of white-fleshed marine species such as cod, haddock etc.

The comparative meals were fed to chicks forming a 4% protein supplement to the regular wheat protein feeds. This gave a total 20% protein diet. The period of tests ranged over four weeks. The conclusion reached was that the freshwater fish meals were similar in supplementary protein value to marine fish meals, presently offered on the market.

Thus, freshwater fish meals could compete nutritionally with marine meals but the cost of production is not economical at present. Due to the higher cost of catching freshwater fish, the scattered nature of the fisheries, and the large quantities of fish required, it is very doubtful that meal made from Canadian freshwater fish will ever enter the world market. On the other hand, there are indications that some areas might be able to economically produce meal on a small scale to meet local market demands.

Scientists at the Freshwater Institute are continuing research in this field. Their aim is to increase the utilization and demand for all freshwater fish and thereby benefit the freshwater fisherman.

BERNARD BLAIS

CAPT T.P. PALLANT

CALVERT C. PRATT

Shown above are the three new members of the Fisheries Research Board of Canada – Barnard Blais, general manager of St. Lawrence Sea Products Co., Quebec, P.Q., Capt. Thomas P. Pallant, of Prince Rupert, B.C., and Calvert C. Pratt, president of Steers Limited, St. John's Newfoundland. They have been appointed to serve for five-year terms, effective January 1, 1968.

Model Simulates Freshwater Lake

Laboratory assistant Gerry Forth checks a model of a freshwater lake designed at the Fisheries Research Board of Canada's Freshwater Institute, Winnipeg, for use in classrooms to study the effects of wind, sun and basin configuration.

A simplified model of a freshwater lake for the purpose of teaching aspects of limnology, ecology and general biology has been constructed by Dr. J.R. Vallentyne at the Fisheries Research Board of Canada's Freshwater Institute, Winnipeg. The model can be built for less than $50.

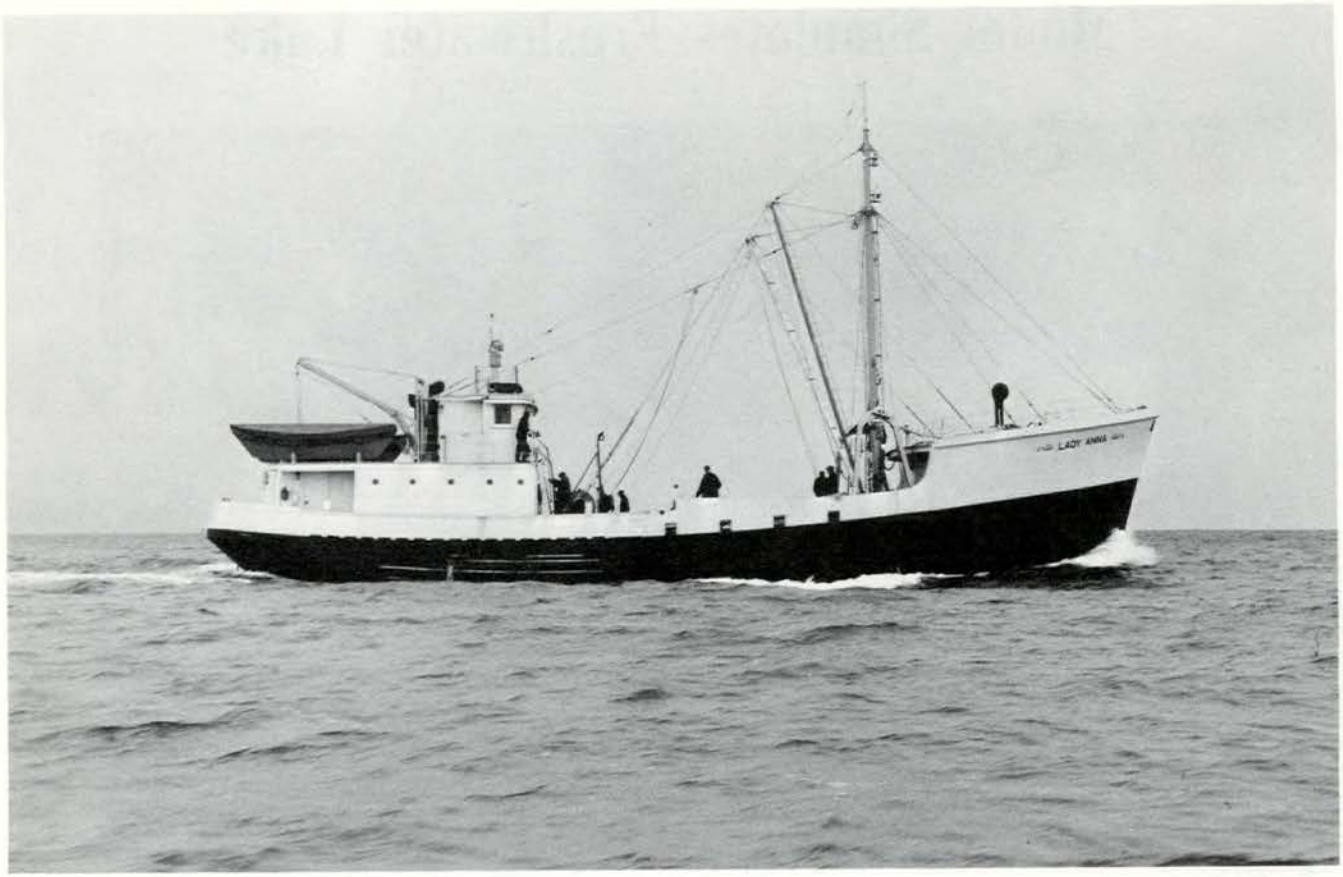
Materials required consist of: an aquarium, corresponding to a lake basin; an infrared light bulb as the laboratory equivalent of the sun; a block of polyurethane foam padding, 10 cm thick, to form an artificial bottom that can be positioned at any desired depth; an electric air gun or small portable fan as a wind generator; twelve laboratory thermometers; and two water-soluble dyes to follow water movements.

The influences of sun, wind, and basin configuration can all be studied as independent variables, and water temperature situations can be generated within 20-60 minutes that would otherwise require 20-60 days in nature. Measurements and calculations are entirely comparable to those employed on lakes.

"The model can be used as a simple yet fascinating project for high school classes, science clubs or by sportsmen and water enthusiasts interested in improving their scientific understanding of lakes," Dr. Vallentyne said. "The demonstrations of subsurface water movements and thermal stratification are so dramatic that they cannot fail to excite the imaginative mind. With the increasing importance of natural waters in our everyday lives, it is essential that we as a people develop some scientific understanding of their properties."

Dr. Vallentyne, who is Scientific Leader of the Eutrophication Section at the Freshwater Institute, developed the model for instruction as part of his research on pollution in Canada's lakes.

Complete instructions and a list of equipment is available to schools, science clubs and others interested by writing to the FRB Freshwater Institute in Winnipeg, Manitoba.



The 100-foot midwater trawler "Lady Anna", engaged in experimental fishing off the coast of Newfoundland, has made spectacular catches of herring.

Spectacular Herring Catches

"Lady Anna" Moves to Newfoundland

The mid-water trawler *Lady Anna* under charter to the federal and provincial Departments of Fisheries continues to make spectacular catches of herring along Newfoundland's southwest coast.

During a period of nine days' fishing in Connoire Bay, west of Burgeo, the 100-foot converted scallop dragger has landed more than 450 tons of herring. The largest single tow yielded 80 tons caught in approximately four minutes.

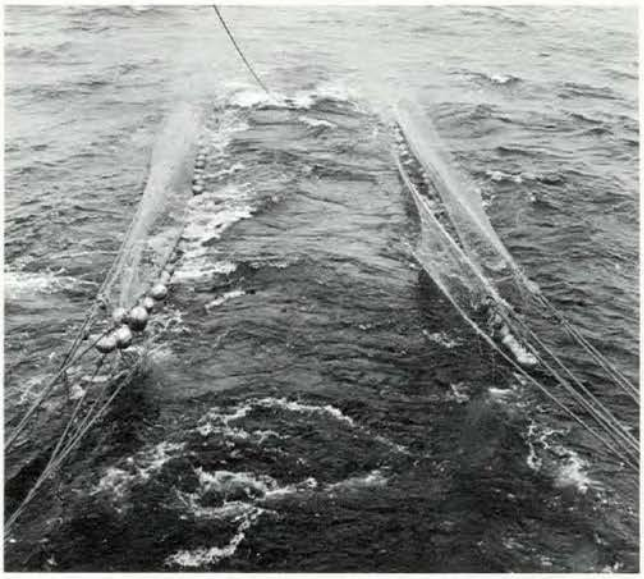
The *Lady Anna* moved to Newfoundland waters in mid January following successful experimental operations in Nova Scotia. On establishing that commercial stocks of herring were not available in St. Mary's Bay, the vessel moved to the southwest coast of the province where seiners were taking full loads of herring daily.

The *Lady Anna*, skippered by Captain Guy D'Entremont of West Pubnico, Nova Scotia, is powered by a 765 horsepower diesel engine. Special deck machinery was installed for the project, and modifications to the superstructure were necessary to accommodate the midwater trawl, which is shot and towed and hauled over the stern although the codend is emptied over the starboard side.

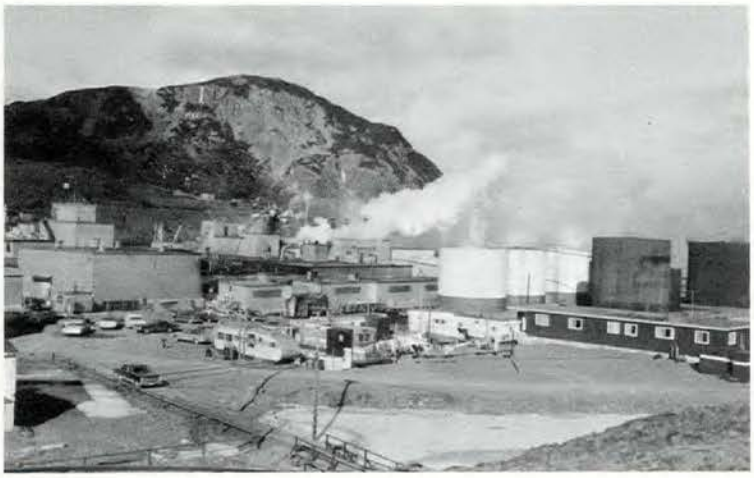
The vessel is chartered by the Industrial Development Service of the federal Department of Fisheries and the Newfoundland Fisheries Development Authority. In the near future experimental fishing for herring will be carried out by the vessel in Placentia Bay, St. Mary's Bay and Fortune Bay, but at the present time the vessel is concentrating on the southwest coast of the province.

The herring reduction plant operated by B.C. Packers at Harbour Breton has so far this year processed more than 50,000 tons of fish taken by some 22 seiners operating along the coast. One large purse seiner operating from the plant landed 1,200 tons of herring during the month of January.

The *Lady Anna* has been transferring her catch to herring packers for delivery to reduction plants.

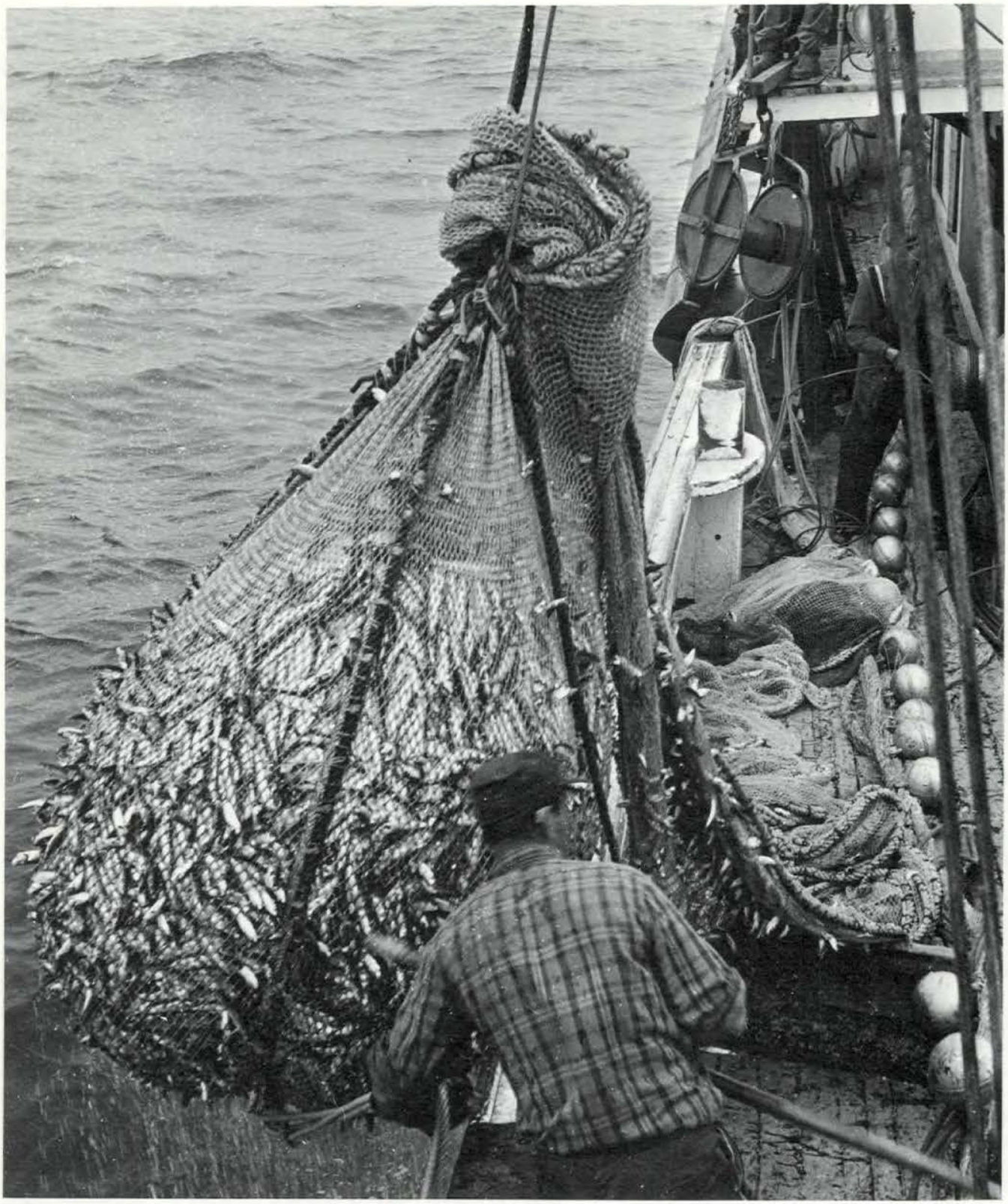


The "Lady Anna" making a tow for herring along the southwest coast of Newfoundland. Note the headline transducer extending from the net at top of photo.



B.C. Packers' reduction plant at Burgeo is currently operating round the clock, seven days a week.

Purse seiner "Western King" arriving at Harbour Breton with a full load of herring.



Codend of the trawl bulging with herring is hauled over the starboard side of the mid-water trawler "Lady Anna" during experimental fishing off Newfoundland.

Utilization of Fish For Animal Food in B.C.

By C.R. Forrester

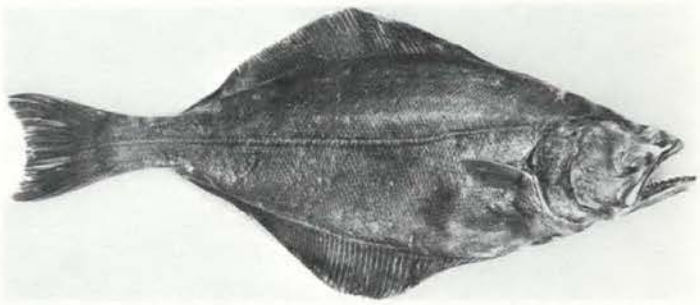
Fisheries Research Board of Canada
Biological Station, Nanaimo, B.C.

DURING THE early 1950's there developed, in British Columbia, an active trawl fishery for bottom fish to meet the demands for animal food from an expanding fur farm (mink) industry on the west coast. Fur farms were increasing in size and number. Many were being re-established in this area from the prairie provinces and other areas because of the diminishing reserves and rising cost of such protein sources as horse meat and freshwater fish.

Species of fish utilized on the farms were primarily those which had found no place in the trawl fishery for food fish (human consumption). This report reviews recent trends in this particular fishery both as to magnitude and species composition of landings and considers market potential and probable total utilization of fish for animal food in British Columbia.

The average annual landings of whole fish for animal food in British Columbia during the period 1945 to 1950 were less than 50,000 lb. In those years the supply of waste material from the filleting operations on trawl landings was sufficient to meet the fur farm requirements. From 1950 onwards, however, demand increased greatly and landings rose from about 400,000 lb in 1951 to over 10,500,000 lb in 1956.

Since 1956, landings have fluctuated between 3.0 and 7.6 million lb, with an annual average of about 4.9 million lb. Variations in the magnitude of the landings have been caused by a number of factors. These include the temporary extensive utilization of protein from other sources (e.g. poultry waste and imports of fish scrap from the United States), the willingness or unwillingness of fishermen to pursue a product of lower unit value than other food fish and occasional difficulties in the financial agreements between fisherman and mink farmer.



The arrowtooth flounder or turbot (*Atheresthes stomias*)

In 1956 the animal food landings constituted 36% of the total British Columbia trawler landings. Since that time they have ranged from about 8% to 29% and averaged about 16.5% of total landings. The

Table I. Otter-trawl landings of whole fish for animal food in British Columbia.

Year	1,000 lb	Year	1,000 lb
1951	398	1959	4,178
1952	1,426	1960	5,809
1953	2,295	1961	7,634
1954	2,460	1962	7,224
1955	7,129	1963	3,738
1956	10,568	1964	4,836
1957	3,982	1965	3,812
1958	3,031	1966	4,849

Table II. Species composition (%) of otter-trawl landings for animal food.

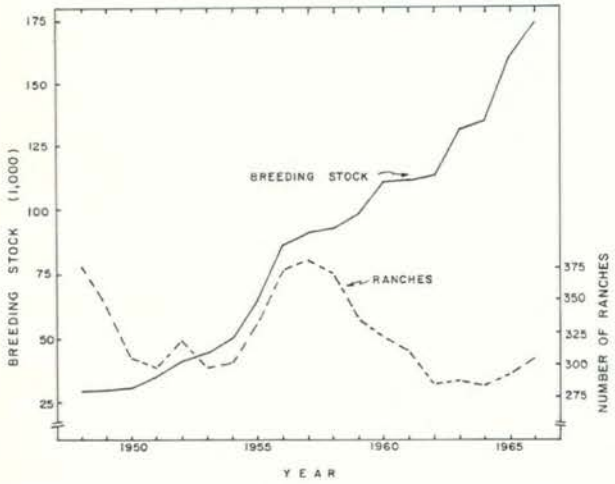
Species	1951-56 mean[a]	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Arrowtooth flounder	62.6	49.4	37.3	52.1	47.3	70.8	50.9	51.7	47.9	47.2	39.9
Whiting	19.5	25.6	13.5	15.8	4.5	3.4	2.0	2.2	2.4	3.3	7.0
Rockfish	2.2	6.7	6.4	14.9	16.4	8.5	10.1	10.2	20.1	16.1	12.4
Butter sole	3.8	4.9	20.5	6.3	24.5	9.7	30.2	24.0	13.7	20.4	33.7
Other sole	4.5	2.3	3.4	1.8	3.0	4.2	1.6	4.7	3.2	5.5	2.1
Pacific cod	1.9	5.6	14.4	3.5	1.0	0.4	1.0	5.1	11.6	5.5	3.3
Starry flounder	1.1	3.5	3.2	3.2	1.9	1.5	3.1	0.5	0.4	0.3	0.4
Skate	0.9	1.0	0.7	0.8	1.0	1.0	0.4	0.4	0.7	0.7	0.0
Other species	3.5	1.0	0.6	1.6	0.4	0.5	0.7	1.2	0.0	1.0	1.2
% in total trawl catch		13.9	11.1	15.4	21.4	25.6	28.8	16.7	15.0	8.7	8.9

[a] From Forrester (1958)

average price paid for species landed for this purpose has been 2.5¢ per pound and thus the average annual landed value during the 1957-1966 period was about $123,000. The bulk of the landings have been made at the ports of Vancouver, Steveston and Prince Rupert, the sites of main trawl landings.

SPECIES UTILIZED

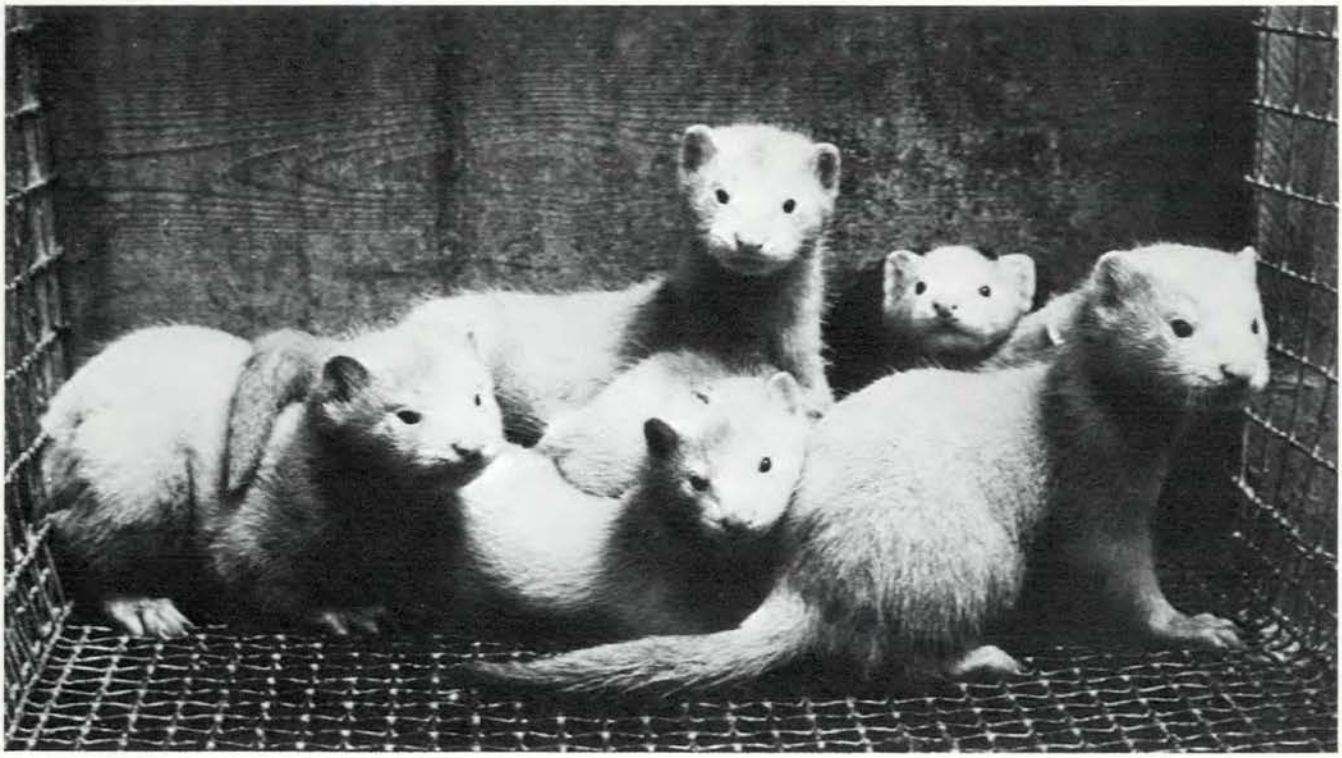
During the 1951-56 period the arrowtooth flounder or turbot *(Atheresthes stomias)* and the whiting or bigeye *(Theragra chalcogrammus)* constituted over 80% of the total landings for animal food. These species were not being utilized for human consumption and existed in relatively dense concentrations within close reach of market centres. Species useful for human consumption were not used extensively because when landed in good condition they commanded higher prices on the foodfish market. The arrowtooth flounder has remained the dominant species in landings since 1956 and the bulk of landings of this species has come from two grounds, the Cape Scott or Mexicana Point grounds off the north end of Vancouver Island and the Swiftsure Bank off the lower west coast of Vancouver Island. On these grounds a specific fishery for the arrowtooth flounder takes places.



Number of mink ranches licensed and their breeding stock in British Columbia, 1948-66 (data courtesy of Livestock Branch, Department of Agriculture, Province of British Columbia).

In recent years, however, there has been increased utilization of other species, particularly (1) the butter sole *(Isopsetta isolepsis)* which is found during winter months in Skidegate Inlet, Queen Charlotte Islands 53°30' N lat 132° W long) and (2) several species of rockfish which are captured incidentally in fishing operations for other species.

During the period 1958-1966 at least 44 species representing 12 families were found in landings of fish for animal food in British Columbia. A high percentage of these were captured incidentally in fisheries for other species and were unsuitable for the fillet market. Representation of the various



A litter of young mink (kits). Photo courtesy of Dr. E.R. Bowness, Master Feeds, Toronto, Ont.

species in landings has been observed to change from year to year because of changing market conditions at the ports of landing. For example: The market for animal food in Prince Rupert in early 1961 was limited. In that year butter sole, the main species landed for animal food in Prince Rupert, constituted a lower proportion of total animal food landings than in 1960 or 1962.

MARKET POTENTIAL

Pet food processors in British Columbia report the use of some fish in their products, but that it is chiefly herring or salmon scrap. Their annual utilization of trawl caught bottom fish appears to be in the region of 250,000 lb. This is less than 10% of the total animal food landings. The major markets for bottom fish for animal food in British Columbia would appear to be the fur farms and of these the principal users are mink ranches. The number of mink ranches licensed in British Columbia has varied in the period 1948 to 1966. From a peak of approximately 380 in 1957 the number has declined to just under 300 during the 1961-66 period. However, the total number of mink carried as breeding stock by these ranches has shown a steady increase from just under 30,000 animals in 1948 to almost 161,000 animals in 1965.

The formative years of the animal food fishery were those from 1950 to 1956 when there was an almost threefold increase in breeding stock of mink. If we assume that landings of whole fish for animal food in 1956 reflected the demand of breeding stock at that time, landings since then should have increased in proportion to the increases in breeding stock. However, as shown in Table I, landings after 1956 never did reach the level attained in that year.

Apparently, other sources of supply were meeting the requirements of the mink farmers. For example, statistics of the Department of Fisheries, Vancouver, B.C., show that 16.0 million lb of mink food was marketed in 1965. However, landings of whole fish for animal food in that year amounted to only 3.8 million lb. The difference of 12.2 million lb was apparently processed fillet waste from the food fish landings in British Columbia. In addition to this quantity marketed, there were imports of scrap-fish (or fish offal) from the United States by several mink breeders or associations in 1965 in the amount of 12.3 million lb. Total supply of fish available in 1965 for animal food appears therefore to have been the marketed 16.0 million lb plus the imported 12.3 million lb, or a total of 28.3 million lb.

We come then to the question of whether or not this amount of fish and fish scrap was utilized specifically as minkfood in 1965. We can estimate the requirements for fish for minkfood in 1965 as follows: Breeding stock of mink in that year was about 160,900 animals. Conversations with mink farmers suggest that this basic stock is generally carried in the ratio of four females to one male; thus number of females in 1965 was approximately 128,700. Litters apparently average about 3.5 young (kits) per female and therefore total production of young mink in 1965 would be about 450,450. The young, together with the original breeding stock, would total about 611,350 feeding animals. An estimate of consumption of food per animal in the interval from birth to pelting (generally May to mid-November) is about 100 lb (Adair, 1956). A minimum total food requirement for the total stock of mink in 1965 would thus be about 61 million lb. The percentage of fish in the diet of mink varies from farm to farm, but percentages of 40 to 70% are not uncommon (Adair et al., 1965 and 1966). A diet of 50% fish for the British Columbia stock of mink in 1965 would thus require just over 30 million lb of fish. It appears, therefore, that virtually all fish for animal food landed, produced or imported into British Columbia in 1965 was utilized for minkfood. Of the 28.3 million lb utilized only 3.8 million lb or about 13% of the total was composed of whole fish landed specifically for that purpose.

FUTURE PROSPECTS

Landings of whole fish for animal food have decreased from the peak landings in 1956 despite the fact that the fur farm industry which created the demand has continued to grow. As noted above, some variation in volume of landings has been caused by factors outside the fishing industry. For a short while the extensive use of poultry waste limited the demand for fish and it is still a major component in some diets. The low level of landings of fish in recent years, relative to that of 1956, does not appear to be associated with any decline in abundance of the species utilized. Estimates of catch per unit of effort of arrowtooth flounder, the main single species utilized, suggest no decline in apparent abundance over the past fifteen years for the main areas of concentration. However, during this period, while the landed value of most other trawl-caught species has increased, the prices for fish which are destined for animal food have shown virtually no change.

Furthermore, in the years since 1956, landings of fish for the fillet market have risen from 17.1 million lb to 39.1 million lb in 1965 with no appreciable change in fishing effort (Forrester, 1967). It appears therefore that increased demand and relatively high prices for other species has left little trawling effort available for the animal food fishery. Continued high demand for, and production of, fillets, while it will likely keep landings of whole fish for animal food depressed, will result in a continued supply of fillet waste for processing. Resurgence of the animal food fishery might depend on: (1) a desire on the part of mink ranchers to obtain the type of protein which whole fish can supply but fillet waste cannot, because of its lower fat content, or (2) a decline in the fillet market fishery with the consequence that demand for fillet scrap will exceed the supply.

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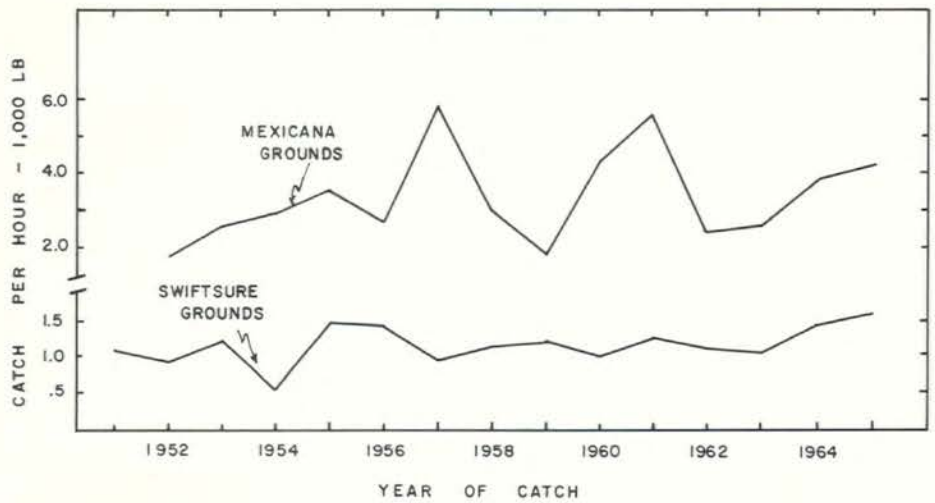

Estimates of apparent abundance (catch per hour) of arrowtooth flounder on Mexicana and Swiftsure grounds, 1951-1965.

Table III. Fishes observed in British Columbia landings of whole fish for animal food during 1958-1966.[a]

Family and common name	Scientific name
*Rajidae – skates	
Big skate	Raja binoculata (Girard)
Longnose skate	Raja rhina (Jordan and Gilbert)
Starry skate	Raja stellulata (Jordan and Gilbert)
Chimaeridae – chimaeras	
Ratfish	Hydrolagus colliei (Lay and Bennett)
Merlucciidae – hakes	
Pacific hake	Merluccius productus (Ayres)
*Gadidae – cods	
Whiting	Theragra chalcogrammus (Pallas)
Pacific tomcod	Microgadus proximus (Girard)
Pacific cod	Gadus macrocephalus (Tilesius)
*Bothidae – sand dabs	
Mottled sand dab	Citharichthys sordidus (Girard)
Speckled sand dab	Citharichthys stigmaeus (Jordan and Gilbert)
Pleuronectidae – flounders	
*Arrowtooth flounder or turbot	Atheresthes stomias (Jordan and Gilbert)
*Flathead sole	Hippoglossoides elassodon (Jordan and Gilbert)
*Slender sole	Lyopsetta exilis (Jordan and Gilbert)
Petrale sole or brill	Eopsetta jordani (Lockington)
Sand sole	Psettichthys melanostictus (Girard)
Curlfin sole	Pleuronichthys decurrens (Jordan and Gilbert)
C-O sole	Pleuronichthys coenosus (Girard)
English or lemon sole	Parophrys vetulus (Girard)
*Butter sole	Isopsetta isolepsis (Lockington)
Rock sole	Lepidopsetta bilineata (Ayres)
Yellowfin sole	Limanda aspera (Pallas)
Dover sole	Microstomus pacificus (Lockington)
Rex sole	Glyptocephalus zachirus (Lockington)
*Starry flounder	Platichthys stellatus (Pallas)
Embiotocidae – seaperches	
Pile seaperch	Damalichthys vacca (Girard)
Shiner seaperch	Cymatogaster aggragata (Gibbons)
Anoplopomatidae – skilfishes	
Sablefish	Anoplopoma fimbria (Pallas)
Hexagrammidae – greenlings	
Lingcod	Ophiodon elongatus (Girard)
*Scorpaenidae – rockfishes	
Pacific ocean perch	Sebastodes alutus (Gilbert)
Silvergrey rockfish	Sebastodes brevispinis (Bean)
Copper rockfish	Sebastodes caurinus (Richardson)
Yellowtail rockfish	Sebastodes flavidus (Ayres)
Quillback rockfish	Sebastodes maliger (Jordan and Gilbert)
Black rockfish	Sebastodes melanops (Girard)
Bocaccio	Sebastodes paucispinis (Ayres)
Orange rockfish	Sebastodes pinniger (Gill)
Red snapper	Sebastodes ruberrimus (Cramer)
Flag rockfish	Sebastodes rubrivinctus (Jordan and Gilbert)
Spinycheek rockfish	Sebastolobus alascanus (Bean)
*Cottidae – sculpins	
Staghorn sculpin	Leptocottus armatus (Girard)
*Batrachoididae – toadfishes	
Midshipman	Porichys notatus (Girard)

[a] Any species legally landed may be used for animal food in British Columbia.
* Those marked with an asterisk make significant or regular contribution to animal food.

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Table IV. Volume and landed value per lb various species of fish taken by otter trawls in British Columbia in 1956 and 1966.

Species	1956 Weight million lb	1956 Value cents/ lb	1966 Weight million lb	1966 Value cents/ lb
"Sole" or Flounders (various spp.)	7.2	4.7	10.3	6.5
Pacific cod	5.1	4.4	26.8	6.9
Lingcod	2.4	8.9	4.3	12.0
Pacific Ocean perch	0.3	4.4	5.2	4.2
Other rockfish	0.2	3.0	0.5	5.4
Weighted mean value		5.2		7.0
Animal food	10.5	2.4	4.8	2.5

News Roundup

Consumer Consultants

Miss Gwen Leslie, B.Sc.H.E., has been appointed Consumer Consultant for the Central Region of the federal Department of Fisheries, with headquarters at Winnipeg.

Miss Leslie was born in Morden, Manitoba, and attended elementary and high schools there before entering the University of Manitoba. She was a member of the Home Economics Students' Council, a member of the staff of The Manitoban and campus reporter for the Winnipeg Free Press.

After graduation, she served as Home Economist with the Manitoba Government at the Manitoba School for Mental Defectives, Portage la Prairie; as assistant dietitian, Municipal Hospitals, City of Winnipeg; as Food Editor, The Winnipeg Tribune, for the past nine years, as an associate editor of The Country Guide.

Miss Gwen Leslie, Consumer Consultant at Winnipeg.

She has been active in the Canadian Home Economics Association having chaired the Manitoba Section's committee on Professional Progress and acted as publicity chairman for the national association from 1962 to 1964. She has served on the executive of the Manitoba Home Economics Association and is now its past president. She is a past president of the Winnipeg branch, Canadian Women's Press Club; past regional director, Canadian Women's Press Club and a member of the Canadian Farm Writers' Federation.

Miss Jeri Johnson is the new Consumer Consultant with the Department of Fisheries at Toronto, Ont.

A native of Saskatchewan, she attended public and high school there and gained her B.Sc. H.Ec. from the University of Saskatchewan in 1960.

After a period as home economics teacher at Kelowna Junior High School, Kelowna, B.C., Miss Johnson joined the staff of Calgary Power as assistant home economist and was subsequently appointed home service supervisor with the City of Calgary Electric System involving promotion of electricity by means of food demonstrations.

Miss J. Johnson, Consumer Consultant at Toronto

Immediately prior to joining the Department of Fisheries she was home economist with S. and L. Seasonings, Toronto, working in the field of product development.

Miss Johnson has travelled extensively in Great Britain, Europe and the United States.

Lobster Licences

In line with government policy of tighter management of the valuable lobster fishery in the Maritime Provinces, operators' lobster fishing licences in all Maritime districts will be limited this year to those persons holding such licences in 1967.

In making the announcement in Ottawa, Fisheries Minister H.J. Robichaud said exceptions may be made where there are extenuating circumstances. Such situations will be examined by

committees on which there are representatives of the Department, fishermen and lobster buyers. This year marks the first wide scale application of licence restrictions, but a similar policy was applied last year in lobster fishing district No. 7B. That area included the waters off Prince Edward Island between North Cape and East Point.

Mr. Robichaud said that this year's action followed requests received from all lobster fishing districts which, he said, evidenced that the majority of fishermen favoured such a policy. The Minister added that there will be no limitations on licences issued to helpers aboard lobster fishing boats. Lobster licences were formerly 25 cents, but this year they have been increased to $2.00 for the boat operator and to $1.00 for helpers.

Extension of lobster licence limitation to all Maritime fishing areas is described as a further step in the Department's program to deter over-exploitation of the important lobster resource. Earlier this month the Minister of Fisheries put a limit on the number of traps to be fished by each fisherman in the Maritimes in 1968. Quebec has had trap limitations for some time. Because individual fishermen in Newfoundland operate on a more limited scale, a trap limit for that province is not being considered at this time.

Obituary

John B. Rutherford, recently retired Assistant Director and Chief of the Research Branch of the Economics Service, Department of Fisheries, died in Ottawa last month, aged 61. He had retired due to ill health in January.

Born in Winnipeg, Man., he was the son of the late Dr. W.J. Rutherford, founder of the College of Agriculture in Saskatchewan. He graduated with B.S.A. and M.S.C. degrees from the University of Saskatchewan, doing additional graduate work at Iowa State College and the University of Minnesota.

With the Dominion Bureau of Statistics from 1935 to 1947, except for war service 1941-45 when he served with the Canadian Army, he was Chief of the Agricultural Branch of the Bureau. He later became Head of the Economics and Statistics Intelligence Service of the Food and Agriculture Organization (F.A.O.) of the United Nations in Rome.

In 1949, Mr. Rutherford was appointed as an Economist and Director of the Fisheries Prices Support Board administered by the federal Department of Fisheries, and he joined the Department in the following year to take charge of the Economics Research Branch. He was assigned to temporary service with the Royal Commission on Canada's Economic Prospects in 1956, and was Director of Research for the Royal Commission on Price Spreads of Food Products in 1958-59. He was author of a number of papers and publications on fisheries economic research, most recently (with D.G. Wilder and H.C. Frick), "An Economic Appraisal of the Canadian Lobster Fishery", published by the Fisheries Research Board of Canada, 1967.

He is survived by his widow, Gladys, a son John, and daughter, Mrs. J.M. Russell, in Oakville, Ont.

This new high-speed 36-foot fibreglass patrol boat, which is shortly to be added to the federal Department of Fisheries' Maritime fleet, was built in Sydney, B.C. She will operate in Northumberland Strait on fisheries protection and search and rescue work.

Smelt Run Late

The commercial smelt fishing season in New Brunswick and Nova Scotia was extended by 10 days this year because the smelt runs in the two provinces were about three weeks later than normal.

Early smelt fishing operations in both provinces were hindered by ice conditions. When the season opened smelts were bringing six cents a pound, but the price later jumped to nine cents. In some districts fishermen were getting as much as 11 cents a pound.

World Trade in Fish Set Record in 1966

World trade in fishery commodities (excluding Mainland China) reached a new high in 1966 of approximately $2,400 million, according to the latest Yearbook on Fishery Statistics issued by the Food and Agriculture Organization.

This is about $220 million higher than 1965 and $420 million above 1964. In quantity it represented more than six million metric tons of fresh, frozen, cured and canned products, and fishmeals and oils. To produce these, the 151 countries contributing to the total used about 20 million tons of whole raw fish from their total catch of 50 million tons.

"It can be said that two out of five tons of fish caught by these countries during 1966 crossed a national boundary in one form or another" said L.P.D. Gertenbach, Chief of the Current Statistics Section of the FAO Department of Fisheries, which compiled the report.

Japan was the leading exporter-earner, according to the Yearbook, with $283,820,000 for 519,300 metric tons sold abroad. Peru, No. 1 fish-catching nation, exported the largest quantity – 1,419,200 tons, almost all fishmeal – but was third in earnings with $204,651,000.

Second after Japan as exporter-earner was Norway with $217,434,000 (642,500 tons). Canada was fourth with $196,747,000 (351,900 tons), Denmark and the Faroe Islands fifth with $142,966,000 (411,100 tons) and Iceland sixth with $128,577,000 (496,300 tons).

The biggest importer was the United States, which bought 1,112,400 metric tons valued at $617,267,000. Second-largest importer was the United Kingdom with $266,398,000 worth of imports (701,300 tons). The Federal Republic of Germany was third with $183,227,000 (778,000 tons), France fourth with $150,044,000 (325,000 tons), Japan fifth with $129,913,000 (266,000 tons) and Italy sixth with $122,552,000 (293,600 tons). European nations, on the whole, were the biggest importers and exporters, both among themselves and with the rest of the world.

It is estimated that more than two-thirds of the total 1966 catch went for human consumption and was marketed fresh, frozen, cured and canned. The remainder was reduced to fishmeal or oils for animal feeding. Almost one-third was sold fresh. Cured fish accounted for 14 per cent, frozen fish 12 per cent and canned fish 9 per cent.

Small increases were reported in frozen and canned fish and in fish reduced to fertilizer. Fresh fish and cured fish production dropped slightly. Said Mr. Gertenbach: "There was a steady, if not spectacular increase in frozen products. In fact, in the whole of frozen and chilled products there have been steady increases each year in virtually all the continents."

Dried and salted fish production was slightly down, but there was an increase in trade in these products, mainly in Asia. Production of canned salmon, herring sardines, anchovies and tuna was up, with trade expanding steadily. Trade also increased in fresh and frozen crustaceans. Fishmeal produced from oily fish species reached a new peak of about 3,770,000 tons.

Herring Waste

Fisheries Minister H.J. Robichaud has warned that purse seiners operating in Maritimes and Newfoundland waters which catch more herring than can be used will be subject to licence cancellation.

Mr. Robichaud said he had received reports, confirmed by Fishery Officers, that purse seiners out of Maritimes and Newfoundland ports were catching more herring than either the catcher vessels or packing boats could carry back to processing plants. As a result, substantial quantities of herring have been dumped at sea.

"This is a most undesirable waste of herring," the Minister said, "and in future any purse seiner caught dumping herring will be immediately liable to having its licence cancelled".

NFLD. POLLUTION LABORATORY

In the article "Pollution Laboratory Expanded in Newfoundland" which appeared in the March, 1968, issue of FISHERIES OF CANADA, pages 17 and 18 were inadvertently transposed. We apologize to readers for any confusion resulting from this error.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-January 1966-1967		May-January 1967-1968	
	Landings (1) '000 lbs	(2) Value $'000	Landings (1) '000 lbs	(2) Value $'000
CANADA - TOTAL	2,153,757	144,122	2,028,066	134,718
ATLANTIC COAST - Total	1,679,035	86,605	1,800,460	90,352
Cod	475,398	21,063	474,250	20,887
Haddock	70,802	5,023	63,488	3,969
Pollock, Hake, Cusk, etc.	51,925	1,980	43,435	1,678
Other Groundfish	7,337	126	9,445	123
Redfish	168,097	4,695	161,922	4,203
Catfish	3,986	132	3,848	123
Halibut	3,098	1,152	2,890	1,111
Other Flatfishes	233,104	7,656	224,639	7,275
Herring & Sardines	532,918	5,986	689,505	7,317
Mackerel	25,743	901	24,724	944
Alewives	8,067	141	6,501	104
Salmon	5,209	2,542	6,202	3,343
Smelts	2,737	238	2,027	205
Swordfish	7,260	3,109	7,915	3,220
Other Fish	13,498	488	11,025	407
Lobsters	35,157	20,240	33,710	22,167
Clams & Quahaugs	4,236	248	4,764	316
Scallops	14,580	6,052	10,717	6,390
Other Shellfish	15,883	862	19,453	1,172
Misc. Items	-	3,971	-	5,398
PACIFIC COAST - Total	474,722	57,517	227,606	44,366
Pacific Cods	19,844	1,782	12,020	980
Halibut (3)	31,360	11,235	24,158	6,111
Soles & Other Flatfish	9,338	591	6,527	424
Herring	226,203	3,747	36,585	616
Salmon	162,185	38,347	129,103	34,556
Other Fish	10,747	474	7,482	353
Shellfish	15,045	1,327	11,731	1,321
Misc. Items	-	14	-	5
BY PROVINCES				
British Columbia	474,722	57,517	227,606	44,366
Nova Scotia	583,978	40,084	291,260	40,008
New Brunswick	318,685	10,539	330,019	10,301
Prince Edward Island	57,739	6,478	43,404	8,145
Quebec	132,244	6,508	185,172	7,279
Newfoundland	586,389	22,996	650,605	24,619

(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 - January 1968

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.394	.477
Cod fillets, Atl, frozen, cello 5's	lb.	.330	.390
Cod fillets, smoked	lb.	.422	.493
Haddock fillets, fresh, unwrapped	lb.	.504	.630
Herring, kippered, Atl.	lb.	.270	.310
Mackerel, frozen, round	lb.	.200	.287
Lobsters, canned, Fancy	Case 48-½ s	-	67.320
Sardines, canned	Case 100-¼ s	9.775	9.567
Halibut, frozen, dressed	lb.	.488	.523
Silverbright, frozen, dressed	lb.	.618	.650
Coho, frozen, dressed	lb.	.920	.947
Sockeye, canned, grade A	Case 48-½ s	27.640	28.233
Pink, canned, grade A	Case 48-½ s	17.120	17.650
Whitefish, fresh	lb.	.450 (1)	.567
Lake trout, frozen	lb.	.442	.547

(1)- Dressed.

PRICES PER CWT. PAID TO FISHERMEN

(Week ending Jan. 13th)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.75
Cod Market	5	5.5
Haddock	8.5	9
Plaice	5	4.5
Black's Harbour		
Sardines	2	-
Vancouver		
Ling Cod	12	-
Gray Cod	7.5	7.5
Soles	8.5	8.5

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF JANUARY

	1967 '000 lbs	1968 '000 lbs
TOTAL - Frozen Fish, Canada	83,990	67,820
Frozen - Fresh, Sea Fish - Total	59,993	43,658
Cod, Atlantic, Fillets & Blocks	10,078	4,933
Haddock, fillets & blocks	3,626	3,945
Rosefish, fillets & blocks	6,129	4,353
Flatfish, (excl. halibut), fillets & blocks	6,578	7,917
Halibut, Pacific, dressed & steaks	7,634	6,878
Other Groundfish, dressed & steaks	1,905	1,107
Other Groundfish, fillets & blocks	5,559	3,082
Salmon, Pacific, dressed & steaks	6,441	4,819
Herring, Atlantic & Pacific	532	486
All Other Sea Fish, all forms	8,661	3,863
Shellfish	2,850	2,275
Frozen - Fresh, Inland Fish - Total	8,132	10,114
Perch, round or dressed	251	2,518
Pickerel, (Yellow & Blue) fillets	1,339	1,309
Sauger, round or dressed	(1)	673
Tullibee, round or dressed	457	165
Whitefish, round or dressed	1,550	1,038
Whitefish, fillets	372	207
Other, all forms	4,163	5,910
Frozen - Smoked Fish - Total	1,336	1,331
Cod Atlantic	686	360
Sea Herring, kippers	380	613
Other, all forms	270	358
Frozen for Bait and Animal Feed	14,529	12,717

(1) - Confidential, included with "Other".

SALTED FISH STOCKS AS AT END OF JANUARY

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		14,036	23,135
Cod		12,993	19,757
Other		1,043	3,378
Dried - salted - Total		15,847	18,366
Cod		14,422	16,961
Other		1,425	1,405
Boneless - Total		467	1,370
Cod		453	1,271
Other		14	99
Pickled - Total	(barrels)	12,751	21,095
Herring	"	6,436	11,322
Mackerel	"	3,433	8,137
Alewives	"	2,745	1,636
Turbot	"	137	-
Bloaters	(18 lb. boxes)	51,423	154,390
Boneless Herring	(10 lb. boxes)	(1)	(1)

(1) - Confidential

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - OCTOBER
(Value in Thousands of Dollars)

		1967 $'000		1968 $'000
Total Exports		128,187		125,100
By Markets:				
United States		89,589		84,536
Caribbean Area		9,567		9,953
Europe		24,388		25,895
Other Countries		4,643		4,716
By Forms:				
Fresh and Frozen		88,969		82,774
Whole or Dressed	29,706		25,209	
Salmon, Pacific	9,812		8,830	
Halibut, Pacific	4,186		2,524	
Cod, Haddock, Hake	266		198	
Swordfish	3,460		3,431	
Other Seafish	4,750		4,754	
Whitefish	2,636		2,224	
Pickerel	1,730		1,093	
Other Freshwater Fish, n.e.s.	2,866		2,155	
Fillets, Blocks and Slabs	39,761		35,794	
Cod, Atlantic	11,507		10,093	
Haddock	4,081		4,148	
Ocean Perch, Hake, Cusk, Pollock	6,157		6,497	
Flatfish	8,096		8,842	
Pickerel	2,104		1,080	
Other	7,816		5,134	
Shellfish	19,234		21,554	
Lobster (Alive & Meat)	14,178		15,650	
Scallops	4,798		5,394	
Other	258		510	
Frozen Fish & Shellfish, pre-cooked	268		217	
Cured		11,547		12,638
Smoked	1,084		840	
Herring	690		449	
Other	394		391	
Salted, Wet & Dried	8,912		10,114	
Cod	7,473		8,774	
Other	1,439		1,340	
Pickled	1,551		1,684	
Herring	966		1,035	
Mackerel	330		394	
Other	255		255	
Canned		16,471		17,934
Salmon	10,973		13,061	
Sardines	2,552		2,817	
Lobsters	1,947		1,290	
Other	999		766	
Miscellaneous		11,200		11,754
Meal	5,558		4,633	
Oil	496		735	
Other	5,146		6,386	

Current Reading

GOLDEYE IN CANADA by W.A. Kennedy and W.M. Sprules. Bulletin 161 of the Fisheries Research Board of Canada. Price $1.50 from the Queen's Printer.

Few freshwater fish have been so highly rated by connoisseurs as the goldeye. Earlier this century, the fame of "Winnipeg goldeye" spread throughout most of North America through inclusion on the menus of Canadian railway diners. Goldeye were featured, when available, during the Prairie crossing of the transcontinental runs and travellers began to look forward with anticipation to the feature dinner on this part of the trip. Transient Canadian and American sportsmen were mainly responsible for the spread of its popularity.

Because of the steady decline in annual production of goldeye after 1929 and because of the insufficiency of literature dealing with its general biology and ecology, an investigation was considered necessary. This investigation was planned and carried out by Dr. W.M. Sprules of the federal Department of Fisheries while employed at the Fisheries Research Board of Canada Biological Station, Winnipeg, Man. Unfortunately, other commitments prevented him from completing the study and from preparing the results for publication. Arrangements were made for collaboration with Dr. W.A. Kennedy, while he was at the Board's Biological Station, London, Ont., so that the results of the investigation might be published.

This investigation was undertaken to determine the habits and ecological requirements of goldeye, to find, as far as possible, the reasons for the dwindling supply, to discover and draw attention to hitherto unexploited populations, and to establish sound management policies which could be applied to goldeye fisheries.

THE SALMON PEOPLE by Hugh W. McKervill. Gray's Publishing Ltd., Sidney, B.C. Price $5.80.

Before he entered the United Church ministry, Toronto-born Hugh McKervill worked among the Indians at Bella Bella, B.C. and acquired an intimate knowledge of salmon fishing by operating his own gillnetter.

His experiences of those earlier years have been put to good use in assembling this very readable and often dramatic account of the beginnings and subsequent development of the multi-million dollar salmon industry in British Columbia.

Opening with a description of "the first salmon ceremony" as practised by the Tsimshian people of the Northwest coast, Mr. McKervill tells how life changed for the natives of B.C. with the arrival of the white man, lured first by furs and gold and then by the bounteous salmon resource.

The history of salmon canning on the West Coast is dealt with in some detail, including references to E.A. Smith's revolutionary invention "the Iron Chink", the remarkable floating cannery nicknamed "Spratt's Ark", and the pioneers of the "cannery clan" such as Alex Ewan, Tom Ladner, E.A. Wadhams, Marshall English and Jacob Todd.

Referring to the many vicissitudes of the pioneer canning industry Mr. McKervill says: "It took a rugged adventuresome spirit to gamble against these odds and the men who built the industry were daring individualists who reflected in their characters something of the wild, lawless sea and coastline, but who in turn clothed the coast with a robust, colourful coat of history."

The author notes that in 1917 some 94 canneries were operating along the coast; today most are little more than a nostalgic memory with the total having dwindled to about 20.

Other chapters deal with some of the famous coastal characters – men like Dan McClusky, 'Pegleg' Olsen, Dr. George Darby, and Robert Cunningham, the 'King of the Skeena' – and the story of the world-renown Hell's Gate fishway. The final chapter, entitled 'Don't Go Near the Water', refers to the many problems facing the salmon industry – pollution, logging, power dams and competition from foreign fishing fleets.

Preparation of the manuscript for this book, which is a welcome addition to Canada's historical lore, was subsidized by the Centennial Commission.

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Spring Style for Canned Fish

THE FLAVOUR, convenience and versatility of canned fish and shellfish are well known to most Canadian consumers. Styling them for spring menus is no problem. With eggs now in peak supply, an elegant seafood soufflé makes an economical luncheon or supper dish, suggest the home economists of the federal Department of Fisheries.

Contrary to widespread supposition, a seafood soufflé is an easy dish to make, they say. It consists of a thick white sauce blended with egg yolks, enriched and flavoured with a finely chopped seafood, combined with whipped egg whites, then baked. Heat causes the many bubbles of air captured in the egg whites to expand and the batter rises, taking on a moist, delicate, fluffy consistency. The cooked dish comes to the table high and handsome, its golden brown crust fairly bursting with airy grandeur.

The following tested recipe makes a delicious soufflé. However, an important point to remember is to time the meal so that the soufflé can be served as soon as it is taken from the oven. As the air inside the dish cools, the soufflé falls. If for any reason the meal is delayed, the soufflé will accommodate you by staying puffed and moist for a short period if left in the oven and the heat reduced.

Seafood Soufflé

1 cup canned fish or shellfish
3 tablespoons butter, melted
3 tablespoons flour
¼ teaspoon salt
1 cup milk
3 egg yolks, beaten
1 tablespoon minced parsley
4 egg whites

Drain and mince the canned fish or shellfish of your choice. If using canned salmon, save the liquid and substitute it for part of the milk to make required one-cup volume. Blend together the melted butter, flour, and salt. Add milk gradually. Stir over medium heat until sauce is thick and smooth. Remove from heat and stir in egg yolks gradually. Add minced fish and parsley. Using a clean beater with no trace of egg yolk, whip the egg whites to the point where they hold short, distinct, moist looking peaks. A speck of egg yolk in the whites will keep them from whipping to their lightest. Gently but thoroughly fold the slightly cooled sauce into the egg whites. Turn at once into a 5-cup baking dish.

While a soufflé may be baked in any casserole, a soufflé dish with straight sides is recommended. For an attractive puffed, finished appearance, fill the dish almost level with the top and then tie a 3-inch aluminum foil collar around the edge to hold the souffle as it rises. Remove collar when you take the dish from the oven. Bake soufflé in a moderate oven, 350° F, for 40 to 45 minutes, or until set, puffed, and lightly browned. Makes 4 servings.

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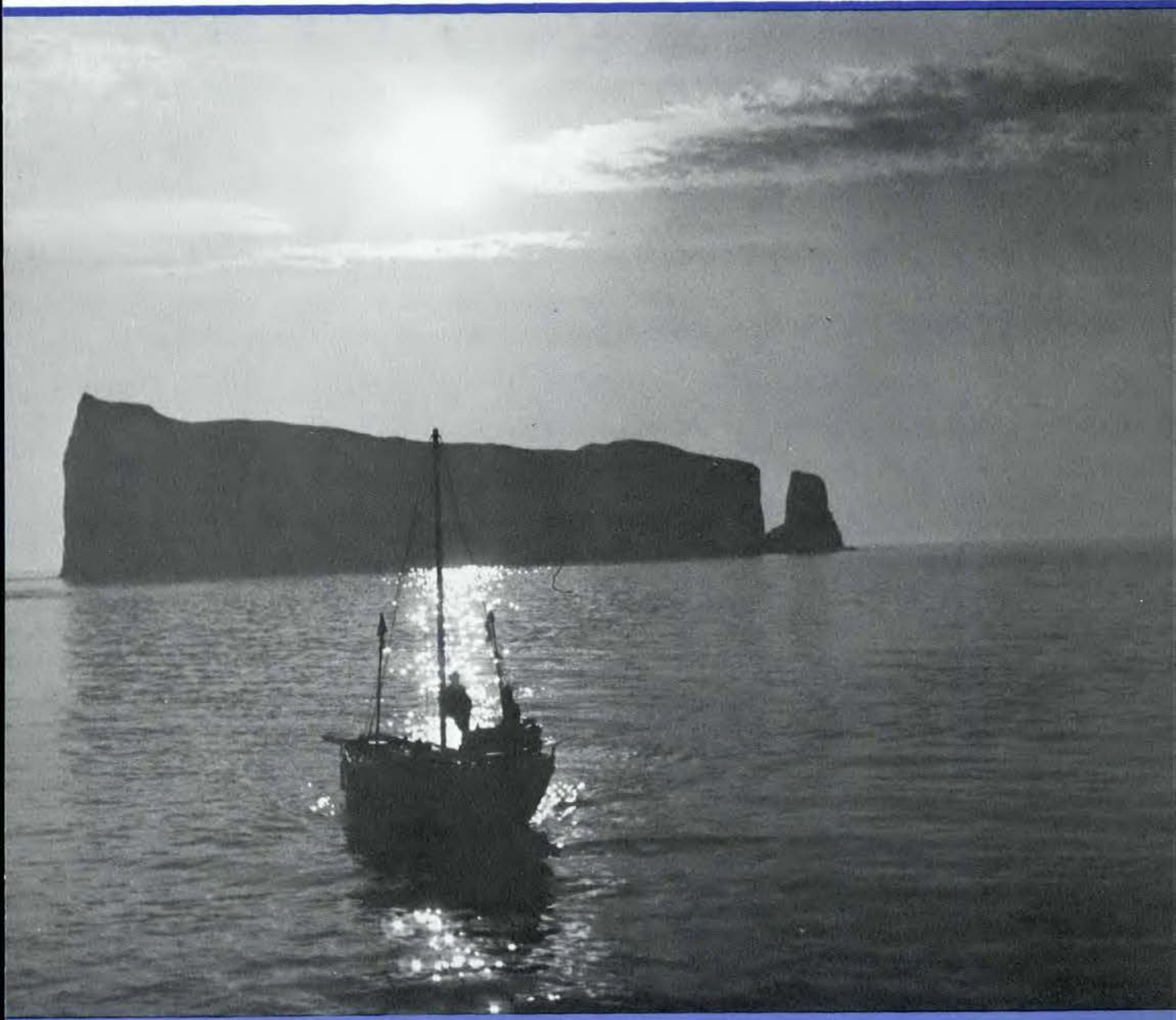

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Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
(formerly Trade News)

Editor
E. H. HEARNDEN

May, 1968

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COVER PHOTOGRAPH - A Quebec fisherman brings his vessel into harbour after a night of fishing at Perce Rock, Que.

Technical Assistance to Canada's Commercial Fisheries

BY JEAN FRECHET*

A DECADE ago there was no Canadian government agency with responsibility in the technological development of the fishing industry. A number of fishing methods were archaic or obsolete and a large proportion of shipboard equipment was not used efficiently. Many species of fish were under-exploited while other commercially significant species were entirely unexploited.

The federal Department of Fisheries now has the nucleus of a section devoted entirely to fishing operations. The principal role of the permanent officers in this group is to assess the problems associated with limited catching abilities, and to recommend types of vessels, equipment, catching gear and techniques with a view either to creating a new fishery or improving an existing one. This team of specialists must also keep up-to-date with respect to related developments in fisheries throughout the world, provide advice to federal and provincial government agencies and the industry, and be responsible for planning, implementing and reporting on a number of projects each year.

It would be impossible for them to implement all the projects undertaken, so it is necessary to engage others with specialized knowledge, under short-term contract arrangements. These men are carefully selected for specific development projects.

The relevant knowledge of the specialist can usually be transmitted to a trainee during a period of time which may vary from six weeks to six months. He may work in several areas on similar development projects. Some of his best trainees may in turn be taken under contract if the need is apparent.

By far the greater number of people contracted under special services are experienced masterfishermen who have achieved outstanding reputations in particular fisheries through contributions resulting in improvements to specific catching gear and/or refinements in the operational technique of such gear. They are knowledgeable in fish behaviour and familiar with efficient fishing vessel layout, machinery and equipment. They are also experienced with acoustical fish detecting electronics equipment which contribute to maximum catching efficiency. Such men have a high earning capacity in their own particular sector of the industry.

Jean Frechet

Before contracting the services of a specialist, an assessment is made of the earnings of men performing similar functions in his own region or country. If the work in Canada is in remote areas, an incentive is offered to attract the man to leave his home base or country and to compensate for possible loss of earnings in his own enterprise. It must also

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Squid jigging machine.

be recognized that a contract is made for a limited period only.

VARIED ASSIGNMENTS

Specialist services are contracted for a wide variety of assignments. Some examples follow:

Crab Traps	Scallop Surveys
Herring Seines	Mollusc Surveys
Drift Nets	Eel Fishery
Fish Processing	Electric Trawls
Cod Traps	Seaweed Surveys
Shrimp Trawls	Lake Trawls
Gear Surveys	Whaling
Gill Nets	Vessel Designs
Tuna Seines	Capelin Seines

A few typical projects, outlining the area of work and the major objectives, are given below, although it should be kept in mind that there are many secondary objectives not listed in this brief analysis.

To increase catch per production unit or unit of effort.

Squid Fishing. Squid were traditionally caught in Newfoundland by hand jiggers, usually by two men in a dory.

A Japanese master fisherman was contracted to introduce a Japanese automatic squid jigging machine. The ingenious Newfoundland fishermen subsequently adapted this machine to local materials and conditions. Their machine, derived from the Japanese unit, is out-producing the traditional hand method by 400% and is gaining in popularity throughout the Newfoundland squid fishery.

To lengthen limited fishing seasons.

Gill Nets. In Quebec and Newfoundland, inshore codtrap fishing lasts an average of six weeks of reasonably good productivity.

An experienced gill net fisherman from Lake Erie was contracted to introduce the Great Lakes gill netting method in order to catch cod before and after the spawning run of capelin, which attracts cod to the stationary traps. Following two seasons of demonstration, many thousands of gill nets are in use, permitting the inshore cod fishermen to be productive over a much longer season. Indeed, often the gill nets have been a "life-saver" in some areas where the codtrap fishery has been a failure.

To harvest unexploited species.

Queen Crab. In the northwest Atlantic queen crabs were caught incidentally by trawlers fishing groundfish but were not harvested.

Alaska and British Columbia crab fishery specialists were contracted to introduce Pacific techniques to the Atlantic area. As a result a number of operators in the Atlantic region are now successfully catching crabs by means of traps and processing this previously unexploited species, with several more planning to enter the new field of endeavour. A

Purse seiner in Bonne Bay, Newfoundland.

Codend of a midwater trawl comes aboard.

large number of presently unproductive draggers and long-liners are being converted for crab fishing and new designs of vessels are being prepared for this promising fishery.

To utilize knowledge of fish behaviour in more productive fishing techniques.

Herring Mid-water Trawling. The great weight of the herring catch is taken in Canada by purse-seiners. In order for a purse-seine to be effective, however, the herring must be concentrated at or near the surface. In addition, the gear cannot be used in rough weather or over rocky bottom (if the depth of water is less than the depth of the net).

Herring are often scattered over wide areas or concentrated in deep water layers and consequently unavailable for purse-seining. It was, therefore, highly desirable to introduce an alternative fishing method to harvest herring effectively under these conditions.

A vessel and gear technologist of the Industrial Development Service, who had previously been involved in special projects relating to mid-water trawling, was assigned to a study of the methods used in Europe and to combine such methods with Canadian techniques. He subsequently supervised the rigging out of a large Nova Scotia vessel and trained the crew for what proved to be a most successful pelagic trawling project. Some of these fishermen have been placed under contract to introduce and demonstrate this technique to the Atlantic region and the British Columbia fishery.

There are now over 100 noteworthy cases in the files of the Department's Industrial Development Service, in which master fishermen have been contracted for such assignments as:

Lowering harvesting costs;
Increasing vessel productivity;
Increasing the harvest of species only available at certain seasons;
Reducing manual labour;
Improving handling of gear and fish.

The provision of technical assistance to Canada's fisheries, however, is not limited to actual fishing operations. Naval architects are involved in originating designs for new and improved fishing vessels; expert fish processors and engineers concentrate on fish handling and unloading, and on fish processing at sea and ashore.

Each project undertaken requires the preparation of interim reports and final reports for publication. The contracted specialist, however, is usually deeply involved in providing technical advice, in training, and in demonstrating complicated techniques. Therefore, each project requires a knowledgeable observer/reporter to assure the provision of adequate reporting. Such assistants must be able to demonstrate ability in the collection of specialized data; they must as a rule be prepared to go to sea. All personnel must work lengthy, irregular hours, often at night and on week-ends and sometimes under arduous conditions.

Outside of the group of permanent officers, the specialists and observers are with the Industrial Development Service for a short time only, since the requirement of their special skills is generally for a very limited period. Their employment on a contract basis, to augment the work of the full-time staff of specialists, is proving to be a most valuable and efficient means of giving a new look to Canada's developing fisheries. It is helping to revolutionize some sections of the fishing industry, to increase income and to upgrade the status of the primary producer at relatively little cost.

Indeed, in this forward-looking program the federal Department of Fisheries is receiving the the complete co-operation of the provincial fisheries administrations, the fishing companies, and of course the support of the men who toil on our oceans and inland waters.

Production Tops 15,000,000 lbs.

The Fisheries of Saskatchewan

BY J.G.K. BARRIE

IT MAY come as a surprise to those who tend to think of the province of Saskatchewan as "bald prairie", to learn that about one-eighth of its surface area of 251,700 square miles is water.

The water bodies that make up this 31,500 square miles, range from tiny pothole lakes in the Great Sand Hills of the southwest, to the tremendous lakes of the Precambrian Shield.....and from the tiny trout streams of the Missouri watershed, to the mighty clear cold rivers of the north such as the Churchill and Fond du Lac.

These gigantic watersheds and the tens of thousands of lakes and ponds that drain into them comprise a vast number of environments that provide a basis for one of Canada's major inland fisheries.

Fish invaded the water areas of what is now the Province of Saskatchewan sometime after the disappearance of the last glacial age. During the post-glacial period, American Indians probably occupied this region and undoubtedly caught the same species of fish as are present in that area today. The fisheries played a vital role in the province's early history by providing a readily available supply of fresh food for the explorers and fur traders, and then later, the hardy pioneer settlers. Fur traders brought the first gill nets into the province.

As Saskatchewan became more settled and the economy of the province developed, the fisheries began to play a less vital role. In areas near lakes and rivers, the fish stocks were utilized for domestic purposes and even today this source of food has great significance in the diet of northern residents. There are at least 61 species of fish, comprising 17 families, to be found in these northern Saskatchewan waters. Some of the more common are whitefish, lake trout, walleye (pickerel), and northern pike. Whitefish is the province's most important commercial

Commercial fishermen pull nets from under the ice at Lac La Ronge, Saskatchewan.

stock, as it represents over 50% of the total catch. Other fish of commercial significance include lake trout, pickerel, pike, sucker, ling, tullibee, sturgeon, goldeye, buffalo fish and perch. Whitefish, pickerel and pike are the most plentiful and widely-spread species, as they are found in nearly all lakes in Saskatchewan.

MARKET VALUE

The waters in northern Saskatchewan yield annually in excess of 15,000,000 pounds of fish, of which about half is whitefish. The total market value each year means several millions of dollars to the industry. The province, which has the third largest freshwater fishery in Canada, issues about 3,000 commercial fishing licences annually.

All fish that are commercially exported out of the province to the United States, Europe or to other provinces in Canada, are inspected by the federal Department of Fisheries, who maintain permanent offices in Prince Albert as well as inspection stations at Meadow Lake and Big River. There are at present eleven fish plants in Saskatchewan that are registered and inspected by the federal Department of Fisheries. They produce about two million pounds of fillets annually.

A recent development is the harvesting of brine shrimp and brine shrimp eggs on Little Manitou Lake, a natural salt water lake near Watrous, Saskatchewan. Brine shrimp products are used as food for aquaria fish by pet fish hobbyists. Two companies harvested 500,000 lbs in 1966. The expansion of this industry to other saline lakes in the province is now being undertaken.

Ambrose Vouvier sets net for commercial fishing operation at Canoe Lake, Saskatchewan.

Approximately 250 lakes in the province are fished commercially, the vast majority of them being

Winter fishing at Last Mountain Lake, Saskatchewan. Nets are pulled off a tractor-drawn sled and "fed" into the water through holes in the ice.

Pulling nets on Peter Pond Lake near Dillon, Saskatchewan.

in the northern half of the province. The most prolific fishing grounds are Lakes Athabaska, Reindeer, Big Peter Pond and Wollaston.

Saskatchewan is one of the top Canadian producers of whitefish and lake trout. About seven million pounds of whitefish and two million pounds of lake trout are harvested annually. The industry also takes approximately six million pounds of other species such as pickerel, northern pike, sucker and cisco for a total annual harvest of fifteen million pounds. About 75% of the total is exported to United States markets. In addition to the commercial production, the mink ranch industry utilizes the "coarse" species of fish that have little other commercial value. This accounts for a harvest of five million pounds. An additional two million pounds are taken by domestic and free Indian permit fishermen.

The introduction of refrigeration, use of aircraft and the extension of roads into the north, has completely changed the complexion of Saskatchewan's fishing industry from the early days when settlers farmed in the summer and fished commercially in the winter. Until a few years ago, commercial fishing was predominantly a winter operation. However there is now a definite trend toward summer production. In 1954, 46% of the total harvest was taken in the summer season. This increased to 65% in 1965. The summer commercial fishery has become more attractive to fishermen and dealers due to the construction of modern handling and freezing facilities, the use of larger and more seaworthy fishing craft, improved transportation equipment and the building of access roads into the northern areas of the province.

Transportation is still the main difficulty in marketing fish caught in both winter and summer. It is a long way from northern lakes to cities in the southern part of the province and U.S. centres. The advent of snow vehicles has replaced the general use of dogs and the old horse and sleighs of another era, although dogs are still used in some of the remote northern areas.

Aircraft and the establishment of new plants to process and freeze the fish are chiefly responsible for the predominance of summer fishing. From northern lakes, aircraft fly the catch to be iced and packed at Beaver Lake, near the Manitoba border, close to Flin Flon. Fish are also flown from Wollaston Lake and trucked from Reindeer Lake to Lynn Lake, Manitoba. A unique situation for Saskatchewan is that fish from Athabaska Lake are transported to the railhead by barge.

SPEEDY TRANSIT

From Beaver and Lynn Lakes, this perishable food product is assured speedy transit to distant cities. Small skiffs and canoes, between 15 and 18 feet in length, are the most commonly used vessels in this fishery. A few two- or three-man boats, 38 to

40 feet in length, are also used primarily on Reindeer, Wollaston and Athabaska lakes.

The province's fisheries are administered by the Fisheries Branch of the Saskatchewan Department of Natural Resources. On the recommendations of the Royal Commission on Fisheries of the Province in 1947, a fisheries research program was inaugurated to secure information on the province's fishery resource. The first major biological and fisheries investigation was undertaken on Lac la Ronge. Since the initiation of the research program, fisheries surveys have been carried out on all major waters. Many other small lakes have been examined also.

A major step was taken in 1964 in the development of the freshwater fisheries with the establishment of the Federal-Provincial Prairie Fisheries Committee. This committee, composed of Deputy Ministers of the federal Department of Fisheries and the appropriate Departments of Manitoba, Saskatchewan and Alberta, was set up as a result of the first Federal-Provincial Fisheries Conference held in Ottawa.

Few people in the province depend on fishing exclusively for their livelihood. However, 2,000 residents derive income from this primary industry, as well as three to four hundred involved in the secondary phases of the industry. At the present time, the Co-operative Fisheries Limited operate eight of the eleven registered fish plants and a large group of the primary producers in the province utilize the service of Co-operative Fisheries Limited.

Workers at a processing plant at Lac La Ronge unload trays of fresh fish from Otter aircraft bringing a catch from Pinehouse (Snake Lake).

Fishermen remove tullibee (ciscoes) from nylon net on Last Mountain Lake. Note plywood windbreak in background.

In the last few years provincial fish culture officials have been placing great emphasis on extending the range of the Arctic grayling species from the far north into the Churchill River area, and on the introduction of eastern brook and rainbow trout and certain warm water species into areas where preliminary studies seem to indicate suitable environment.

FRB APPOINTMENT

Dr. Keith S. Ketchen, Assistant Director of the Fisheries Research Board's Biological Station, Nanaimo, B.C., will be seconded to Fisheries Research Board headquarters at Ottawa for a one-year tour of duty beginning August 1. Dr. Ketchen's appointment is part of a continuing Board program to bring senior scientists to Ottawa for specialized administrative duties, on a one-year basis. He will assume the position held for the past year by Dr. R.G. Ackman who will return to the FRB Research Laboratory, Halifax.

Trends in Marine Fisheries Along the Pacific Coast

BY K.S. KETCHEN

Fisheries Research Board of Canada Biological Station, Nanaimo, B.C.

EDITOR'S NOTE: This article is based on a paper presented by Dr. K.S. Ketchen at a recent meeting of the American Fisheries Society.

IT IS MY intention to review events of the past 50 years and to limit discussion, except in special instances, to fisheries occurring north of the United States-Mexico border in a relatively narrow coastal band running from California to the international date line in Bering Sea, a distance of four to five thousand miles.

It goes almost without saying that a country's historical participation in fisheries is governed by so many factors that it is virtually impossible to make reliable forecasts of events based on past experience. Were it otherwise, one might be urged to conclude absurdly from events subsequent to 1936 along the Pacific coast that the United States is heading out of the business of **catching** fish at an average rate of decrease of 54 million lb. per year and that she will have no fishery at all by 1990. Canadian fish production, on the other hand, has tended to increase rather gradually during the same period, leaving us with the tenuous forecast that her production by 1990 will be about 25% greater than it is today.

Such attempts to predict future developments by consideration of past history are, to say the least, foolhardy for what we are looking at here is the net effect of a number of changes arising from a multitude of causes. While overall production by North American nationals is indeed at a much lower level than it was several decades ago, some fisheries are producing at record levels, some have shown remarkably little change over the years, while still others are today nothing but a memory.

For those fisheries which have undergone change over the past 50 years, and indeed for those which have not, numerous explanations are available ranging from economic, sociological and political factors, to the presence or absence of good management practice or to factors beyond man's control respecting the biology or environment of the species involved. Combinations of these factors may have applied at different phases in the development of fisheries for individual species and of course the picture becomes hopelessly confounded when it is necessary to consider groups of species.

It is inevitable therefore that in attempting to provide you with a reasonably complete picture of developments in the Pacific even straight observation of events, to say nothing of their causes, becomes most hazardous indeed. Sweeping observations on trends applying to the whole coast may provide mistaken impressions of events in particular regions and respecting individual species.

I propose to deal with two primary groups of North American fisheries – first the pelagic ones (for members of the herring, salmon, tuna, and mackerel families) and secondly the demersal or ocean bottom fisheries for crustacea, flounders, cods and numerous other groundfish. This in turn will lead quite naturally into a final topic concerning the development of fisheries by foreign nationals.

A. FISHERIES CONDUCTED BY NORTH AMERICAN NATIONALS

Disregarding the period during the 18th and 19th centuries when vessels of at least five nations plied the waters along the west coast of North America in search of the much-valued sea otter, the Pacific coast fisheries until very recent years have been unique in comparison with those of the eastern and western North Atlantic. For the better part of a century the United States and Canada have been the

only countries involved in fishery enterprises at their Pacific doorstep. This uniqueness, coupled with numerous similarities in the economies and traditions of the two countries, has no doubt had some bearing on the fact that it is only in the northeast Pacific that examples can be found of workable international conservation treaties on fisheries.

1. Fisheries for clupeoids

Contributing very heavily to the Pacific coast fisheries of the past 50 years have been the clupeoid fishes. By far the most important is (or, more accurately, **was**) the Pacific sardine *(Sardinops caerulea).* The development of this mighty fishery principally off California, but also in waters northward to Canada and its subsequent catastrophic collapse needs little elaboration here. So important was this fishery by the middle 1930's that it dwarfed all other Pacific coast fisheries and thus its collapse played the principal role in the declining total fish production of the United States.

The cause of the collapse has been the subject of considerable dispute, some insisting that it was due to overfishing alone while others have attributed most of the misfortune to Mother Nature. The views of Murphy (1966) hold considerable appeal since they invoke, in a sense, both explanations. He considers that the stock was overfished and indeed continues to be overfished, but the environmental void created by the decline of the sardine became occupied by the northern anchovy *(Engraulis mordax).* Furthermore, he considers that the present situation cannot be altered without intervention of man or nature to reduce the abundance of anchovy. Efforts to exploit the large anchovy resource, at least until recently, have been frustrated by regulations designed to protect the anchovy as a forage fish for species valued by the sport fishing fraternity.

The Pacific herring *(Clupea pallasi)* has for many years been exploited by Canada and the United States mainly in the bays, inlets and channels which mark the coastline from British Columbia northward to the Gulf of Alaska. Canada's production has followed a long-term increase, while that in Alaskan waters has tended to decline from maxima achieved in the 1930's and 1940's. There have been noticeably greater population fluctuations in the latter region, but in both regions economic factors have had some bearing on the ups and downs. Demands for fish meal and the excited talk about fish protein concentrates meet with increasing opposition from people who urge that herring fishing be restricted in order to preserve a food supply for the much more valuable salmon stocks.

Although total Canadian production of salmon on the Pacific coast has shown only a slight tendency to decline over the past 50 years, United States production has shown a downward trend since the middle of the 1930's.

2. The salmon fisheries

By far the most valuable of the fisheries along the Pacific coast of North America are indeed those for the five species of Pacific salmon (the sockeye, *Oncorhynchus nerka;* the pink salmon, *O. gorbuscha;* the chum, *O. keta;* the coho, *O. kisutch* and the chinook salmon, *O. tshawytscha).* All five have for many decades been fished commercially, but there is an evermounting competition between commercial and sport fishing interests for a share of the two last-mentioned species. I shall not attempt to provide much of an appraisal of trends since each species must be treated separately and even then satisfactory, verifiable explanations of historical events are virtually impossible. Whereas Canadian total production of salmon has shown only slight tendency to decline during the past 50 years, United States production (which originates mainly in the waters of Alaska) entered a prolonged downward trend in the middle 1930's from which there appears to be little or no sign of recovery.

There are, of course, many factors which contribute to the success or failure of salmon fisheries. Despite strenuous attempts to prevent overfishing, they have not always been particularly successful. Many of the critical factors in the freshwater and marine environments are beyond man's control. Within the past few decades much concern has been expressed concerning society's need for hydroelectric power and hence for power dams, and the ever-mounting problem of pollution of North American river systems. Also within recent times there has been much concern about the interception of salmon on the high seas by nationals of countries other than those possessing the rivers and streams where those salmon originated.

3. Fisheries for scombrid and carangid fishes

The next major group of species which deserves consideration are the tunas, tuna-like fishes, and the mackerels and mackerel-like fishes.

In the warmer waters of the northeastern Pacific and particularly in the tropical waters adjacent to central America there are fisheries for four members or close relatives of the tuna family (the yellowfin, *Thunnus albacares;* the albacore, *T. alalunga;* the bluefin, *T. thynnus;* and the skipjack, *Euthynnus pelamis).* Along with these are the fisheries for species frequently grouped in fisheries statistics as "tuna-like" fishes: the Pacific bonito, *Sarda chilensis* and yellowtail, *Seriola dorsalis.* Finally there are the Pacific mackerel, *Scomber japonicus* and jack mackerel, *Trachurus symmetricus.*

(a) *The tunas and tuna-like fishes*

The albacore, a tuna which has a more northerly distribution than other members of the family, seasonally and only occasionally ventures as far north as the Canadian coast. It was the first of the tunas to be used in the United States canning industry. As market acceptance improved around the time of World War I, the fishery spread to the other species and southward into the tropical seas. Production took a marked upward surge in the 1940's and has since stabilized in the neighbourhood of 300 million lb. per year.

To United States fishermen the most valuable species and indeed the one which accounts for the bulk of the catch is the yellowfin tuna. Almost all of the catch comes from waters off Latin America. The second most important, the skipjack, is likewise taken in tropical waters.

Under the terms of reference of the Inter-American Tropical Tuna Convention, to which belong five out of nine countries which exploit the tunas of the eastern Pacific, attempts are now being made to regulate the fishery for yellowfin tuna. Currently the annual catch, 90% of which is made by the United States, is considered to be greater than that which would provide the maximum sustainable yield. On the other hand prospects appear good for continued expansion of the fisheries for other tunas, particularly the skipjack.

(b) *Mackerel and jack mackerel*

Fisheries for the Pacific mackerel and jack mackerel occur entirely in waters adjacent to California and both species are used almost entirely for canning. The fishery was of negligible importance before 1930 and until 1946 the Pacific mackerel was the dominant species in the catch. The jack mackerel, which until 1947 was taken only incidentally in the fishing for Pacific sardine, now assumes a dominant role in the mackerel fisheries. Fluctuations in availability as well as marketing difficulties account in part for the lack of stability in catch. The current dominance of the jack mackerel appears to have been occasioned by the scarcity of Pacific mackerel (Roedel, 1953).

B. DEMERSAL FISHERIES

We turn now to two groups of fisheries dependent on animals which live on or close to the ocean bottom. In other regions of the northern hemisphere there are great expanses of continental shelf which have provided enormous harvests since early times. Except for eastern Bering Sea, where the shelf projects several hundred miles from shore, the rest of the North American Pacific coastline has a rather narrow shelf rarely over 50 miles wide and in some places as little as one or two miles. It is on the creatures of the continental shelf and upper continental slope that demersal fisheries employing various kinds of fishing gear depend.

1. Fisheries for crustacea

The North American fishery for crustacean shellfish has undergone some remarkable advances in the past 50 years. Until about 1950 most of the attention was devoted to the Dungeness crab *(Cancer magister)* and to a lesser extent to pandalid shrimps of several species.

The most spectacular development in the fisheries for crustacea has been in Alaska where

there is now a burgeoning trap fishery for the king crab *(Paralithodes camtschatica)*. In the short space of 15 years the catch has risen from virtually nothing to 126 million lb. in 1965 and 158 million lb. in 1966. Early reports for 1967 suggest their production is slipping.

Most of the United States catch of king crabs comes from the Gulf of Alaska and regions westward along the Alaskan Peninsula to the Aleutian Islands. In 1964 and 1965, however, the United States revived a fishery which had existed during the early 1950's in the eastern Bering Sea where she competes for the harvest with vessels from Japan.

2. Fisheries for groundfish

I have reserved until the last a commentary on the groundfish fisheries of the west coast of North America, not only because the subject is complicated by a great number of species, caught by a variety of gears, but also because it is in regard to groundfish that so much of importance has developed in recent years. Much has come to pass which changes the complexion of the northeastern Pacific fisheries, for this region, long a "private preserve" for Canadian and United States nationals, has become the site of massive fisheries by Japan and the U.S.S.R.

From 1915 to 1935 groundfish landings by the United States and Canada varied around 100 million lb. per year, approximately half of which consisted of Pacific halibut *(Hippoglossus stenolepis)* taken by setline gear. The remainder consisted of numerous species caught with various kinds of gear including setlines, handlines and forerunners of the modern day otter trawl.

In the late 1930's it was discovered that the dogfish shark *(Squalus acanthias)* was possessed of a liver which contained high concentrations of Vitamin A. Prior to that time the dogfish was used for the manufacture of meal and oil, but to a degree insufficient to reduce its interference with other, more important fisheries. As World War II got under way former sources of Vitamin A (e.g. from Atlantic cod) became much reduced. In response there developed an intensive fishery for dogfish along the Pacific coast, particularly between Oregon and British Columbia. While various types of gear such as setlines and sunken nets were employed to catch this species, most of the catches were taken by a newly created otter-trawl fleet. By 1946 it was apparent that the dogfish had been much reduced in abundance, so much so that there was a conference to consider means of conservation. However, by 1950 the need for such intervention became unnecessary as the fishery rapidly collapsed following the discovery and manufacture of synthetic Vitamin A.

Fortunately dogfish was not the only species which encouraged development of an otter-trawl fishery. Wartime demand for fish to compensate for meat shortages prompted expansion of fisheries for flounders of various species, Pacific cod, lingcod and numerous species of rockfish *(Sebastodes)*. Thus the groundfish fishery following the collapse of interest in dogfish continued on at a level of 220 million lb., or more than double that which prevailed prior to World War II.

Returning to halibut, it should be mentioned our selection of a 50-year period beginning in 1915 catches the tail end of a sharp decline in abundance resulting from a "fishing up" of primitive accumulations and overfishing on grounds closest to port. although total catch stabilized through the 1920's at about 50 million lb., this was being accomplished only by ever-increasing fishing effort and expansion of the fishery to new grounds (Thompson and Bell, 1934). By 1930 a treaty had been signed by Canada and United States which enabled joint action to restore the halibut population to a level which would permit the maximum sustainable yield. Largely as a result of regulations set by the International Pacific Halibut Commission, abundance of halibut was gradually restored with commensurate increase in the allowable catch from waters of the northeastern Pacific.

Throughout the past 35 years North American trawlers have been prohibited from landing catches of Pacific halibut. While there is frequent complaint that trawl fisheries for species less valuable than halibut cannot be prosecuted without significant detrimental effect on halibut, there is as yet no clear evidence in the relatively small region of the Pacific coast where the two fisheries overlap (mainly off British Columbia) that they have been incompatible. Over a large part of the halibut's range in the Northeast Pacific, namely from northern British Columbia to Bering Sea, the only form of fishing for groundfish by North American nationals has been with setline gear and with interest almost entirely in halibut. To this day the North American trawl fisheries extend only from California to British Columbia.

Joint action by the United States and Canada through the International Pacific Halibut Commission has helped restore the abundance of halibut over the past 37 years.

C. THE DEVELOPMENT OF FISHERIES BY JAPAN AND USSR

As of 1953 there remained in the northern hemisphere only one major region in which the resources of groundfish (other than halibut) were essentially untapped. This involved the 150,000 square miles of continental shelf extending from the northern British Columbia coast (Dixon Entrance) 2,000 miles to the westward into Bering Sea.

Japan was the first nation to launch a major trawling operation. Her fishery began in 1954 and expanded rapidly on the rich fishing grounds of eastern Bering Sea. She was joined by the U.S.S.R. in 1959 and by 1961 the groundfish production of these two nations in Bering Sea alone reached an estimated 2 billion lb. (Fig. 7). In that year nearly 60% of the world catch of flounders came from the northeastern Pacific and the bulk of this was yellowfin flounder *(Limanda aspera)* from eastern Bering Sea.

As a result of heavy exploitation during the late 1950's and early 1960's the yellowfin flounder stock declined rapidly. This decline stimulated a shift to alternative fish supplies. Japan turned to other previously unutilized species in Bering Sea (e.g. the Alaska pollock, *(Theragra chalcogrammus)* and at the same time launched a comparatively small operation south of the Alaska Peninsula and in the Gulf of Alaska. Although the U.S.S.R. continued to fish heavily in Bering Sea, she engaged in a major expansion eastward into the Gulf of Alaska with further buildup of her fleet through 1965.

By 1966 the Soviet fishery had extended well southward to British Columbia, Washington and Oregon. Most of the effort, both by Japan and the U.S.S.R., in Alaskan and British Columbia areas was directed to capture of deepwater rockfishes among which the so-called Pacific ocean perch *(Sebastodes alutus)* played a prominent role. This species prior to 1966 had been fished in the southern part of its range to a small extent by Canadian vessels but mainly by those of Washington and Oregon.

The Soviet operation off Washington and Oregon was attracted also by large concentrations of Pacific hake *(Merluccius productus)* which only recently had been discovered and assessed by United States scientific exploratory operations and which showed promise of playing an important role in the Washington and Oregon domestic fisheries.

Groundfish fisheries by North American nationals developed slowly but steadily after World War II and made particularly important gains between 1964 and 1966. Such developments, gratifying as they were locally, paled by comparison with the growth of the U.S.S.R. and Japanese fisheries in the northeastern Pacific.

It is abundantly clear that within a very short span of years Japan and the U.S.S.R. have become the dominant producers of fish protein in the northeastern Pacific. By 1965 the North American catch of **all species** combined was little more than 1.7 billion lb. as compared with the foreign catch, consisting primarily of **groundfish,** of 2.6 billion lb. So we might ask again, this time with a little more seriousness, whether we North Americans are heading out of the business of catching fish.

D. DISCUSSION

At present there are four fisheries treaties applying to the northeastern Pacific which give only partial protection to resources currently exploited by North American nationals. The convention between Canada and the United States concerning the sockeye and pink salmons of the Fraser River provides reasonably effective control. However this arrangement would be in jeopardy were it not for another treaty, the International Convention for the High Seas Fisheries of the North Pacific (a tripartite treaty involving Canada, the United States and Japan). By the terms of this treaty Japan, equipped as she is for high seas fishing for salmon, is obliged to abstain from fishing for salmon east of a mid-Pacific line drawn through Longitude 175°W. Since some North

American salmon, particularly those originating from streams of western Alaska and Bristol Bay, are known to move west of the so-called "abstention line" and are vulnerable to capture by Japan, the North Pacific treaty by no means provides complete and effective protection to all of the North American salmons and of course there is nothing of a legal nature regarding the high seas to stop some other nation, not party to the treaty, from entering the fishery.

A third treaty between Canada and the United States concerns the halibut fishery. Here again the benefits of this treaty would now be in serious jeopardy were it not for the previously mentioned tripartite treaty which includes the provision that Japan shall abstain from fishing for halibut in waters east and south of Bering Sea. Nevertheless, there remains the potential danger that the U.S.S.R. or some other nation not party to the treaty will launch a concerted effort to exploit halibut in the eastern Pacific. The U.S.S.R. is under no obligation to abstain but so far seems to have been interested only in species providing a high volume or weight return per unit of effort.

The convention dealing with the tropical tunas of the eastern Pacific, unlike the others I have mentioned, is an open-ended one. Currently there are five member countries. Canada is now seeking admission and certain Latin American countries as well as Japan may soon follow suit. With at least one of the tunas now being fished at a level which apparently exceeds the maximum sustainable yield and with the United States being the dominant producer of that species it seems likely that her present position will be weakened as more and more countries become adherents to the convention, with each demanding a share of a pie which is of limited size.

Respecting fisheries for groundfish other than halibut there is no treaty nor is there any immediate prospect of one which would embrace all four of the nations engaged in fisheries of the northeast Pacific. To be sure there are several bilateral and temporary agreements, for example between the U.S.A. and Japan, between the U.S.A. and U.S.S.R. which provide at least a theoretical basis for these nations to reach some sort of agreement. However, these private arrangements likely would not last long after the intervention of third parties.

Thus, much of the future of the Pacific coast fisheries depends on activities at the international political level. In other respects the future will depend on national political policies for there still remain situations in which fisheries regulations designed to resolve internal or domestic problems place North American fishermen at a serious disadvantage in the international arena.

Quite aside from the political considerations western North American fishermen are hobbled by economics at least insofar as the non-luxury species are concerned. It is obvious that numerous species have never been exploited to the full and that others were not even fished at all until foreign nations with quite different bases to their economies appeared on the scene.

By world standards fishermen of the west coast are well off financially but at the same time their costs of fishing as well as the shore costs of processing are probably greater than those anywhere else in the world. In the remaining decades of this century it is likely that the United States and Canada will exert strenuous effort to maintain their fisheries for luxury species (salmon, king crab and other crustacea, and perhaps halibut and tuna). But in the face of rising costs the future of fisheries for species of low unit value will depend very much on the economic feasibility of remaining in a competitive position to meet the requirements of poorer nations and poorer peoples within our own society. If our costs are too high then obviously nations which can afford to fish for species of low unit value will, and perhaps should, have the advantage.

At the moment it is difficult to say whether the enormous growth of foreign fisheries for groundfish in the northeast Pacific can be sustained. It seems unlikely because we are fast running out of unexploited fishery resources.

It is quite clear that a far better framework for international utilization of resources of the sea must be established in order to achieve full and sustainable utilization. It would not be a complete exaggeration to say that anarchy reigns in the North Pacific as in other parts of the world, primarily because the time-honoured law of "freedom of the seas" is incompatible with the special and legitimate interests of coastal states.

An outstanding example is the special interests of coastal states which bear the brunt of the expense and responsibility for not only maintaining the anadromous salmon but also for enhancing those resources by installation of costly fishways, stream

In recent years, Japan and the U.S.S.R. have become the dominant producers of fish protein in the northeastern Pacific, with the foreign catch consisting primarily of groundfish. Photo shows a Russian refrigerated transport ship taking on board fish from a trawler in mid-ocean.

clearance programs and by artificial propagation. In other words, the notion of a common property resource which fits so nicely with the concept of freedom of the seas finds very little real application to the fisheries of the North Pacific which hinge so heavily on salmon. In the case of some purely marine species (such as the halibut) whose current productivity has been achieved by one or more coastal states at much cost in research and prudent management, there are here again understandable grounds for recognition by other nations of the special interest of the coastal state(s). While partial provision for such recognition is given in the 1958 Geneva Convention on Fishing and Conservation of the Living Resources of the High Seas, rather few nations have ratified it and there have been rather few, if any, examples demonstrating its workability.

Where the major potential difficulty seems to lie is in the fact that in areas where a coastal state claims special interest in particular species (usually the most valuable) there are other resources some of which are little utilized, if at all. From a legal standpoint and indeed from a moral standpoint when we think of the world's growing need for protein such resources should most certainly be brought into full production—if not by the coastal state then by others which can afford to do so. The complications are enormous and there may never come a time when they can be resolved to everyone's satisfaction. Thus, when we talk about trends in the fisheries of the Pacific coast, the major problems are those which transcend the field of fisheries biology. Indeed there is some question whether conventional fisheries biological research is obsolete in the sense that it cannot provide our governments with the scientific basis for management quickly enough to stave off the possibly ruinous effects of the large task-force operations which are now being mounted by foreign nations.

In light of this highly dynamic situation and current lack of generally acceptable and workable arrangements among nations, it would indeed be foolhardy to predict our position in fisheries of the Pacific even five years hence, let alone forecast where we might stand by the end of this century.

Automation and the Fishing Industry

BY L.W. PROCTOR*

Mechanization of the fishing industry has been apparent for many years in many ways – sail gave way to steam, which gave way to diesel engines, echo sounders took over from the trial trawl, power blocks and winches helped haul nets aboard, gutting machines took over from hand wielded knives, to note a few examples. So it is with the future; equipment will become more sophisticated to eliminate guesswork, thereby improving working efficiency.

Use of computer techniques will become more prevalent. They are already in use on board, in a simple form perhaps but nevertheless computers. Examples are the Decca navigator and the automatic pilot. Perhaps eventually, with advances in technology, a small computer will control many existing functions, such as vessel control to a pre-set position with automatic trim control, taking cognizance of depth soundings and radar signals.

The main advantage of computers, of course, is their ability to accept enormous quantities of data and produce an interpretation, or analysis, within a very brief time period. As fishing knowledge increases with the passage of years, this computer speed may be useful to the industry in analysing this historical record.

As any fisherman knows, fish will congregate where conditions prevail which are to their liking. Over a number of years these conditions can be recorded and, from analysis of them, trends can be determined of items such as food supply and water temperature. Eventually it should be possible to increase the probability of catching fish by observing these trends, to determine where the conditions are right and there is, therefore, a good chance of fish being found.

Automatic Data Processing is another, different, form of automation. By using a computer, information can be obtained in less than an hour which would take a man one hundred years, even if he could do it at all.

At present A.D.P., as it is called, is used mostly for payroll processing and some catch statistic analysis, but perhaps the fishermen would receive better weather predictions if the meteoroligical offices could receive a greater number of inputs. These inputs could be fed into a computer at high speed, analysed, and a complete weather map produced within a few minutes. Inputs from 600 points in the Gulf of St. Lawrence area could be read in, analysed and a report printed in about four minutes.

OCEAN CONDITIONS

Extending this a few steps further, receipt of data on ocean conditions such as temperatures versus depth, water conditions with fish food content, etc., coupled with the date, location and atmospheric condition could allow analysis for detection of periodic conditions. Records of fish concentration taken at the same time could be coupled with the oceanographic conditions and any relationship would become evident after a period of some years.

Eventually, after collection of sufficient data, say five to seven years, trends would emerge and it may then be possible to give considerable service to the fishermen by production of a "fish" map which would show the probability of finding fish in a given area; the accuracy of the probability report will depend on the quantity of data available for analysis and, of course, its accuracy. A computer will not be able to predict a catch but can indicate, from a large, accurate "memory", where fish are likely to be.

There are many by-products to be obtained from such analysis from a saving in search time to design of an optimum vessel. In addition to financial advantages, the working hours would be reduced, allowing more time ashore for a given catch or greater catches for the time now spent.

There is no doubt that data processing is a tool which is here to stay and undoubtedly has many areas of use. The fishing industry can make use of this tool to improve efficiency and make life easier for all concerned.

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Anti-fouling Coatings for Boats

BY M.L.H. THOMAS
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Ellerslie, P.E.I.

THE BOTTOM of a ship or boat painted with ordinary paint quickly becomes the home for a variety of organisms, both plant and animal, which, if allowed to remain, seriously slows the vessel and increases fuel consumption. There are hundreds of different kinds of these so-called fouling organisms, mostly classed as barnacles, moss animals, tube-worms, clams, sea squirts, or sea weeds.

It seems possible that fouling could be prevented in two main ways. The simplest would be to coat the surface of the hull with a substance which would be physically unattractive to the small active (larval) stage of the fouling organism when it is looking for a suitable place to settle. One would think that a very smooth or slippery surface might do. Many of the modern plastics, particularly Teflon, appear to have such surfaces. However, an Australian worker recently tested Teflon for its anti-fouling properties and found that many organisms settled actively on it and developed normally. The same is true of other plastics. In fact, a substance with a surface physically unsuitable for fouling organisms to settle and grow on has not yet been found. Most fouling animals and plants possess quite remarkable powers to adhere to surfaces.

The other possible method of preventing fouling would be to make the bottom of the boat poisonous or repellent to fouling organisms so that they cannot settle, or would die almost immediately if they do. All successful anti-fouling coatings are based on this system. The extensively used anti-fouling paints all contain substances poisonous to fouling organisms.

ANTI-FOULING PAINTS

Most successful anti-fouling paints contain a compound of copper, called cuprous oxide. Cuprous oxide will dissolve only slowly in sea water but is very poisonous to fouling organisms.

There are two basically different types of paint containing cuprous oxide. The first of these is called the "continuous contact" type. Continuous-contact paints rely for their action on a large amount of the poison in the surface layer of the paint. Such paints need only be applied as a thin coat. The second

Figure 1. A boat left in the water for the summer at Ellerslie, Prince Edward Island. The side with no fouling was painted with a modern, cuprous-oxide paint, the other with ordinary bottom paint.

type, known as "soluble matrix" paints, contain a lower concentration of the poison but have a porous structure which allows poisons to reach the surface from within the paint. This latter type is applied as a thick coating. The soluble matrix paints are more effective but good examples of either kind will resist fouling for two years.

These commonly used "copper" anti-fouling paints have several serious disadvantages. One of these is that if they are applied directly to metal hulls, they cause considerable corrosion. This disadvantage can be circumvented by pre-painting with a special paint. A second disadvantage is that these paints have quite a soft surface that does not resist wear well. A further fault is that most of these paints must be immersed in sea water before they are dry. If this is not done, the surface of the paint hardens and seals the poison beneath it where it cannot do its job.

NEW ANTI-FOULING PAINTS

It has long been known that metals other than copper, such as mercury and tin, have compounds that are very poisonous to fouling organisms. However, until recently, paints containing them had not been successfully developed.

A few years ago a group of organic compounds of tin were shown to be especially effective as anti-fouling agents. Two compounds, a liquid technically known as bis(tri-n-butyltin)oxide and commonly called TBTO, and a solid, tri-n-butyltin fluoride, commonly called TBTF, have been successfully used in anti-fouling paints. TBTO is also a good wood preservative which prevents marine borer (shipworm, etc.) attack.

Tests of these paints showed performance comparable to that of cuprous oxide ("copper") paints and several important advantages:

1) These paints do not cause corrosion of metal hulls.

2) The poisons are white or colourless, enabling the production of anti-fouling paints in a wide variety of attractive colours.

3) The poisons can be incorporated in a wide variety of paint types. Some of these, e.g. vinyl-base paints, have a relatively hard, smooth surface.

4) Paints containing this material do not lose their effectiveness on drying. Consequently, boats do not need to be launched immediately after painting and may be repeatedly hauled without destroying the properties of the paint.

TBTO has also been incorporated in solid plastics, porous stainless steel, etc., and such preparations have pointed to an important added advantage. It has been shown that areas close to a TBTO-treated substance may also be protected. This "fringe benefit" means that a small gouge or scrape in paint would not immediately become fouled and also that unpaintable objects may be protected by surrounding them with TBTO paint, plastic, or impregnated metal. An interesting application of this property is the use of a ring of treated plastic to protect the lenses of continuously immersed underwater TV cameras used in research.

Paints with a vinyl base and containing TBTO or TBTF have been especially effective and possess a hard, smooth surface which, in itself, provides some protection. Recently "copper" paints have also been produced in a vinyl base and found to be as effective as the old-type paints. However, such "copper" paints still cause corrosion on metal hulls.

TESTS OF NEW PAINTS

With fouling a constant problem in eastern Canadian waters, and as there were recent developments in anti-fouling paints, it was decided to test several new paints at Ellerslie. Tests included paints using cuprous oxide, TBTO or TBTF as the poisonous agent. The following main types were tested:

1) Standard, modern, cuprous-oxide, continuous-contact paint.

2) Vinyl-base, cuprous-oxide, continuous-contact paint.

3) Vinyl-base TBTO and TBTF paints.

4) Epoxy-resin, TBTO paint.

5) Standard, continuous-contact, TBTO paint.

Our tests showed type (1) to be outstanding in preventing fouling in this area. Figure 1 shows the appearance of a boat hull, one side of which was painted with a good paint of this type, and the other side with an ordinary bottom paint. However, several of the type (3) paints were almost as good as type (1), and showed advantages of hardness, smoothness, and durability which make them the best choice for most

uses. Other types tested did not show such distinct advantages but most gave good protection.

Our tests were confined to wooden hulls and panels.

RECOMMENDATIONS

Recommendations for anti-fouling paints for wooden hulls –

(1) Routine use on previously painted hulls: Use a modern, cuprous-oxide paint of proven performance (a good index of quality is the weight of the paint – a heavy paint contains plenty of cuprous oxide). One coat per year should suffice where the bottom is not abraded. Care must be taken to launch the boat within the manufacturer's specified time, and the boat should not be hauled without repainting.

(2) New hulls – not previously painted – shipworm not a serious problem: Apply two coats of vinyl-base paint containing 5% or more of TBTO or TBTF. One treatment like this should last two years.

(3) New hulls – not previously painted – shipworm problem areas: Apply one coat of a wood preservative containing 2% TBTO, followed by two coats of modern, cuprous-oxide, TBTO or TBTF paints. (Note: Some of the preservatives may leave an oily film which may prevent the adhesion of vinyl-base paints. Test on a piece of wood before using.) Durability will depend on the paint used. A vinyl-base TBTO or TBTF paint will last two years.

The new paints mentioned above are often not readily available. If they are available, they may not be easily recognized. Read the label carefully – it will often give information on the type of paint. In particular, look for TBTO or TBTF content. Enquire at your paint dealer's about the types mentioned. He should be able to get the type you need quite easily. Once people start to use these new paints, they will become more readily available.

Current Reading

CHILLING AND FREEZING SALMON AND TUNA IN REFRIGERATED SEA WATER by S.W. Roach, H.L.A. Tarr, N. Tomlinson, and J.S.M. Harrison. Bulletin No. 160 of the Fisheries Research Board of Canada. Price $1.75 from the Queen's Printer.

Although use of refrigerated sea water (RSW) for preserving fish aboard vessels was introduced into the British Columbia salmon fisheries in 1955, it was not until 1961 with the conversion of the vessel *Western Express* that the usefulness of this system for transporting and storing salmon was demonstrated commercially.

Since that time scientists at the Vancouver Laboratory of the Fisheries Research Board of Canada, in co-operation with the Industrial Development Service of the federal Department of Fisheries, have studied developments in the application of this method in B.C. fishing vessels. This bulletin contains the results of these investigations.

Design data are given for RSW installations on salmon packers, including specifications for tanks, mechanical units, chillers, condensers, pumps, piping, suction screens, controls and safety devices. The operation of systems employing a mixture of ice, sea water, and salt but no mechanical refrigeration is described and data given for calculating the salt and ice requirements.

The conversion of British Columbia seine boats for brine-spray freezing tuna and the modifications made to the conventional California system to meet the requirements of the Canadian fishery are dealt with, as well as describing laboratory investigations into the partial freezing and storing of salmon in salt-fortified sea water at temperatures between 25 30 degrees F.

Also considered are the various changes that occur in fish stored unfrozen in RSW, partially frozen in salt-fortified RSW, and in tuna during freezing in brine spray. These include changes in weight, in flesh salt content and in free drip, loss of soluble components from the flesh, development of rancidity and proteolysis, appearance of discolouration in flesh, and bacterial spoilage. The advantages and disadvantages of the different procedures in these respects are discussed.

Suggestions for Handling Atlantic Coast Shrimp

BY P.M. JANGAARD
Fisheries Research Board of Canada, Halifax, N.S.

Pink shrimp *(Pandalus borealis)* is the most common species found in northern waters and is fished commercially in Maine, Greenland, Iceland, Norway, Alaska and British Columbia. The striped pink shrimp *(Pandalus montagui)* is also present in some areas.

Biology. *Pandalus borealis* is a deep water shrimp and is usually found on a muddy bottom. The eggs are laid in July-August, fertilized and carried by the female until hatching in early spring. After about 1-2 years of growth and molting, the shrimp becomes mature as a male in its second or third year. About the fourth winter the same shrimp changes to a female. All large shrimps are, therefore, females.

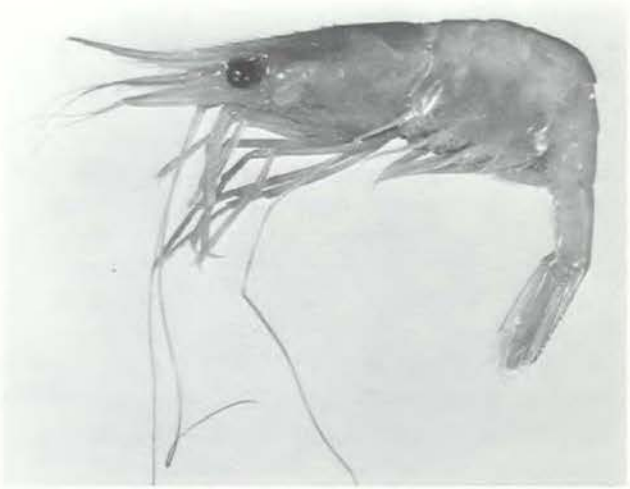
Fishing methods and areas. Shrimp are caught in otter trawls or beam trawls described in several publications (see references). The trawling speed should be quite slow, 1½ to 2 knots.

Treatment on board. It is very important that when fish, rocks and other debris have been removed, the shrimp are **thoroughly washed** in sea water. Mud is contaminated with bacteria and will accelerate spoilage and off flavors if not removed, especially under the "head" (which also contains the digestive system). Larger shrimp often bring better prices, and a preliminary sorting might be carried out at this stage using a box with slats spaced 1/4" to 3/8" apart.

Depending on the disposition of the product, the shrimp can be cooked on board, or brought in to the processing plant well chilled if the trip is of more than one day's duration.

Some examples of processing for various markets carried out in other fishing areas are described below.

Cooked, whole shrimp for fresh consumption. For this type of product the shrimp should preferably be cooked on board since the color, shine and "curl" of a top quality product will suffer when the shrimp are more than a few hours old. Some European markets prefer the shrimp to be tightly curled and a salt content higher than is usual in Canada. In Norway a strong brine is used (30-40 lbs. salt to 10 gal. water, 23-29% by weight) and only enough shrimp added to the boiling brine so it can be brought back to a boil in 1-2 minutes. The total cooking time should not exceed 3-4 minutes, and the shrimp are then spread in a thin layer on trays to cool. No water or ice must come in direct contact with these shrimp, and they are stored, not more than 5" deep, in containers and kept in a cool place.



Pink Shrimp *(Pandalus borealis)*

Cooked shrimp for freezing whole. The same precautions must be taken as above with regards to freshness, cooking, cooling and storage. However, a much less concentrated brine can be used for cooking, for instance, 6 to 10% salt by weight (10 lbs. per 10 gal.) depending on the ultimate market.

Cooked shrimp for peeling, freezing or canning. If the shrimps are to be peeled for subsequent freezing or canning, they can be cooked on board in brine, sea water or freshwater, cooled in sea water and brought in on ice. They can also be iced raw on the vessel (in boxes, not pens) and cooked ashore. If cooked in fresh water, a brine dip is used to flavor the peeled shrimp before freezing. Brine and acid (citric, ascorbic) can be added to canned shrimp.

Raw, peeled or headed shrimp for freezing. The raw material for these products can be brought in iced in boxes. Hand-peeling of raw shrimp is difficult,

Law Seminar

In Halifax recently, twenty-one Fisheries Protection Officers from the four Atlantic Provinces attended a special two-week course learning the best methods of catching those who break the fishing laws and following through to conviction.

The seminar, the first of its kind ever organized between the Department and another law-enforcement agency, was carried out in co-operation with the Halifax Police Department.

In his opening address to the school, the Regional Director, R.E.S. Homans, said the course was unique to the area in that it brought together fisheries protection officers and experienced law enforcement officers for a better understanding of each other's particular roles. Other speakers included A.P. Fitzgerald, Chief, Conservation and Protection Branch, and Halifax's Chief of Police, V.W. Mitchell.

The objective of the training seminar was to provide fisheries protection officers with more knowledge in the elements of the law as it applies to their problems of enforcing regulations. Periods of instruction included basic investigation procedure, making arrests, issuing summonses and warrants, interrogation of prisoners, duties in court, the role of peace officers and other subjects relative to the position of fishery protection officers.

Instructors included J.G. Carton of Ottawa, Departmental Solicitor, Superintendent G. Robinson, Inspector J. Wrin and Sergeant E. Langille of the Halifax Police Department and G. Graham, Crown Prosecutor.

Continued from previous page

but use of mechanical peelers requires a high level of production for economical operation. Heading of raw shrimp and freezing of the shell-on tails is a possible market outlet.

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(Note: The above report is issued as New Series Circular No. 33 by the Halifax Laboratory of the Fisheries Research Board of Canada).

Aquatic Research

An invitation to aquatic research scientists from Canada's universities to use the facilities of the Fisheries Research Board of Canada at St. Andrews, New Brunswick, has been issued by Dr. J.M. Anderson, Director of the station. Laboratory space, holding facilities for aquatic organisms, some boat time, and use of SCUBA diving equipment will be made available at no charge, Dr. Anderson said.

The invitation furthers a Board policy to work closely with the universities in the aquatic sciences and has been greeted with enthusiasm, especially from universities in Ontario.

Dr. Anderson stresses that the invitation is extended particularly to university professors and their graduate students. Preference will be given to those graduate students who will be accompanied by their supervising professors. The invitation is open on a year-round basis, beginning mid-May 1968.

Depending on the nature of the work undertaken, the laboratory complex will house from 10 to 20 researchers. Requests to use the facilities will be filled on a first-come, first-served basis.

Arrangements for living accommodations will be the responsibility of the university researchers but assistance will be given in locating suitable accommodation if required, Dr. Anderson said.

N.Pacific Fur Seal Commission Meets in Moscow

Representatives from Canada, Japan, the U.S.S.R. and the U.S.A. attended the eleventh meeting of the North Pacific Fur Seal Commission, held in Moscow, April 8-12. The Commission was established by the Interim Convention on Conservation of North Pacific Fur Seals which was ratified in 1957.

At the opening meeting, Mr. M.N. Sukhoruchenko, Deputy Minister in the Ministry of Fisheries of the U.S.S.R., made the following statement:

"The work of the Commission in preserving the fur seal resources and in carrying out the rational killing of fur seals is of great importance. The fruitful co-operation of scientists and specialists of Canada, Japan, the United States and the Soviet Union, who assist the Fur Seal Commission, contributes greatly to scientifically-based recommendations which lead to practical steps for the rational use of living marine resources.

"During the whole period of the Convention, the Commission's work to preserve fur seals has set a good example for the successful resolution of complicated problems of international hunting regulations."

The Commission's research is directed toward achieving the maximum sustainable yield from the fur seal resource with due regard to the effect on other living marine resources, and toward studies of sealskin quality and the effectiveness of various methods of sealing.

During 1967, 17,505 skins of fur seals were taken by the Soviet Union on the breeding islands, and 65,816 skins were similarly taken by the United States. Canada and Japan each received 15 per cent from both of these groups, as provided by the Convention.

The Commission's Standing Scientific Committee, which met prior to the Commission, completed work on a comprehensive summary of investigations conducted during 1964-66. This will be published in the three official languages of the Commission. The information in this and earlier reports will be taken into account by the Party Governments when the future of the Convention is considered after October, 1968.

An interesting development in recent years has been the re-establishment and growth of rookeries in the Kuril Islands, whose seals had been exterminated during the 19th century.

The Commission reviewed evidence obtained to date concerning whether or not pelagic sealing could be permitted in conjunction with land sealing under certain circumstances, without adversely affecting achievement of the objectives of the Convention. It was decided that information bearing on this question is not yet sufficient for a final decision. A recommendation will be made by the Commission that appropriate research be continued.

Under the Commission's scientist exchange program, Dr. Tadayoshi Ichihara, Japanese Far Seas Fisheries Research Laboratory, visited the Pribilof Islands in 1967 to observe sealing activities and the preliminary processing of seal skins. Mr. Hiroshi Kajimura, U.S. Marine Mammal Biological Laboratory, visited Japan in 1967 to observe the pelagic sealing for research purposes off the coast of that country. In 1968 a Japanese scientist will be on board a United States research vessel operating in the eastern Pacific Ocean. Also, in 1968 the United States plans to send two fur seal biologists, an ornithologist and an interpreter to the Commander Islands.

The Commission is composed of representatives from the member countries of Canada, Japan, the U.S.S.R. and the U.S.A. The Commissioners are Dr. W.M. Sprules, Director, International Fisheries Service, Department of Fisheries of Canada; Mr. Shinji Miyoshi, Director, Production Division, Japanese Fisheries Agency; Dr. S.G. Federov, Chief, International Fisheries Division, All-Union Research Institute of Marine Fisheries and Oceanography, U.S.S.R., and Mr. John I. Hodges, Deputy Assistant Director for Resource Development, U.S. Bureau of Commercial Fisheries. Dr. Sprules, Chairman of the Commission, presided at the meetings.

In keeping with the practice of rotating offices among the Party Governments, Commissioner Miyoshi of Japan was elected to be the next chairman of the Commission, and Commissioner Federov of the U.S.S.R. was elected vice-chairman. The next meeting of the Commission will be held in Tokyo, Japan, starting February 24, 1969.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May – February 1966-67		May – February 1967-68	
	Landings[1] '000 lb.	Value[2] $'000	Landings[1] '000 lb.	Value[2] $'000
CANADA – TOTAL	**2,265,149**	**147,523**	**2,152,769**	**138,872**
ATLANTIC COAST – Total	**1,754,312**	**89,157**	**1,919,495**	**94,144**
Cod	487,738	21,632	502,060	22,102
Haddock	78,423	5,583	71,300	4,537
Redfish	170,396	4,749	164,155	4,258
Catfish	4,101	136	4,195	134
Halibut	3,357	1,265	3,354	1,287
Other Flatfishes	242,802	7,990	236,131	7,675
Pollock, Hake, Cusk	54,906	2,096	45,474	1,751
Other Groundfish	7,634	130	9,722	129
Herring & Sardines	570,825	6,442	754,241	8,000
Mackerel	25,743	901	24,724	944
Swordfish	7,260	3,109	7,930	3,235
Alewives	8,072	142	6,501	104
Salmon	5,209	2,542	6,202	3,343
Smelts	4,077	348	2,767	282
Other Fish	13,530	492	11,090	414
Lobsters	35,229	20,305	33,765	22,228
Clams & Quahaugs	4,307	254	4,918	327
Scallops	14,796	6,165	11,181	6,776
Other Shellfish	15,907	864	19,785	1,204
Misc. Items	–	4,012	–	5,414
PACIFIC COAST – Total	**510,837**	**58,366**	**233,274**	**44,728**
Pacific Cods	20,986	1,862	13,693	1,113
Halibut[3]	31,360	11,235	24,158	6,111
Soles & Other Flatfishes	10,538	655	7,070	457
Herring	257,102	4,257	37,815	641
Salmon	162,203	38,356	129,122	34,566
Other Fish	11,857	505	8,378	376
Shellfish	16,791	1,478	13,038	1,456
Misc. Items	–	18	–	8
BY PROVINCES				
British Columbia	510,837	58,366	233,274	44,728
Nova Scotia	605,342	41,531	629,916	42,198
New Brunswick	331,363	10,818	341,566	10,560
Prince Edward Island	57,824	6,484	43,527	8,156
Quebec	132,551	6,533	185,308	7,292
Newfoundland	627,232	23,791	719,178	25,938

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

MID-MONTH WHOLESALE PRICES – FEB. 1968

		Montreal $	Toronto $
Cod fillets, Atl. Fresh, unwrapped	lb.	.403	.477
Cod fillets, Atl. frozen, cello 5's	lb.	.332	.390
Cod fillets, smoked	lb.	.428	.493
Haddock fillets, fresh, unwrapped	lb.	.511	.630
Herring, kippered, Atl.	lb.	.278	.310
Mackerel, frozen, round	lb.	.203	.287
Lobsters, canned, Fancy	Case 48-½s	–	67.320
Sardines, canned	Case 100-¼s	9.775	9.567
Halibut, frozen, dressed	lb.	.481	.523
Silverbright, frozen, dressed	lb.	.616	.650
Coho, frozen, dressed	lb.	.929	.947
Sockeye, canned, grade A	Case 48-½s	27.640	28.233
Pink, canned grade A	Case 48-½s	17.120	17.650
Whitefish, fresh	lb.	.450[1]	.543
Lake Trout, frozen	lb.	.432	.547

[1] Dressed

PRICES PER CWT. PAID TO FISHERMEN

(Week ending February 17th)

	1967 $	1968 $
Halifax		
Cod Steak	5.25	5.75
Cod Market	5	5.5
Haddock	8.5	9
Plaice	5	4.5-5.25
Yarmouth		
Haddock	7.5	–
Vancouver		
Ling Cod	12	8-12
Grey Cod	5-7.5	6-7.5
Soles	2.5-9	8.5-9.5

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF FEBRUARY

	1967 '000 lb.	1968 '000 lb.
TOTAL – Frozen Fish, Canada	**70,404**	**58,910**
Frozen – Fresh, Sea Fish – Total	**47,367**	**37,309**
Cod, Atlantic, Fillets & Blocks	7,703	5,193
Haddock, Fillets & Blocks	3,709	3,180
Rosefish, Fillets & Blocks	5,051	3,114
Flatfish, (excl. halibut) Fillets & Blocks	5,750	5,749
Halibut, Pacific, dressed & steaks	6,006	5,363
Other Groundfish, dressed & steaks	744	1,864
Other Groundfish, fillets & blocks	4,173	2,606
Salmon, Pacific, dressed & steaks	4,800	3,515
Herring, Atlantic & Pacific	494	490
All Other Sea Fish, all forms	6,659	4,157
Shellfish	2,278	2,078
Frozen – Fresh, Inland Fish, – Total	**6,912**	**8,370**
Perch, round or dressed	62	1,868
Pickerel (Yellow & Blue) fillets	1,291	1,063
Sauger, round or dressed	863	513
Tullibee, round or dressed	426	204
Whitefish, round or dressed	1,274	936
Whitefish, fillets	214	169
Other, all forms	2,782	3,617
Frozen – Smoked Fish – Total	**1,161**	**1,155**
Cod, Atlantic	606	352
Sea Herring, kippers	240	488
Other, all forms	315	315
Frozen For Bait and Animal Feed	**14,964**	**12,076**

SALT FISH STOCKS AS AT END OF FEBRUARY

		1967 '000 lb.	1968 '000 lb.
Salted and Pickled Fish, Atlantic Coast			
Wet-Salted – Total		**10,471**	**18,582**
Cod		9,742	16,379
Other		729	2,203
Dried-Salted – Total		**12,563**	**16,742**
Cod		11,438	15,008
Other		1,125	1,734
Boneless – Total		**575**	**1,665**
Cod		553	1,560
Other		22	105
	(barrels)		
Pickled – Total		**9,030**	**12,097**
Herring	"	6,315	6,148
Mackerel	"	2,715	5,162
Alewives	"	[1]	787
Turbot	"	–	–
Bloaters	(18 lb. boxes)	29,302	138,976
Boneless Herring	(10 lb. boxes)	[1]	[1]

[1] Confidential.

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS MAY – NOVEMBER

		1966 $'000		1967 $'000
TOTAL EXPORTS		**146,249**		**146,720**
By Markets:				
United States		100,689		95,409
Caribbean Area		11,772		11,079
Europe		28,591		33,702
Other Countries		5,197		6,530
By Forms:				
Fresh and Frozen		**99,989**		**94,868**
Whole or Dressed	**33,133**		**29,688**	
Cod, Haddock, Hake	325		264	
Halibut, Pacific	4,640		2,946	
Salmon, Pacific	10,874		10,650	
Swordfish	3,646		3,821	
Other Seafish	5,449		5,709	
Whitefish	3,033		2,575	
Pickerel	1,920		1,229	
Other Freshwater Fish, n.e.s.	3,246		2,494	
Fillets, Blocks and Slabs	**45,907**		**41,831**	
Cod, Atlantic	13,274		11,892	
Haddock	4,537		4,561	
Ocean Perch, Hake, Cusk, Pollock	7,093		7,425	
Flatfish	9,626		10,569	
Pickerel	2,423		1,355	
Other Fillets & Blocks	8,954		6,029	
Shellfish	**20,617**		**23,113**	
Lobsters (in shell & meat)	14,625		16,209	
Scallops	5,567		6,237	
Other	425		667	
Frozen Fish & Shellfish, pre-cooked	**332**		**236**	
Cured		**14,121**		**16,006**
Smoked	**1,387**		**977**	
Herring	913		513	
Other	474		464	
Salted, Wet & Dried	**10,885**		**13,130**	
Cod	9,122		11,611	
Other	1,763		1,519	
Pickled	**1,849**		**1,899**	
Herring	1,089		1,150	
Mackerel	461		438	
Other	299		311	
Canned		**19,615**		**22,831**
Salmon	13,045		17,132	
Sardines	3,212		3,359	
Lobsters	2,159		1,461	
Other	1,199		879	
Miscellaneous		**12,524**		**13,015**
Meal	6,055		5,041	
Oil	528		893	
Other	5,941		7,081	

Norwegian Fishery Statistics

NORWEGIAN EXPORTS BY TYPES OF PRODUCTS, 1966-1967

Quantity in Thousand Pounds
Value in Thousand Kroner

	Jan. - June 1967 Q.	Jan. - June 1967 V.	Jan. - June 1966 Q.	Jan. - June 1966 V.
GRAND TOTAL		717,146		657,781
Fresh or Iced Herring and Sprat (brisling)	37,906	12,767	42,145	15,418
Denmark	20,759	6,636	-	-
West Germany	4,464	1,744	28,314	10,424
Other Countries	12,683	4,387	13,831	4,994
Fresh or Iced Fish, n.o.p.	15,826	26,435	18,698	32,677
Sweden	6,047	12,011	7,059	14,920
United Kingdom	4,575	5,620	5,937	7,412
Other Countries	5,204	8,804	5,702	10,345
Frozen Herring and Sprat (brisling)-except fillets	17,026	6,199	22,545	9,540
Frozen Fish, n.o.p.- except fillets	15,991	24,593	14,572	21,025
Frozen Fillets of Fish	74,649	111,137	83,649	133,557
Finland	4,063	7,007	5,029	8,828
Sweden	8,349	17,566	10,192	21,702
France	3,538	6,824	2,846	6,215
U.S.S.R.	9,187	10,883	8,587	11,235
United Kingdom	15,633	27,144	16,753	30,416
Czechoslovakia	4,784	5,189	4,691	5,231
West Germany	10,004	8,448	15,891	19,456
United States	4,319	7,966	8,241	14,081
Other Countries	14,772	20,110	11,419	16,393
Salted Herring and Sprat (brisling)	9,493	7,743	8,075	7,041
Salted Fish, n.o.p.	6,614	8,400	5,406	7,351
Dried Fish (stockfish)	18,231	45,930	19,421	43,667
Nigeria	15,108	36,099	16,647	35,703
Salted and Dried Fish (klipfish)	38,724	82,988	34,964	73,655
Dominican Republic	4,056	6,706	4,982	8,121
Brazil	18,763	42,123	14,074	30,713
Other Countries	15,905	34,159	15,908	34,821
Smoked Herring and Fish	4,194	5,400	3,086	3,606
Crustaceans and Molluscs, not canned	1,854	14,780	3,880	35,470
Sweden	648	5,386	979	8,761
United Kingdom	985	5,907	2,454	21,576
Other Countries	221	3,487	447	5,133
Fish Oils, excluding waste and brown oils	14,391	9,214	14,202	10,844
Fish, Prepared or Preserved- In airtight containers	31,606	77,876	30,262	72,806
United Kingdom	7,112	17,210	8,501	20,589
United States	12,310	34,019	10,827	29,033
Other Countries	12,184	26,647	10,934	23,184
Fish, Prep. or Pres. - In non-airtight containers	8,497	14,070	9,506	17,294
Herring Meal	489,556	257,461	247,552	153,835
Sweden	29,839	16,536	24,531	15,173
Belgium	26,111	13,457	24,531	15,279
France	51,795	27,378	43,254	27,377
Italy	14,427	8,005	9,171	5,736
Netherlands	21,775	11,286	6,739	4,452
Poland	8,754	4,428	11,045	7,095
United Kingdom	150,155	79,093	86,021	52,804
West Germany	44,526	19,731	6,144	3,699
United States	98,707	54,888	-	-
Other Countries	43,467	22,659	36,116	22,220
Other Meals	10,499	4,985	16,170	9,106
All Other Products	4,421	7,168	7,680	10,889

NORWEGIAN EXPORTS BY COUNTRIES, 1966-1967

Quantity in thousand pounds
Value in Thousand Kroner

	Jan.-June 1967 Q.	Jan.-June 1967 V.	Jan.-June 1966 Q.	Jan.-June 1966 V.
GRAND TOTAL		717,146		657,78
United States	118,782	101,941	23,272	48,34
Frozen Fillets of Fish	4,319	7,966	8,241	14,08
Fish, prep. or pres.- In airtight containers	12,310	34,019	10,827	29,03
Herring Meal	98,707	54,888	-	-
Other Products	3,446	5,068	4,204	5,23
Brazil	18,763	42,123	14,074	30,71
Salted and Dried Fish (klipfish)	18,763	42,123	14,074	30,71
Dominican Republic	4,232	6,859	5,324	8,40
Salted and Dried Fish (klipfish)	4,056	6,706	4,982	8,12
United Kingdom	188,477	146,428	129,593	145,12
Fresh or Iced Fish, n.o.p.	4,575	5,620	5,937	7,41
Frozen Fillets of Fish	15,633	27,144	16,753	30,41
Crustaceans and Molluscs, not canned	985	5,907	2,454	21,57
Fish. prep. or pres. - In airtight containers	7,112	17,210	8,501	20,58
Herring Meal	150,155	79,093	86,021	52,80
Other Products	10,017	11,454	9,927	12,33
France	60,217	42,866	49,577	40,89
Frozen Fillets of Fish	3,538	6,824	2,846	6,21
Herring Meal	51,795	27,378	43,254	27,37
Other Products	4,884	8,664	3,477	7,30
Belgium	31,924	21,823	29,403	21,62
Herring Meal	26,111	13,457	24,531	15,27
Sweden	55,843	70,499	52,392	77,33
Fresh or Iced Fish, n.o.p.	6,047	12,011	7,059	14,92
Frozen Fillets of Fish	8,349	17,566	10,192	21,70
Crustaceans and Molluscs, not canned	648	5,386	979	8,76
Herring Meal	29,839	16,536	24,531	15,17
Other Products	10,960	19,000	9,631	16,78
Finland	4,624	8,126	7,929	11,06
Frozen Fillets of Fish	4,063	7,007	5,029	8,82
Denmark	32,811	16,251	12,174	13,55
Fresh or Iced Herring and Sprat (brisling)	20,759	6,636	-	-
Italy	25,161	27,231	19,170	25,13
Herring Meal	14,427	8,005	9,171	5,73
Netherlands	25,358	16,686	8,599	8,85
Herring Meal	21,775	11,286	6,739	4,45
West Germany	79,928	45,909	70,339	50,65
Fresh or Iced Herring & Sprat (brisling)	4,464	1,744	28,314	10,42
Frozen Fillets of Fish	10,004	8,448	15,891	19,45
Herring Meal	44,526	19,731	6,144	3,69
Other Products	20,934	15,986	19,990	17,07
Poland	8,754	4,428	11,045	7,09
Herring Meal	8,754	4,428	11,045	7,09
Czechoslovakia	18,045	12,283	19,130	13,72
Frozen Fillets of Fish	4,784	5,189	4,691	5,23
U.S.S.R.	15,382	13,919	15,794	14,85
Frozen Fillets of Fish	9,187	10,883	8,587	11,23
Nigeria	15,108	36,099	16,647	35,70
Dried Fish (stockfish)	15,108	36,099	16,647	35,70
All Other Countries	96,069	103,675	97,351	104,70

Recent Appointments

The appointment of Antonin (Tony) Proulx, 44, of Ottawa as Chief of the Economic Intelligence and Statistics Branch, Economics Service of the federal Department of Fisheries, has been announced by Deputy Minister of Fisheries Dr. A.W.H. Needler. Mr. Proulx had been Assistant Chief of the Branch since 1963.

He succeeds J. Neil Lewis of Ottawa, who retired late in 1967 after 17 years with the Department's Economics Service. A native of Saint John, N.B., and graduate of Acadia and McGill Universities, Mr. Lewis entered Federal Government service with the Department of Agriculture in 1937. He served with the Combined Food Board and the International Emergency Food Council in Washington during and in the years following the Second World War, rejoining the Agriculture Department in 1948. Two years later he entered the Department of Fisheries. He was appointed Chairman of the Fisheries Prices Support Board in 1966, but resigns from this post March 31.

Mr. Proulx was born at Montmagny, Quebec, and was educated there and at Laval University where he received a B.A. degree in 1943 and a B.Sc. degree in 1947. On graduation he joined the Quebec Department of Industry and Commerce. He moved to Ottawa in 1950 to join the Department of Fisheries as a statistician in the Economics Service. He is married and has five children.

John P. Parkinson, a native of Olds, Alberta; and an engineering graduate of the University of Alberta, has been appointed chief engineer of the Department of Fisheries Resource Development Service in Ottawa. The appointment, made through the Public Service Commission of Canada, was announced by Dr. A.W.H. Needler, Deputy Minister of Fisheries.

As a member of the Policy, Advisory, Planning and Co-ordinating Group within the Resource Development Service, Mr. Parkinson will be responsible for developing, recommending and advising on policy and program decisions for the most effective allocation of resources on a national scale, the co-ordination of engineering plans and programs with other federal and provincial departments and agencies.

Antonin Proulx

John Parkinson

Roger Mondoloni

Mr. Parkinson will advise on complex regional engineering programs of a development and applied research nature aimed at maintaining the stocks of fish, shellfish and crustacea in the Pacific, Maritimes, Newfoundland and Central regions. In the latter region, Resource Development Service activities mainly concern fisheries in the Northwest Territories and in controlling predation by lamprey eels in the Great Lakes.

Roger Mondoloni, a former Ottawa journalist and CBC French radio and television network producer at Montreal, has been appointed chief of the French section of federal Department of Fisheries' Information and Consumer Service in Ottawa. His appointment was made through the Public Service Commission of Canada.

Mr. Mondoloni was associated with the Federal Government last year as an information officer in the Privy Council office assisting in arranging state visits in connection with Canada's centennial celebrations. Immediately prior to his fisheries appointment he was press officer in the public relations section of the Public Service Commission.

Born of Canadian parentage in France, Mr. Mondoloni graduated as a bachelor of arts from the University of Paris and carried out post-graduate studies there. He started his working career in Canada in 1952 as a reporter on Le Droit, Ottawa. During the same period he taught French to evening classes at the Ottawa University.

Mr. Mondoloni joined the French section of the CBC International Service at Montreal in 1955. Three years later he became a producer of special events and outside broadcasts for the CBC French service working in Montreal.

If undelivered return to:
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New 1968 Regulations For the Benefit of Lobster Fishermen.

1. **All lobster fishing vessels must be registered.**
2. **Boat operator and each helper must be licensed.**
3. **Every lobster trap must be tagged.**

(Item number 3 applies only to the Maritime Provinces.)

Here's what you do: Register your lobster fishing vessel through your local Federal Department of Fisheries Officer. Fee is $3.00. Serial numbered license plates will be given to you. Display them where they can easily be seen on your boat.

From any Fishery Officer also apply for an operator's license. Fee is $2.00. Each helper on a vessel must be licensed. Fee is $1.00. Get metal tags for your lobster traps at no charge from the Department of Fisheries. They will be marked with your lobster fishing district, year, and serial numbers.

Please note: At the time of registration, owner will be asked facts about his vessel, gear, equipment and fishing operation. To avoid any possible delay please be prepared to give this information.

DEPARTMENT OF FISHERIES
Hon. H. J. Robichaud, M.P., Minister
Dr. A. W. H. Needler, Deputy Minister
Ottawa, Canada

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1968

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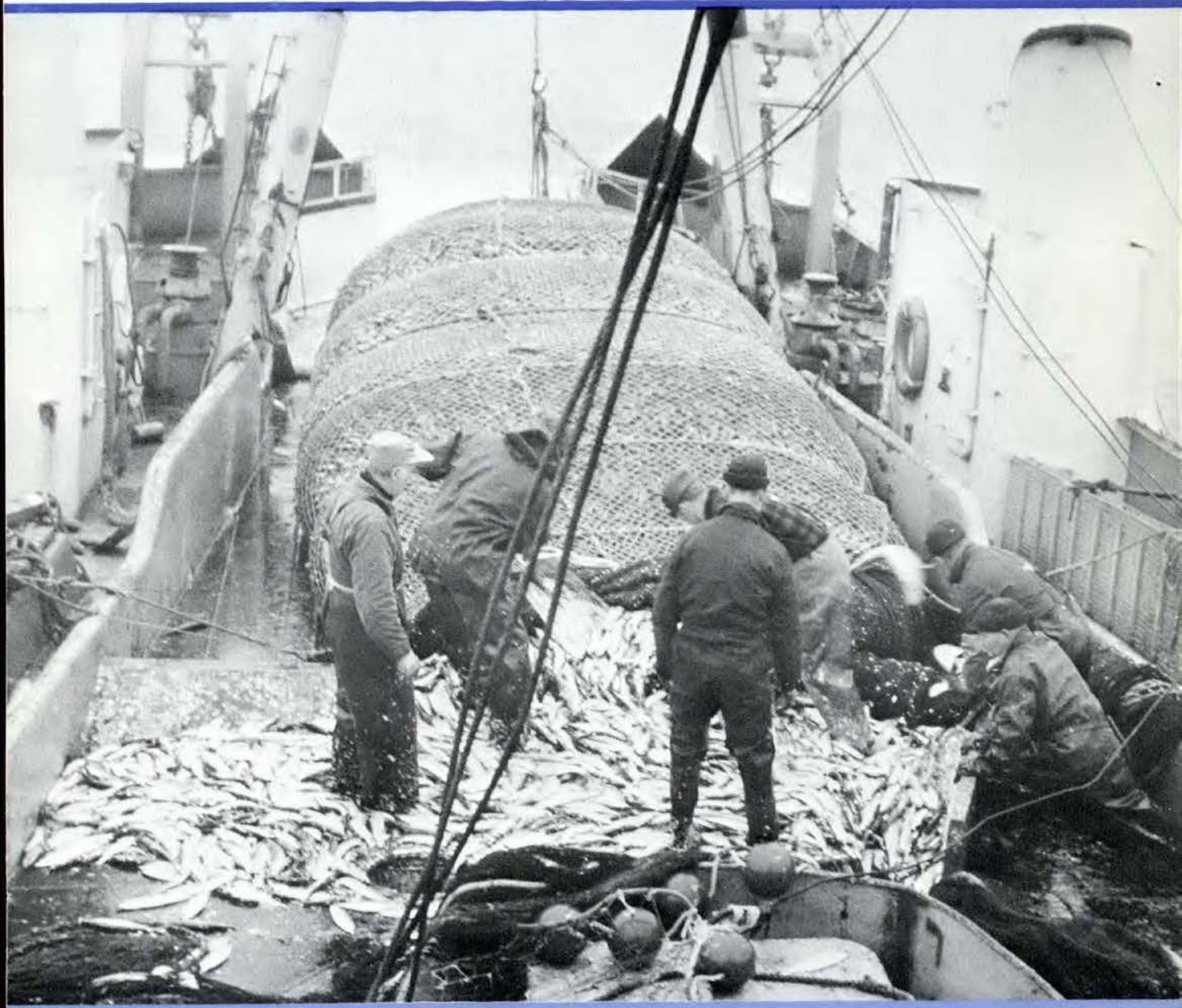

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★ Begin Exploration for Queen Crab
★ Conservation & Protection Service
★ Fisheries Council Annual Meeting

Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
(formerly Trade News)

Editor
E. H. HEARNDEN

June , 1968

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COVER PHOTOGRAPH - A bumper crop of herring is landed aboard the Halifax stern trawler Brandel in one tow by a mid-water trawl. Technical assistance in this operation was given by the Industrial Development Service of the federal Department of Fisheries. Another picture appears on page 23.

Start Extensive Search For Queen Crab Stocks

BY JACK RYCROFT*

AN EXPLORATION of extensive areas of the Gulf of St. Lawrence to establish distribution and abundance of Queen crabs is being undertaken this year by the Industrial Development Service of the federal Department of Fisheries.

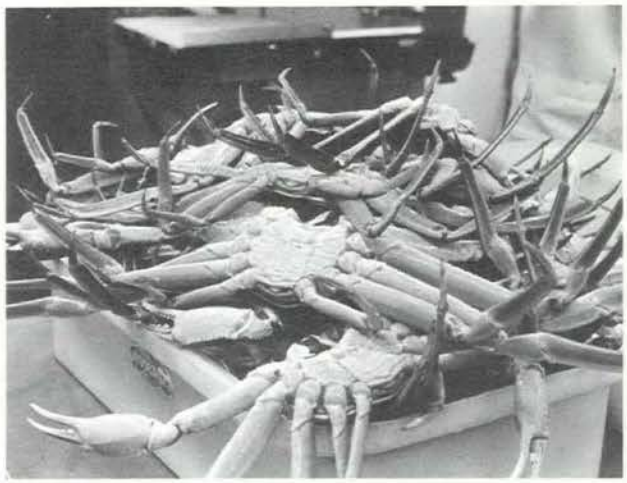
Atlantic Queen crab *(Chionoecetes opilio)* has become an increasingly important resource in the Atlantic commercial fishery due to the stimulus of preliminary experimental catching and processing carried out under federal-provincial cost sharing arrangements during the past three years.

Many vessel owners are presently rigging out for crab fishing and processing plants are gearing up to handle the anticipated production. Last year's catch of Queen crab by Atlantic coast fishermen amounted to 1½ million pounds.

In view of the anticipated intense fishing pressure on known stocks, exploration becomes extremely urgent—not only because a crab trap fishery could revitalize depressed sections of the fishery in certain areas, but also to ensure that sufficient stocks exist to provide a continuing supply to equal the increasing demand.

SYSTEMATIC SEARCH

It is believed that approximately 40,000 square miles of the Gulf of St. Lawrence may produce Queen crabs in commercial quantities. Because of the size of the area, a highly systematic search pattern must be employed.



Queen crab – object of an intensive search in the Gulf of St. Lawrence.

Lines drawn horizontally and vertically at 2½-mile intervals will provide a basic search pattern. Decca positions at each point will permit an accurate and easily recorded search to be conducted. While traps set in this manner could miss small concentrations of crabs, any area of significant population would certainly be bisected and a more intensive search could be carried out.

The prime search areas plotted represent a total of more than 5,000 positions to be fished, and it is expected it will take at least two seasons to complete the survey.

Two vessels are being chartered by the Industrial Development Service to carry out the exploration. One of these, the 65-ft. combination vessel *St. Cecilia II*, built last year for the Cheticamp Fish Co-op Ltd., Cheticamp, N.S., has already started operations in the Gulf off Cape

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* Mr. Rycroft is with the Industrial Development Service of the federal Department of Fisheries, Ottawa.

Depressed Fishery to Get Federal Aid

The Government has had under study conditions in the Atlantic Coast groundfish industry resulting from a depressed market for frozen fish products. In order to promote orderly marketing and to prevent serious losses to fishermen and processors alike, federal Fisheries Minister H.J. Robichaud last month announced the Government's approach to the problem including emergency financial assistance for Atlantic Coast fishermen who are dependent upon the groundfish fishery, if the returns from the 1968 season cause a serious drop in fishermen's incomes.

The Department of Fisheries is stepping up many of its programs directed towards improvements in the industry. It has commissioned a study of in-plant efficiency with a view to reducing processing costs. This study will be extended to production methods and trawler efficiency. The federal Government, in co-operation with the provincial administrations, has joined with the industry through the Fisheries Council of Canada in sponsoring an industry study of the Canadian market for fishery products. New export promotion schemes are being developed to supplement the already extensive export sales programs of the Department of Trade and Commerce. In addition the Atlantic Development Board has undertaken an in-depth study of marketing methods of the Atlantic Coast industry in the U.S. market.

It is the intention to get in motion as soon as possible such re-organization as is required to make the industry a viable entity capable of holding its own in the world markets.

Returns to fishermen for the balance of the 1968 season are dependent upon the market situation. The future course of the market cannot be determined at the present time and the nature and scope of assistance to be made available at the end of the present year will be based on average fishermen's returns for their catch in 1968 as compared with the average of the previous three years.

Continued from previous page

Breton. A second vessel will be integrated into the operation at a later date.

HERRING FOR BAIT

Crab traps to be used in the sampling will be of standard size and frozen herring bait will be used throughout the survey. All crabs caught will be returned to the water immediately after being weighed and measured.

Information acquired during the exploration will be of considerable assistance to an investigation by the Fisheries Research Board of Canada into the life history of the Queen crab. This, together with other information supplied by commercial fishermen, will help enlarge the present scanty knowledge of the quantities of commercial-size crabs on the grounds, and the effects of the environment and season on crab abundance and biology.

A general report on the exploration will be published at the end of the 1968 program and, in addition, interim reports will be published periodically.

Along with the program of exploration described above, provincial fisheries departments are undertaking local explorations in areas adjacent to their coasts under federal-provincial cost sharing arrangements.

Market Research

An in-depth market research study of the Canadian domestic market for fishery products is to be inaugurated shortly. The two-year $200,000 study will be jointly financed by federal and provincial governments and the Canadian fishing industry.

The Fisheries Council of Canada, which proposed the study on behalf of the industry, will put up $50,000 of the cost, the federal Government will contribute $75,000, and the remaining $75,000 will be shared among participating provinces.

Purpose of the market investigation is to secure information on which the fishing industry may base future promotional efforts to improve sales of fishery products in Canada. A firm of consultants is to be engaged to undertake the study.

Total marketed value of Canadian fishery products is approximately $320 million, of which 30 per cent is sold on the domestic market.

600 Delegates at Convention

Fisheries Council Meets in B.C.

A CALL for a stiffer Government attitude towards the creation of offshore limits to protect Canadian fishermen was made by Mrs. Marie S. Penny, of Ramea, Newfoundland, in her presidential address to the 23rd Annual Meeting of the Fisheries Council of Canada held in Vancouver, B.C., May 5-8.

"We know there are difficulties – but if action is not forthcoming fast, many nations which up to now have not had historic rights in many of our waters will have acquired such rights" Mrs. Penny told the 600 delegates at the meeting. She added there was also the inevitable danger of this foreign fishing seriously depleting the fish stocks off Canada's coasts.

Speaking subsequently, federal Fisheries Minister H.J. Robichaud pointed out that the Government had been involved in prolonged and most difficult negotiations to determine the baselines from which the 12-mile zone is to be measured. Because of the configuration of the Canadian coastline it was evident, he said, that difficult problems would have to be faced in drawing headland to headland baselines in a manner that would ensure international recognition.

"It has, therefore, become necessary to explore various means of meeting this problem and possible alternative solutions" the Minister said. "Prolonged international discussions have taken place which, as you all know, resulted in long delays in finding a solution which would not only meet our immediate needs but which would provide lasting benefits to the Canadian fishing industry. Drastic or irresponsible moves on the part of the Canadian Government would have been of no benefit to the industry and could have set us back for at least another quarter of a century."

MARKET RESEARCH

Mrs. Penny praised the industry for the steps it is taking to engage in a joint marketing research program to ascertain ways and means of raising the per capita consumption of fish in Canada. She emphasized that an industry that depends on export markets for over 70 per cent of its living is vulnerable.

Mrs. Marie Penny, of Newfoundland, retiring president of the Fisheries Council of Canada, greets the Hon. H.J. Robichaud, federal Minister of Fisheries.

Mrs. Penny also had praise for the Canadian fishing industry for the quantity of its products and declared that proposed U.S. legislation concerning inspection of imported as well as domestic fish would prove a boon to Canada. "We are miles ahead of most of our competitors in this field" she said.

On the question of sealing, Mrs. Penny declared: "We are heartily fed up with those who are out to sacrifice our sealing industry on the grounds of cruelty. The Minister of Fisheries has fought a good fight – we hope it continues – and that those

misguided 'do-gooders', using largely manufactured evidence, may turn their attention to more sensible fields."

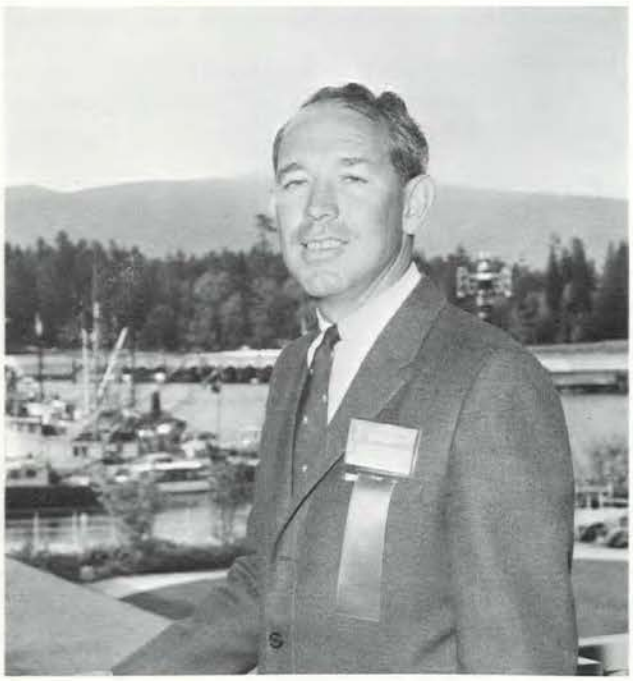
MINISTER'S SPEECH

The need for continued federal-provincial co-operation, the multi-million dollar Babine project to propagate salmon, the Atlantic salmon rearing station on the St. John River, N.B., and the great contribution of the Fisheries Research Board of Canada, were some of the key points made by Fisheries Minister Robichaud in his address to the Council.

On the Pacific coast, plans are taking shape for major exploratory efforts directed to the development of an offshore herring fishery and groundfish fishery. Mr. Robichaud said in spite of a negative outlook in some quarters, it was his belief that the role of the Government in Canada's fisheries development program is to undertake risks beyond those it is reasonable to expect the industry itself to take.

Speaking of federal-provincial co-operation, the Minister said he was pleased to note the success that had been achieved by recent fisheries development conferences. The offshore fishing vessel conference in Montreal, the Atlantic herring fishery conference in Fredericton and that dealing with fish protein concentrate in Ottawa were clear examples

Mrs. Marie Penny was made an honorary princess of the Capilano Indian band of the Squamish Tribe at a ceremony in Stanley Park, Vancouver. Chief Simon Baker named her "Mother of Fishes".



Richard I. Nelson, of Vancouver, B.C., newly-elected president of the Fisheries Council.

of this co-operation. Equally good results were hoped for in the important conference planned for October in Montreal which will be devoted to the use of materials in the construction of fishing vessels.

WORLD FISHERIES

"Organization of World Fisheries" was the subject of an address by Dr. A.W.H. Needler, Deputy Minister of Fisheries for Canada. He said that whatever else the immediate future has to offer in the international fisheries field, it is not stability.

In the case of complex multi-nation fisheries, the measures under international conventions had, in general, been "too little and too late" and there appeared little indication of better success in the future unless there was a radical change of heart by the participating countries.

Dr. Needler said the reasons for such a situation are complex. The process of reaching a firm

Minister Reflects On Fisheries Career

Federal Minister of Fisheries H.J. Robichaud, who has announced that he will not be seeking re-election at the June 25 federal election, made the following remarks in the course of his address to the Fisheries Council of Canada at their annual meeting in Vancouver, May 6-8:

"All my life I have been connected with fisheries one way or another. As a civil servant I have served for over 15 years both at federal and provincial levels and I have tried to be a faithful and devoted employee of fisheries. At no time, however, have I been in closer contact with the primary producers and with the industry than in the last five years in my capacity as federal Minister of Fisheries.

"While my personal decision not to seek re-election in my constituency of Gloucester will result in relieving me from this responsible post, I express the hope that my early departure will not keep me too distant or apart from this great and most important Canadian industry, an industry which has been part of my life since my childhood days.

"My relationship with the industry and with my Department has been most pleasant and cordial. I want to say how deeply I have been impressed by the outstanding role played by your Council in this program of progress and development. Such rewarding results would, however, have been impossible had it not been for the unlimited co-operation and devotion which you and I have received from my departmental

Hon. H.J. Robichaud

officials at headquarters as well as in the field.

"May my successor, whoever he may be, be assured of the same degree of co-operation and enthusiasm and may all segments of the fishing industry benefit for years to come and continue to contribute to the social, economic and nutritional wellbeing of our people."

scientific basis for estimating what catches may be taken on a continuing basis has been slow—and acceptance of the estimates even slower. However, he believed that performance is improving both in the estimates and in their acceptance.

In discussing the future, Dr. Needler said perhaps the threat of a continuing world-wide tendency on the part of coastal states to claim seaward extension of their jurisdiction over fisheries (sometimes for 200 miles or more) will convince the great distant fishing nations of the absolute necessity of arriving at rational international regulation of the high seas fishery without avoidable delay.

In the meanwhile fishing power, world catch, and world demand for the products of the fisheries all continue to increase.

CONSERVATION PROBLEMS

Speaking on the topic "Conservation of World Fisheries Resources", Dr. J.L. Kask, Director of Investigations, Inter-American Tropical Tuna Commission, said that if the principal of the freedom of the seas and the right to fish enjoys wide but in some instances, qualified acceptance in the public mind, then the principal of conservation is certainly a close runner-up in public esteem. But, as with freedom to fish, this esteem appears to be greater in theory than in practice. All agree that conservation is something very good and desirable, but all are

not agreed on what this noble word means exactly or whether in any of its meanings it should apply to 'me' or the 'other fellow'.

Dr. Kask said that although we have gained some experience over the years in how an international resource can be studied and managed, the question of how and by whom the costs of study and management are to be borne has not been resolved. And although the High Seas Fishing Convention, now ratified by the required 22 nations, provides for some national policing and compulsory arbitration, there still is no effective international provision made to supervise the observance of conservation measures.

"Although we have accomplished much in our search for the new conservation, we still have far, far to go" Dr. Kask declared. "This is a king's size challenge for the world community".

Dr. Norman J. Wilimovsky, of the Institute of Fisheries, University of B.C., spoke on the oceans' resources, pointing out that the world fish catch is now 57,000,000 metric tons per year, compared with 18,000,000 tons before the Second World War.

He said biologists report there are 25 million metric tons off both coasts of North America of available commercial species, although the present catch is around three million tons.

With no change in gear but simply a change in attitude, regulations and the approach to the problem, the world catch could be doubled, Dr. Wilimovsky continued. With some additional effort on fishing gear and with intelligent management it is probable the catch could be quadrupled.

An outline of the historical development and present conditions of the fisheries of South Africa was given to delegates by Mr. P.J. O'Sullivan, of the South African Fish Meal Producers' Association.

ELECTION OF OFFICERS

Richard I. Nelson, 38-year-old president of Nelson Bros. Fisheries Ltd., Vancouver, B.C., was elected president of the Fisheries Council of Canada for 1968-9.

A native of New Westminster, Mr. Nelson is a graduate of the University of B.C. in mechanical engineering and of the Harvard Graduate School of Business Administration.

Other officers elected were: National vice-president, W.O. Morrow, Nova Scotia; past president, Mrs. Marie Penny, Newfoundland; other vice-presidents, E.L. Harrison, British Columbia; L.H. Omstead, Jr., Ontario; Bernard Blais, Quebec; Senator Donald McLean, New Brunswick; A. Bailey, Newfoundland; G.C.R. Clouston, Quebec.

The 1968-69 officers of the Fisheries Council of Canada.

Conference on Construction Materials

New thinking on the use of materials used in the construction of fishing vessels of all kinds will be expressed by one of the world's leading naval architects at a Canadian conference to be held in Montreal next October 1-3. Jan-Olof Traung, Chief of the Fishing Vessel Section of the Food and Agriculture Organization of the United Nations, Rome, will provide the keynote for more than 30 papers to be presented by Canadian and world experts on the subject.

The Conference on Fishing Vessel Construction Materials is being sponsored by the Federal-Provincial Atlantic Fisheries Committee, which is made up of the deputy ministers responsible for fisheries in the Federal Government and the governments of Quebec, Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland.

The views of Canadian naval architects, boatbuilders, materials suppliers, fishing vessel operators and governmental specialists will be augmented by those of specialists from the United States, Japan, South Africa and the leading European fishing countries. They will discuss significant developments and trends in the use of traditional and newer materials. These will include steel, wood, plywood, laminated wood, resin and glues, single-skin and cored plastics, and concrete.

Construction techniques will be the subject of several papers, and comparative assessments of the various materials and their economic possibilities will be submitted at the final session of the three-day meeting. The views of the fishing industry on the materials with which its future vessels might be built also will be expressed.

Pre-conference registration with the Secretariat, provided by the Industrial Development Service of the Department of Fisheries of Canada, Ottawa, indicates that about 400 people from this country and from abroad will attend the conference, which will be the first of its kind to be held anywhere.

HERRING REDUCTION PLANT

The caption to a photograph on page 15 of the April, 1968, issue of FISHERIES OF CANADA incorrectly located the B.C. Packers' reduction plant at Burgeo, Newfoundland. This should have read Harbour Breton, Nfld.

"Culinary Magic" Show in Kamloops, B.C.

The third annual Culinary Magic Show held in Kamloops, B.C., by the Kamloops section of the Restaurant Association attracted more than 600 people to the one-day exhibit. A popular part of the show was the seafood preparation demonstration presented by the federal Department of Fisheries Pacific region consumer consultant Miss Edna Raynor. Photo at left shows Miss Raynor at work, employing closed circuit television. At right are winning entries in the seafood section of the chef's display.

Conservation and Protection Of Canada's Fisheries

BY NIX WADDEN

A SIMPLE definition of "conservation" as given by one venerable dictionary is the "wise use" of natural resources; this is a broader and perhaps truer interpretation than that of "official care and preservation" cited by a current college dictionary. The latter form of conservation concerns itself only with the perpetuation of a resource; the former serves the interests of both nature and humanity.

As applied to fisheries, the broader concept of conservation is directed toward the preservation and enhancement of the fisheries resource, and its prudent utilization by man. To succeed in this two-fold objective, it is necessary to provide protection of fish stocks from natural or man-made hazards, and to ensure by the establishment and enforcement of laws and regulations the orderly harvesting of the resource.

The need for conservation measures in the fisheries was recognized in British North America many years before Canada's birth at Bytown a century ago. Statutes and strictures dating back to the early 19th century sought to curb and control excesses in fishing practices in coastal and inland waters of the Maritimes, and Upper and Lower Canada. In all the welter of legislation assimilated in the first federal Fisheries Act of 1868, emphasis in administration of the fisheries was on protective laws and regulations: the Act was drafted "for the Regulation of Fishing and the Protection of Fisheries".

This preoccupation with restrictive legislation was only to be expected in an era when knowledge of fisheries science was limited and the resource appeared to be without limit. As knowledge and experience have broadened, increasing attention has been directed toward improvement of the resource by positive means. Regulation of fisheries remains, however, a fundamental instrument for the management of this valuable natural resource.

The Conservation and Protection Service maintains a fleet of more than 80 vessels to patrol Canada's coastal, inland and international waters. Shown here is the Pacific region patrol vessel "Howay".

The responsibilities of the federal Department of Fisheries in regard to fisheries protection and regulation were exercised over the years by the Protection Branch which in 1965 became the present Conservation and Protection Service. Its principal function is the administration and operation of programs designed to maintain and expand fish stocks through the development and enforcement of regulations. The work of this service continues to be closely coordinated with that of the former Fish

Culture Development Branch, now the Resource Development Service.

Through the Conservation and Protection Service, the federal department regulates all marine and freshwater fisheries of the Atlantic coast provinces except those of the Province of Quebec; all the freshwater fisheries of the Northwest and Yukon Territories; and the fisheries for marine and anadromous (salt-to-fresh-water-migrant) species in British Columbia. Overall policy is set at department headquarters in Ottawa, but day-to-day operations are directed from regional headquarters at Vancouver, Winnipeg, Halifax and St. John's.

OBJECTIVES

In broad terms the objectives of the service are:

1) to conserve and, where possible, expand the primary fishery resource of Canada;
2) to promote optimum use of the fishery resource by fishermen, the fishing industry and the general public consistent with the principles of sound fishery resource management;
3) to encourage harvesting of the sustainable yield of fish in a manner that will provide the greatest return to the national economy;
4) to ensure adherence on the part of Canadian fishermen and, in some cases, fishermen of other nations to the provisions of international agreements designed to manage fish stocks in international waters;
5) to develop public understanding of the fishery resource, its environment and the philosophy governing exploitation of the resource, and to maintain public respect for the law.

In fulfillment of its role in fisheries management, the Conservation and Protection Service is responsible for the administration of a formidable body of regulations developed over the years for the control of marine and freshwater fisheries under federal jurisdiction. Varying widely in detail from region to region, these regulations may be grouped into several fairly distinct categories:

1) *Conservation Regulations:* Most important of all, they are designed to protect and conserve fish stocks which are in danger of depletion through excessive harvesting. These regulations endeavour to achieve their purpose by:

a) restricting the times when fishing is permitted, e.g. by observance of closed seasons and weekly closed times, as on Sundays;

b) restricting the type of fishing gear used; e.g., by requiring minimum size of mesh or maximum length or depth in nets;

c) restricting the size of fish caught, e.g. as in lobster;

d) restricting the quantity of fish that may be taken, e.g. by quotas in certain sea and freshwater fisheries, also for marine mammals such as seals, whales, etc., and bag limits for sport fishing.

2) *Socio-economic Regulations:* These are motivated primarily by the desire to preserve social and economic values in the affected region, e.g.

a) halibut fishing restrictions on the Pacific coast, limited to longline vessels;

b) spacing of lobster seasons, designed to achieve even marketing distribution and consequently high returns to fishermen;

c) similar spacing of lake fishing seasons in the Northwest Territories to ensure maximum benefit to the resident population;

d) protection of historic domestic fisheries, e.g. the longstanding Indian food fishery in British Columbia, to ensure adequate food supplies and to honour historic agreements.

3) *Rival Gear Regulations:* Reflecting the ever-present conflict of interest between the traditional and the progressive, this set of regulations aims to strike a compromise between one type of fishing gear and another, usually between one that is established in usage and one that is new but more efficient, e.g.,

a) herring weir vs. seine, as in the Bay of Fundy;

b) offshore trawler vs. inshore cod gillnetter and/or handliner, as in Newfoundland and Maritimes;

c) salmon purse seine vs. salmon gillnet, as in British Columbia salmon fisheries;

d) sport fishing vs. commercial fisheries, particularly where salmon are involved and in some freshwater fisheries.

4) *Environmental Regulations:* These are intended to protect the fishery resource from man-made hazards, especially those which affect anadromous or freshwater species. They include:

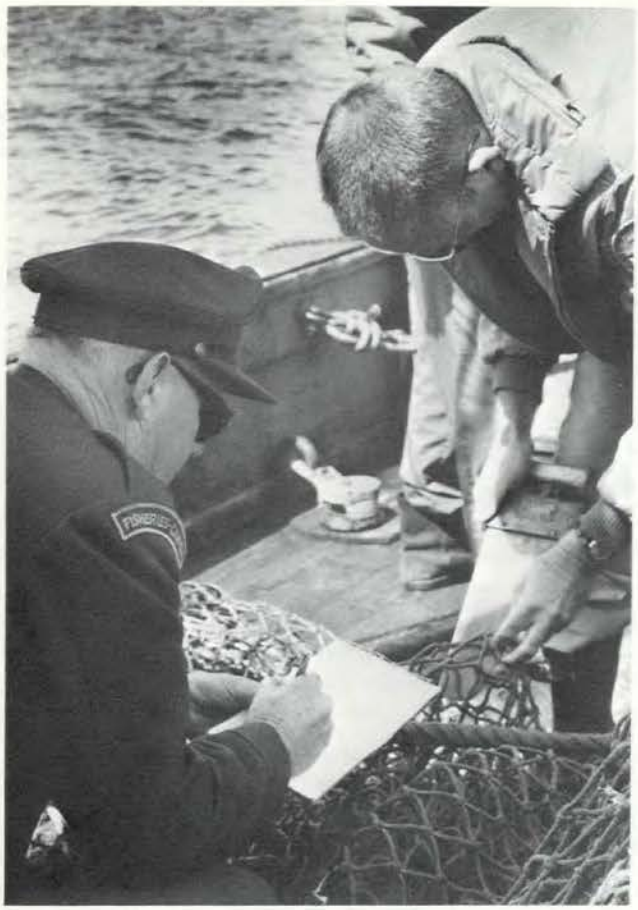
a) anti-pollution regulations, e.g. those concerning sewage, industrial wastes, etc.;

b) gravel removal regulations, to prevent silting of river beds;

c) logging and forest spraying regulations, to control forestry practices insofar as they affect the fisheries resource;

d) hydro-electric development regulations where dams are involved to provide for protection of fish stocks affected by hydro projects;

e) irrigation regulations, to protect fisheries from the adverse effects of agricultural irrigation.



Checking the mesh size of fishing nets to ensure compliance with international agreements is part of the varied duties of Fishery Officers.

Essentially a field force, the Conservation and Protection Service deploys a corps of trained, experienced Fishery Officers throughout fishing areas of the Atlantic and Pacific coasts and in the Territories. The service as a whole numbers approximately 1,200 employees, including some permanent Fishery Officers, together with lesser numbers of river guardians, wardens, patrolmen, as well as crews to man Departmental patrol vessels.

DIVERSIFIED FLEET

For effective supervision of fisheries operations, efficient transportation afloat, on land and in the air is essential. Afloat the service maintains a diversified fleet of more than 80 vessels to patrol coastal, inland and international fishing waters. Officers in the field are equipped with motorized vehicles for river, road and snow travel, while aircraft, including helicopters, are extensively used on a charter basis in reaching the more remote fishing areas. Rapid communication is even more essential, and mobile telephones and radio communications are increasingly being adopted as standard equipment by C. & P. vehicles and vessels.

In the course of normal patrol duties, federal Fishery Officers have a unique opportunity to feel and record the pulse of the fishing industry as they observe the progress and problems of the fisheries within their particular areas of jurisdiction. Their regular reports submitted to their respective Regional Headquarters provide a clear and continuing picture of the industry, and pinpoint problem areas which may require attention by appropriate authorities.

Two years of on-the-job training are normally required for recruits to the Fishery Officer ranks; after that, steps up the career ladder depend upon the ability and initiative of the individual. Most senior officers of the Conservation and Protection Service progressed through the ranks in this way. Recruits are usually posted to small communities to work under direction of a superior officer, but may be assigned to several locations to gain experience throughout the training period.

As an example, a recruit in the Pacific Region, where the responsibilities of the service are mainly concerned with management of the valuable salmon fisheries, may be posted to a sub-district extending over 5,000 square miles having a coastline of 600 miles. In this position, the trainee may be required: to carry out surveys by boats, vehicles, aircraft and on foot to assess exploitation rates of the various commercial, sport and Indian food fisheries and to assess the strength of fish population and spawning escapements; to carry out and supervise spawning ground inspections; and to make recommendations for amendment of fishery regulations. He may also have to observe, investigate and report on "multiple water use situations", i.e., cases where operations potentially harmful to fish are being conducted. He is of course required to carry out enforcement activities to detect and prevent abuses of fishery regulations and to conduct prosecutions.

BROADER SCOPE

At an intermediate level, duties of the Fishery Officer are broader in scope as he assumes responsibility for planning, organizing and implementing conservation programs within the geographic area (sub-district) to which he is assigned. He has authority to recommend or apply controls against conditions such as stream obstructions which may

adversely affect fish life, and to recommend action to deal with major problems.

In addition to other duties, the officer in charge of a sub-district may be required to carry out a certain amount of educational activity through personal contacts with fishermen, sportsmen, industry representatives and the general public; also by public addresses, film presentations and lectures to interested groups.

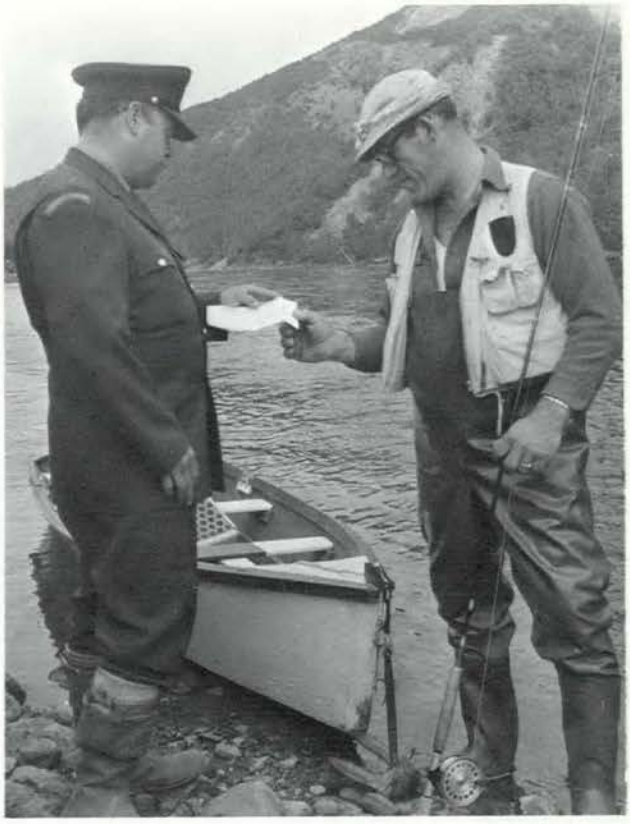
Organization of the Conservation and Protection Service in the three large coastal regions – Pacific, Maritime and Newfoundland – is headed by a Branch Chief. The regions are divided into several districts, each comprising a number of sub-districts. The Senior Officer is responsible for the direction within the district of programs of fishery management conservation, environment conservation, and law enforcement.

It is perhaps only at the district level and beyond where the interrelationship among the various aspects of the conservation function are fully evident and understood. Management conservation provides for the utilization and propagation of the varying stocks of fish; while environment conservation has to do with the maintenance of fish environments in a natural or near-natural state so that the stocks of fish provided for propagation purposes will regenerate the cycle. Without effective management there is little or no environmental conservation; without the latter, the fruits of management conservation will be lost.

LAW ENFORCEMENT

Law enforcement is not an end in itself but merely an adjunct to the total conservation function; it is the final action to conserve the resource when abuses threaten the very existence of the resource. Without effective law enforcement, there is no protection against wanton despoilation of the resource. Without effective management and environment controls, law enforcement may be only an exercise in futility since the probability of there being any resource to protect is small.

Historically the mainstay of the federal Fisheries Protection service at sea, the patrol vessels that ply Pacific, Atlantic, Arctic, and inland waters continue to perform essential duties as waterborne watchdogs of the Canadian fisheries. In patrolling the sea fisheries, protection vessels sometimes range far afield, venturing to points as distant as the Bering Sea and the offshore fishing grounds of the northwest Atlantic, in fulfillment of enforcement responsibilities assumed under international fisheries agreements.



A Fishery Officer checks an angler's licence. Essentially a field force, the Conservation and Protection Service has some 1,200 employees.

Patrol vessels in Maritime and Newfoundland regions share in the task of enforcing among Canadian fishing vessels observance of trawl mesh-size regulations of the International Commission for the Northwest Atlantic Fisheries. Largest and speediest of the Atlantic patrol fleet are the 175' *Chebucto* based in Halifax, and its older sister ship, the *Cape Freels* operating out of St. John's. Both steel hulled protection craft are equipped to carry out search and rescue missions when required in addition to normal patrol duties. Later this year a large new patrol vessel designed for long-range patrol duties in Pacific waters is scheduled to go into service. Capable of making non-stop patrol missions to the halibut fishing grounds in the Bering Sea, this 180' all weather ship will also be equipped for search and rescue operations, as well as exploratory fishing and other research activities.

The importance of vigilant and well equipped patrol craft on Canada's sea coasts has been em-

In remote fishing regions, helicopters and fixed-wing aircraft are chartered for effective patrol and transportation of officers and equipment.

phasized by the greatly expanded international fisheries, and also the passage by Canada of the Territorial Sea and Fishing Zones Act, extending national fishing limits to twelve miles. Sea patrols in territorial waters are augmented by air surveys to guard against any encroachment on Canadian fishing zones by foreign vessels.

Among the more demanding responsibilities of the Conservation and Protection Service within the past few years have been those dealing with the control of fishing effort in Pacific salmon and Atlantic lobster fisheries, and the control of hunting practices in the Atlantic sealing industry.

LICENSING PROGRAM

A system of licensing all commercial fishermen and fishing vessels on the Pacific coast came into effect April 1, 1966. Fishermen wishing to take part in the salmon fishery must purchase an additional licence. On the Atlantic coast, licenses have been issued in recent years for lobster and salmon fisheries, both of which have been subjected to heavy fishing pressure. In 1966, regulations were introduced on an experimental basis to limit the number of lobster traps per fisherman, and this year trap limits have been extended to all Maritime districts. In addition, all lobster fishing boats in the Maritimes and Newfoundland must be registered with the Fisheries Department in 1968. The aim of this program is to obtain an accurate inventory of craft, gear and fishermen engaged in the lobster fishery. This information is required for the implementation of an efficient management program in this valuable but overcrowded industry and to increase economic returns of the bona fide fishermen.

Supervision of the seal hunt in the Gulf of St. Lawrence and along the Front of Labrador and the Newfoundland coast has developed into a major responsibility of the service. Regulations governing the duration of the season and the permissible hunting methods have been strictly enforced in the interests of conservation and humaneness.

Appointment

Ronald J. McNeill of Halifax has been appointed Chief, Inspection Branch of the Maritimes Region for the federal Department of Fisheries. He was the successful candidate in a public service promotional competition.

He succeeds Dr. C.M. Blackwood who was appointed assistant regional director of the Maritimes Region, Department of Fisheries, in August, 1966. He has been acting chief of the Inspection Branch since that time.

A native of Summerside, P.E.I., Mr. McNeill received his Bachelor of Arts degree from St.

Ronald J. McNeill

Dunstan's University, Charlottetown, in 1939, and his Bachelor of Science degree from Dalhousie University in 1948.

In 1939 Mr. McNeill joined the Prince Edward Island Highlanders, subsequently transferring to the West Nova Scotia Regiment. During his army career he served in Canada, the United Kingdom and North West Europe. He was discharged with the rank of Captain.

Following his graduation from Dalhousie, Mr. McNeill joined the department's Fish Inspection Laboratory at Halifax, serving also at Shediac and St. Andrew's, N.B. and at Charlottetown, P.E.I.

Boost Catch Limit for Yellowfin Tuna

A catch limit for 1968 of 93,000 tons of yellowfin tuna has been set by the Inter-American Tropical Tuna Commission for its regulatory area in the Eastern Tropical Pacific. This is the highest catch quota for yellowfin set in recent years and compares with limits of 79,300 and 84,500 tons in 1966 and 1967 respectively. The regulatory area includes a large body of water off the shores of North and South America between latitude 40N. and 30S.

Canada, which became a member of the IATTC on April 1, 1968 has a developing interest in tuna fisheries, particularly since the establishment last year by a Canadian company of a large tuna canning plant and tuna fishing fleet at St. Andrews, N.B.

At its meeting in Panama City, April 2-5, the Commiss on adopted a Canadian proposal that the Commission's staff submit specific proposals at the 1969 annual meeting for a program of experimental fishing to ascertain the maximum sustainable yield of yellowfin tuna. This followed a Commission statement that it had insufficient data at the present time to predict precisely the effect of fishing beyond the present level of intensity.

A United States proposal that the 1969 opening date for unrestricted fishing for yellowfin tuna in the area be changed from January 1 to March 1, will be the subject of a mail vote by member-countries. Votes are to be submitted before September 30, 1968.

At the 7th Intergovernmental Meeting on Conservation of Yellowfin Tuna, held in conjunction with the IATTC meeting, there was considerable discussion on the proposed study of the effects of present conservation methods. It was agreed to set up a secretariat, consisting of Gerald V. Howard, of the U.S. Bureau of Commercial Fisheries, and Dr. Alejandro Cervantes D., of Mexico. The secretariat will work in co-operation with the Commission's director of scientific investigations on a questionnaire to be circulated for the purpose of the study. After the questionnaires are completed, the working group will prepare a proposal for consideration at the 1969 meeting.

Canadian Commissioners attending the meeting were E.B. Young, federal Department of Fisheries, Ottawa, and Emerson Gennis, president, Ocean Maid Foods Ltd., Toronto, with Dr. P.A. Larkin, of the Institute of Fisheries, University of B.C., and Dean J. Browne, of the Department of Trade and Commerce, attending as advisers.

Member-countries, in addition to Canada, are Costa Rica, Mexico, Panama and the United States. Observers attended from Colombia, Chile, Japan, Nicaragua and Puerto Rico, as well as from FAO and UNESCO. Dr. J.L. Kask, a former Chairman of the Fisheries Research Board of Canada, is the Commission's director of scientific investigations.

The Commission elected Dr. A.W.H. Needler, Deputy Minister of Fisheries for Canada, as chairman, succeeding Eugene D. Bennett of the United States. The next meeting of the Commission will be held in Ottawa, April 15-18, 1969.

Quebec Fisheries in 1967

Gross income of fishermen in the Province of Quebec in 1967 amounted to $7,418,624, derived from landings of 190,384,400 lb. of fish and shellfish and 27,901 seals.

Preliminary figures issued by the Quebec Bureau of Statistics show that landings were up by 31.8% in 1967 while fishermen's gross income rose by 6.7%. A herring catch of 645,554 lbs., compared with 353,415 lbs. in 1966, accounted for a large part of the increased landings.

Quantity and value of fish landed by region are as follows:

	1967		1966	
	lb.	$	lb.	$
Gaspe	72,477,100	3,066,480	64,746,600	2,997,308
North Shore of St. Lawrence	15,803,500	899,145	13,520,300	797,810
No. of Seals	6,714	47,186	6,460	48,810
Magdalen Is.	102,103,800	3,314,285	66,197,400	2,899,056
No. of Seals	21,187	91,528	22,041	209,389

In 1967, offshore fishing yielded 126,839,606 lb., worth $3,438,396; the inshore fishing contribution was 63,555,233 lb., worth $3,841,514.

At 86, He's Still Fishing

Nova Scotia's 'Old Man of the Sea'

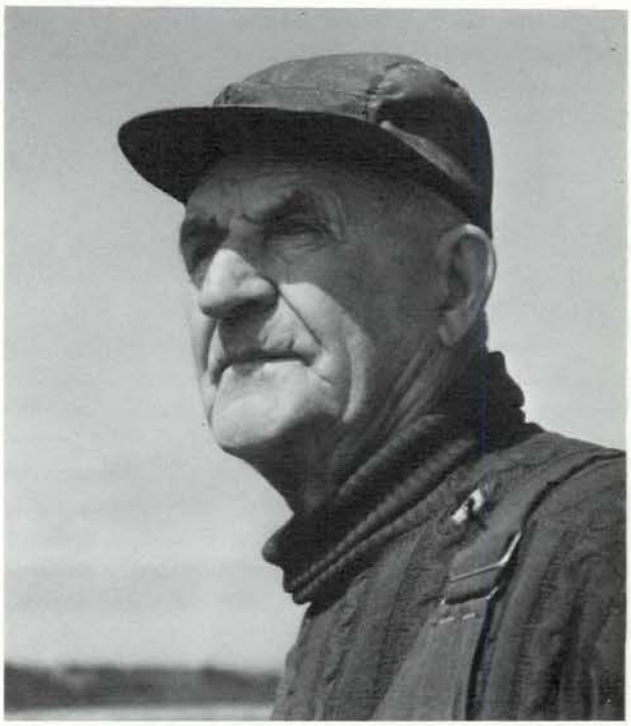
BY W.J. LEVER

HOW MANY 86-year-old men today get up at 5 o'clock in the morning, particularly in the chilly, early spring, take to sea in a small open boat and put in a full day's hard work hauling some 150 lobster traps, by hand, from depths of up to ten fathoms?

And how many 86-year-old men can boast that they have been doing their job for 74 consecutive years without missing any time and without suffering any major illness?

There is such a man! He is Nova Scotia lobster fisherman Garnet W. Snow of Ecum Secum. Born in this small, picturesque fishing village some 100 miles east of Halifax on what is now Highway #7 in 1882, this amazing octogenarian has been a fisherman since he was 12 years of age when he started with his grandfather in 1894.

He says that in the days when he started "we used to row to the fishing grounds at one o'clock in the morning and would not return until late afternoon or early evening and many times not until late at night."



Lobster fisherman Garnet Snow, of Ecum Secum, Nova Scotia. Aged 86, he still puts in a full day's work.

VARIED FISHING EXPERIENCE

In his threescore and fourteen years in boats, Mr. Snow has engaged in all types of inshore fishing, but during the past few years has limited himself to lobster fishing when the season is open in his district, Lobster District No. 5, from April 10 to June 30. He fishes with his 65-year old son, Curtis. They're partners under the new Lobster Licence and Trap Limit Regulations and fish 150 traps, although they could fish up to 375. They plan to set more when the weather warms up.

As he recalls his years as a fisherman, Mr. Snow says "fishing definitely isn't what it used to be. There are fewer fish and the lobsters appear to be gone".

"I remember", he sadly reflects, "when we took lobsters by the hundred weight; raked them in at the shore, filled our boats, and perhaps that was the trouble. We probably took too many in the old days. There were buyers and canneries everywhere and no restriction".

Mr. Snow recalled that in his grandfather's day lobsters were considered valueless. "People wouldn't eat them so they fed them to the hogs and used them as fertilizer" he said. "But when the demand came for lobsters we took thousands of pounds of them and sold them for as little as 60 cents a hundred weight." He added that in his lifetime he has landed "well over one hundred thousand pounds of lobsters".

Referring to the many changes that have occurred along the shore he says: "Years ago it used to take us a week or more to get our salt, dried fish

to Halifax by road, when there was a road. We hauled heavy loads by horse and team. It was all splitting, salting and drying fish in the early days".

On the subject of travel Mr. Snow admits, with no regrets, that he's "never been outside mainland Nova Scotia". He once went to Pictou, 100 miles to the northwest, and as far as Liverpool, 200 miles along the province's south shore.

LIKES ECUM SECUM

Garnet Snow emphasizes that he likes Ecum Secum and loves fishing and the sea. "Was married over seventy years (his wife died several years ago), raised a nice family; five boys and one girl (one son was killed during the Second World War while serving with the United States Army). Have five grandchildren. No great grandchildren yet, but..."

This elderly gentleman from Ecum Secum chuckles when asked whether he ever got caught violating fishing regulations. "Well, one time I did. I recollect that when I was ten, in 1892, myself and a couple of friends had a salmon net set on the Liscomb River when a fishery overseer of the then Department of Marine caught us and warned us. But we moved down the river a little way and set it again and he caught us again. There was no warning the second time. We paid a small fine, but it discouraged me from ever repeating the mistake. I learned my lesson young".

Mr. Snow and his son, Curtis, hauling traps aboard their small lobster boat.

In his over seventy years in the boats, Mr. Snow says he only had one really bad experience and that was many, many years ago. He explained that he was out fishing with a small boy in the boat when a heavy off-shore wind came up and drove them out to sea. They managed to make it to an island some ten miles off and stayed there three days before the wind died down so they could make it ashore. They didn't go hungry, because they had quite a few lobsters in the boat so they made up a fire and ate well on lobster meat. "The folks on shore thought we were gone for sure that time," he laughed, "but I'm still around".

Showing a remarkable indifference toward his age, physically and mentally, Mr. Snow says he never smoked or drank in his life, but "might take it up one of these days". He does not display a furrowed brow or a deeply wrinkled face and speaks with confidence when referring to "next year's" lobster season.

STORM DAMAGE AID

A contribution of $6,666 has been made by the federal Department of Fisheries to the Disbursement Committee for the assistance of lobster fishermen in the Canso area of Nova Scotia. The grant matches the contribution made by the Province of Nova Scotia to assist Canso area lobster fishermen in meeting losses due to storms in 1967.

The federal Government has also entered into an agreement with the Province of New Brunswick to implement a program of assistance to New Brunswick lobster fishermen whereby they will be compensated for 50 per cent of lobster traps lost in a severe storm, September 2, 1967.

Fish Catch in U.S. Lowest in 25 Years

Commercial fishery landings in the United States in 1967 were marked by two extremes – the largest and most valuable shrimp catch in history and this century's smallest harvest of Alaskan salmon.

Preliminary data compiled by the U.S. Bureau of Commercial Fisheries indicate that United States fishermen landed about 4.1 billion pounds, the smallest domestic catch in 25 years. Menhaden and salmon accounted for the largest declines.

The total Pacific salmon take declined from 387.5 million pounds in 1966 to 206.4 million in 1967, while the value dropped from $73.5 million to $48.6 million.

Among individual species, the chinook (king) and the silver (coho) salmon showed relatively slight declines. The catch for chum or keta was almost halved, going from 56.5 million pounds in 1966 to 32 million.

More drastic declines were shown for the pink salmon, which were in low cycle in Alaska, and went from 163 million to 48.3 million pounds. The red salmon (sockeye) dropped from a recent record high of 102 million pounds to 64.7 million.

While these variations occurred in the total U.S. catch of all salmon species, in some areas such as the States of Washington and Oregon, the catch increased over 1966 primarily because of an excellent run of coho salmon in the Columbia River.

Although not a food fish, the menhaden, used chiefly for processing into fish meal, oil and solubles, is the country's leading catch by weight. The 1967 preliminary data show a total of 1.17 billion pounds, down from 1.31 billion in 1966. On the Atlantic Coast, the catch went from 515 million pounds to 465.7 million, and on the Gulf Coast, from 792.7 million pounds to 700.1 million. A catch of 2.3 billion pounds was taken in 1962. This was a record.

Among the mackerels, the harvest of Pacific mackerel dropped from 4.6 million pounds in 1966 to a mere 600,000 pounds in 1967.

Other species showing declines included haddock, king and blue crabs, whiting, Pacific herring, Atlantic and Gulf flounders, Atlantic Ocean perch, and sea scallops. The Pacific sardine has practically disappeared.

Species showing an increased harvest are tuna, Pacific hake, shrimp, Atlantic cod, alewives, anchovies, and oysters.

Coho Investigation

The Department of Fisheries 1968 coho investigation program in Juan de Fuca Strait went into operation May 1. This program, started in 1967, is being conducted to define the migratory behaviour relative to the abundance and feeding habits of early season coho in the Strait. Additional information will also be obtained on the effort-distribution data for both sports and commercial fisheries in the Victoria-Juan de Fuca region.

The 1968 program is in two parts. During the May 1 to July 1 period in Area 20, the chartered commercial vessel *K. Charles* will be tagging "blue-back" coho in Sooke and Pedder Bay region. From May 1 to July 15 in the Becher Bay to Glacier Point, and from Sombrio Point to Port San Juan a troll sampling survey will be carried out using the chartered commercial trollers *Valiant I* and *Tidewater III*.

The Department will also use a series of weekly aerial surveys between May 15 and September 30 to obtain further information on the distribution of sport and commercial gear in the region.

Much of the success in a tagging program depends on the return of recovered tags. A one-dollar reward is offered for all tags returned to a Fishery Officer, or mailed to the Department's Pacific regional headquarters.

ICNAF APPOINTMENT

Mr. Spencer G. Lake, of Burgeo, Newfoundland, has been appointed a Canadian Commissioner on the International Commission for the Northwest Atlantic Fisheries for a two-year period. He replaces Mr. Paul P. Russell, who has resigned from the Commission.

Fish Exposition Set for Boston October 16 - 19

The latest advances in fish-catching methods, processing, fishing vessel design and technology will be on view at the second annual American Commercial Fish Exposition, being held at Boston's War Memorial Auditorium, October 16-19.

Some 400 exhibitors are expected to take part—double the number participating in last year's successful event.

The Canadian Government, with the Fisheries Council of Canada, will be undertaking a Canadian exhibit this year and will join with hundreds of firms producing fisheries products and gear for the industry. Major producers of equipment have already reserved space at the show and include marine propulsion companies, producers of electronic gear for fishermen, pumping, refrigeration and processing equipment, as well as architects and shipbuilders.

"Canada Day" at the Exposition will be Thursday, Oct. 17. Arrangements are being made for a dinner so that Canadian representatives of fishing firms will have the opportunity to meet with fish brokers, processors and equipment manufacturers from the United States and other countries.

The Exposition will also provide an opportunity for those Canadians in subsidiary fields, i.e. manufacturers of fishing equipment, to meet with potential buyers. Last year 17,000 visitors attended the Exposition.

Another highlight of Canada's participation will be the reception given by the Canadian Consul for visiting Canadian fishermen and government officials from Canada to meet United States and international buyers and manufacturers.

At last year's Exposition, a very successful Canadian Fish Tasting Reception was given at the Canadian Consulate General for 40 food editors of leading U.S. magazines and newspapers. A similar reception will be held at this year's Exposition.

An indication of the success of Canada's participation in last year's Exposition is reflected in the fact that two large contracts for fishing equipment have been awarded to Canadian firms with a total value well over $1,500,000. In addition, Canadian fish has been arriving in increasing quantities to fish processors and distributors in Boston, which retains its position as the largest fish distribution centre in the United States.

The seminar program during the course of the Exposition will be followed, as last year. Seminars will cover such topics as modern fishing technology, vessel design, developments in electronics and the latest processing methods.

Further information about the Commercial Fish Exposition may be obtained from the Consul and Trade Commissioner, Canadian Consulate General, 500 Boylston Street, Boston, Mass. 02116.

A section of last year's Commercial Fish Exposition in Boston, Mass.

Announce Fisheries Research Grants

Grants totalling $340,000 to further research in the aquatic sciences, have been announced by Dr. F. Ronald Hayes, Chairman of the Fisheries Research Board of Canada.

Universities receiving these awards include: Memorial University, St. John's, Newfoundland; Dalhousie University, Halifax; University of New Brunswick; McGill University; Macdonald College; Ottawa University; Guelph University; University of Manitoba; Simon Fraser University; University of British Columbia; and University of Victoria.

The largest single award was $100,000 to Professor H. Welch of the Department of Zoology, University of Manitoba, to support the Aquatic Biology Research Unit in Winnipeg.

Professor M. Laird, Memorial University, received a Development Grant of $60,000 to promote expansion of the Marine Biology Program.

$26,000 was awarded to Dalhousie University of which $20,000 will be used by the Institute of Oceanography in the study of oceanic productivity in waters of eastern Canada. $3,000 was awarded to the Department of Biology at the University of New Brunswick.

Grants to McGill University total $10,200 to provide support for graduate students who are working in Fisheries Research Board Laboratories.

A grant of $6,500 was awarded to Dr. R.A. McLeod of Macdonald College for development of a method for detecting and enumerating bacteria using radioactive phosphorus.

Awards to the University of British Columbia include $50,000 for the aquatic biology program under the direction of Professor W.S. Hoar, Head of the Department of Zoology; $7,600 to Mrs. B.E. March of the Poultry Sciences Department who is studying the biological availability of amino acids of fish meal proteins as affected by manufacturing and storage procedures; $6,000 to Dr. G.C. Hughes, of the Botany Department, engaged in a distributional study of the Saprolegniales in B.C.; $7,600 to Dr. G.H. Dixon for a study of the biosynthesis of sperm-specific proteins during spermatogenesis in salmonid fish; $4,000 to Dr. B. McK. Bary, of the Institute of Oceanography for an investigation into the ecology of marine Tintinnidae in coastal waters of B.C.

An award of $4,200 was made to Dr. A.P. van Overbeeke of the Biology Department of Simon Fraser University for an investigation into the presence and distribution of biogenic monoamines in pituitary gland and hypothalamus of salmonid fish.

A grant of $15,400 to the University of Victoria included an award of $10,000 to Dr. T.D.D. Groves for quantitive studies on the bioenergetics and nutrition of salmon and trout.

Groundfish Imports Subject of U.S. Study

The U.S. Bureau of Commercial Fisheries has begun an investigation to determine whether groundfish imports are adversely affecting the domestic industry.

Statistics gathered by the Bureau of Commercial Fisheries indicate that for the decade ending in 1967, imports of fillets and blocks made from groundfish almost doubled, going from 161,396,000 pounds to 316,860,000. During this period, spokesmen for major segments of the domestic groundfish industry report serious economic declines. In 1967, imports supplied a major share of the domestic consumption of these products.

The study, which involves such species as cod, haddock, hake, pollock, cusk, ocean perch, and flounder, will deal only with imports in the form of fillets and blocks. Frozen fish blocks are the raw material for fish sticks and portions which are among the most popular forms of ready to cook or ready to heat fishery items. It was requested by congressmen, senators, and representatives of the domestic fishing industry from the New England and Pacific Northwest areas.

Bureau personnel will attempt to learn whether the domestic slump is a result of imports or if other factors are involved.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May – March 1966-67		May – March 1967-68	
	Landings[1] '000 lb.	Value[2] $'000	Landings[1] '000 lb.	Value[2] $'000
CANADA – TOTAL	**2,355,729**	**151,789**	**2,305,593**	**143,992**
ATLANTIC COAST – Total	**1,829,485**	**92,854**	**2,067,017**	**98,867**
Cod	500,316	22,212	526,111	23,158
Haddock	92,154	6,599	84,064	5,524
Redfish	173,877	4,833	167,990	4,353
Catfish	4,259	141	4,609	149
Halibut	3,774	1,432	3,886	1,534
Other Flatfishes	256,696	8,473	251,360	8,208
Pollock, Hake, Cusk	60,043	2.297	49,515	1,900
Other Groundfish	7,959	135	9,939	134
Herring & Sardines	594,922	6,691	838,527	8,878
Mackerel	25,743	901	24,725	944
Swordfish	7,290	3,135	7,937	3,241
Alewives	8,074	142	6,503	104
Salmon	5,209	2,542	6,202	3,343
Smelts	4,233	361	3,482	356
Other Fish	13,558	495	11,151	423
Lobsters	35,358	20,434	33,947	22,440
Clams & Quahaugs	4,406	263	5,204	345
Scallops	15,641	6,626	11,759	7,269
Other Shellfish	15,973	872	20,106	1,239
Misc. Items	–	4,270	–	5,325
PACIFIC COAST – Total	**526,244**	**58,935**	**238,576**	**45,125**
Pacific Cods	23,260	2,042	16,288	1,310
Halibut[3]	31,360	11,235	24,158	6,111
Soles & Other Flatfishes	11,173	696	7,770	493
Herring	267,122	4,422	38,007	650
Salmon	162,226	38,367	129,161	34,585
Other Fish	12,545	524	9,004	392
Shellfish	18,558	1,629	14,188	1,575
Misc. Items	–	20	–	9
BY PROVINCES				
British Columbia	526,244	58,935	238,576	45,125
Nova Scotia	636,865	44,062	680,798	44,947
New Brunswick	331,900	10,846	360,380	10,914
Prince Edward Island	57,835	6,485	44,173	8,184
Quebec	132,642	6,623	185,738	7,370
Newfoundland	670,243	24,838	795,928	27,452

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

MID-MONTH WHOLESALE PRICES – MARCH 1968

			Montreal $	Toronto $
Cod fillets, Atl. Fresh, unwrapped		lb.	.407	.483
Cod fillets, Atl. frozen, cello 5's		lb.	.338	.390
Cod fillets, smoked		lb.	.428	.500
Haddock fillets, fresh, unwrapped		lb.	.513	.630
Herring, kippered, Atl.		lb.	.278	.310
Mackerel, frozen, round		lb.	.210	.287
Lobsters, canned, Fancy	Case	48-½s	–	67.320
Sardines, canned	Case	100-¼s	9.734	9.567
Halibut, frozen, dressed		lb.	.481	.523
Silverbright, frozen, dressed		lb.	.621	.650
Coho, frozen, dressed		lb.	.934	.947
Sockeye, canned, grade A	Case	48-½s	27.547	28.233
Pink, canned, grade A	Case	48-½s	17.067	17.650
Whitefish, fresh		lb.	.500[1]	.567
Lake Trout, Frozen		lb.	.432	.547

[1]Dressed.

PRICES PER CWT. PAID TO FISHERMEN

(Week ending March 16th)

	1967 $	1968 $
Halifax		
Cod Steak	5.25	5.75
Cod Market	5	5.5
Haddock	8.5	9
Plaice	5	4.5-5.25
Yarmouth		
Haddock	–	6
Black's Harbour		
Sardines	–	2
Vancouver		
Ling Cod	12-16	12
Grey Cod	6-7.5	6-7.5
Soles	8.5-12	4.5-8.5
Salmon (Redspring)	–	–

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF MARCH

	1967 '000 lb.	1968 '000 lb.
TOTAL – Frozen Fish, Canada	**65,705**	**50,300**
Frozen – Fresh, Sea Fish – Total	**41,653**	**31,256**
Cod, Atlantic, Fillets & Blocks	5,810	4,015
Haddock, Fillets & Blocks	5,023	4,139
Rosefish, Fillets & Blocks	4,410	2,024
Flatfish, (excl. halibut) Fillets & Blocks	5,938	4,246
Halibut, Pacific, Dressed & Steaks	4,693	4,952
Other Groundfish, Dressed & Steaks	1,114	806
Other Groundfish, fillets & blocks	4,137	2,058
Salmon, Pacific, dressed & steaks	3,107	2,550
Herring, Atlantic & Pacific	605	580
All Other Sea Fish, all forms	4,978	3,810
Shellfish	1,838	2,076
Frozen – Fresh, Inland Fish, – Total	**6,198**	**5,448**
Perch, round or dressed	117	918
Pickerel (Yellow & Blue) fillets	1,206	672
Sauger, round or dressed	838	306
Tullibee, round or dressed	407	173
Whitefish, round or dressed	1,002	791
Whitefish, fillets	182	126
Other, all forms	2,446	2,462
Frozen – Smoked Fish – Total	**1,444**	**1,260**
Cod, Atlantic	765	368
Sea Herring, kippers	206	509
Other All Forms	473	383
Frozen For Bait and Animal Feed	**16,410**	**12,336**

SALT FISH STOCKS AS AT END OF MARCH

		1967 '000 lb.	1968 '000 lb.
Salted and Pickled Fish, Atlantic Coast			
Wet-Salted – Total		**7,201**	**14,171**
Cod		5,910	12,477
Other		1,291	1,694
Dried-Salted – Total		**10,718**	**13,949**
Cod		9,837	12,650
Other		881	1,299
Boneless – Total		**516**	**1,324**
Cod		501	1,222
Other		15	102
	(barrels)		
Pickled – Total		**5,774**	**8,159**
Herring	"	3,265	3,776
Mackerel	"	2,509	3,953
Mlewives	"	[1]	430
Turbot	"	[1]	–
Bloaters	(18 lb. boxes)	8,908	115,182
Boneless Herring	(10 lb. boxes)	[1]	[1]

[1]Confidential

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS MAY – DECEMBER

		1966 $'000		1967 $'000
TOTAL EXPORTS		**163,111**		**166,883**
By Markets:				
United States		112,191		106,660
Caribbean Area		13,481		13,073
Europe		31,555		40,053
Other Countries		5,884		7,097
By Forms:				
Fresh and Frozen		**111,571**		**106,834**
Whole or Dressed	**35,698**		**33,419**	
Cod, Haddock, Hake	348		333	
Halibut, Pacific	4,938		3,152	
Salmon, Pacific	11,517		12,308	
Swordfish	3,859		4,136	
Other Seafish	6,068		6,401	
Whitefish	3,366		3,007	
Pickerel	2,071		1,334	
Other Freshwater, Fish, n.e.s.	3,531		2,748	
Fillets, Blocks and Slabs	**52,222**		**47,074**	
Cod, Atlantic	15,474		13,306	
Haddock	4,821		4,950	
Ocean Perch, Hake, Cusk, Pollock	7,725		8,749	
Flatfish	10,807		11,863	
Pickerel	2,501		1,523	
Other Fillets & Blocks	10,894		6,683	
Shellfish	**23,205**		**26,054**	
Lobster (in shell & meat)	16,560		18,447	
Scallops	6,175		6,863	
Other	470		744	
Frozen Fish & Shellfish, pre-cooked	**446**		**287**	
Cured		**16,287**		**19,552**
Smoked	**1,601**		**1,258**	
HeHerring	1,073		667	
Other	528		591	
Salted, Wet & Dried	**12,523**		**16,149**	
Cod	10,585		14,466	
Other	1,938		1,683	
Pickled	**2,163**		**2,145**	
Herring	1,283		1,284	
Mackerel	538		521	
Other	342		340	
Canned		**21,689**		**26,039**
Salmon	14,464		19,588	
Sardines	3,613		3,913	
Lobsters	2,282		1,537	
Other	1,330		1,001	
Miscellaneous		**13,564**		**14,458**
Meal	6,640		5,413	
Oil	550		1,320	
Other	6,374		7,725	

The Halifax stern trawler 'Brandel' hauls in a catch of herring following a tow with a mid-water trawl. The Industrial Development Service of the federal Department of Fisheries provided technical assistance in this trawling operation.

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DEPARTMENT OF FISHERIES

Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister — Ottawa, Canada

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