FISHERIES
(formerly Trade News) OF CANADA

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- Lamprey Attack Extends to Lake Huron
- Gaspereaux Fishing in the Maritimes

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

July, 1967

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COVER PHOTOGRAPH - A centre of attraction at the recent International Exposition on Water for Peace in Washington was a respirometer developed by the Fisheries Research Board of Canada Biological Station, Nanaimo, B.C., in connection with their salmon studies. Here the apparatus is explained to U.S. Secretary Stewart L. Udall (right) by David Denbigh, of the Department of Fisheries Information Service. With Mr. Udall is the Hon. Jean-Luc Pepin, Canada's Minister of Energy, Mines and Resources.

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Fisheries Exports in 1966 Break All Records

By T.R. Kinsella*

THE VALUE of Canadian fisheries exports set a new record in 1966 for the fifth consecutive year. Exports in 1966 were worth $219.1 million, about 3 per cent more than in 1965, and were shipped to markets in 76 countries.

Exports of fresh or frozen, whole or dressed seafish totalled 181.7 million pounds worth $34.6 million, compared with 151.4 million pounds worth $30 million in 1965. Fresh and frozen Atlantic and Pacific salmon did particularly well. Fresh and frozen seafish and freshwater fillets, smoked fish, and canned fish all made gains. However, Canada exported less of other fish products, namely, fresh or frozen, whole or dressed freshwater fish; frozen seafish blocks; salted groundfish; pickled and dry-salted fish; molluscs and crustaceans; fish and whale meals; and marine oils.

FRESH AND FROZEN FISH

The year 1966 opened with a strong demand for fresh and frozen fish generally. During the first part of the year, prices in the United States for frozen fish blocks to be used in the manufacture of fish sticks and portions climbed to a record high. As a result, exporters from many countries tried to increase sales in this market. (Canada's competitors are Iceland, Greenland, Denmark, Norway, Poland, West Germany, South Africa, Britain, Argentina, France (St. Pierre and Miquelon), Japan, Switzerland, Belgium and the Netherlands.) The United States market weakened about mid-year and c.i.f. prices to wholesalers tumbled from 29 cents per pound to about 21 cents in December. Among the reasons were the relaxation of the Roman Catholic rules of abstinence, larger European production, and the tight money policy in the United States. Importers who had previously contracted in advance for their requirements began to buy on a day-to-day basis.



Exports of fresh and frozen Atlantic and Pacific salmon increased substantially in 1966. Photo shows a catch of B.C. salmon being unloaded.

The Icelandic-Soviet Trade Agreement helped to stabilize the market. In 1966, Iceland delivered to the U.S.S.R. 12,000 metric tons of frozen fillets, 5,000 tons of whole frozen fish and 5,000 tons of frozen herring. The 1967 Agreement calls for the

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delivery of between 12,000 and 15,000 tons of frozen fillets, 5,000 tons of whole frozen fish and 5,000 tons of frozen herring.

The consensus in the trade is that 1967 will be a better year for fish in the U.S. market. The reasons given are that meat prices remain high, the U.S. population is growing at the rate of three million a year, exporting countries are quality-conscious, and the low chloresterol in fish makes a good selling point. Families who used to eat fish as a penance will now eat it for pleasure.

Fresh and Frozen Ocean Perch and Groundfish Fillets and Blocks (cod and related species)--The United States in 1966 imported 315 million pounds (295 million in 1965), more than ever before, and Canada again supplied over half. Canada, in fact, provided 180 million pounds (177.7 million in 1965) and was also the leading supplier of fresh and frozen cod fillets, with 26 million pounds out of the 41 million pounds imported into the United States from all sources. Iceland came second with a million pounds, followed by Denmark and Norway.

Fresh and Frozen Haddock, Hake, Pollock and Cusk--Imports into the United States from all sources totalled 26.1 million pounds (20.7 million in 1965). Canada supplied 18.5 million pounds of this, Iceland 4.1 million, Denmark 1.7 and Norway 1.4 million.

Ocean Perch or Redfish Fillets--The United States imported 41.6 million pounds, of which Canada supplied 37.6 million, West Germany 2.9 million and Iceland nearly 700,000. The year before, Canada supplied 22 million pounds out of a total of 25.7 million.

For the first time since the United States started to import frozen fish blocks or slabs, the quantity bought was less than in the previous year; imports were down by 8.2 million pounds to 206.6 million. Canada was the main source of supply with 98 million pounds (119.8 million in 1965), followed by Iceland 37.9 million (47.1 million in 1965), Greenland 18.7 million (11.5 million in 1965), Denmark 16.1 million (10.7 million in 1965), Norway 11.9 million (11.4 million in 1965, Poland 9.7 million (1.3 million in 1965), West Germany 4.6 million (4.2 million in 1965), South Africa 3.3 million (688,000 pounds in 1965). These frozen blocks or slabs were shipped to 50 firms in the United States which produced 81.3 million pounds of fish sticks and 146.6 million pounds of fish portions in 1966, compared with 82.5 million pounds of sticks and 140.5 million pounds of portions in 1965. High tariffs on these particular products make it difficult for Canadian processors to compete in the United States, but Canada continues to be the leading supplier of frozen blocks. Most of the U.S. processors buying them are in the Atlantic Coast States, but there are some inland, in the Gulf States and on the Pacific coast.

Britain is also an important market for Canadian frozen cod blocks and slabs. Shipments from Canada in 1966 reached 6.98 million pounds, worth $1.5 million (3.97 million pounds valued at $833,000 in 1965). Britain imported 69 million pounds of quick-frozen fish from all sources in 1965, double the quantity imported in 1960. Figures for Britain's 1966 imports are expected to be similar.

Atlantic and Pacific Fresh and Frozen Salmon--There was a substantial increase in exports of fresh and frozen, whole or dressed salmon in 1966. Sales of Atlantic salmon almost doubled to reach 2.3 million pounds, worth $2.1 million (1.3 million pounds worth $1.1 million in 1965). Exports of fresh and frozen Pacific salmon rose by almost 4 million pounds to 22.2 million worth $15.1 million (18.4 million worth $12 million in 1965). Frozen, whole or dressed coho salmon was the leading variety at 12.4 million pounds worth $8 million (8.9 million pounds worth $5.7 million in 1965). Britain, France, the United States and the Netherlands were the most important markets but coho salmon was exported also to 18 other countries.

Atlantic and Pacific Halibut--Exports of fresh or frozen, whole or dressed Atlantic halibut were up by a million pounds to 3.8 million pounds worth $1.9 million (2.7 million worth $1.5 million in 1965). Exports of fresh and frozen Pacific halibut, on the other hand, fell to 16.6 million pounds valued at $6.8 million from 19.8 million pounds worth $7.3 million in 1965. The United States and Britain were the major outlets.

SALTED FISH

Exports of Canadian salted groundfish (cod and related species) were 70.5 million pounds in 1966, down from the 74.6 million shipped to foreign markets in the previous year but, at $18.4 million, worth slightly more. This should be compared with the figures for previous years--93.6 million pounds worth $21.2 million in 1964 and 106.4 million worth $21.3 million in 1963. The gradual shift from salted cod to frozen fillets and blocks continued throughout 1966. Exporters enjoyed a firm market because there was little carryover of stocks in the major producing countries or the markets from the previous season. Jamaica was still the most important outlet and Puerto Rico, Trinidad, the United States, Portugal and Spain were major purchasers.

The high cost of exchange limited sales in Brazil, and the Cuban market was closed entirely because of the shortage of exchange. Price ceilings imposed by the Jamaican authorities in 1963 were still in effect.

Shipments of hard dried light salted cod (43 per cent moisture or less) were down to 11.7 million lb. worth $3.2 million (16.9 million worth $4.4 million in 1965). Puerto Rico, Jamaica, Spain, the

United States, Italy and Portugal were the main markets. However, exports of heavy salted cod (43 per cent moisture or less) at 30 million pounds worth $7.4 million were up (25.9 million worth $6 million in 1965). Jamaica was the main market, followed by Puerto Rica, Trinidad, Leeward and Windward Islands, Portugal and Barbados.

Canada sold wet salt cod to Spain, Norway, Greece and the United States. A larger quantity of boneless salt cod was exported in 1966, some 8.2 million pounds valued at $3 million compared with 7.8 million worth $2.8 million in the previous year. The bulk of it went to the United States, Puerto Rico, Bermuda, Trinidad and the Dominican Republic.

The quantity of salted scale fish (pollock, hake and cusk) exported in 1966 was 10 million pounds worth $2.5 million, slightly less in quantity but slightly more in value than in 1965. The Dominican Republic, Guyana (formerly British Guiana), Leeward and Windward Islands, Puerto Rico and Surinam were important markets.

SMOKED AND PICKLED FISH

Exports of pickled alewives, pickled split herring, pickled fillets of herring, and mild-cured salmon were higher. Canada exported less vinegar-cured herring and pickled mackerel in both fillet and split forms. The quantity of hard-cured smoked herring bloaters and boneless herring bloaters was larger. The principal markets were the Dominican Republic and Haiti.

Export sales of canned fish in 1966 were higher in both quantity and value and amounted to 47.8 million pounds worth $25.9 million (45.5 million pounds worth $24.7 million in the previous year). The major type was canned salmon, with pink and sockeye showing substantial gains. Exports of canned sardines reached an all-time high in volume and in value. Shipments of canned herring and canned lobster were also higher.

The 1966 pack in the United States at 4.3 million cases (3.6 million cases in 1965) was considerably larger because of bigger packs of the pink and chum species. In 1965 the Japanese pack was 1.8 million cases and the Soviet pack 202,000 cases but 1966 figures have not yet been released; they are expected to be a little higher.

Canned salmon -- Total Canadian canned salmon production in 1966 was 1.8 million cases of 48 pounds each compared with 914,000 cases in 1965.

The value of Canadian exports of all species of canned salmon in 1966 reached 25.5 million pounds valued at $18.62 million (26.4 million pounds worth $18.65 million in the previous year). Canned pink salmon led the other species in quantity and value, followed by sockeye and coho. The principal market for Canadian canned salmon was Britain. Other important outlets were Belgium, Australia, New Zealand, Ireland, France, Netherlands, Italy, South Africa, Trinidad, Denmark, Venezuala, Barbados, and Netherlands Antiles.



Export sales of Canadian canned fish were higher in both quantity and value in 1966. Exports of canned sardines reached an all-time high in volume and value.

There were no restrictions on imports of canned fish into Australia. Imports into New Zealand are under global licence. There has been no change in South Africa, where a quota system governs imports of canned fish.

Canned sardines--The pack in 1966 totalled 1.2 million cases of 20 pounds each and exceeded the previous highest output of 1.1 million cases in 1965. A strong demand in the 38 traditional markets led to all-time record exports by quantity and value. Shipments reached 15.9 million pounds worth $5.5 million (14.4 million worth $4.7 million in 1965). The principal markets were Jamaica, Dominican Republic, British Guiana (now Guyana), Australia, the United States, Barbados, Leeward and Windward Islands, South Africa, Britain, Panama, Austria, New Zealand, Surinam, and Fiji.

Other canned fish and shellfish--Canada also exported in 1966 herring, kippered snacks, chicken haddie or flaked fish, lobster, crab, mackerel and clams.

Shipments of molluscs and crustaceans during 1966 were lower at 41 million pounds worth $34.5 million (43.6 million valued at $39.2 million in 1965).

Lobster--Shipments of lobster in the shell, fresh or frozen, during 1966 were valued at $15.2 million, $2 million less than in the previous year. The major markets were the United States, Britain, France, Netherlands, Belgium, West Germany, and Switzerland. Fresh or frozen lobster meat sales totalled $6.9 million ($8.6 million in 1965), and were mainly to the United States although Britain also purchased substantial quantities. Canned lobster exports were worth $2.6 million in 1966 ($2.5 million in the previous year). The United States, Britain, West Germany, Sweden, Netherlands, Belgium, and Denmark were the main buyers.

Scallops -- Landings of scallops dropped to 18.3 million pounds with a landed value of $7.5 million (19.7 million worth $10.8 million in 1965). Exports totalled $8.8 million and went chiefly to the United States and France but West Germany, Britain, and Bermuda took smaller quantities.

There was less Atlantic squid exported but more Atlantic clams and oysters, more Pacific crabs and clams but less Pacific oysters and shrimps.

FISHERIES BYPRODUCTS

The output of Pacific herring meal fell sharply to 27,181 tons from 40,129 tons in 1965. The production of Pacific herring oil fell to 3.1 million imperial gallons from 4.5 million in the previous year. However, the reverse was the case in the Atlantic fishery where herring meal production reached 27,500 tons (12,800 tons in 1965) and herring oil output rose to 1.7 million gallons from 781,000. Exports of herring meal from both coasts totalled 73.4 million pounds worth $6.9 million (80.2 million valued at $6.6 million in 1965). Industrial herring oil shipments in 1966 amounted to 790,000 pounds worth $76,000 (7.6 million worth $759,000 in the previous year). Almost all of the herring meal and oil exported went to the United States and Britain. The over-all production of Atlantic Coast groundfish meal and oil was about the same in 1966 as in 1965: fish meal 41,594 tons (42,794 tons), fish body oil 269,052 gallons (213,791 gallons), and fish liver oil 447,730 gallons (493,694 gallons). Britain and the United States were the principal export markets.

An important new development in the fisheries byproducts field was the United States authorities approval of fish protein concentrate or fish flour made from whole fish (hake) for human use. This may help to convince potential overseas purchasers. The concentrate is a virtually odourless, tasteless powder, white to light tan in colour. It contains over 80 per cent animal protein and several nutritionally beneficial minerals. Pilot plants for the production of fish protein concentrate or fish flour are under consideration in Canada. There is no commercial demand at present but in the longer term, fish protein concentrate could make a major contribution to feeding people in developing countries.

PROMOTING FISH SALES

The Department of Trade and Commerce, in co-operation with the federal and provincial fisheries departments and the trade across Canada, began in 1962 a systematic examination of fisheries production and markets in the principal producing and consuming countries of the world. As part of this program, Canadian Fisheries Reconnaissance Missions visited New Zealand and Australia in 1966 and recently toured Austria, Czechoslovakia, Rumania, Hungary, and Yugoslavia. On the spot examinations in 1966 were also made in Hawaii, Ceylon, Singapore, Malaysia, India, Britain, and France. Trade Commissioners round the world report periodically on fisheries production and potential consumption in their respective areas; this information is used by the federal and provincial government fisheries officials and the Canadian fisheries industry.

A new venture in 1966 was the fisheries display at the International Food Fair in Paris. Some 40 Canadian exporters of fisheries products exhibited and samples of various species of freshwater fish were cooked by an expert chef at the display and sampled by potential French importers. Some Canadian fisheries exporters also displayed their products in British, West German, and United States food fairs. ✔

Attack on Sea Lamprey Extends to Lake Huron

By R. N. Wadden

ENCOURAGED by success achieved in combating destructive sea lampreys in Lake Superior, Canada's lamprey control experts are now extending their attack upon stocks of the fish-killing parasite in Lake Huron.

Completion of the four-year control program begun last year is scheduled by 1969, and involves the treatment of lamprey-populated tributaries with a chemical "lampricide" capable of killing sea lampreys without harming their intended victims. Similar treatments in Lake Superior have achieved a 90% reduction in the number of parasites. A concurrent treatment program is being conducted by United States authorities in the upper Great Lakes.

The success attained to date by chemical control in Lake Superior has made possible a beginning in rehabilitation of the depleted lake trout population by the large-scale planting of hatchery-reared lake trout. Experimental work has also been initiated to plant in other lakes the hybrid "splake" and a number of Pacific coast salmon species.

Lamprey control activities on the Great Lakes are co-ordinated by the Great Lakes Fishery Commission under a convention ratified in 1956. The Canadian control operations are carried out, under contract with the Commission, by the Sea Lamprey Control Experiment Station at Sault Ste. Marie, Ont., which forms a branch of the Resource Development Service of the federal Department of Fisheries. Its area of responsibility extends to the Canadian segments of Lakes Superior, Huron, Erie and Ontario as well as Lake St. Clair. The Fish and Wildlife Service, Bureau of Commercial Fisheries, of the United States Department of the Interior is responsible for lamprey control work on the American side of these lakes and in all of Lake Michigan.

Sea lampreys invaded the upper Great Lakes during the 1930's and 1940's after establishing a small population in Lake Erie some years earlier. Rapidly multiplying in numbers, the disc-mouthed parasites decimated the native fish stocks, causing a complete collapse of the valuable lake trout fisheries.

Annual catches of lake trout in the three upper lakes declined from 15 million pounds to 350,000 pounds: in Lake Huron, where the first sea lamprey was detected just 30 years ago, the catch plunged from 3.4 million pounds to almost nothing. (In 1966, the lake trout catch on the Canadian side of Lake Huron totalled just 1,100 pounds.)



Focal point of the Department of Fisheries battle against sea lampreys in the Great Lakes is the Sea Lamprey Control Experiment Station at Sault Ste. Marie, Ont.

Lampreys are harmless to fish throughout the lengthy period as larvae or "ammocoetes" which lasts from four to seven years. During this period, they live quietly in the mud at the bottom of tributary streams, eating planktonic life and keeping well out of sight of enemies. On reaching a length of about six inches, the toothless, worm-like ammocoetes develop the adult lamprey's characteristic sucking-disc mouth with its numerous horny teeth. At the same time, it loses its taste for plankton and descends the stream to feed upon fish life in the lake.

Throughout its lake-dwelling period lasting one year to 18 months, the lamprey preys voraciously upon fish, attacking its victims by clinging with its sucker-like mouth and draining the fish of its life's blood. Many fish are killed by these attacks; those that survive bear scars inflicted by the predator. The incidence of scar-bearing fish taken in fishermen's nets provides a fairly reliable gauge of the seriousness of lamprey activity in the lake.

Efforts to bring about control of the deadly lamprey in the upper lakes have been carried on for 20 years now, but only within the last eight years have they met with really encouraging results. Mechanical traps and later electrical barriers erected on spawning streams proved of little effect in halting the advance of the round-mouthed monster, and success was only attained with the application of a selective chemical developed for this express purpose.

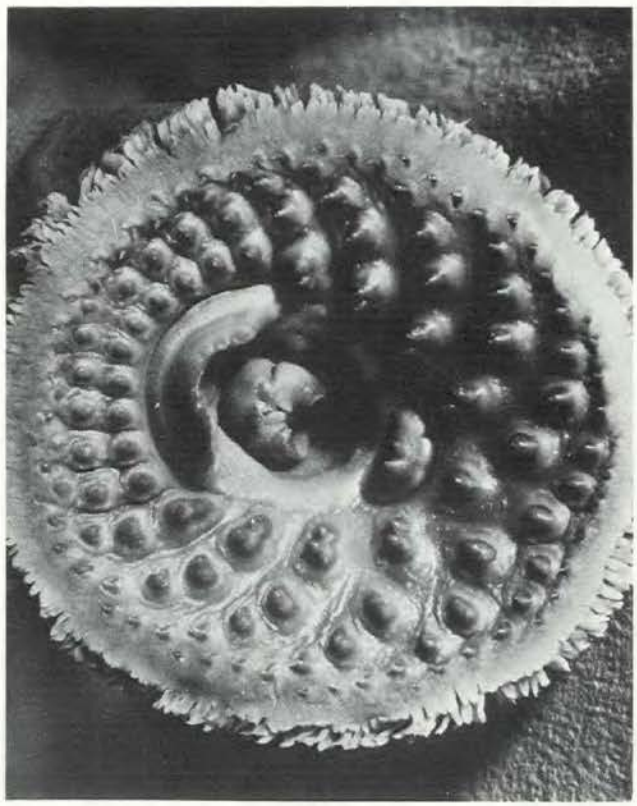
DISCOVERY OF "TFM"

Studies initiated at the United States Fish and Wildlife research centre at Hammond Bay, Michigan, produced a "specific lampricide", a chemical which will kill lampreys when applied to spawning streams without doing serious harm to fish. This chemical, discovered after testing of more than 6,000 others, is identified scientifically as "3-trifluormethyl-4-nitrophenol". More familiarly, it is called simply "TFM".

Treatment of streams with TFM was begun experimentally in 1958, and systematic treatments commenced in Lake Superior in the following year. All 38 known lamprey spawning streams on the Canadian side of the lake received one or more treatments by 1966, but the program produced impressive results as early as 1962, when the number of lampreys collected at the assessment barriers dropped by 80%. Further chemical treatments exerted added pressure on the lamprey stocks, and by 1966 barrier collections indicated the population was reduced by approximately 90% from the level when treatments commenced.

There was further evidence to confirm the fact that the battle against Lake Superior lampreys was being won. A general reduction was reported in the number of lamprey-scarred fish taken by fishermen. There was an increase in the size of fish taken, and an earlier maturing of the surviving lake trout stocks in the lake. Moreover, specimens of young of the year taken from the inshore fishery were found, indicating that planted hatchery-reared lake trout had successfully spawned and survived. Successful chemical treatments had also been carried out by United States authorities on Lake Michigan streams.

With all of this evidence indicating success in lamprey control and lake trout rehabilitation, the Sea Lamprey Control units on both sides of the border embarked in 1966 upon the next phase in the program - an assault upon the still-thriving lamprey hordes in Lake Huron. Groundwork for this campaign has already been laid. Crews from the Fisheries Research Board of Canada, which conducted this operation prior to 1966, surveyed Lake Huron streams in 1956-58, discovering lampreys in 38 tributaries. (Other Canadian lamprey streams include 22 in Lake Ontario, six in Lake Erie, one in Lake St. Clair and, as already noted above, 38 in Lake Superior, for a total of 105. On the American side of the lakes, 225 lamprey streams have been located).



Circular mouth of the adult sea lamprey is lined with sharp, conical teeth. The sharp tongue rasps away fish scales to enable the lamprey to suck its victim's blood and body juices.



Sea lamprey feeding on a lake trout.

Chemical treatments with TFM were carried out in 1960-61 on 20 streams in Georgian Bay and North Channel, but further work in Lake Huron was discontinued in order to concentrate efforts in Lake Superior. The present round of treatments in Lake Huron is being conducted in a four-year cycle. In 1966, the first stage was completed with the treatment of ten streams in St. Mary's River and on St. Joseph's Island, all in the Sault Ste. Marie area. This year, work is being concentrated in the North Channel, where 12 streams are scheduled for TFM treatment. In 1968 nine lamprey streams scattered through Georgian Bay are to be treated, and the campaign will wind up in the following year with treatment of seven streams on Manitoulin Island and two in southern Lake Huron.

CHALLENGING TASK

Supervising and organizing this extensive program is a full-time occupation even though actual treatments are conducted only in six months of the year. For Dr. J. J. "Jim" Tibbles, Director of the Sea Lamprey Control Experiment, it is a constantly challenging yet rewarding task.

A native of Toronto and graduate of the University of Wisconsin, Dr. Tibbles has been engaged in lamprey control work since he joined the Fisheries Research Board at Sault Ste. Marie in 1956. He later transferred to the FRB Biological Station at London, Ont., but continued in lamprey work, becoming Director of the Sault station in 1965. When the responsibility for lamprey control was passed over from the Fisheries Research Board to the federal Department of Fisheries in 1966, Dr. Tibbles decided to continue as Director of the station, which then became a branch of the Department's Resource Development Service.

The affable, soft-spoken scientist has no illusions about the prospects for wiping out the Great Lakes lampreys, although he is confident in the effectiveness of chemical treatments. Asked if he can foresee a day when the parasite will be completely under control, he says: "It would be practically impossible to eradicate the sea lamprey from the Great Lakes, and a form of control will have to be maintained to ensure that the lamprey population is kept at a low level."

To carry out the wide range of duties required for the Canadian lamprey control program, Dr. Tibbles has under his direction a staff of highly trained and experienced scientists and technicians numbering at peak periods as many as 50 persons. The complement of nine biologists includes, in addition to the Director, Aarne Lamsa, Assistant to the Director, whose experience in sea lamprey work dates back to 1954 when he joined the Sault staff as a student.

Two chemical treatment crews working in the field this season are headed by biologists Stanley Dustin and William Davis, assisted by Pat Shera, Gordon Higginson, Wayne Westman and Peter Clancy. One crew is working in Lake Huron while the other is engaged in stream re-treatments in Lake Superior.



Laboratory assistant checks condition of ammocoetes and trout subjected in bioassay test to varying concentrations of lampricide.



Electrical barrier on stream at St. Joseph's Island, Lake Huron, is used to assess sea lamprey spawning run. High voltage signs warn passers-by to keep their distance.

Lampricide treatments are costly -- representing an expediture of approximately $75,000 per year per lake for TFM supplies alone in Canadian streams. Substantial savings have been effected by the addition to the TFM of a chemical "synergist" known as "Bayer 73". This has the effect of reducing by about 50% the amount of TFM required to kill lamprey.

Application of the lampricide into the stream is made, whenever practical, by means of pumping apparatus located in the upper reaches of the watershed beyond the points of distribution of the sea lamprey. The size of the stream and the ease or difficulty of access determine the type of pumping equipment used. All forms of transportation, including railway, boats, fixed wing aircraft, helicopters, trucks and even motorcyles, are used to convey men and equipment into the treatment sites.

In preparation for treatments, a mobile bioassay laboratory is set up near the treatment site in order to determine the amount of TFM required to kill lamprey without causing undue harm to fish. Other tests are performed in order to calculate the rate at which the chemical should be released into the water. Chemical analysis trailers are also employed to monitor the concentration of lampricide so that it can be maintained at the required level until it reaches the lake.

Electrical barriers are used in lamprey control operations as a means of estimating the size of spawning runs. Consisting of pairs of electrodes set into the stream bed, these devices are designed to assess the number of lampreys venturing upstream. Fish are prevented from entering the electrical field by wire mesh traps and fences.

At the present time 24 electrical barriers are in operation in Lake Superior, eight on the Canadian side, 16 on the American, and there are 10 in Lake Huron, nine of them on the Canadian side.

Patient but productive work being done for the rehabilitation of fish stocks in the Great Lakes in conjunction with lamprey control constitutes a story in itself. In Lake Superior, where the native stocks of lake trout were never completely wiped out, federal, state and provincial agencies have co-operated in planting about 16 million hatchery fish since 1958 to help re-establish the species. This restocking program is the responsibility, in Canada, of the Ontario Department of Lands and Forests.

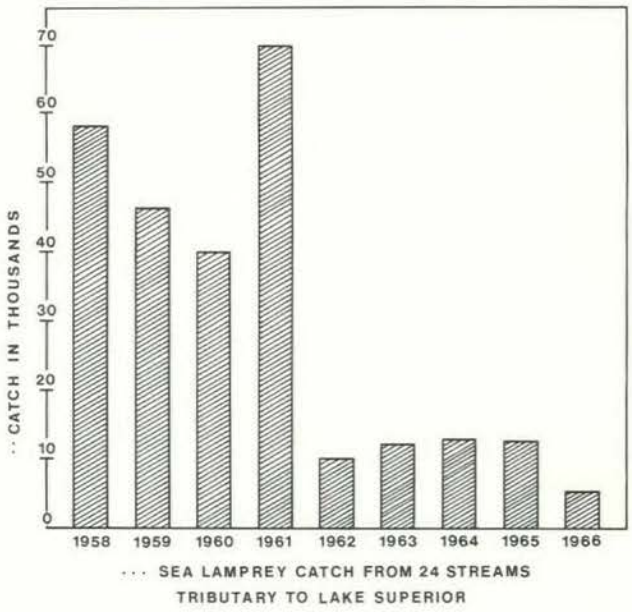
EXPERIMENT WITH "SPLAKE"

In Lake Huron, the Ontario department is pioneering an experimental planting of "splake", a hybrid developed by crossing the lake trout with the speckled (or brook) trout. This selectively bred hybrid has been developed in such a way as to fit the environment formerly occupied by the lake trout, but to be able to reproduce in spite of the presence of some sea lampreys. It is expected to combine the early maturity of speckled trout with

the size and deep swimming ability of the lake trout. It is planned to commence large-scale planting of splake in Lake Huron by 1969 or 1970, when sea lamprey control is expected to be effective. United States agencies have agreed to share in this experiment in Lake Huron, using splake instead of lake trout.

In another experiment, the Research Branch of the Ontario Department of Lands and Forests is introducing in Lake Huron and Lake Ontario a landlocked variety of Pacific sockeye salmon, commonly called "kokanee". These lakes were chosen for the experiment because of suitable environmental conditions and in view of the depressed state of their commercial and sport fisheries. Three million eggs were contained in the first of four annual plantings carried out in 1964-65. Good growth and survival were recorded.

Another Pacific coast import, coho salmon, has been introduced by United States agencies in streams tributary to Lake Michigan and Lake Superior with some impressive results. The young coho were planted as four to six-inch fingerlings in the spring of 1966. Within three months, several coho measuring up to seven inches and weighing up to two pounds were taken in nets in Lake Michigan, and by fall, anglers were taking between one and two



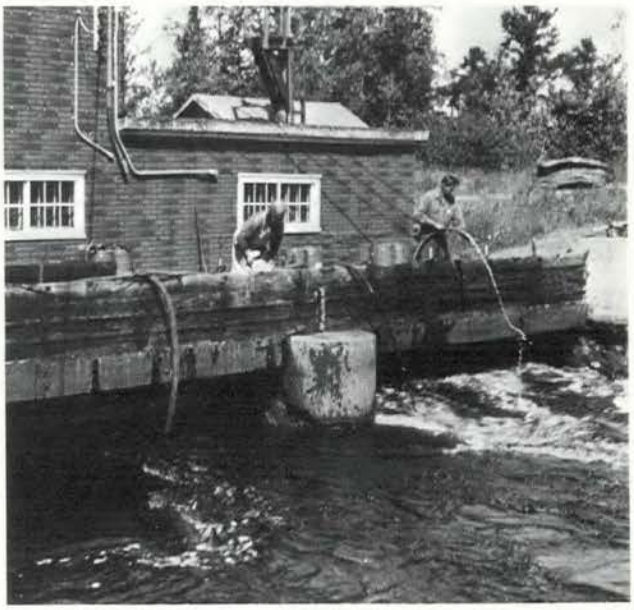
··· SEA LAMPREY CATCH FROM 24 STREAMS TRIBUTARY TO LAKE SUPERIOR

thousand fish averaging about three pounds in weight. Heavyweight of the lot was a hefty two foot coho that weighed seven pounds - not bad for a fish that four months earlier weighed only one ounce.

Plans are now afoot to plant chinook or spring salmon eggs from the Pacific in Lake Michigan streams. If these and other experimental plantings prove successful, the commercial and game fisheries of the Great Lakes will be well on the road to recovery. ✔



A lightweight motorcycle is used to transport lampricide over rough terrain to reach treatment point.



Pumping TFM into an aquaduct leading to turbines at base of Kakabeka Falls near Fort William, Ont.

Canada's Exhibit Draws Attention at Water for Peace Exposition

MORE THAN 2,500 delegates and observers, representing some eighty-nine countries, met at Washington, D.C., May 23-31, to talk water. They were participating in the International Water for Peace Conference called by U.S. President Lyndon B. Johnson.

The conference studied the entire range of global water problems and provided an opportunity for technologists, scientists and government officials to exchange information on ways and means of combating drought and water pollution.

The 63-man Canadian delegation, which included federal and provincial government representatives and officials, was headed by the Hon. Jean-Luc Pepin, Minister of Energy, Mines and Resources. Representing the federal Department of Fisheries were Dr. R.R. Logie, Assistant Deputy Minister (Operations) and K.C. Lucas, Director of Resource Development.

Attending from the Fisheries Research Board of Canada was Dr. J.P. Tully, who presented a background paper entitled "Some Canadian Fisheries Research Accomplishments Concerning Water". Background papers were also contributed by Mr. Lucas, on "Fisheries Resource Considerations in Water Management in Canada", and by A.L.W.



U.S. President Lyndon B. Johnson was one of many interested spectators at the Canadian exhibit at the International Water for Peace Exposition in Washington.

Tuomi, of the Department's Economic Services, on "Recreative Sport Fishing a Peaceful Use of Canadian Water."

PRESIDENT'S APPEAL

In an opening address to the conference, President Johnson said provision of adequate water supplies was humanity's greatest need. He urged all nations to do what they could to quicken the pace of science and technology, train more manpower and build better institutions for managing water resources.

With the population shift to urban centres it was important to have substantial supplies of clean water, the President said, but at present 40 per cent of city dwellers had no water service. By the year 2000 the world's population was expected to increase to six billion persons and the demand for water would be more than doubled.

President Johnson pledged to share U.S. technological advances in water management and development with all countries of the world. In addition, he said he had created a Water for Peace office within the State Department to co-ordinate U.S. programs with those of other countries.

At a press conference prior to the opening session, Mr. Pepin said Canada's most pressing problem with regard to water was to combat pollution of the Great Lakes. He added that the federal Government was conducting co-operative studies to assess water resources with the governments of Ontario, Quebec and Prairie Provinces.

CANADIAN EXHIBIT

Attracting attention at the concurrent International Exposition on Water for Peace was a large Canadian exhibit on the theme "Water for Life", where particular interest was shown in a display of several large trout in a respirometer developed at the Fisheries Research Board of Canada Biological Station at Nanaimo, B.C. The respirometer assists in measuring the energy a fish uses in swimming at various rates under varying water conditions. Among other displays in the Canadian exhibit was a model of the Department of Fisheries' Qualicum River salmon development project in British Columbia. ✔



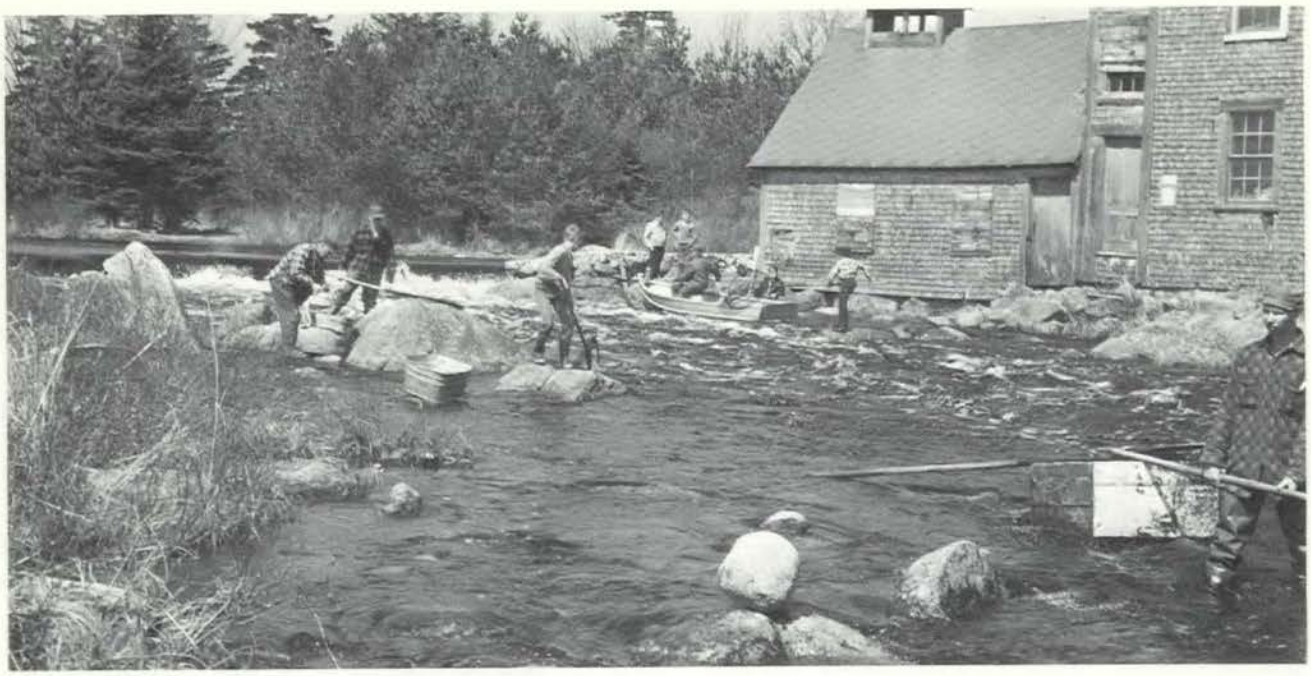
Dr. J.P. Tully (left) of the Fisheries Research Board, Ottawa, chats with U.S. Secretary of State Dean Rusk at the Water for Peace Conference.



A model of the Department of Fisheries' Big Qualicum River project in B.C. is explained to U.S. Secretary of Agriculture Orville Freeman (right) by K.C. Lucas, Director of Resource Development.

U.S. Fishing Fleet

The United States commercial fishing industry added the largest number of new vessels last year than at any time since 1949, reports the Department of the Interior's Bureau of Commercial Fisheries. A total of 816 vessels was added to the fleet, the highest since the 1,002 additions in 1949. Nearly half the new vessels, 373, list home ports in the Gulf Coast states.



Dip-netting for gaspereaux in the Barrington River, Nova Scotia.

Gaspereaux Fishing in the Maritimes

By G.J.Gillespie

WHEN the native Mayflowers bloom in the deep forests and a myriad of lakes and streams are made luminous in the moonlight by the sparkling splashes caused by millions of gaspereaux swarming in from the sea, it is a sure sign that spring has arrived in the Maritime Provinces.

The annual migration of gaspereaux--a swift-moving, silvery fish known by several names -- usually commences in May and continues until late in June. While it cannot be classed with cod and other groundfish species as an important segment of the commercial fishing industry, nevertheless, it provides a quick and easy income for many fishermen taking advantage of the short fishing period. Last year 12.1 million pounds of gaspereaux were landed in the Maritimes, representing a landed value of $235,000. The figures reflect only the fish passing through normal trade channels, but many thousands of pounds more are taken by fishermen for bait and home consumption.

By what name this herring-like fish is known depends largely on one's geographical position in the Maritimes. While it is generally known as gaspereau, in some areas it is known as "alewife." In other places -- particularly in some parts of south-western Nova Scotia -- people refer to it as a "kiack".

In the New England states, for instance, the fish are known as alewives and gaspereaux as well as "branch-herring" or "big-eyed herring". Coupling herring in the nomenclature is natural enough, because alewives and sea herring belong to the same family, Clupeidae. That, by the way, makes them second cousins to such other fish as the pilchard and the shad.

EASY TO CATCH

One of the easiest fishes in the world to catch -- they can literally be scooped up with buckets in

shallow water -- the alewives belong to the family of anadromous fishes. In that respect they are like the Atlantic salmon. That is, they come into freshwater streams to spawn but spend most of their lives at sea.

As is the case of most anadromous fish, information about the alewife's life at sea is scanty. The eggs hatch in fresh water in a few days and the baby fish sets out to sea when about a month old. It is believed the alewife matures after spending three or four years at sea, but the salt water chapters of its odyssey remain a mystery. While trawlers fishing the deep, offshore banks gather all manner of marine species in their trawls, rarely do they catch a gaspereau or alewife in their trawls.

Usually, at the age of three or four years the alewives school in the millions and head toward the spawning grounds. After spawning, they return to the sprawling wastes of ocean and return again in due season to reproduce their kind.

The alewife has characteristics of the herring. In length it may measure twelve inches and in weight around ten or eleven ounces. It is similar to herring in flavour and fatness and is well fortified with bones. It is greyish-green on the back, although sometimes the shading on the back may run toward a bluish color. Its sides are silvery with variegated dark stripes. It has a distinctive black spot behind each gill cover on the short head.

WIDELY DISTRIBUTED

The alewife is widely distributed from the coasts of the Maritime Provinces and Labrador, and embracing the St. Lawrence River, to Lake Ontario and along the Atlantic coast from Maine to the Carolinas. However, the main commercial fishery is centred in the Maritime Provinces, mostly in New Brunswick and Nova Scotia.

Essentially, it is a river fishery in the Maritimes. Trap-nets, pound-nets, gill-nets, dip-nets and weirs are used at one place or another, mostly in rivers to catch the fish on their upstream migration.

However, there is a substantial alewife lake fishery. This occurs mainly in the Grand Lake system in central New Brunswick. In this large area of water comprising Grand Lake and three connected lakes -- Indian, French and Maquapit -- 80 trap-nets have caught large quantities of alewives since fishing began early in May.

While Grand Lake is the largest of this system of lakes which drain into the St. John River via its tributary the Jemseg, most of the traps are set on Indian and French lakes. Grand Lake, measuring 32 miles long and seven miles in width at its widest point, has few traps.



Hauling aboard a catch of gaspereaux.

Some of these traps yield up to 45 barrels of alewives daily. They are fished mainly by local inhabitants -- descendants of United Empire Loyalists who settled the territory in the 1780's -- but some traps are operated by fishermen coming from the coastal regions in Kent and Westmorland counties.

The traps are brailed daily, mostly by dip-nets, and dumped into open motorboats much similar to those used by lobster fishermen in Northumberland Strait. In turn, the alewives are transferred to small, flat-bottomed scows. Ashore, an endless-chain loading apparatus transfers the fish into trucks which take them to marketing points.

Most of the catch goes to the pet food trade, but a portion is processed, principally pickled or salted. The Caribbean area is the main market for the latter product. A small quantity goes into the fresh fish trade and some is smoked.

Trap-netting gaspereau is relatively new in the Grand Lake system. It is a growing fishery, and one that is being closely watched by the federal Department of Fisheries whose main concern is managing the stock to the best advantage in line with proper conservation policies.

The Grand Lake area is steeped in history. It was probably there that the first inland fishing of any commercial consequence in the Maritimes took place. That was during the French regime in the 17th century and the mid-half of the 18th century. French explorers navigated the St. John River and into the Jemseg which is the main outlet of the Grand Lake system.

During the English conquest in the 1750's, the French settlers were driven from the St. John River valley and its environs, and the English settlers came. It was not, however, until the War of American Independence that the area assumed importance as a permanent settlement. That came when United Empire Loyalists, seeking new homes under the British crown, settled the river valley and the Grand Lake region. They, too, exploited the Grand Lake fishery but not on the scale that it is being exploited today.



Trap-netting for gaspereaux on the Grand Lake system of Nova Scotia.

Thanks From Thailand

Every year the Information and Consumer Service of the federal Department of Fisheries sends out thousands of items of information in answer to requests not only from Canada but from places all over the world.

Occasionally recipients express their appreciation with a note of thanks. Few, however, go to such lengths as Richard Tapp, a young student living at Khonkaen in Thailand, who sent a two-page registered air-mail letter to say "thanks" for the fisheries literature he received and also tell in some detail about life in his country.

Richard goes to school at the University building in Khonkaen. School there starts at 7:30 in the morning and finishes at noon owing to the heat.

Of the weather, he says, "There are 3 main seasons in Thailand; they are hot, cool, and dry or rainy. There are many rains before the rainy season in June. In December 1966 we had a terrible cold spell, the temperature went down to 46° above. But recently it's gone up to 112° above."

Richard goes on to describe the varieties of poisonous snakes in Thailand and tell about his dog, the cost of servants and highway construction.

Announce Changes In Federal Policy On Vessel Assistance

Major changes in government policy with respect to financial assistance in the construction of fishing vessels have been announced by federal Fisheries Minister H.J. Robichaud. These changes are made in amendments to the Fishing Vessel Assistance Regulations under which fishing vessel assistance is administered.

Mr. Robichaud said that, effective April 26, 1967, all applications for contributions in respect to fishing vessels that are to be built according to plans and specifications approved by him, must be received before the construction of such vessels can be commenced.

A second amendment provides that applications for financial assistance for fishing vessels to be built to plans and specifications not approved by the Minister of Fisheries must be received by the Minister 30 days before a start is made on the construction of such vessels.

The Minister's announcement stated that any vessel on which construction was started after April 26 is subject to the new regulations. However, to prevent any hardships to fishermen who made commitments to have vessels built after April 26 and were unaware of the changes in the regulations, a special provision has been made. Under this provision, each application submitted will be examined in the light of the requirements outlined in June, 1964, which provide that the vessel for which assistance is sought must be an efficient fishing craft, is built according to specifications and is capable of providing a diversification in the fishing activities of the fisherman applicant.

The Minister emphasized, however, that from June 15, 1967, the requirements of the regulations will be fully applied.

Under Fishing Vessel Regulations the Minister of Fisheries is empowered to enter into an agreement with provincial fishermen's loan agencies - fishermen's loan boards or, in the case of the Province of Quebec, the Minister of Industry and Commerce - to make contributions toward the cost of building fishing vessels.

Such an agreement stipulates that the federal government would provide:

(1) Twenty-five per cent of the approved cost of any fishing vessel having a minimum length of 35 feet and a maximum length of less than 45 feet;

(2) Thirty per cent of the approved cost of constructing any fishing vessel having a minimum length of 45 feet and a maximum size of less than 100 gross tons; or

(3) Forty per cent of the approved cost of any wooden fishing vessel having a minimum size of 100 gross tons.

In order to be eligible for assistance fishing vessels under 15 gross tons must be inspected to the satisfaction of the Minister. Before financial aid is considered for vessels of 15 gross tons or larger a certificate from the Board of Steamship Inspection is necessary.

Research in St. Margaret's Bay

With final planning completed, the Dartmouth Laboratory of the Fisheries Research Board of Canada at the Bedford Institute of Oceanography is about to commence a concentrated scientific investigation of the varied biological life and physical conditions of St. Margaret's Bay and adjacent coastal waters off the South Shore of Nova Scotia.

Dr. L.M. Dickie, the director of the laboratory, is confident that the St. Margaret's Bay project and other programs of the laboratory will lead to scientific information on the characteristics and potential of the most productive fishing areas and how they are maintained.

Associated with the project is the development of an electric-acoustic system recently designed at the laboratory for counting and identifying species of fish. If successful, there are prospects that the research will help fill long-standing needs of local fisheries for both equipment and fishing information.

The St. Margaret's Bay project was started in a limited way last summer, but with the expansion of facilities at the Dartmouth Laboratory, it is now hoped to continue operations on a year-round basis. This summer the main activities will be based at Mill Cove on the west side of the Bay from where three research vessels will operate and where trailers will provide temporary laboratory facilities ashore. Certain equipment will operate from a moored launch in the Bay itself.

13 Nations Attend ICNAF Meeting

The 17th annual meeting of the International Commission for the Northwest Atlantic Fisheries (ICNAF) was held in Boston, Mass. June 5-9, 1967, with T. A. Fulham (USA) presiding. Delegations attended from 13 of the 14 member-governments, namely: Canada, Denmark, France, Federal Republic of Germany, Iceland, Norway, Poland, Portugal, Romania, Spain, the Union of Soviet Socialist Republics, the United Kingdom, and the United States of America. Italy did not send a delegate.

Observers represented the Governments of Eire, the Netherlands and Japan, as well as the International Council for the Exploration of the Sea (ICES), the Intergovernmental Oceanographic Commission (IOC), the North-East Atlantic Fisheries Commission (NEAFC) and the Scientific Committee on Oceanic Research (SCOR) of the International Council of Scientific Unions (ICSU).

The Commission Standing Committee on Research and Statistics met under the Chairman, Dr. W. Templeman, to review the status of the fisheries and the researches carried out by the scientists of the various member countries. Studies were continued on the effects of increasing fishing activity and environmental changes and of possible regulatory measures on the yields of the commercial species in the Northwest Atlantic Ocean.

The Commission gave full consideration to the problem of the conservation of harp and hood seal stocks in the Northwest Atlantic. Briefs were heard from the International Society for the Protection of Animals and the Ontario Humane Society, who were primarily concerned with the humane killing of seals in the commercial sealing operations. Mutual understanding of the conservation and humane points of view is proving effective. Representatives of Canada, Denmark and Norway will meet in Hamburg in October, 1967, to give serious consideration to sealing regulations, both from the conservation and humane points of view, and to discuss international inspection and possible joint enforcement procedures. The Commission agreed that harp and hood sealing should only be carried out in the Front Area (Labrador-Newfoundland) between 12 March and 25 April each year.

The Commission reviewed the status of its proposals for international regulation of the trawl fisheries and was pleased to note that with the approval of a modified Polish-type topside codend cover to overcome the difficulty the USSR was experiencing meeting topside codend regulations and that with the acceptance by Poland of the 1965 proposals for trawl regulations, all international trawl regulations proposed up to and including 1965 will become effective in the Northwest Atlantic.

The Commission discussed the relative merits of trawl-mesh measuring gauges and agreed that the use of a single gauge for international and national enforcement of trawl regulations is most desirable. The Commission will attempt to arrange joint consideration with the North-East Atlantic Fisheries Commission of respective regulations with a view to devising a single procedure and gauge for measuring meshes of nets used in the whole Atlantic area. The Commission agreed that there should be a fixed pressure or pull of 5 kilograms and that the standard of 50 consecutive meshes used in measuring a codend be changed to 20 consecutive meshes specified for its mesh measuring regulations. With the increased use of synthetic twines in the manufacture of trawl nets, the Commission has established mesh differentials with manila as a standard.

CONSERVATION MEASURES

The Commission had considerable discussion of the report of a Joint Working Group of Biologists and Economists on Possible Conservation Measures for the Convention Area. As a result of proposals for limitation of fishing by limiting catch or by limiting effort as conservation measures for application, the Commission set up a new Standing Committee on Regulatory Measures. This Standing Committee will meet in 1967 to consider its program of operation and its future work on the economic and administrative aspects of the problems of introducing regulation measures and those of the Commission's Committee on Research and Statistics on the scientific aspects of these problems. The new Standing Committee will present a preliminary report of its activities to the next Commission meeting.

On the question of the developing commercial fishery for Atlantic salmon in the waters off Greenland, the Commission agreed to publish the scientific assessment of the problem prepared jointly by the scientists of the International Council for the Exploration of the Sea and ICNAF. A Canadian proposal to prohibit Atlantic salmon fishing on the High Seas in the Convention Area was deferred for further research and data analysis upon which to have a decision.

The Commission heard 12 research docu-

ments from world authorities presented in response to a request at the 1966 Annual Meeting for information on the environmental factors that may have affected the growth of cod and for a synthesis of hydrographic and meteorological fluctuations in the Northwest Atlantic.

The Commission continued its 1966 discussion of an international inspection scheme to ensure enforcement of the Commission's conservation measures. It was noted that a scheme of joint enforcement had been adopted by the Fifth Meeting of NEAFC. The Commission agreed that member countries should examine the NEAFC scheme with a view to its application in the Northwest Atlantic under the existing ICNAF trawl regulations. Such views will be considered by an ad hoc Committee on Trawl Regulations which will meet prior to the 1968 Annual Meeting under the chairmanship of a Canadian delegate.

The Commission elected Mr. V. Kamentsev (USSR) Chairman, and Dr. A. W. H. Needler (Canada), Vice-Chairman, of the Commission for the two ensuing years.

The Commission accepted the invitation of the Government of the Polish People's Republic to hold its 19th Annual Meeting in Warsaw, Poland, between 2 and 7 June, 1969. The Commission had been invited in 1966 to hold its 18th Annual Meeting in London between 4-8 June, 1968.



The "Cutter Rock", latest addition to the Pacific Region patrol fleet of the federal Department of Fisheries, was launched at Bel-Aire Shipyards, Vancouver, earlier this year. The 55-foot wooden vessel will be based at Prince Rupert and will patrol in the Nass River.

FRB Appoints New Director at St. Andrews

Dr. John M. Anderson, 40, of Ottawa, has been appointed Director of the Fisheries Research Board of Canada Biological Station at St. Andrews, N. B. He succeeds Dr. J. L. Hart who is reitirng after 38 years as scientist and administrator with FRB.



Dr. J.M.Anderson

Born and educated in Toronto, Dr. Anderson received his higher education at the University of Toronto, where he graduated B. Sc. F. in 1951 and received his Ph. D. in animal physiology in 1958.

In 1958, he joined the University of New Brunswick in Fredericton as Assistant Professor of Biology. He continued in that post until 1963 when he was appointed Associate Professor in the Department of Biology at Carleton University.

Both at the University of New Brunswick and at Carleton, Dr. Anderson has carried out personal research and has supervised graduate student studies in fisheries biology. His major research interest has been in the area of physiology of fishes. This work has been carried out in close collaboration with FRB, particularly the staff of the St. Andrews station.

Dr. Hart was born in Toronto and is a graduate of the University of Toronto where he was awarded the Jean Balmer and Edward Blake scholarships. He joined the Fisheries Research Board in June 1929 and served in central Canada on freshwater investigations and, later, on marine studies on the Pacific coast. In 1950 he was appointed director of the FRB Biological Station in Nanaimo, B. C. Four years later, he moved to St. Andrews to head up the fisheries research program there.

Dr. Hart is to continue in his post until relieved by the newly-appointed director about September 1 this year.

Move Approved at ICNAF Meeting

Shorten Sealing Season on "Front" in 1968

THE SEALING season for taking harp and hooded seals in the "Front" area off Canada's east coast will be shortened by five days in 1968 in order to give further protection to older, breeding seals, Fisheries Minister H. J. Robichaud has announced.

He said a recommendation to this effect had been approved at the annual meeting in Boston, Mass., recently of the International Commission for the Northwest Atlantic Fisheries.

Other recommendations approved by the meeting call for an expanded program of research on seals in the "Front" area, consideration of additional regulations from both the conservation and humane points of view, and discussions on international inspection and possible joint enforcement procedures.

Three countries - Canada, Denmark and Norway - are involved in sealing in the Northwest Atlantic and all are members of ICNAF.

The Minister's announcement followed a visit he made to Boston while the meeting was in progress, at which he held discussions on problems of the seal fishery with representatives from Norway.

URGED BY CANADA

Mr. Robichaud said that for a number of years Canada had urged that the Atlantic sealfishery be brought within ICNAF's sphere of responsibility and this had finally been achieved last year. However, he emphasized, even while the formalities in attaining this end were under way the individual countries concerned, particularly Canada and Norway, were carrying out programs of research as well as studying other aspects of the seal fishery.

The Minister said that the recommendation to terminate the seal fishery next year on April 25, as compared with April 30 in previous years, was an important step in providing additional protection for older seals. Also approved by ICNAF was a recommendation prohibiting the taking of adult seals in whelping patches; however, Mr. Robichaud pointed out, this measure had been in practice between Canada, Denmark and Norway for a number of years under a "gentleman's agreement", and in effect it was now confirmed by the Commission.

Mr. Robichaud added that two other provisions under the "gentleman's agreement" would continue to be observed by the three countries. These consist of a prohibition against the use of helicopters or other aircraft in sealing operations on the "Front" and a requirement that seal pelts be removed from the ice to the base of operations within 24 hours from the day the seals are killed.

In considering the need for additional regulations, the Minister said, it was imperative that there should first be a thorough and objective program of research to determine what is required in the way of controls. He cited as an example the quota of 50,000 on the number of young seals that may be taken in one season by ships and aircraft in the Gulf of St. Lawrence, where Canadians are the only operators. This had proven to be a realistic figure and, Mr. Robichaud stressed, was adopted on the basis of many years of intensive scientific research.

SEAL SCIENTISTS TO MEET

While a good deal of research on seals has been conducted on the "Front" area, it was felt by the ICNAF panel on sealing that this activity should be expanded. As a result, the Commission approved the recommendation that seal scientists from Canada, Denmark and Norway meet in Hamburg next fall to consider research requirements and formulate a co-ordinated program to provide the data required for determination of population estimates and sustainable yields. At the same time, senior officials of the three countries will meet to give serious consideration to sealing regulations taking into account both conservation and humane factors, and they will also discuss international inspection as well as possible enforcement procedures.

Mr. Robichaud said that his discussions with the Norwegian representatives were most cordial and promising. As regards the use of humane methods in taking seals, he added, Norway intended to adopt similar regulations to those of Canada and both countries would co-operate closely in the formulation of these regulations and in their enforcement in the "Front" area. ✔

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-April, 1965-66 '000 lbs	May-April, 1965-66 $'000	May-April, 1966-67 '000 lbs	May-April, 1966-67 $'000
CANADA - TOTAL	2,271,553	142,725	2,445,677	150,890
ATLANTIC COAST - Total	1,730,035	96,949	1,928,250	93,423
Cod	592,164	24,908	519,222	22,740
Haddock	105,300	7,179	109,033	7,769
Pollock, Hake, Cusk, etc.	78,713	2,687	73,512	2,640
Rosefish	125,617	3,313	178,728	4,944
Catfish	4,559	150	4,571	153
Halibut	5,128	1,704	4,371	1,631
Plaice & Other Flatfish	229,199	7,376	271,256	8,942
Herring & Sardines	433,674	4,499	629,794	7,076
Mackerel	24,846	817	25,741	902
Alewives	12,193	206	8,125	142
Salmon	4,625	2,222	5,176	2,671
Smelts	4,591	334	4,228	361
Swordfish	7,781	3,250	7,350	3,181
Other Fish	14,982	616	13,675	492
Lobsters	39,967	26,015	36,219	21,297
Clams & Quahaugs	4,171	252	4,606	279
Scallops	20,608	10,578	16,879	7,308
Other Shellfish	21,917	843	15,764	895
PACIFIC COAST - Total	541,518	45,776	517,427	57,467
Pacific Cods	26,754	1,998	24,554	2,156
Halibut (1)	31,983	10,851	31,796	11,288
Soles & Other Flatfish	7,096	460	11,334	709
Herring	362,726	5,532	265,307	4,394
Salmon	86,385	25,071	153,447	36,676
Other Fish	8,956	289	12,619	515
Shellfish	17,618	1,575	18,370	1,729
BY PROVINCES				
British Columbia	541,518	45,776	517,427	57,467
Nova Scotia	613,553	49,294	675,676	45,055
New Brunswick	285,786	10,393	338,351	10,781
Prince Edward Island	46,836	6,860	57,820	5,990
Quebec	153,435	6,468	134,091	6,491
Newfoundland	630,425	23,934	722,312	25,106

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

MID-MONTH WHOLESALE PRICES - APRIL 1967

	Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped lb.	.375	.443
Cod fillets, Atl, frozen, cello 5's lb.	.325	.383
Cod fillets, smoked lb.	.420	.473
Haddock fillets, fresh, unwrapped lb.	.483	.580
Herring, kippered, Atl. lb.	.255	.337
Mackerel, frozen, round lb.	.192	.260
Lobsters, canned, Fancy case 48-½s	61.667	63.887
Sardines, canned case 100-¼s	9.695	9.600
Halibut, frozen, dressed lb.	.556	.620
Silverbright, frozen, dressed lb.	.602	.627
Coho, frozen, dressed lb.	.798	.807
Sockeye, canned, grade A case 48-½s	27.430	28.400
Pink, canned, grade A case 48-½s	16.497	17.123
Whitefish, fresh lb.	.488 1/	.500
Lake trout, frozen lb.	.444	.523

1/ - Dressed.

PRICES PER CWT. PAID TO FISHERMEN

(Week ending April 15)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	4.5	5
Yarmouth		
Haddock	-	5
St. John's Nfld.		
Cod	-	-
Haddock	2.75-4	-
Rosefish	2.5	-
Vancouver		
Ling Cod	12-15.5	5-12
Gray Cod	6-7.5	4.5-7.5
Soles	8.5	5-8.5
Salmon (Rdspg)	-	31-75

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF MARCH

	1966	1967
	'000 lbs	'000 lbs
TOTAL - Frozen Fish, Canada	48,895	65,705
Frozen - Fresh, Sea Fish - Total	26,673	41,653
Cod, Atlantic, Fillets & Blocks	3,778	5,810
Haddock, fillets & blocks	2,397	5,023
Rosefish, fillets & blocks	1,609	4,410
Flatfish, (excl. halibut), fillets & blocks	2,557	5,938
Halibut, Pacific, dressed & steaks	2,811	4,693
Other Groundfish, dressed & steaks	935	1,114
Other Groundfish, fillets & blocks	2,141	4,137
Salmon, Pacific, dressed & steaks	2,598	3,107
Herring, Atlantic & Pacific	379	605
All Other Sea Fish, all forms	3,977	4,978
Shellfish	3,491	1,838
Frozen - Fresh, Inland Fish - Total	4,791	6,198
Perch, round or dressed	239	117
Pickerel, (Yellow & Blue) filiets	128	1,206
Sauger, round or dressed	1/	838
Tullibee, round or dressed	153	407
Whitefish, round or dressed	1,606	1,002
Whitefish, fillets	343	182
Other, all forms	2,322	2,446
Frozen - Smoked Fish - Total	1,773	1,444
Cod Atlantic	1,073	765
Sea Herring, kippers	374	206
Other, all forms	326	473
Frozen for Bait and Animal Feed	15,658	16,410

SALTED FISH STOCKS AS AT END OF APRIL

Salted and Pickled Fish, Atlantic Coast		1966 '000 lb.	1967 '000 lb.
Wet-salted - Total		3,893	6,736
Cod		2,950	4,118
Other		943	2,618
Dried - salted - Total		3,540	9,053
Cod		3,151	8,150
Other		389	903
Boneless - Total		340	357
Cod		317	327
Other		23	30
Pickled - Total	(barrels)	4,066	8,021
Herring	"	3,463	6,192
Mackerel	"	12	1,079
Alewives	"	591	750
Turbot	"	-	-
Bloaters	(18 lb. boxes)	30,198	6,018
Boneless Herring	(10 lb. boxes)	-	34

1/ Confidential included with "Other".

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY-JANUARY

(Value in Thousands of Dollars)

	1965-1966		1966-1967	
Total Exports		173,858		184,551
By Markets:				
United States		123,333		123,541
Caribbean Area		13,976		15,310
Europe		31,315		38,865
Other Countries		5,234		6,835
By Forms:				
Fresh and Frozen		120,735		123,834
Whole or Dressed	35,650		39,447	
Salmon, Pacific	9,369		12,858	
Halibut, Pacific	5,890		5,495	
Cod, Haddock, Pollock, etc.	348		401	
Swordfish	3,897		3,875	
Other Seafish	5,297		6,609	
Whitefish	4,220		4,046	
Pickerel	2,603		2,252	
Other Freshwater Fish, n.o.p.	4,026		3,941	
Fillets	54,921		58,495	
Cod, Atlantic	19,893		17,982	
Haddock	3,700		5,110	
Rosefish, Hake, Pollock, etc.	5,342		8,462	
Flatfish	9,009		12,149	
Pickerel	2,425		2,687	
Other	14,552		12,105	
Shellfish	29,898		25,355	
Lobster (Alive & Meat)	20,925		18,175	
Other	8,973		7,180	
Frozen Fish & Shellfish, precooked		266		507
Cured		18,479		18,622
Smoked	1,635		1,882	
Herring	1,036		1,177	
Other	599		705	
Salted, Wet & Dried	14,052		14,354	
Cod	12,008		12,265	
Other	2,044		2,089	
Pickled	2,792		2,386	
Herring	1,703		1,456	
Mackerel	647		570	
Other	442		360	
Canned		20,830		27,315
Salmon	13,581		19,138	
Sardines	3,857		4,252	
Lobsters	2,293		2,440	
Other	1,099		1,485	
Miscellaneous		13,814		14,780
Meal	7,756		7,148	
Oil	1,558		716	
Other	4,500		6,916	

Current Reading

PRESERVATION OF FISH PRODUCTS BY REFRIGERATION by V. P. Zaitsev. (Available from the U. S. Department of Commerce. Price $7. 00).

This is a revised and enlarged edition of a comprehensive book on the theory and practice of fish preservation by refrigeration, first published in Moscow in 1962. It has been translated from Russian by the Israel Program for Scientific Translations under an agreement with the U. S. Department of the Interior and the National Science Foundation, Washington, D. C.

The 315-page volume intended mainly for engineers and technicians in the fish industry, covers chilling, freezing and storage of fish, as well as thawing and fish-fillet production. Basic planning of shore refrigeration plants and refrigerated vessels is explained and problems of quality control are discussed. Types of equipment and machinery for fish refrigeration are described and the necessary calculation given.

FISHING BOATS OF THE WORLD: 3. Edited by Jan-Olof Traung (Published by Fishing News (Books) Limited, London, Eng. Price $23. 50).

This is the third in the series of major volumes resulting from Congresses on Fishing Boats called by the Food and Agriculture Organization of the United Nations. The third FAO Fishing Boat Congress was held at Gothenburg, Sweden, in October, 1965, at which particular attention was paid to the smaller types of craft used in inshore and near-water fishing and, in the case of developing nations, to indigenous craft such as canoes powered with outboard and inboard engines.

Consisting of more than 650 pages, this latest volume is divided into six sections. The first covers factors which influence the design of boats in various communities. The second deals with the performance capabilities of craft in practical operation. The third is concerned with materials such as wood, aluminum, plastics, fibreglass and reinforced plastic; after surveying their use, pertinent comparisons are made with conventional materials. The fourth section concerns itself with engineering problems relating to engine location, engine types, deck machinery and refrigeration equipment.

The fifth section is of particular interest to small boat users and contains many plans that should prove valuable to developing countries. Finally, the sixth section deals with recent developments in new craft, such as stern trawlers, tuna longliners and combination vessels, as well as with the potential value of catamarans for certain types of fishing.

The use of computers in designing fishing boats of low resistance and good stability is outlined in a paper entitled "New Possibilities for Improvement in the Design of Fishing Vessels". Joint authors of this paper are Jan-Olof Traung, Head of the FAO Vessel Section; Dr. D. J. Doust, of Montreal and J. G. Hayes, of the National Physical Laboratory, London, Eng.

Another paper giving a statistical analysis of the resistance data relating to medium-sized fishing vessels is accompanied by more than 50 illustrations and should prove of special value to naval architects.

The vast experience of Editor Jan-Olof Traung, who edited the two previous volumes, ensures continuity and a high standard in this latest edition. With the preceding volumes, the series constitutes a library of well over a million words and about 2, 400 tables and illustrations.

FISHERIES IN KOREA. (Government of the Republic of Korea, Office of Fisheries, Seoul).

The Korean fishing industry suffered a serious setback from the Korean War, with a number of fishing boats lost and fish processing plants destroyed. However, steady re-development has taken place and with the setting up of the Office of Fisheries in 1966, the industry began to achieve marked progress towards modernization.

During 1967 the Government of Korea is embarking on an ambitious five-year development plan which they hope will increase the annual catch from the present 600, 000 metric tons to an estimated 1, 300, 000 metric tons. The plan includes "the construction of fishing boats, installation of basic fishing facilities, establishment of advance bases for fishing, expansion of the cultured fishery, and other projects."

This book deals extensively with the coastal and off-shore fishery of Korea, both past and present. There is a chapter on Fishery Economy, and a section on Major Fishery Statistics. A collection of excellent photographs is presented at the front of the book.

If undelivered return to:
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Summer Days are Salmon Days

WHEN you want a really superb dish, serve salmon. Because of its delicious flavour and attractive colour, salmon is a prized catch both on this continent and in Europe. June and July are the months to look for fresh Atlantic salmon at your local fish market. Peak months for fresh Pacific salmon are June through September.

An appealing dish on a hot day is glazed salmon steaks served on salad greens and accompanied by a tart, mayonnaise type dressing. Kitchen-tested directions for preparing this dish have been supplied by the home economists of the Department of Fisheries of Canada.



Lemon Glazed Salmon Steaks

4 salmon steaks (about 2 pounds total weight)
1 teaspoon salt

Sprinkle steaks with salt. Place each on a sheet of greased aluminum foil. Fold foil over steaks and seal edges of packages with double folds to make steam-tight. Place on a baking sheet and bake in a hot oven at 500° F. Allow 15 minutes cooking time per inch thickness for steaks which are fresh or thawed. Allow double that time if the steaks are solidly frozen. The salmon is cooked when it has lost its watery look, taking on a lighter, opaque shade, and when it will flake easily when tested with a fork.

While the steaks are still warm, remove and discard skin and bone. Chill. Place on a rack. Garnish to taste with colourful foods, taking care to keep slices thin. Pictured are steaks garnished in three simple fashions: thin, over-lapping slices of cucumber dotted with capers; crescents of ripe olive with a fancy cut of hard-cooked egg yolk; and thin slices of hard-cooked egg, colour accented with narrow strips of pimiento.

Glaze

1 envelope unflavoured gelatin
1/4 cup cold water
1 cup boiling water
1 tablespoon sugar
1/2 teaspoon salt
3 tablespoons lemon juice

Soften gelatin in cold water. Dissolve in boiling water. Add sugar, salt, and lemon juice. Chill until slightly thickened. Spoon half of glaze over steaks and chill until set. To keep remainder the consistency of thin syrup, heat gently over hot water and stir, when it thickens. Coat steaks a second time with the glaze. Chill until firm.

To serve, trim off any excess jelly and arrange steaks on a platter lined with salad greens. Accompany with Richelieu Dressing. Makes 4 servings.

Richelieu Dressing

1 cup mayonnaise
1/4 cup dairy sour cream
4 teaspoons lemon juice
1 teaspoon finely grated lemon peel
1/2 teaspoon Worcestershire sauce

Combine all ingredients thoroughly. Chill. Makes $1\frac{1}{4}$ cups.

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, 1967

FISHERIES

(formerly Trade News) OF CANADA

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★ Resource Development in the Pacific Region

★ Scientists Study Lobsters' Diet

★ GATT Negotiation Reduce Trade Barriers

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

August, 1967

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COVER PHOTOGRAPH - A 670-ft fishway and 280-ft. barrier dam on the Meziadin River, approximately 125 miles northeast of Prince Rupert, B.C., was completed in June, 1966. The project is one of many described in the 1966 report of the Resource Development Branch of the federal Department of Fisheries contained in this issue.

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Resource Development In The Pacific Region: Report For 1966

ACTIVITIES of the Resource Development Branch of the federal Department of Fisheries in the Pacific Region continued to expand in 1966.

Favourable progress was made in the field of development with the completion of the $700,000 Meziadin fishway, the full utilization of the spawning channel on the Fulton River (Babine) and a start on several other facets of the major development programs at Babine Lake. Additional encouraging results were recorded in the assessment of the Big Qualicum project in 1966. In this respect egg-to-fry survival of native stock and adult returns of the transplanted stock were the highest on record.

Management studies were continued on salmon stocks of the Skeena River, Nass River, Fraser River, Rivers Inlet, Johnstone Strait, Juan de Fuca Strait and the Strait of Georgia. These studies along with day by day assessments of catch and escapement data for a number of fisheries provided information required for regulatory changes throughout the season. A study of international salmon stocks in Dixon Entrance and an assessment of the herring stocks of this coast was added to the Branch's program in 1966.

Fisheries problems created by industrial development continued to increase chiefly as a result of the continued expansion of the forestry and mining industries in British Columbia. Considerable effort was expended in the solution of fisheries problems in the field of pollution, log driving, gravel removal, stream obstructions and water diversions. The Branch continued to work closely with major oil companies undertaking marine seismic surveys and with mining companies regarding their effluent and tailings disposal.

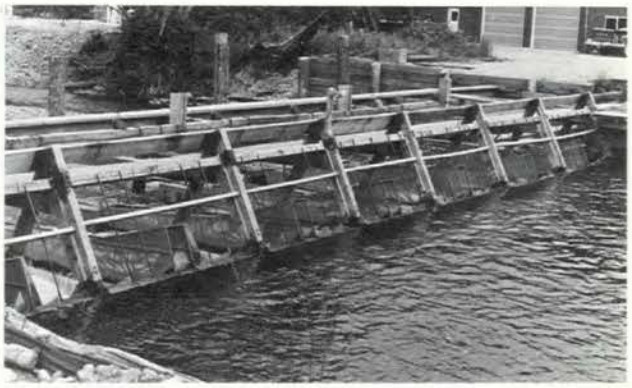
Development

Big Qualicum River Project

The rate of runoff to the lower Big Qualicum River, Vancouver Island, is regulated for the exclusive benefit of salmon production by means of extensive works constructed by the Branch in the early 1960's.

In 1966, for the third consecutive year, the flows were manipulated, as desired, to create improved spawning conditions; to curtail the shifting of gravel which occurred formerly as a result of freshets during the incubation period; and to provide above-normal flows during the natural low-flow summer months.

The 1965-66 egg-to-fry survival rates of all species equalled or exceeded those recorded in the previous six years. In this connection, the chum salmon survival rate was estimated



Downstream migrant sampling traps at the Big Qualicum River, B.C.

at 46 percent which represents an 80 percent increase over the approximately 25 percent recorded in each of the first two years of flow control. Moreover, as evidenced by the magnitude of the emergent fry emigration near the river mouth, the coho salmon survival rate increased to 21 percent of the potential egg deposition from a previous high of 12 percent. While the chinook salmon fry output continued at a high level, as compared to that prior to implementation of flow control, the increase has been made up entirely of newly-emerged fry, with no significant change being observed in the output of stream-reared fingerling (5 gram average weight) migrants.

The increased egg-to-fry survival rates of chum and coho salmon over the winter of 1965-66 are attributed largely to the fact that both species utilized spawning areas which were of higher quality than those of the preceding two years. Observations undertaken in 1964-65 to assess the effects of depth, velocity, and gravel quality on the distribution of spawners resulted in an operational change in the fall of 1965 whereby the formerly specified spawning flow of 250 cfs was reduced to 150 cfs. The accompanying velocity reductions resulted in the spawners utilizing relatively high-gradient, coarse-gravel riffles.

Inspection of the accompanying table which sets out the annual escapements of salmon to the Big Qualicum River during the assessment study period shows that the 1966 chum salmon escapement was significantly greater than that in 1965, and is the highest since 1960. The pink salmon escapements in 1965 and 1966 are first generation returns from eyed eggs transplanted from the Cheakamus River (Howe Sound) and Bear River (Johnstone Strait), respectively. The returns from the Bear River stock are particularly encouraging inasmuch as the escapement is capable of providing more than the original number of eggs taken (6.7 million), and despite an exceptionally high seasonal exploitation rate in the Johnstone Strait fishery.

SALMON ESCAPEMENTS TO THE BIG QUALICUM RIVER, 1959-66

Year	Chum	Coho[1]	Chinook	Pink
1959	98,500	3624	2411	11
1960	60,000	2562	1569	0
1961	13,800	2886 (600)	1111	1
1962	46,700	4618 (395)	787	0
1963	37,900	4500[2]	619	1
1964	36,400	5230 (371)	781 (179)	0
1965	18,800	3817 (695)	1255 (137)	75
1966	53,400	4953 (629)	1170 (300)	11,900

[1]Counts of precocious jack males are included in each total. Numbers of jacks shown in brackets.

[2]Big Qualicum fence count incomplete. Total escapement estimated on basis of escapement to Hunt's Creek tributary which normally constitutes 20 percent of the system total.

For the second consecutive year a representative number of chum salmon fry emigrating from the Big Qualicum River were marked for future identification in order to provide the means for measuring their contribution to the commercial net fishery. In 1966, approximately 400,000 fry, migrating from both the natural stream and spawning channel, were marked by removal of their adipose fins and one of their ventral fins. Two groups of juvenile chinook salmon migrants, consisting of newly-emerged fry and stream-reared fingerlings, were also marked with distinctive clipping of their pectoral fins in order to provide the means to determine their relative contributions to the adult return.

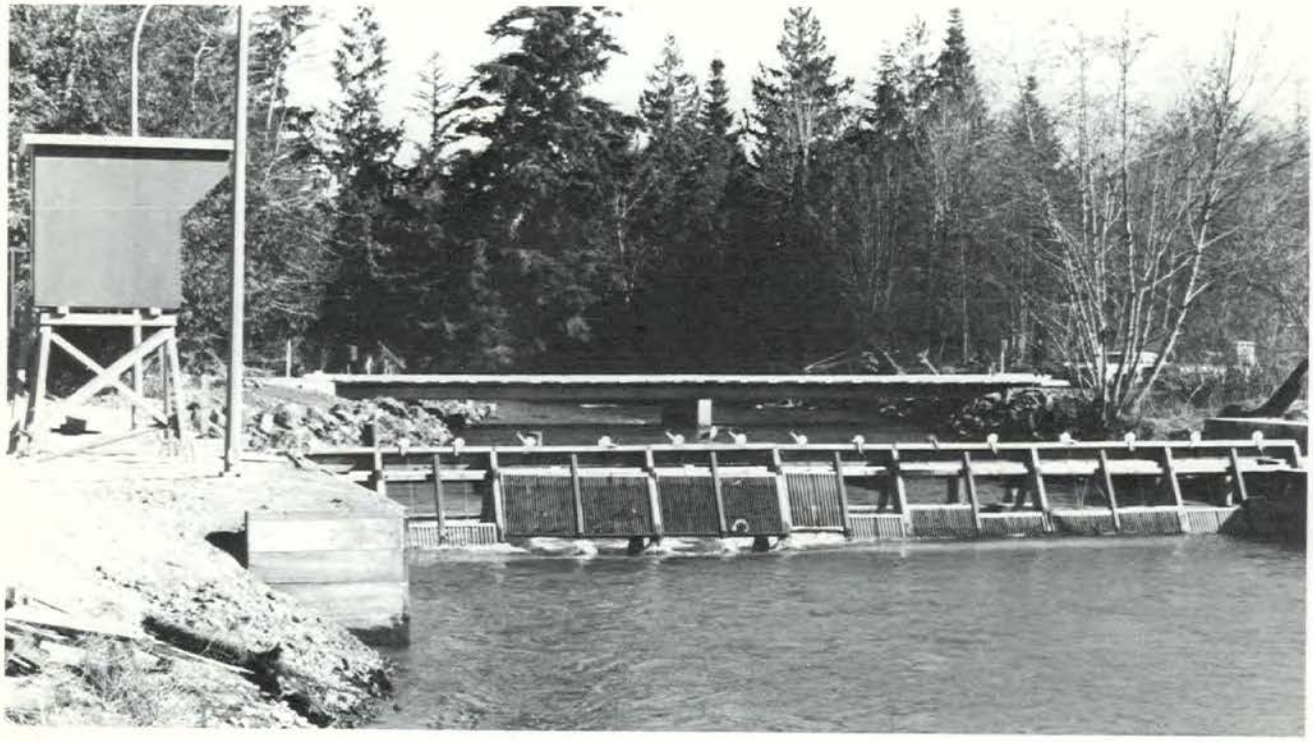
Babine Lake Development Project

The peripheral streams of the main basin of Babine Lake are incapable, in their natural state, of producing sockeye fry in sufficient numbers to utilize the full potential of the basin as a nursery area. Accordingly, the Branch embarked on a major construction program in 1965 to provide additional and improved spawning areas. To this end, the principles of flow control and spawning channels are being applied at Fulton River and Pinkut Creek, the two major tributaries, with a view to increasing their combined output of sockeye fry by some 125 million per year. Current estimates for this work indicate that it will entail a seven-year construction period and a total expenditure of some $8.4 million (1966 costs).

During 1966, the Fulton River Spawning Channel No. 1, which was constructed in 1965, became fully operational when it received 22,000 adult spawners.

In 1966, also, definite plans were formulated for partial flow-control schemes and artificial spawning channels at both Fulton River and Pinkut Creek.

Flow regulation at Fulton River will be achieved by the construction of a concrete gravity dam, which will be capable of raising the level of Fulton Lake by 27 feet, and control works located at the outlet of Fulton Lake. The storage volume of



An adult salmon counting weir at the Big Qualicum River.

76,000 acre feet in the Fulton Lake reservoir ensures that a minimum flow of 200 cfs can be maintained in the river during the spawning and incubation periods. Spring floods, with a probable occurrence of once in ten years, will be regulated to a maximum discharge of 3500 cfs. The control works, consisting of a vertical gateshaft, regulating tunnel, and valve house, will be so constructed that flows to the river may be drawn, as desired, from several depths in the reservoir, thereby providing a means of controlling water temperatures. They will also be capable of regulating the Fulton Lake outflows during the springtime fry migrations to simulate the natural spring runoff pattern.

SECOND CHANNEL

Plans are being prepared for a second spawning channel at Fulton River which will be 16,700 feet long by 50 feet wide. It will be capable of accommodating 135,000 adult spawners.

Flow regulation at Pinkut Creek will be obtained by means of a low dam at the outlet of Taltapin Lake and an integral control structure which will ensure that a minimum discharge of 70 cfs can be maintained during the spawning and incubation periods. A spawning channel, 8000 feet long by 40 feet wide, with a capacity for 54,000 adult spawners, will be constructed alongside the main spawning grounds near the mouth of Pinkut Creek. A second stage of this channel, 12,000 feet long by 40 feet wide, can be added at a later date to accommodate an additional 81,000 spawners.

During 1966, the following six construction projects, representing a total expenditure of $1.1 million, were completed or were well underway.

(a) Project No. 2 – Taltapin Lake Control Works

A contract for $196,705, which was awarded in June for the construction of a low dam and control works at Taltapin Lake, was completed on November 30, 1966.

(b) Project No. 3 – Fulton River Tunnels

A contract for $646,047, which was awarded in June for the excavation of the regulating tunnel, water-supply tunnel for spawning channel No. 2, and the gateshaft and valve house, was expected to be completed in February 1967.

(c) Construction of the Fulton River counting fence, which will facilitate complete enumeration of both adult and juvenile migrants, and will double as the diversion weir for spawning channel No. 2, was completed at a total cost of $70,000.

(d) A 70-foot extension to the highways bridge across Fulton River, costing some $25,000, now extends beyond the entrance of spawning channel No. 2.

(e) The Fulton River camp, warehouse facilities, additional living accommodation, permanent water-supply system, and temporary electric power supply were completed at a cost of $20,000.

(f) Ten miles of a single-lane access road, and clearing of the site of the Pinkut Creek Spawning Channel, were undertaken at a cost of $60,000.

SURVEYS CONTINUED

Concurrent with the construction work, engineering surveys and exploratory diamond-drilling were continued in both areas. Moreover, a comprehensive hydrometeorological program was initiated in 1966 to develop criteria for the design and operation of spawning channels, regulating works, and reservoirs. These studies encompass water quality and quantity, temperature profiles in reservoirs, spawning channel and river temperature conditions, and climatological factors. The basic data required for these studies is being obtained by means of a network of weather stations, hydrometric stations, water temperature thermographs, and snow courses which have been established for this express purpose. The hydrometeorological program unifies all hydrometric measurements at Fulton River, Pinkut Creek, and Morrison River to serve all of the engineering and biological studies associated with the Babine Development Program.

In the spring of 1966, 1.0 million sockeye fry migrated from the Fulton River spawning channel, representing a survival in excess of 80 percent from the time of planting of the eyed eggs to fry emergence. As an unusually high spring runoff prevailed in the river, operational problems with the enumeration gear resulted; consequently an accurate quantitative measure of the abundance of emerging river fry was not possible. In four previous years, the natural egg-to-fry survival was found to be in the order of 10 to 31 percent of the potential egg deposition.

Fry abundance in Pinkut Creek was estimated by sampling pre-emergence fry with a hydraulic sampler and supplemented by catching migrant fry in a series of trapping units. An estimated 6.9 million fry left the spawning area; this represents a survival of 12.5 percent of the potential egg deposition, or 36.5 percent of the post-spawning egg population.

In the fall of 1966, 90,800 sockeye were counted into the Fulton River; of this, 28,000 utilized the spawning channel. Consequently the potential egg depositions in the stream and channel were 69.5 and 34.1 million respectively, for a total of 103.6 million. In previous years (1961-65) egg deposition in the river has ranged from 137.2 to 237.7 million. The channel spawning population was closely observed with respect to spawning behaviour, distribution, and success of spawning. A comparison was made between the channel and the river; the results indicate that in the aspects examined, no significant differences could be found.

A total of 28,000 sockeye entered Pinkut Creek in the fall of 1966, of which 8500 were females. The potential egg deposition estimated at 24.0 million eggs is considerably lower than that occurring in previous years (55 to 228 million eggs), but is close to the calculated optimum for the stream. Consequently, the loss of spawn from such factors as superimposition was indicated to be substantially lower this year.



Fin marking juvenile salmon prior to emigration from the Qualicum River.

To examine further developmental possibilities, a survey of the Morrison River, another major tributary stream to Babine Lake, was made during the spawning season. Of the 6400 sockeye observed, 70 percent were located in the lower half of the stream. In 1961, up to 90 percent of a much larger population was found within the same area.

A winter program was initiated in November, 1966, in the Babine Lake area to assess ice conditions and other physical parameters such as dissolved oxygen, in an attempt to determine the suitability of the environment with respect to the survival of sockeye spawn. Despite inundation of the Fulton River spawning channel bed to considerable depths because of ice blockage at the fishway, the survival of spawn was indicated to be good as of March, 1967.

Meziadin River Fishway

The final stage of the two-year construction project to provide fish-passage facilities at two falls on the Meziadin River, approximately 125 miles northeast of Prince Rupert, was completed successfully in June, 1966, when the facilities were placed in service in time to assist the 1966 spawning migration.

These facilities consist of a 280-foot-long barrier dam extending across the full width of the river, which directs salmon to the fishway entrance; a 670-foot-long, eight-foot-wide vertical-slot fishway; an auxiliary water supply system to improve attraction qualities at the fishway entrance; and counting facilities at the fishway exit. The total cost of these works, including the construction of some ten miles of access road, is approximately $850,000.

This fishway, which provides a safe migration route around both falls, will eliminate the serious losses and delays sustained at certain water levels by the major sockeye salmon runs to Meziadin Lake and its tributaries.

During the period of sockeye migration into Meziadin Lake a tag and recovery program was conducted to assess the degree of delay and rate of migration through the fishway. Fish were tagged at the base of the barrier dam on the extreme right bank and immediately in front of the fishway entrance at left bank. Recovery of tagged fish was conducted at the exit of the fishway, and results indicated that (a) fish tagged at the right bank were recaptured, on the average, 3.5 days after tagging; (b) fish tagged directly in front of the fishway entrance were recaptured, on the average, 2.0 days after tagging.

The results of this tagging program suggest that the fishway operated efficiently in 1966; for comparison, the average delay of fish tagged on the right bank in years prior to construction has ranged between two and 11 days.

Nanika River Rehabilitation Program

Prior to 1954 the escapement of sockeye salmon to the Nanika River ranged between 20,000 and 70,000 fish annually. Beginning in 1954, however, the population demonstrated an apparent collapse which extended to all cycles. The period of lowest escapement occurred during the years 1957-59 when the Nanika River escapement actually totalled 1000 or less sockeye for three consecutive years. In order to save the stock from possible extinction a decision was made in 1959 to increase fry production by means of hatchery incubation of eggs from a

donor stream. In 1960 a pilot hatchery operation was carried out; in 1961 a total of 3.9 million fry were produced from an egg take of 5.2 million; and for the subsequent three years over 12 million eggs were incubated.

In recent years the Nanika River sockeye stock has shown definite signs of recovery and the concern with respect to its future status has eased considerably. For this reason the hatchery operation, which was initially established as a rehabilitation measure, was limited during the 1965-66 season to the incubation of 3.4 million eyed eggs for transplantation to an experimental incubation channel located near the hatchery site. This channel was kept in operation throughout the winter of 1965-66 as a means of assessing the operation of this type of facility under extreme winter conditions. Egg-to-fry survival from the channel totalled 50 percent in 1966 as compared to 80 percent in 1965. The operation of both the hatchery and the channel was discontinued in 1966 pending evaluation of the contribution made by those facilities in terms of adult production.

The 1966 sockeye salmon escapement to the Nanika River, which totalled 10,700 fish, represented the largest escapement since 1953. An examination of the age composition, scale characteristics and fecundity of the stock has produced no evidence that a significant segment of the 1966 escapement resulted from hatchery production. Also, the 1966 escapement consisted predominantly of age 5 fish and a return of this magnitude could have been expected from natural reproduction of the 1961 Nanika River sockeye escapement which totalled 7500 fish.

The biological program, initiated in 1961 to assess the contribution of the artificial transplants and the status of the native sockeye population, now consists primarily of a smolt and adult enumeration and sampling program.

Tahltan River Slide

The major landslide which engulfed the Tahltan River, a tributary of the Stikine River near Telegraph Creek, in April, 1965, remained unstable throughout 1965; and while the spawning migrations of last year were air-lifted around the slide by means of a helicopter, the Branch had to look to developing a permanent solution to the problem.

In the spring of 1966 crews returned to the site to alleviate fish-passage conditions throughout the length of the slide area, and at Descheeka Falls, some 20 miles further upstream. Extensive blasting was undertaken at three falls in the slide area, and the drop at Descheeka Falls was reduced by dropping rock into the river so as to raise the tailwater level at the falls.

Despite indications that the salmon migrations would be able to move naturally past these obstructions, after the work had been completed, a report was received in early July that a block existed in the slide area. Subsequent inspection of the site revealed that further erosion of the slide material had occurred, causing a velocity barrier at the upper falls, although the two lower ones were still passable.

A crew was sent to the site to implement methods of passing the fish around the obstruction by means of dip-nets and a helicopter. These operations were initiated on July 25, and, by the time they ended on August 17, 1900 sockeye had been air-lifted around the obstruction, while 24,500 had been dip-netted and passed over by hand.

A dip-netting program also had to be implemented at Descheeka Falls when it was found that the rocks placed in the river in the previous spring had moved out of position during the subsequent freshet, thereby re-creating the obstruction at the falls. Some 3000 sockeye had been passed around the falls by means of dip-nets by the time additional rocks had been placed in the river. As it was then found that most of the salmon were able to surmount the falls, the dip-net salvage program was discontinued.

The emergency measures employed at the slide and Descheeka Falls in 1966 resulted in an escapement of 21,600 sockeye to the Tahltan Lake spawning grounds, as compared with the total of 26,400 which were transported around the slide.

Further attention will be directed toward these two sites in 1967.

River Diversions

Erosion and scour resulting from heavy rains which occurred in November and December created fisheries problems in some streams along the coast.

At Phillips River, near Bute Inlet, where the Branch had expended some $40,000 the previous year to re-direct the river onto the spawning grounds, extremely high runoff resulted in the deposition of boulders and gravel in the channelized area, cutting off most of the flow to seeded spawning grounds downstream. The obstructing material was removed by means of a bulldozer, and normal flows were restored on the spawning grounds within a week. Subsequent tests indicated that this action had been taken before any damage was sustained by the incubating eggs.

Extremely high flows in Norrish (Suicide) Creek, in the lower Fraser valley, during the early part of December, 1966, caused the stream to break through its banks at several locations, posing a threat to the Canadian Pacific Railways' transcontinental line. As a result the Company submitted a proposal to confine the flow to one channel by dyking off several side channels in conjunction with deepening of the main channel. In view of the imminent danger to the rail line this temporary solution was approved by the department and the work was subsequently undertaken.

The Branch will be co-operating with the CPR in 1967 to attempt to develop a permanent solution to this problem.

Investigations and Assessments

Topographic surveys were undertaken at Phillips River, near Bute Inlet, and at Kleanza (Gold) Creek, near Terrace, to obtain basic data to determine whether or not stream improvement measures could be justified. Other engineering surveys were

undertaken at obstructions such as those at the Marble River, near Port Alice, and the Tahltan River, in the Stikine River system, looking to developing plans for their alleviation.

The Fraser Valley's development surveys which were initiated in 1964 to develop measures to restore the declining chum salmon stocks was continued in 1966. The preliminary studies have shown that the Vedder-Chilliwack, Harrison-Chehalis, and Stave Rivers offer the most promise for salmon development projects. Preliminary layouts and cost estimates for alternative spawning channel proposals in the Vedder system are currently in progress, and aerial mapping of the Harrison-Chehalis flats is underway to obtain data which will permit similar investigations to proceed in that system.

Queen Charlotte Islands

The Queen Charlotte Islands program began in 1961 with surveys designed to assess the physical and biological factors affecting production of the chum and pink salmon stocks of that area. The abundance and distribution of salmon were specifically noted in nine streams: Yakoun, Mamin, Datlamen, Ain, Naden, Copper, Pallant, Deena and Mathers, because of an existing potential for fisheries development work. In addition, the Yakoun River, the principal pink salmon producer of the Queen Charlotte Islands, was singled out for a special study. Utilizing a counting tower and diversion fence the pink salmon escapement in 1966 to the Yakoun River was estimated at 773,000. The total Yakoun River pink salmon population, i.e. catch and escapement, was calculated to be in the order of 1,800,000. This represents a tenfold increase in population magnitude over a period of two cycles. Measurements of the available spawning area indicated the river should accommodate approximately 650,000 spawning pink salmon.

Tsolum River

A concrete dam and control works were installed at the outlet of Wolf Lake, a tributary to the Tsolum River, in 1964 to release up to 25 cfs from mid August to October to provide better flow conditions during the migration and spawning of pink salmon. In the last three years the distribution of pink salmon has been more widespread within the watershed than in previous years and pre-spawning mortality has not been observed. It is concluded that the controlled runoff from Wolf Lake has eliminated two factors which were limiting production of pink salmon. Further studies are now underway with a view to making recommendation for the improvement of spawning areas.

Puntledge Spawning Channel

The Puntledge River spawning channel was constructed in 1965 by the British Columbia Hydro and Power Authority to eliminate the problem of turbine mortality to downstream migrant chinook salmon fry. These are the progeny of a summer run which migrates to spawning areas upstream of Stotan Falls, near the outlet of Comox Lake. In the first year of operation 87 percent (236) of the total escapement of 270 chinook salmon entered the spawning channel, and 92 of the 98 females which entered the channel survived the three-month holding period and spawned successfully. The magnitude of the 1966 fry emigration was not accurately measured because of a leakage of fry around the trapping gear, which was not detected until late in the season.

While the adult escapement to the channel increased to 627 in 1966, the egg potential actually decreased to less than that in 1965 due to a preponderance (90%) of males which resulted from an imbalance in the year-class contributions. Two-year-old "jack" males comprised 57 percent of the run, and four-year-old individuals, which would normally contribute the major portion of the females, were almost totally absent (0.5%). Three-year-old males and females comprised the remainder of the escapement.

Eighteen (28%) of the 64 females in the 1966 population died without spawning, as a result of severe head injuries for which there is no ready explanation. Available evidence suggests, however, that the injuries were incurred before the fish entered the channel, and that they may have stemmed from a then unknown dislocation of two protective gratings over the diffuser system at the downstream end of the fishway leading into the channel, which allowed the fish to descend into hazardous locations. This defect has been corrected, and it is not anticipated that it will be a factor in future operation.

Indian River Chinook Salmon Transplant

Experiments undertaken at Big Qualicum River, Vancouver Island have indicated that adult returns stem principally from those fry which reside in the stream for up to three months before going to sea. Since large numbers of Qualicum River chinook fry migrate directly to sea, and are presumed lost to the fishery, there is reason to believe that their premature migration may be related to the rearing capacity of the stream, and that these fry might rear to the normal migrant stage if they were transferred to other river systems.

Accordingly, 42,000 newly-emerged chinook salmon fry were transplanted from the Big Qualicum River to Indian River, Burrard Inlet, in late March, 1966, as an experiment to determine whether or not significant numbers would take up residence for the normal 2-3 month period in this stream which does not support a native population of chinook salmon.

Downstream-migrant trapping gear was operated near the mouth of Indian River to assess the migratory behaviour of the transplanted fry, and to compare the fingerling migrants, with similar size and timing characteristics (5 gram average weight in June), to those in the donor stream.

The results of the transplant were not encouraging inasmuch as the majority of the fry migrated into the estury within a few days of their release. Trapping, beach-seining, and swimming observations, employing underwater gear, all failed to reveal the presence of any 2-3-month-old fingerling migrants.

Laboratory studies in which Big Qualicum chinook fry were reared under temperature regimes comparable to those in the donor and recipient streams showed that Indian River temperatures, which averaged 6-7°F. lower than those at Big Qualicum, retarded the growth rate by about 65 percent. This could greatly increase the freshwater mortality rate by extending the stream residence period required to reach normal size for migration into saltwater.

Cowichan River Chinook Salmon

A study was initiated in the fall of 1965 to determine the status of the chinook salmon escapement to the Cowichan River, Vancouver Island, and to provide information complementary to that being obtained in assessment studies associated with the Big Qualicum River Project, on the freshwater dynamics of a chinook salmon population. This study has involved a two-year adult enumeration program, employing a tower-count method, and a juvenile migrant enumeration program, which was undertaken during the spring of 1965.

The migration of juvenile chinook salmon near the mouth of the Cowichan River was found to consist of two distinct groups, having size and timing characteristics similar to those previously observed at Big Qualicum. The first migration peak was comprised of newly-emerged fry (0.5 grams average weight) which entered the lower reaches of the river during March, and a second migration peak, consisting of fingerlings averaging 5 grams in weight, which occurred during June, several months after fry emergence. The emigration of newly-emerged fry was estimated at 3.2 million, which represented 18 percent of the potential egg deposition of the 1965 escapement. The 1966 results indicate a very high egg-to-fry survival rate and a fry input greatly exceeding the initial rearing capacity of the system above the enumeration site.

The 1966 chinook spawning escapement upstream of the counting tower at Skutz Falls has been estimated at 3900 four-year-olds and 4400 jacks. On the basis of helicopter surveys and interpretation of tagging data made available through a Fisheries Research Board study, it is estimated that approximately 49 percent of the large chinooks and 57 percent of the jacks spawned downstream of the tower site. The system escapement therefore has been estimated at 17,700, of which 10,100 were jacks, and 7600 large chinooks. This represents a substantial increase over the 8600 estimated in 1965, and it is the largest recorded since 1957.



Collecting salmon eggs for transplanting to another watershed.

Yukon Rainbow Trout Introduction Program

In order to provide increased sport fishing opportunity for residents of the Yukon Territory the Branch has undertaken a program of rainbow trout introduction to lakes located near major population centres. Rainbow trout populations have been established in four lakes near Whitehorse through stocking with eyed eggs obtained from British Columbia.

In 1966 a plant of 100,000 eyed eggs was made at Hanson Lakes, a lake system 1.7 square miles in surface area located near the town of Mayo. Hanson Lakes were poisoned with toxaphene in 1963 to eradicate the native northern pike and whitefish populations prior to the stocking of rainbow trout which commenced in 1965. A lake poisoning was also carried out at Wye Lake, near the town of Watson Lake, in September, 1966. As rotenone poison was used in this case rapid detoxification is anticipated and rainbow trout will be planted in the summer of 1967.

Salmon Management

Skeena River Salmon Management Committee

The operational duties associated with management of the Skeena River salmon stocks were continued in 1966. These consisted of a day by day assessment of the magnitude of catch and escapement for the purpose of recommending regulatory changes throughout the season. In addition, personnel of the Resource Development Branch assumed the responsibility for enumerating, by tag and recovery techniques, the pink salmon escapements to the system.

A tagging problem was also conducted at McLean Point, located approximately 25 miles above the upriver commercial fishing boundary, with the objective of acquiring further information on the timing of the major sockeye and pink salmon population.

The 1966 season was characterized by returns of both sockeye and pink salmon at levels lower than anticipated. Commercial catches in Area 4 of these species totalled 570,000 and 1,000,000 respectively. The catch of coho recorded by gillnets totalled 14,000 and 37,000 respectively, which were approximately average for both species.

The sockeye escapement to the system totalled 447,000, of which 390,000 entered Babine Lake. The Bulkley-Morice and Lakelse escapements were above average for recent years, but escapements to all other secondary areas were extremely light.

Pink salmon escapements to early streams, and Kispiox River in particular, were very light as was the escapement to

the mainstem Skeena River. The escapement to Lakelse amounted to 400,000 out of the total system escapement of 620,000.

As indicated by test-fishing catches, escapements of coho, chinook and chum salmon were among the highest on record since 1956.

Nass River

A test-fishing program, which was initiated in 1963 to provide a daily index of sockeye escapement from the commercial fishing area and thereby to assist in the management of the Nass River sockeye stocks, was continued in 1966. In addition to the test-fishing program, the 1966 program included:

(1) enumeration of seaward-migrant smolts from Meziadin Lake;
(2) enumeration of adult sockeye escapement to Meziadin Lake;
(3) enumeration of adult sockeye escapement to Bowser Lake;
(4) sampling of the Bowser Lake and Meziadin Lake escapements for racial characteristics;
(5) assessment of the Meziadin fishway.

The downstream migrant enumeration program conducted at Meziadin Lake and the Bowser Lake adult enumeration program both met with limited success. The adult escapement to Meziadin Lake totalled 65,000 sockeye in comparison with 113,000 and 98,000 in 1964 and 1965, respectively. The test-fishing index suggested that the escapement of sockeye to the system was the lowest since inception of the program in 1963.

Rivers Inlet

The sockeye salmon stock of Rivers Inlet, located on the coast midway between Vancouver and Prince Rupert, is one of the most valuable on the British Columbia coast. The annual catch averages between 900,000 and 1,000,000 sockeye. The commercial fishery in the area is conducted in Rivers Inlet while the spawning and rearing areas of the stock are located in the Owikeno Lake system. Since 1959 this Branch has conducted a series of field studies in the area which have included: adult enumeration using both tagging and dichotomous sampling techniques; limnological studies on Owikeno Lake, lake tow-netting studies to measure juvenile sockeye abundance and survival; and racial timing studies.

The 1966 program included:

(1) a continuation of the tow-netting and limnological studies;
(2) an attempt to enumerate the total return of sockeye to Rivers Inlet utilizing a dichotomous sampling technique; and
(3) racial timing studies which involved tagging at the mouth of Rivers Inlet from the chartered seine vessel and recovery on the spawning grounds.

As anticipated, the total stock returning to Rivers Inlet in 1966 was far below average. Although the recorded catch totalled only 528,000, the stringent regulations applied during 1966 resulted in a fair spawning escapement.

Johnstone Strait

(a) Pink Salmon

The 1966 pink salmon return to the Johnstone Strait area totalled more than double the predicted level of 1.7 million. In view of this strong return, a four-day fishing week was applied throughout the season and a total of approximately 3.4 million pink salmon were landed. Although the assessment of the 1966 escapement is not complete at this time, a relatively good escapement is indicated. In total, the 1966 stock represents the largest even-year pink salmon return to the Johnstone Strait area during the 1952-66 period.

(b) Chum Salmon

On the basis of pre-season studies on the status of the Johnstone Strait-Fraser River study area stocks, a 1966 return of 584,000 chum salmon was predicted. Such a return would have constituted in total, less than one-half the escapement level recorded during the pre-1955 period of high production. Because of the low return anticipated for 1966, no commercial fishing for the purpose of exploiting chum salmon was permitted in the entire Johnstone Strait-Fraser River region.

In order both to obtain an approximate measure of the strength of the run as it developed and also to acquire pertinent age composition data, fishing by chartered purse-seine vessel was conducted in the upper straits region throughout the chum salmon migration period.

Although the assessment of the 1966 escapement is not complete at this time, it is evident that the total return has considerably exceeded the predicted return of 584,000 chum salmon.

Fraser River Chum Salmon Investigation

In 1966, the Branch continued the investigation which was initiated in 1960 to assess the condition of the Fraser River chum salmon stock; to determine the factors responsible for a decline in both the escapement and commercial catch since the mid-1950's; and to acquire the additional information required for management and rehabilitation of the stock. The Fraser River study has been closely integrated with an overall assessment presently being conducted on the chum salmon stocks indigenous to the Johnstone Strait-Fraser River region. As a result of studies conducted to date, it has been possible to design fishing patterns that provide a maximum degree of protection to the peak of the very important mainstem Fraser River stock, not only during its period of passage through Area 29, but also through the Johnstone Strait and Strait of Georgia fishing areas. The 1966 Fraser River program included: enumeration of both system and tributary spawning; test-fishing in the lower river; and enumeration of the total system chum salmon fry output from the 1965 escapement.

The total 1966 escapement considerably exceeded the escapements recorded in all other years since the Fraser River chum salmon investigation was initiated in 1960. On the basis of preliminary calculations, the 1966 system escapement totalled approximately 430,000, which compares favourably with the escapement range of 164,000 to 325,000 recorded during the period 1960-65.

Fraser River Chinook Salmon Program

The chinook salmon test-fishing program which was initiated on the Fraser River in 1964 was continued during the period April through September in 1966. Analysis of the test-fishing catches provides a daily and seasonal index of chinook salmon escapement which may be applied to the management of the Area 29 chinook salmon fishery.

Strait of Georgia Chinook and Coho Investigation

The Strait of Georgia represents the major tidal sport fishing area of the province and in addition supports a large commercial troll fishery. Both fisheries are almost entirely dependent on stocks of chinook and coho resident to the area. The annual sport catch, since 1953, has averaged approximately 40,000 chinook salmon, 70,000 coho salmon and 90,000 grilse, and the annual commercial troll catch during the same period has approximated 100,000 chinook salmon and 300,000 coho.

During the fall of 1962 the Branch initiated a biological investigation of the chinook and coho stocks indigenous to the region, with a view to obtaining the additional knowledge necessary to maintain effective utilization of the stocks in the face of the increasing demands being placed on those stocks, particularly by the rapidly developing tidal sport fishery.

The 1966 investigation included the following studies:

(1) A tagging program in the vicinity of Hornby and Denman Islands during May and June to further define the summer distribution of coho salmon which concentrate annually in that area during the early summer and which are subjected to an intensive commercial troll fishery during July.

A total of 980 tags were applied to coho captured from a chartered purse-seine vessel and to date 403 tags or 41 percent have been returned. The results of the study indicate that a significant movement of rearing coho away from the area occurs during the early summer and that these fish subsequently become available in other areas of the Strait of Georgia, particularly in the Comox and Campbell River regions.

(2) A chinook salmon sampling program at fish buying camps throughout the Strait of Georgia during the commercial troll fishing season April 15 to September 30.

This program was conducted to accurately define the age and size of capture of chinook salmon by the troll fishery in the various areas of the Strait of Georgia region. The sampling also serve as a follow-up assessment of the regulation changes implemented in 1965 which were aimed basically both at reversing a recent downward trend in average weight and at increasing summer availability.

Although considerable additional knowledge was gained on size of chinooks in the harvest, strength of year class, and differences in size and availability by area of catch, at least one additional year of study will be required before any results can be accurately interpreted.

(3) A tagging program by troll vessel in the Nanaimo – southern gulf Islands region.

Sampling and analysis of commercial troll catch statistics have shown that a major concentration of chinook salmon in the four to six pound size class are present each year in this region, and these fish contribute heavily to the local commercial troll fishery. The tagging was conducted in October and November on this stock and is currently being repeated. The aim of this study is to determine the subsequent distribution and availability of these fish.

A total of 1303 chinook salmon were tagged during the course of the program and to date 21 have been returned. The majority of the tag returns are expected during the 1967 and 1968 fishing seasons.

Investigation of Coho Salmon Susceptibility to Hook and Line Gear

To examine time changes in hook and line susceptibility of coho salmon a troll test fishing and commercial seine sampling program was conducted in western Juan de Fuca Strait during August and September of 1965 and September of 1966. Troll test-fishing and seine sampling were co-ordinated both temporally and spatially so that samples from both gear types would be from the same coho population. Analysis of data demonstrated that coho, although susceptible to hook and line gear throughout the season, were significantly less susceptible after the first week in September as compared to early August. Decreased susceptibility was correlated with increased sexual maturity as evidenced by the selection of less mature fish during September by the troll gear. The mechanism by which sexual maturity affects susceptibility is complicated likely involving a decrease in feeding intensity.

International Chinook and Coho Committee

In 1963 a joint Canada-United States "Informal Chinook and Coho Committee" was formed to deal with problems related to intermingling of Canadian and American chinook and coho stocks on the Pacific coast of North America. The Committee's terms of reference included preparation by each country of a review of available information on migration and exploitation of chinook and coho salmon along the Pacific coast of North America and recommendations for future research. The data



Scale samples, weights, and lengths are taken from troll caught chinooks at fish buying camps in Georgia Strait.

exchange between Canadian and American fisheries agencies is complete and at present the Canadian review is nearing completion.

Industrial Projects

Logging

During the year no new British Columbia Logging Orders were issued; however, the Order providing for regulation of log driving in the Stellako River was revised and gazetted early in February.

Observations and physical assessment of the effects of the 1966 Stellako log drive were undertaken by the International Pacific Salmon Fisheries Commission, the B.C. Research Council and the Department. The findings as reported by the B.C. Research Council were inconclusive and were not considered to be sufficiently different to alter the conclusions presented in the 1965 report.

No progress was made in respect to provision of log dumping or loading facilities associated with the Wannock Forest Access Road at Rivers Inlet. As a result, the Department authorized a limited log towing operation in early July.

Log driving and associated stream development activities in the Nass and Quesnel Rivers were conditionally approved by the Department.

The Stream Protection Clause system is continuing to function satisfactorily. Extension of the system to include the Kamloops Forest District has been accepted by the B.C. Forest Service with the result that all salmon producing streams in the province are so protected. A revision of Provincial legislation now provides stream protection clauses in Timber Licence agreements. All Forest Districts and the B.C. Forest Service Engineering Services Division have been provided with detailed maps showing salmon spawning distribution. Spawning distribution maps have also been provided to major logging companies in the Queen Charlotte Islands, Kitimat and Terrace areas.

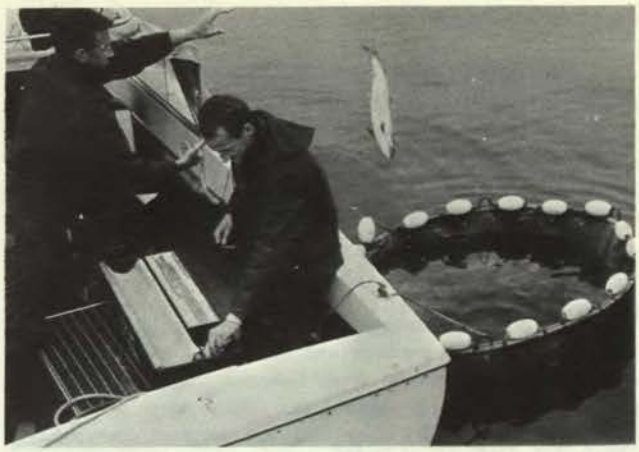
Liaison with the B.C. Forest Service and several major logging companies concerning forest access road construction in salmon producing watersheds is continuing.

An assessment of the potential effect of log driving on adult migrating salmon in the Quesnel River was undertaken and a report has been prepared.

Investigations of the extent of beach spawning in Owikeno Lake were commenced to provide more positive information for presentation to the forest industry and B.C. Forest Service when discussing the location of log dump sites. In critical areas the lake current patterns are also being documented to determine the likelihood of contamination of spawning areas by the drift of logging debris.

Gravel Removal

The British Columbia Gravel Removal Order was revised in 1966 to include eight additional streams or watersheds.



Tagging coho salmon the fish are anaesthetized, tagged and then held in a recovery pond to revive prior to release.

The gravel lease application referral system established with the co-operation of the Provincial Lands Branch is functioning most satisfactorily. Major gravel removal problems are encountered when the property involved is privately owned or when the removal of gravel is considered necessary to protect property from flooding.

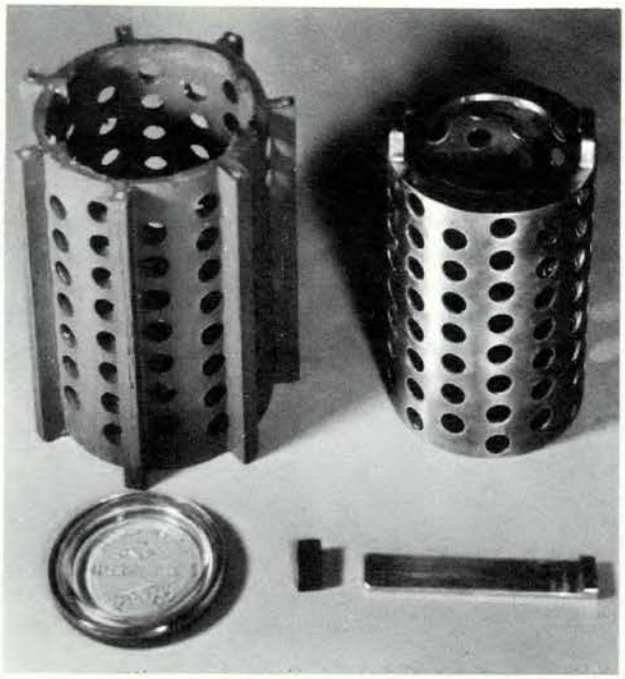
Assessment of the gravel replacement potential in the Mamin and Yakoun Rivers was continued in 1966. The data to date do not indicate a rapid replacement in either of the rivers examined and the removal of river gravel has been discontinued.

Marine Seismic Explorations

Seismic explorations in coastal waters in 1966 was limited to a relatively small conventional survey undertaken by Shell Canada Ltd. in the area adjacent to the west coast of Vancouver Island during the January-to-March period and an August-to-October gas exploder survey by Pan American Oil Company in the Hecate Strait – Queen Charlotte Sound area.

The Shell Canada program was carried out under the fishery protection conditions established prior to the Company's 1963-64-65 exploration programs which included continuous supervision by Department representatives. The detonation of 2320 charges ranging in size from 5 to 300 lbs. resulted in a total observed mortality of 7274 fish. Eighty-five percent of the mortality consisted of herring and rockfish, 12 percent miscellaneous fishes and nearly 3 percent salmon (predominantly juvenile). The incidence of mortality was slightly higher than the 1963-65 average thus suggesting that winter seismic operations in the Pacific area are potentially as destructive as those undertaken in the spring and summer.

Technical meetings with Shell Canada and information from other agencies has resulted in the drafting of a number of fishery protection conditions pertaining to the Company's proposed 1967-68 exploratory program and the marine seismic activity



Intergravel sediment sampler showing the neoprene outer cylinder on the left and the brass inner container on the right.

associated with this operation.

Pollution

Two new pulpmills came into production at Prince George in the summer of 1966. They are equipped with biological treatment facilities which were incorporated, after lengthy negotiations with the Department and the International Pacific Salmon Fisheries Commission, to render the effluent harmless to fish. Monitoring programs and bio-assays which are being conducted on a weekly basis ensure that the specified quality standards are being attained.

The effluent from the Kamloops pulpmill, which commenced operations in 1965, continues to be harmless to fish, as indicated by bio-assays similar to those being performed at the Prince George mills.

Negotiations looking to developing improved effluent-disposal facilities at the Prince Rupert sulfite-kraft pulp complex have resulted in agreement in principle whereby the Company will provide a pipeline and diffuser which will discharge the very high BOD wastes from the sulfite mill into Chatham Sound, while the remaining effluent will be discharged into Wainwright Basin. This will have the effect of greatly improving the dissolved-oxygen levels in Wainwright Basin which have, in the past, been depressed to extremely low levels.

Early in 1966, the Department was advised of tentative plans for the construction of an unbleached kraft pulpmill at Emsley Cove, near the head of Douglas Channel. As a result, the Branch initiated studies to acquire detailed information concerning local tidal and current movements, and water quality, which would be required before recommendations could be advanced with regard to effluent disposal requirements for fisheries protection. On the basis of the data obtained, the most suitable site for the effluent diffuser was selected, and it was determined that the magnitude of the Emsley Creek salmon stocks were such that protective measures would be required to ensure that these populations would be maintained, either in the natural stream or by means of a spawning channel elsewhere to compensate for losses which might otherwise be anticipated at Emsley Creek.

A continuous monitoring program of the Bulkley-Morice system was initiated in 1966 to assess the possible effects of a proposed 750-tpd unbleached kraft pulpmill at Houston which is scheduled to commence operation by late 1969. The program consists largely of chemical water-analyses and sampling of invertebrate fauna to provide data which will enable the Department to define the conditions which prevail in the natural state. Any changes stemming from the future release of pulpmill effluent will therefore be readily detectable. Six stations were established from approximately three miles above the proposed outfall to 80 miles below. Chemical and biological sampling is conducted at six-week intervals throughout the year. Currently, most of the biological monitoring involves the collection and identification of the macro-invertebrates on the river bed. Samples are collected periodically from colonizing trays which are anchored to the stream bottom. This method of collecting aquatic insect larvae and other bottom-dwelling species appears to be fulfilling the requirements as the trays generally contain large numbers of specimens. The assimilation of two years' pre-mill data on the biological and chemical conditions in the river system should be valuable in developing designs for the effluent treatment facilities which will be necessary to protect the fisheries resource.

Pesticides

The good liaison and spirit of co-operation which has existed between the Branch and the major users of pesticides continued in 1966. These major groups include those who apply insecticides for mosquito and forest-pest control; herbicides for brush control alongside roads, railways, powerline rights-of-way, and in areas where the rates of succession can be accelerated through control of deciduous trees; sodium arsenite for the control of marine borers around pilings and dock facilities; and copper sulfate for control of snails which are the vectors for swimmer's itch. The fish-protective measures employed by the Department may include recommendations to the effect that: (1) application must precede the appearance of fish in the spray area; (2) untreated buffer swaths are to be maintained between the spray areas and the waters frequented by fish; and (3) pesticides which are the least toxic to fish must be used whenever possible. In all cases, the mixing of spray solutions, the washing of spray equipment, and the disposal of surplus spray solutions near watercourses is strictly prohibited.

Industrial Pollution

The Branch negotiated with six mining companies in 1966 to develop suitable effluent disposal facilities at their operations. In several instances field surveys were undertaken to determine the distribution of fish in the area concerned, and bio-assays were conducted on simulated process effluents.

Dr. J. L. Hart Honoured on Retirement

An affectionate farewell to a long-time associate and friend was the theme of a dinner June 16 honouring Dr. J.L. Hart, retiring director of the FRB Biological Station at St. Andrews, N.B.

About 150 guests attended the festive event held at the Sir James Dunn Memorial Arena in St. Andrews. They included Dr. F. Ronald Hayes, Chairman of the Fisheries Research Board, and Mrs. Hayes, and Dr. R.R. Logie, Assistant Deputy Minister of Fisheries (Operations).

Dr. Hayes paid tribute to Dr. Hart's dedication to fisheries science and to FRB and noted that Dr. Hart was the first man in the history of the Board to reach retirement age as director. Dr. Hayes presented a scroll, over the signatures of Minister of Fisheries H.J. Robichaud and the Chairman of the Fisheries Research Board.

Humorous anecdotes covering the 38-year span of Dr. Hart's service with FRB complemented the serious comments on his outstanding contribution to fisheries science in Canada. Dr. Logie, representing the Deputy Minister of Fisheries, who was out of the country, brought special greetings from Dr. Needler.

Dr. Harry Hachey, Mayor of St. Andrews and a former associate of Dr. Hart's at the Biological Station, represented the community.

Employee groups, Fishery Officers of the Department of Fisheries, Maritimes Region, and the Department's Maritimes Regional Headquarters made presentations to Dr. Hart.



Dr. J.L. Hart (right), retiring director of FRB Biological Station, St. Andrews, N.B., reads scroll honouring his 38 years of service as a fisheries scientist and administrator. The scroll, signed by the Minister of Fisheries, the Honourable H.J. Robichaud, and the Chairman of the Board, Dr. F. Ronald Hayes, was presented by Dr. Hayes, at left.

Dr. Hart was born in Toronto and is a graduate of the University of Toronto where he received his B.A. in 1925, his M.A. in 1926 and his Ph.D. in 1930. At university, he was awarded the Jean Balmer and Edward Blake scholarships. He joined the Fisheries Research Board in June 1929 and served in central Canada on freshwater investigations and, later, on marine studies on the Pacific coasts. In 1950 he was appointed director of the FRB Biological Station in Nanaimo, B.C. Four years later, he moved to St. Andrews to head up the fisheries research program there. ✔

Continued from previous page.

Moreover, a large number of bio-assays were conducted on various slimicides which were scheduled for applications of water intakes and cooling-water systems of diverse industrial plants.

Applied Research

The development of a sonar system for counting adult salmon ascending large rivers was continued in 1966. In this connection, a field test conducted in Cowichan Bay during late October and early November demonstrated that the design principles are sound, and that further work is warranted. Currently, work is underway to rebuild the system to all solid-state, while optimizing the performance of all components to meet the special requirements of the counter.

An inter-gravel sediment sampler which measures the increments of sediment- or wood-fiber accumulations in spawning gravel at the depth of egg deposition has been used successfully in the field. A local manufacturer is now equipped to make these instruments in quantity and further calibration tests are planned.

A fish-scale projector was designed and built to take the Department's standard scale cards and provide fixed magnifications of 50, 100, 200, and 400 times, plus the facility to obtain other magnifications if required.

A model study to determine the nature and magnitude of injuries to fish caused by hydraulic turbulence within turbines has been initiated. Also, some progress has been made in the design of an instrument to measure turbulence within full-size turbines.

Tests were completed to determine the maximum voltage gradient that could be tolerated for salmon in the vicinity of the saltwater anode of a high-voltage direct-current transmission line currently under construction by B.C. Hydro and Power Authority to connect Vancouver Island with the main line. ✔

GATT Negotiations Reduce Trade Barriers

THE KENNEDY ROUND of negotiations under the General Agreement on Tariffs and Trade (GATT) was successfully concluded on June 30, 1967, when Canada and other participating countries signed the final text of the negotiations in Geneva. The agreement which has emerged is the most far-reaching ever negotiated to reduce the barriers to international trade. Some 50 countries have participated and about $40 billion of world trade will be favourably affected by the results.

The principal results have been that over wide ranges of industrial goods substantial tariff-reductions, mostly 50 per cent, have been agreed on by the major industrialized countries; the basic elements of an international agreement on wheat have been successfully negotiated; significant gains have been made in reducing the barriers to trade in other agricultural products, and a convention on the application of anti-dumping duties has been signed by major trading countries.

During the negotiations, special efforts were made to improve the trading position of the less developed countries. Over a considerable range of tropical products of particular interest to developing countries, elimination of tariffs by many developed countries has been agreed to. Through the operation of the most-favoured-nation rule, which provides for equal treatment for imported goods, all GATT countries stand to benefit from these results. The tariff reductions flowing from the negotiations will be phased over a period of years.

The Agreement has significant effects on Canada's trade and fishery products. The United States will be eliminating duties on $91.4 million of 1966 Canadian fisheries products exports. This covers fresh, frozen and salted fish from both the coastal and inland fisheries. Tariff reductions, generally 50 per cent, are to be made on a further $740,000 of Canadian products. In terms of either duty elimination or reduction, some 76 per cent of total dutiable Canadian exports of fisheries products to the United States will be affected. The United States made no change in the access for groundfish fillets which are subject to tariff quota provisions.

The EEC countries, France, Germany, Italy, Belgium, Netherlands, and Luxembourg, will be making reductions from 15

MAJOR U.S. TARIFF REDUCTIONS ON FISHERY PRODUCTS FROM CANADA

Brief Product Description	*Present Rate*	*Final Rate*	*U.S. Imports from Canada 1966 (U.S. $'000)*
Fresh, chilled or frozen cod, cusk, eels, haddock, hake, pollock, shad, sturgeon and freshwater fish	0.5c./lb	free	10,721
Fresh, chilled or frozen halibut and salmon	0.50c./lb	free	13,403
Fresh or chilled mackerel	0.5c./lb	free	2,094
Fresh or chilled swordfish	1c./lb	free	3,773
Other fish, fresh, chilled or frozen	1c./lb	0.5c./lb	232
Fish, scaled in bulk or in containers weighing over 15 lb each.	1c./lb	free	145
Fish frozen in blocks over 10 lb	1c./lb	free	24,738
Wolf fish fillets	1.c./lb	free	694
Fish fillets other than of groundfish & yellow perch	1.5c./lb	free	19,610
Cod, cusk, haddock, hake and pollock salted or pickled, whole	0.2c./lb	free	4,358
Cod, cusk, haddock, hake and pollock salted or pickled, skinned or boned	0.75c./lb	free	2,880
Herring, salted or pickled	0.1c./lb	free	1,687
Mackerel, salted or pickled	0.2c./lb	free	110
Groundfish, smoked or kippered, other than whole	1.c./lb	free	360
Herring, smoked or kippered, other than whole	0.0c./lb	free	210
Smoked salmon	10%	5%	120
Herring, in containers over 15 lb	5%	free	459

per cent to 33 per cent from current rates on virtually all fishery items currently exported by Canada. The most important of these are: Frozen salmon from 10 per cent to 8 per cent; 1966 exports $5.2 million. Canned salmon, from 16 per cent to 13 per cent; 1966 exports $4.1 million. Saltwater fish fillets, from 18 per cent to 15 per cent; $549,000. Fresh lobsters, from 15 per cent to 10 or 13 per cent; $530,000.

In earlier GATT negotiations and in the Kennedy Round, it had been accepted that the main purpose was to reduce barriers to trade through reductions in the levels of most-favoured-nation tariffs, and that in this process there will be some erosion of the various preferential tariff systems applicable among several groups of countries in the GATT.

During the Kennedy Round, Britain and Canada maintained close consultation on matters of mutual concern. About 95 per cent of Canadian export to Britain enter free of duty. The terms of entry for these products will not be changed by the Kennedy Round. For those on which preferential protective duties apply, Britain will be making proportionate reductions.

Swedish tariff reductions on canned lobsters are from 75 kr/ to 40 kr/. In 1965 she imported $330,000 worth of Canadian canned lobsters.

Most Canadian export products now enter Denmark free of duty. However, there has been a duty of 80 ore /kg on canned salmon and canned lobster in the past. This will now be cut by 50 per cent. In 1964 the values of Danish imports of Canadian canned salmon and canned lobster were $68,000 and $25,000 respectively.

Japan will be lowering her tariffs on Canadian salted, dried or smoked salmon roe from 15 per cent to 7.5 per cent. Last year she imported $1,561,000 worth from this country.

Among the less developed countries making contributions of interest to Canada was Brazil which, as part of a recent tariff reform, eliminated a number of non-tariff barriers arising from consular formalities, prior deposits, etc. Brazil has also bound a number of tariff rates of which duty-free entry for cod are important to Canadian exporters.

Israel will be making reductions of from 5 to 3 Israeli pounds per kg on imported Canadian canned salmon.

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. Rates on fish oils are reduced from 17½ or 20 per cent to 15 per cent.

This information was extracted from an article appearing in the July 1 issue of **Foreign Trade**, *the publication of the Department of Trade and Commerce.*

Frozen Storage of Whole Lobsters

by P.M. Jangaard
Fisheries Research Board of Canada, Halifax, N.S.

The preservation of whole lobsters from a week to several months without serious quality deterioration is difficult. Commercial processors usually cook the lobsters completely, extract the meat and freeze or can the meat with or without the addition of brine and citric or ascorbic acids. However, many customers would like to be able to freeze or purchase frozen, whole lobsters that can be cooked subsequently and served freshly boiled or broiled.

When raw lobsters are frozen whole and then thawed later and cooked, the meat adheres to the shell and is very difficult to remove. The following precooking procedure claims to overcome this problem.[1]

PRECOOKING: The lobsters were precooked in a 2% salt brine at 195° for 70 seconds, cooled quickly to room temperature and frozen. After freezing, the lobsters were glazed with a fine spray of water, wrapped in freezer paper and stored at -20°F (-29°C). The lobsters in preparation for consumption were thawed and then boiled for 15 minutes in a 3% salt brine. The quality was very good after 6-9 months frozen storage. At higher storage temperatures, for instance 0°F (-18°C) a storage time of no greater than 3 months could be expected to give a good product. Temperatures in the freezing compartments of domestic refrigerators are seldom lower than 10-15°F (-9 to -12°C) and consequently the quality of frozen lobsters will deteriorate after a few weeks' storage.

COMPLETE COOKING: A number of fully cooked lobsters were frozen whole, glazed, wrapped in freezer paper and stored at -20°F (-29°C). These lobsters remained of good quality for about 3 months but had poor texture and flavor after 6 months. Another study[2] showed that fully cooked whole lobsters could be kept for about 3 months at -5°F (-21°C) but for less than a month at +15°F (-9°C).

ELECTROCUTION: A recent patent[3] claims that raw lobsters can be frozen and stored satisfactorily if they are first killed by electrocution. For his own safety, this method should not be attempted by anyone not thoroughly familiar with the procedure.

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The Fisherwomen Of Cherry Hill

By G.J. Gillespie



Mrs Conrad



Mrs Tumblin

A STUTE, indeed, would have been the savant who could predict that a young woman working on the night shift in a North Carolina cotton mill would find herself 35 years later operating a fishing boat in turbulent Atlantic waters off the coast of Lunenburg County, Nova Scotia. But that's exactly what happened to Mrs. Rosie Conrad, housewife – fisherwoman, who lives with her husband in the fishing hamlet of Cherry Hill in Lunenburg County.

To add to the uniqueness of this situation, a few houses away from Mrs. Conrad's snug seaside home lives another woman who also sails a fishing boat and harvests lobsters and groundfish from the inshore waters. She is Mrs. Bessie B. Tumblin, mistress of the fishing craft *Don't Tell*. An alert and active woman, she is a great-grandmother and has been fishing since she was 10 years old.

Mrs. Conrad's story opened with romance. At 18 she left her Norfolk, Virginia, home to work in a Carolina cotton mill. One Saturday night, a year later, she met the man who was to radically change her life. He was Alonzo Conrad, a tall, soft-spoken Lunenburger who then was engineer aboard a fishing trawler out of Gloucester, Mass.

Alonzo's trawler had put into a nearby Carolina port for supplies. He and a shipmate decided on a night ashore and wound up at the local dance. He danced with the girl from the cotton mill. It was love at first sight.

A few weeks later the trawler returned. As Mrs. Conrad smilingly recalled the incident: "He came over to see me, and without any beating around the bush he asked me to marry him. I hardly knew his name, but I knew he was my man. We were married right away and that's how I came to Nova Scotia."

After his marriage, Alonzo quit the trawler and brought his bride home to his birthplace at Cherry Hill. He bought himself a fishing boat and embarked on a fishing career to provide a livelihood for his Southern bride. She sailed with him on occasions and gradually learned to handle the boat as well as the fishing gear.

In a couple years a child was born to them. They christened her Joanne. All went well for a while, but a serious illness struck the bread-winner of the little household that was to leave him a semi-invalid.

A FLOATING NURSERY

That was in the era before medical care plans and unemployment insurance, and Mrs. Conrad was faced with the problem of providing for herself and her child. The sea offered her main hope for a living. But how was a mother with a small baby to go fishing? She jumped that hurdle, too, by fashioning a crib in the cuddy or wheelhouse of her fishing boat, and took Joanne with her. Thus, the fishing boat also became a nursery for the little girl.

Mrs. Conrad has fished continuously for more than 30 years. In addition, she has acquired other skills and, on occasions, takes on such jobs as house-painting, hanging wall-paper and whitening ceilings.

Although unable to handle fishing gear, Mr. Conrad sometimes accompanies his wife on fishing trips. "I like to have him along for company" grinned Mrs. Conrad, "but really I don't need him because I figure I am a pretty darn good fisherman."

Her daily routine is unchanging. Every morning off goes the alarm at five a.m. and her day begins. If the weather is fit enough for gulls to fly she is down at her boat at nearby Broad Cove and off to the fishing grounds. With the exception of a couple months in the dead of winter she fishes pretty well around the year.

The lobster fishing season in her area opens Dec. 1 and continues on until May 31. During most of that time she is lobstering. In the summer and fall she is groundfishing – catching cod and haddock as well as mackerel and herring when they are running.

The past spring has been tough on Mrs. Conrad as well as on other fishermen along Nova Scotia's south shore. Fierce storms caused heavy losses to lobster traps.

"When I resumed lobster fishing early in the spring", recounted Mrs. Conrad, whose voice still has the softness of a Southern accent, "I set 70 lobster traps. Then the storm came. Out of those 70 traps I hauled only one. Another time I lost 125 traps. Never found buoy, line or anything." Mrs. Conrad is philosophical about her losses. It's all a part of the game, she says.

The fisherwoman from Virginia looks ahead to many more years of fishing. Slim and supple, she has poise and a healthy, tanned complexion.

She is enthusiastic, too, "Fishing," she says, "is a great life. I love the sea and, besides, what other job could bring me more money than fishing does? Alonzo and I are happy here. We have our home and we have three wonderful grandchildren. When school closes the ten-year-old one will come fishing with me. She loves it and I love having her with me."

BORN TO THE SEA

Mrs. Bessie Tumblin, the great-grandmother, was born to the sea. She is a native of LaHave Island and a daughter of a fisherman, the late Benjamin Bushen. "I started fishing when I was ten years old," she recalled.

After she finished schooling, it was natural that she would marry a fisherman, and she did. They had several happy years in their cottage home at Cherry Hill where they raised seven children. Her husband, Earl Tumblin, was a schoonerman. He sailed aboard the big, tall-sparred salt baniers out of Lunenburg. One day he sailed away in his schooner and it came back, but not with him. With a shipmate he was lost in a dory when fog settled like a blanket of doom on Scatari Bank. Their names are listed with the hundreds of Lunenburg sailormen who sailed away never to return.

That was 28 years ago. And, like Mrs. Conrad, Mrs. Tumblin had a problem. With a growing family, where was she to turn? It was to the sea. And, as she says, the sea was good to her. "It brought us a living, and that's all that counted after Earl had gone."

For nearly three decades she has sailed from Broad Cove in her little boat and harvested the waters to put victuals on the table and clothing on the backs of her children. There were lean times and good times, but she reared her family. Five of her seven children are still alive, married and doing well.

Mrs. Tumblin is alone now, but she still fishes. Up at four a.m. and down to the cove to her boat *Don't Tell* she heads for the fishing grounds if the weather is at all suitable.

With a sense, probably inherited from her fishing ancestors, Mrs. Tumblin knows her way about the inshore waters as a villager knows the streets of his community.

"It doesn't seem to matter to me how thick the fog is, I can always find my way back to the cove," Mrs. Tumblin says. "I guess it's all a matter of getting used to it. My daddy, he was like that, too. He could always find his way even if it was thick'o'fog."

This, in brief, is the story of two happy women. Their possessions aren't great, but they love the sea and they love to fish. Mrs. Conrad spoke for both of them when she said: "What more do I want? I have few regrets and I wouldn't trade all this for all the gold in Fort Knox." ✔

Attend Fish Buffet

Women journalists from 30 countries around the world enjoyed a delicious fish buffet in the modern test kitchen of the Department of Fisheries, Confederation Heights, late in June.

In Canada under the auspices of the Canadian Women's Press, they visited various points of interest in Ottawa including some government departments, to learn more about Canada and the Canadian way of life.

At the Department of Fisheries, the meal began with Nova Scotia Fish Chowder, followed by Baked British Columbia salmon with Almond Stuffing, Coquilles St. Jacques, and Tuna Stroganoff Casserole.

The Department's Chief Home Economist, Miss Margaret Myer, was hostess, she was assisted by home economists Mrs. Pauline Klosevych, Miss Maria Richard, and Miss Odette Doucette.

Following the meal, Deputy Minister A.W.H. Needler, greeted the guests and presented them with a gift of books giving information about Canadian fisheries and the cooking of Canadian fishery products. He was thanked on behalf of the visitors by Mrs. Ruth Watson, Vice President of the Ottawa Branch of the Canadian Women's Press Club and organizer of the Ottawa tour.



Mrs Pauline Klosevych and Mrs Vers Foster of the Department of Fisheries serve women journalists from various countries during a fish luncheon at the Ottawa Test Kitchen.

Scientists Study Lobster Diet

By G.J. Gillespie

UNTIL A FEW years ago Canadian lobster research was confined mainly to the biological field. At the Fisheries Research Board of Canada's station at St. Andrews, N.B., biologists have studied the living lobster under almost every conceivable condition. Scientists trained as scuba divers have invaded the lobsters' habitat at the bottom of the sea and have observed their behavior under varying conditions. In the laboratory lobsters have been hatched from larvae and raised to maturity in confinement; their mating and moulting processes have been studied in the laboratory aquaria, and scientists have mimicked water temperatures and other conditions to which lobsters are exposed in their natural habitat.

While biological research is being continued by Dr. D.G. Wilder and his associates, attention is also being focussed on the technological aspects of lobster research. In the board's Halifax station, Dr. James Stewart and a team of scientists and technicians have been subjecting the lobster to biochemical and microbiological studies.

For the past two or three years, the Halifax biochemists have been examining the lobster's chemical make-up and have conducted a series of experiments dealing with its blood metabolism, its resistance to disease and its feeding habits and preferences.

With several hundred lobsters held in captivity in especially designed tanks, Dr. Stewart's team has been studying the creature under different degrees of temperature and other water conditions.

The Halifax scientists have been interested particularly in the lobster's diet requirements. This study has three aims: the effect of diet on the general physical conditions and the ability of the animal to withstand disease, and to find out what the nutritional requirements are to keep lobsters healthy when they are confined to pounds where natural food supplies are unavailable.

By means of blood tests scientists are able to assess the general physical condition of lobsters both fed and unfed. Herring have been the standard diet for lobsters kept in captivity commercially over long periods. The investigation has shown thus far that lobsters fed only on herring are not getting the required nutrients. Scientists, however, have found that the herring diet must be supplemented with a high protein food such as beef liver.

In the Halifax experiment, some lobsters are fed nothing, others are fed exclusively on herring, while a third lot is fed herring along with beef liver. Tests have established that the lobsters fare better on the latter diet.



Dr. James Stewart examines lobster being used in studies at the Halifax station of the Fisheries Research Board of Canada.

Lobsters, however, appear to be able to forego food for long periods. Lobsters in the Halifax station have gone without food for as long as 13 months. These were kept in fairly low water temperature and did not decline as much physically as those kept without food at a higher temperature for shorter periods.

Deterioration of lobsters kept without food is manifested by a decline in muscle tissues in the tail and the claws. The rigid body shell in which lobsters are encased must be kept filled. If there is no food to fill it then the claws and tail become filled with water in the places where the muscle has shrunk. The taste of the meat apparently is not affected by starvation, although the tomale or the liver may be affected.

In its natural habitat the lobster is not a selective diner. It will nibble at anything that may come its way. It is known, however, that lobsters eat a variety of fish and shellfish, perhaps any marine animal of suitable size they can capture. The amount

eaten varies with water temperature and also seems to be affected by moulting. The large claws are used to catch and hold live food but do not appear to actually crush or tear it apart. Even hard-shelled foods such as clams are simply held by the mouth parts and small pieces of the shell edge are bitten off until the soft tissues are exposed.

DINES A LA CARTE

At the bottom of the sea the lobster has almost limitless food resources. He is free to dine any time he feels hungry and the menu is pretty well a la carte in whatever quantity he wants. That situation has led to the observation that when a lobster invades a trap – often baited with herring – he is really looking for a dessert to finish off the meal he has already eaten.

The Halifax station has about 700 live lobsters in captivity. These are confined in holding tanks which are supplied with water by a long pipeline extending from the station to the bottom of Halifax harbour. This provides a continuous and fresh supply of filtered sea water to keep him alive and healthy.

The lobsters under study are, on the average, market-size (about a pound each). Scientists find these lobsters easier to work with than the jumbo or large-sized lobsters of five pounds and more. They have had the odd freak lobster. One was a fair-sized animal, normal in every way except that his color was blue. He was given to the station by a fisherman who had picked him up in a trap.

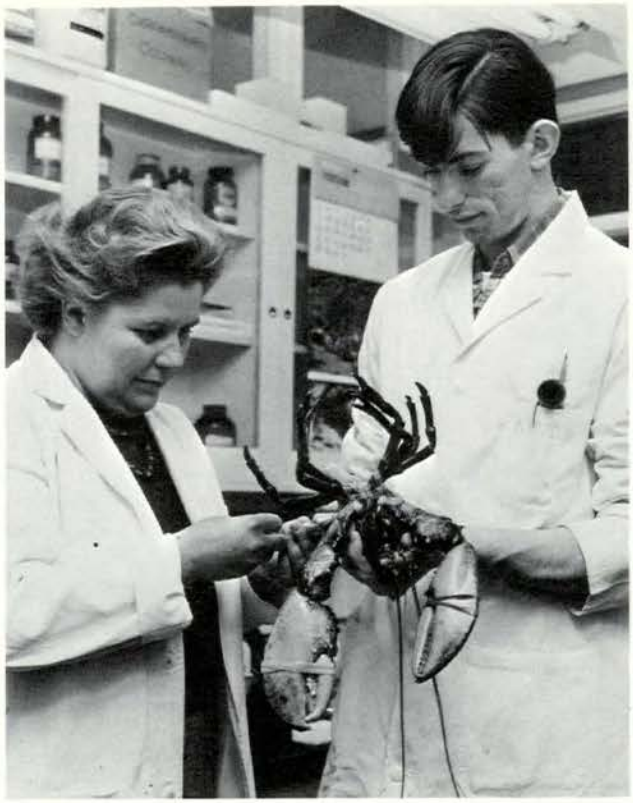
The blue lobster thrived for many months. Then one day something occurred that shouldn't happen even to a lobster. A female of the species went berserk in the tank and dismantled the lobster in the navy blue armor. It could be she was sensitive to indigo.

Lobster research at the Halifax station is by no means at an end. Many things have been learned, but there is much more to be added to the dossier before the project ends. The moulting process, for instance. Each time a lobster sheds its shell its growth and weight increases substantially. Is there a way to increase the number of moults? The scientists would like to answer that question.

HEALTH IS IMPORTANT

Of course, an important aspect of the whole program is the lobster's health. Normally, lobsters are healthy creatures, but like all living creatures they are sometimes affected by disease. The study of its body chemistry is providing technologists with more and more clues.

A health case in point were the casualties among lobsters stored in certain tidal pounds. This happened a few years ago. Samplings were made of lobsters from different districts where casualties occurred and indications were that the creatures had been infected with a specific bacterium while still at sea. The source of trouble was identified. It is emphasized that this particular disease is not harmful to humans.



Taking blood sample to assess physical condition of lobster.

Yes, a lot is known about *Homarus americanus*. There is still much more to be known. With biologists and technologists collaborating in this study, new avenues of knowledge are being opened which are being added to the accumulation of existing data on this interesting marine animal which means so much to the fishing economy of inshore fishermen in the Atlantic Provinces. ✔

Research Vessel Conference

Invitations are now going out to Food and Agriculture Organization member governments to attend the Second FAO Technical Conference on Fishery Research Craft to be held at the Pacific Science Center, Seattle, Washington from December 11 to 15.

The theme for the Conference will be "Modern Fishery Research Craft", with emphasis being placed on unusual, advanced and integrated craft. Topics will include: design and construction of fishery research vessels; craft requirements in relation to types of research activities; and craft requirements in relation to conditions of operation.

The Bureau of Commercial Fisheries of the U.S. Department of the Interior is the co-sponsor of this Conference.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May 1966		May 1967	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	170,551	15,216	142,882	9,577
ATLANTIC COAST - Total	155,325	11,977	135,052	7,847
Cod	34,542	1,512	27,046	1,177
Haddock	12,048	857	9,329	601
Pollock, Hake, Cusk, etc.	8,599	319	4,190	150
Rosefish	3,842	105	1,825	49
Catfish	565	20	473	16
Halibut	645	192	516	182
Plaice & Other Flatfish	32,004	1,054	29,493	962
Herring & Sardines	45,587	476	54,077	535
Mackerel	292	23	Ø	Ø
Alewives	1,851	46	598	18
Salmon	222	132	154	95
Smelts	13	2	51	8
Swordfish	271	164	186	133
Other Fish	360	19	368	16
Lobsters	12,030	6,326	4,557	3,085
Clams & Quahaugs	546	33	589	38
Scallops	1,842	692	1,379	759
Other Shellfish	66	5	221	23
PACIFIC COAST - Total	15,226	3,239	7,830	1,730
Pacific Cods	4,745	365	969	82
Halibut (1)	6,079	2,019	2,340	563
Soles & Other Flatfish	711	47	301	23
Herring	348	19	284	17
Salmon	1,126	600	1,581	816
Other Fish	272	11	80	4
Shellfish	1,945	178	2,275	225
BY PROVINCES				
British Columbia	15,226	3,239	7,830	1,730
Nova Scotia	50,716	5,709	36,444	4,105
New Brunswick	34,277	1,224	20,305	845
Prince Edward Island	8,128	1,709	1,971	282
Quebec	24,018	1,173	39,864	728
Newfoundland	38,186	2,162	36,468	1,887

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

MID-MONTH WHOLESALE PRICES - MAY 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.373	.443
Cod fillets, Atl, frozen, cello 5's	lb.	.328	.383
Cod fillets, smoked	lb.	.420	.473
Haddock fillets, fresh, unwrapped	lb.	.475	.580
Herring, kippered, Atl.	lb.	.253	.337
Mackerel, frozen, round	lb.	.190	.260
Lobsters, canned, Fancy	case 48-½s	61.667	63.887
Sardines, canned	case 100-¼s	9.695	9.600
Halibut, frozen, dressed	lb.	.548	.600
Silverbright, frozen, dressed	lb.	.605	.627
Coho, frozen, dressed	lb.	.808	.807
Sockeye, canned, grade A	case 48-½s	27.430	28.400
Pink, canned, grade A	case 48-½s	16.497	17.123
Whitefish, fresh	lb.	.558(1)	-
Lake trout, frozen	lb.	.444	.523

(1) Dressed

PRICES PER CWT. PAID TO FISHERMEN

(Week endg. May 13)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	4.5	5
Yarmouth		
Haddock	7	6
St. John's Nfld.		
Cod	-	-
Haddock	2.75	-
Rosefish	2.5	-
Vancouver		
Ling Cod	12-14	10-16
Gray Cod	6-7.5	6.5-12
Soles	6-9.5	8-8.5
Salmon (Rdspg)	35-77	45-71

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF APRIL

	1966 '000 lbs	1967 '000 lbs
TOTAL - Frozen Fish, Canada	54,430	59,733
Frozen - Fresh, Sea Fish - Total	31,012	36,183
Cod, Atlantic, Fillets & Blocks	7,269	4,657
Haddock, fillets & blocks	4,262	7,148
Rosefish, fillets & blocks	832	2,882
Flatfish, (excl. halibut), fillets & blocks	3,437	4,814
Halibut, Pacific, dressed & steaks	1,515	4,422
Other Groundfish, dressed & steaks	1,340	1,236
Other Groundfish, fillets & blocks	3,175	3,701
Salmon, Pacific, dressed & steaks	1,194	1,932
Herring, Atlantic & Pacific	376	464
All Other Sea Fish, all forms	4,288	3,144
Shellfish	3,324	1,783
Frozen - Fresh, Inland Fish - Total	4,933	5,776
Perch, round or dressed	641	112
Pickerel, (Yellow & Blue) fillets	124	1,111
Sauger, round or dressed	(1)	807
Tullibee, round or dressed	(1)	264
Whitefish, round or dressed	1,395	686
Whitefish, fillets	314	207
Other, all forms	2,459	2,589
Frozen - Smoked Fish - Total	2,070	1,501
Cod Atlantic	1,268	786
Sea Herring, kippers	314	194
Other, all forms	488	521
Frozen for Bait and Animal Feed	16,415	16,273

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

SALTED FISH STOCKS AS AT END OF MAY

Salted and Pickled Fish, Atlantic Coast

Wet-salted - Total		4,879	5,444
Cod		3,163	3,429
Other		1,716	2,015
Dried - salted - Total		2,768	6,059
Cod		2,385	5,439
Other		383	620
Boneless - Total		387	313
Cod		285	271
Other		102	42
Pickled - Total	(barrels)	4,675	5,108
Herring	"	2,900	3,689
Mackerel	"	10	405
Alewives	"	1,765	1,014
Turbot	"	-	-
Bloaters	(18 lb. boxes)	16,000	-
Boneless Herring	(10 lb. boxes)	5,000	4,012

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - FEBRUARY

(Value in Thousands of Dollars)

		1965-1966		1966-1967
Total Exports		188,525		202,620
By Markets:				
United States		132,948		132,217
Caribbean Area		15,517		17,294
Europe		34,401		45,742
Other Countries		5,659		7,367
By Forms:				
Fresh and Frozen		130,185		133,440
Whole or Dressed	39,000		43,159	
Salmon, Pacific	10,434		14,429	
Halibut, Pacific	6,504		6,098	
Cod, Haddock, Pollock, etc.	423		453	
Swordfish	3,969		3,900	
Other Seafish	5,770		7,102	
Whitefish	4,718		4,514	
Pickerel	2,733		2,422	
Other Freshwater Fish, n.e.s.	4,449		4,241	
Fillets, Blocks and Slabs	59,131		62,711	
Cod, Fillets & Blocks, Atlantic	21,495		19,355	
Haddock Fillets & Blocks	3,979		5,595	
Rosefish, Hake, Pollock, etc.	5,753		8,685	
Flatfish	9,664		13,064	
Pickerel	2,545		2,864	
Other Fillets and blocks	15,695		13,148	
Shellfish	31,688		26,966	
Lobster (Alive & Meat)	21,712		19,092	
Other	9,976		7,874	
Frozen Fish & Shellfish, pre-cooked	366		604	
Cured		20,677		21,404
Smoked	1,778		2,111	
Herring	1,108		1,317	
Other	670		794	
Salted, Wet & Dried	15,798		16,597	
Cod	13,646		14,354	
Other	2,152		2,243	
Pickled	3,101		2,696	
Herring	1,923		1,647	
Mackerel	675		595	
Other	503		454	
Canned		22,935		32,214
Salmon	14,863		23,245	
Sardines	4,354		4,793	
Lobsters	2,437		2,569	
Other	1,281		1,607	
Miscellaneous		14,728		15,562
Meal	8,370		7,577	
Oil	1,673		787	
Other	4,685		7,198	

Norwegian Fish Exports 1966-1967

BY TYPES OF PRODUCTS

Quantity in Thousand Pounds
Value in Thousand Kroner

	Jan.-Mar. 1967 Q.	Jan.-Mar. 1967 V.	Jan.-Mar 1966 Q.	Jan.-Mar 1966 V.
GRAND TOTAL	-	387,397	-	346,780
Fresh or Iced Herring and Sprat (brisling)	32,233	10,789	38,066	13,796
Denmark	18,102	5,757	-	-
West Germany	2,873	1,176	26,061	9,564
Other Countries	11,258	3,856	12,005	4,232
Fresh or Iced Fish n. o. p.	5,356	7,737	6,772	9,491
United Kingdom	1,978	2,608	2,679	3,319
Frozen Herring and Sprat (brisling)-except fillets	8,694	2,961	10,218	4,398
Frozen Fish, n. o. p. -except fillets	7,807	9,500	6,521	8,898
Fresh or Iced Fillets of Fish	2,320	1,832	4,793	3,910
Frozen Fillets of Fish	37,316	55,145	36,497	58,279
Finland	3,049	5,240	3,091	5,521
Sweden	3,937	8,125	5,624	11,900
U.S.S.R.	8,962	10,620	2,612	3,337
United Kingdom	4,257	7,658	4,780	8,265
Czechoslovakia	2,734	3,100	3,126	3,560
West Germany	1,929	2,299	5,366	7,041
East Germany	3,858	3,286	2,557	2,131
United States	2,427	4,615	2,934	5,186
Other Countries	6,163	10,202	6,407	11,338
Salted Herring and Sprat (brisling)	2,506	3,617	3,018	3,452
Salted Fish, n. o. p.	2,779	3,506	2,483	3,327
Dried Fish (stockfish)	10,173	25,812	11,254	25,011
Italy	950	3,577	994	3,379
Nigeria	8,364	19,802	9,453	19,591
Other Countries	859	2,433	807	2,041
Salted and Dried Fish (klipfish)	24,276	54,086	23,747	49,391
Dominican Republic	2,046	3,506	3,296	5,331
Brazil	14,143	31,716	10,670	23,174
Other Countries	8,087	18,864	9,781	20,886
Crustaceans and Molluscs, not canned	1,747	18,594	1,975	17,444
Sweden	619	6,147	633	5,031
United Kingdom	888	8,631	1,047	8,978
Other Countries	240	3,816	295	3,435
Fish Oils, excluding waste and brown oils	7,237	4,781	8,630	6,711
Fish, prepared or preserved-				
In airtight containers	16,378	40,200	16,248	39,335
United Kingdom	3,036	7,191	4,508	11,001
United States	6,598	18,222	5,862	16,267
Other Countries	6,744	14,787	5,878	12,067
Fish, prep. or pres. -				
In non-airtight containers	3,368	5,964	4,038	7,640
Herring Meal	248,029	135,622	134,883	84,911
Sweden	13,587	8,014	14,517	8,906
Belgium	12,597	6,570	14,041	9,071
France	24,154	13,021	22,591	14,484
Italy	7,187	4,071	4,592	2,926
Netherlands	11,096	5,823	4,392	2,907
Poland	4,345	2,168	5,313	3,503
United Kingdom	73,649	39,718	48,391	29,720
West Germany	13,287	6,602	4,070	2,509
United States	68,358	38,914	-	-
Other Countries	19,769	10,721	16,976	10,885
Other Meals	5,608	2,625	9,397	5,297
All Other Products	2,505	4,626	2,878	5,489

BY COUNTRIES

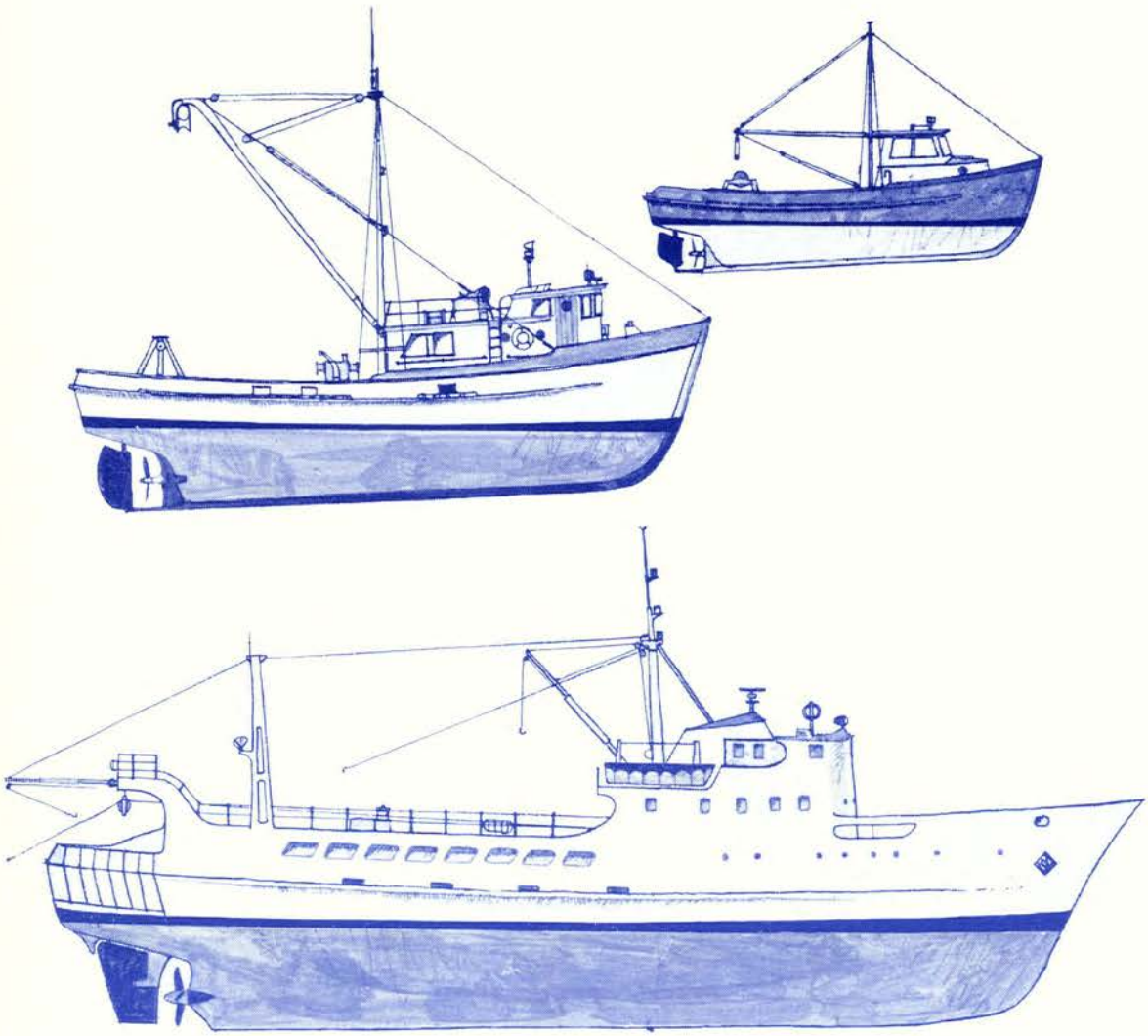
Quantity in Thousand Pounds
Value in Thousand Kroner

	Jan.-Mar. 1967 Q.	Jan.-Mar. 1967 V.	Jan.-Mar. 1966 Q.	Jan.-Mar. 1966 V.
GRAND TOTAL	-	387,397	-	346,780
United States	79,602	65,016	10,842	24,187
Frozen Fillets of Fish	2,427	4,615	2,934	5,186
Fish, prep. or pres. - In airtight containers	6,598	18,222	5,862	16,267
Herring Meal	68,358	38,914	-	-
Other Products	2,219	3,265	2,046	2,734
Brazil	14,143	31,716	10,670	23,174
Salted and Dried Fish (klipfish)	14,143	31,716	10,670	23,174
Dominican Republic	2,161	3,607	3,499	5,498
Salted and Dried Fish (klipfish)	2,046	3,506	3,296	5,331
United Kingdom	90,260	72,461	68,200	68,400
Fresh or Iced Fish, n. o. p.	1,978	2,608	2,679	3,319
Frozen Fillets of Fish	4,257	7,658	4,780	8,265
Crustaceans and Molluscs, not canned	888	8,631	1,047	8,978
Fish, prep. or pres. - In airtight containers	3,036	7,191	4,508	11,001
Herring Meal	73,649	39,718	48,391	29,720
Other Products	6,452	6,655	6,795	7,117
France	27,902	17,616	25,453	19,965
Herring Meal	24,154	13,021	22,591	14,484
Belgium	14,934	10,029	16,857	12,626
Herring Meal	12,597	6,570	14,041	9,071
Sweden	23,244	32,499	27,315	37,653
Frozen Fillets of Fish	3,937	8,125	5,624	11,900
Crustaceans and Molluscs, not canned	619	6,147	633	5,031
Herring Meal	13,587	8,014	14,517	8,906
Other Products	5,101	10,213	6,541	11,816
Finland	3,419	5,933	5,338	7,104
Frozen Fillets of Fish	3,049	5,240	3,091	5,521
Denmark	21,822	9,580	6,741	6,700
Fresh or Iced Herring and Sprat (brisling)	18,102	5,757	-	-
Italy	12,374	13,655	9,696	13,591
Dried Fish (stockfish)	950	3,577	994	3,379
Herring Meal	7,187	4,071	4,592	2,926
Other Products	4,237	6,007	4,110	7,286
Netherlands	12,812	8,356	5,639	5,705
Herring Meal	11,096	5,823	4,392	2,907
West Germany	30,327	18,736	46,736	29,039
Fresh or Iced Herring and Sprat (brisling)	2,873	1,176	26,061	9,564
Frozen Fillets of Fish	1,929	2,299	5,366	7,041
Herring Meal	13,287	6,602	4,070	2,509
Other Products	12,238	8,659	11,239	9,925
East Germany	6,795	5,471	6,764	5,410
Frozen Fillets of Fish	3,858	3,286	2,557	2,131
Poland	4,345	2,168	5,313	3,503
Herring Meal	4,345	2,168	5,313	3,503
Czechoslovakia	9,555	6,484	9,660	7,458
Frozen Fillets of Fish	2,734	3,100	3,126	3,500
U.S.S.R.	10,737	11,693	5,582	4,883
Frozen Fillets of Fish	8,962	10,620	2,612	3,337
Nigeria	8,364	19,802	9,453	19,591
Dried Fish (stockfish)	8,364	19,802	9,453	19,591
All Other Countries	45,536	52,575	47,660	52,293

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

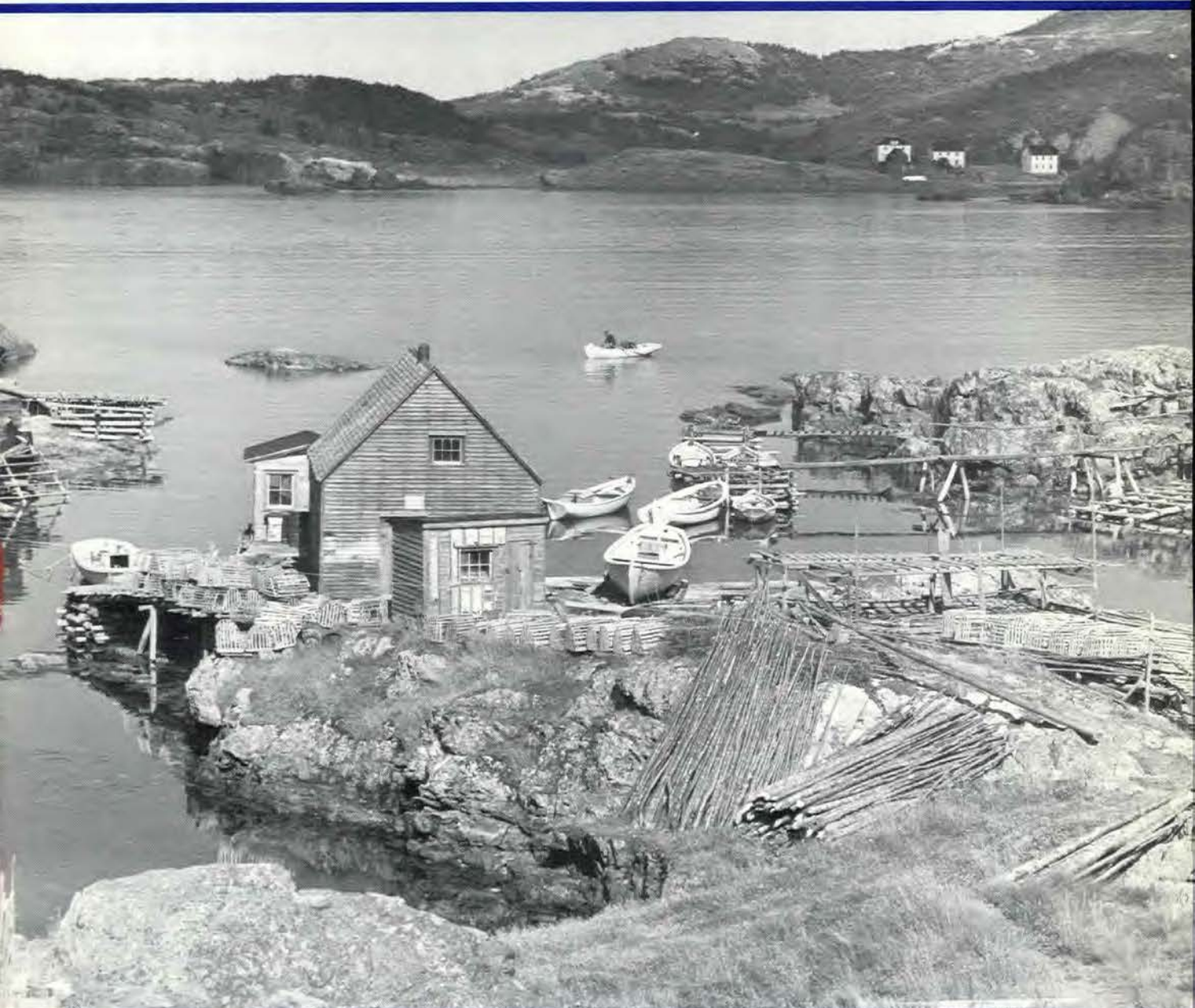
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FISHERIES

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★ Babine Lake Sockeye Salmon Development

★ Water Pollution Legislation in Canada

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

September, 1967

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COVER PHOTOGRAPH - A summer scene at picturesque Bonavista Bay, Newfoundland.

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Views Exchanged at Ottawa Conference

Economic Research in Fisheries

ECONOMISTS FROM government agencies and universities across Canada exchanged views on economic research in the fisheries at a recent Ottawa conference sponsored by the federal Department of Fisheries. Attended by more than 35 persons, including three from the United States, the two-day conference featured informal discussions on the economics of the primary and secondary fishing industries, the marketing of fishery products, and policy research.

Discussion on the economics of the primary fishing industry and of fishery management, one of four main topics covered at the meeting, was introduced by Dr. Parcival Copes of Simon Fraser University, B.C. Dr. Copes noted that the common property nature of the resource, the dependence of economic research upon biological data and the need to integrate biological and economic research tended to make economic research into fisheries in some respects different from research in other fields of economics.

Panelists discussing this topic stressed the need for closer co-operation among economists and biologists and for fuller economic data on both commercial and sport fisheries. In general discussion it was pointed out that there is a need to identify the gaps in existing knowledge in fisheries economics and to anticipate problems in fisheries management.

Specific areas in which a need was indicated for economic research included the development of techniques for evaluating sport fisheries, establishment of criteria to determine priorities in the use of common resources, study of industrial organization in fisheries and assessment of the economic impact of control measures.

STAFF EXCHANGE PROGRAMS

In considering available sources of research personnel, comparisons were made between the support extended to non-government economic research by the Department of Fisheries, the Department of Agriculture and the United States Bureau of Commercial Fisheries. Staff exchange programs between government agencies and universities were recommended, and stress was placed on the need for an up-to-date bibliography of past fisheries economic research, and for a list of completed research projects and of personnel engaged in this field.

Also recognized was the desirability of a master plan mapping out areas of research and establishing priorities, and requiring continuing liaison among all participating agencies. Such liaison could be maintained by a permanent committee of consulting economists as is done in the United States. It was noted that the U.S. Bureau of Commercial Fisheries has plans to establish a list of all United States universities and personnel engaged in fisheries economic research.

Leading a discussion on economics of the fish processing and distribution industry, Dr. S.S. Mensinkai of Memorial University of Newfoundland, noted that comparatively few studies had been undertaken in the secondary industry in that province. He described as a serious drawback the lack of statistical data, particularly in regard to the capacity, utilization and location of processing plants. Most plant studies had been made by engineers and there had been few economic studies to determine the optimum plant size. In spite of the difficulties in obtaining data, such studies were necessary in order to solve problems of plant size in areas where the fish supply was seasonal or continuous.

Dr. Mensinkai stated that in areas of seasonal fish supply, processing plants must be flexible enough to operate at levels both well above and well below the optimum rate. Such plants were profitable only if they were part of a larger organization. It was not profitable for a single plant firm to operate in an area of highly seasonal raw material supply, and therefore there should be more integration, he concluded.

D.A. MacLean of the federal Department of Fisheries, Halifax, advised that investigation into the Maritimes processing industry had been limited by the lack of data. The industry was tending towards domination by a few large firms, but the relationships between large and small firms were not known. Information was also lacking on marketing.The east coast,he concluded, has too many plants in too many locations and the capacity is too high.

FISH MARKETING

Introducing the third conference topic, the economics of fish marketing, was Dr. Darrel A. Nash of the U.S. Bureau of Commercial Fisheries. Discussing this subject, Prof. Norman H. Morse of Dalhousie University, Halifax, said the expansion of markets governed the exploitation of fisheries resources on the east coast. He suggested research work should be done on the broad aspects of marketing, including market organization, prices, etc.

In this discussion, mention was made of recent interest in fish farming in the United States by large companies quite

removed from the fishing industry, such as aircraft and oil companies. Judging from the amount of suitable land available, the potential yield from fish farming could, it was estimated, exceed the present total fish catch in the United States. The lack of development of a marketing system, however, was hampering its growth.

Reporting on a 1965 study of the distribution of fish products in Toronto, H.C. Frick of the Economics Service, Department of Fisheries, referred to some of the problems encountered in such consumer surveys. In Toronto it was found that one-third of the fish and fish products were sold through hotels, restaurants and institutions: this was about the same proportion as that found in a survey in the late 1940's. A change had taken place in the marketing structure, however, since as much as three-quarters of the volume of some wholesalers went to these outlets, while a smaller proportion was sold to retailers. This change was due to direct purchases of frozen fish products from brokers and processors' agents by retail food chains which had largely supplanted the small retail food stores.

Considerable discussion was held on the problem of compiling data on fish consumption and demand. Difficulties encountered in measuring Canadian demand prompted suggestions that United States market demand curves be accepted as a fair approximation of North American conditions generally. Dr. Nash gave a detailed explanation of the methods used in measuring market demand in the United States.

Discussion on policy research in fisheries economics, introduced by Zenon W. Sametz, Director of Regional Development Economics, Department of Fisheries, delved into the theoretical aspects of research and the broad implications of economic policy in fisheries. During general discussion on this topic, the need was raised for sociological as well as economic research, particularly in moving from abstract basic research toward implementation of a new policy. It was pointed out that in some problem areas, such as economic rationalization of the B.C. salmon fishery, there was now a need for a plan of implementation which could perhaps best be developed by a Royal Commission.

The paramount importance of entry control in fisheries was acknowledged, but an effective plan was needed to determine the best way of realizing acceptable social adjustments in the long term interest of all concerned, so that the persons displaced by entry control would have alternative employment. This meant that other departments and agencies would have to become involved, because some of the needed steps were beyond the scope of a resource agency alone.

Participants in the two-day round of discussions, in addition to Department of Fisheries personnel, were: Dr. M.E. Andal, Department of Agriculture; Prof. Raoul Andersen, Dept. of Sociology and Anthropology, Memorial University of Nfld.; Dr. Walter J. Anderson, Canadian Agricultural Economics Research Council; Prof. Copes; Edward Dailey, Branch of Economics Research, U.S. Bureau of Commercial Fisheries; Dr. John A. Dawson, Economic Council of Canada; Dr. S.E. Drugge, Dept. of Economics, University of Alberta; Prof. Marcel Daneau, Dept. of Economics, Laval University; Dr. John F. Graham, Dept. of Economics and Sociology, Dalhousie University; Dr. Cecil B. Haver, Dept. of Economics, Macdonald College; John Houtsma, Dept. of Economics, Mount Allison University; Dr. Mensinkai; Prof. Morse; Dr. Nash; Dr. Virgil J. Norton, U.S. Bureau of Commercial Fisheries; Prof. Peter Pearse and Prof. A.D. Scott, Dept. of Economics, University of British Columbia.

Reach Agreement on Food Labelling

Agreement on a general international standard of food labelling was reached at a meeting in Ottawa recently of representatives from 22 member countries of the United Nations attending the Third Session of the Codex Committee on Food Labelling, held under the chairmanship of the Government of Canada.

H.V. Dempsey, Director of the Inspection Service of the Department of Fisheries, was the chairman of the session. Representatives were present from Argentina, Australia, Belgium, Canada, Cuba, Denmark, Dominican Republic, Ecuador, Federal Republic of Germany, France, Israel, Japan, Mexico, Netherlands, Norway, Poland, Sweden, Switzerland, Trinidad and Tobago, Turkey, United Kingdom and United States of America. Also participating were the following international organizations: Food and Agriculture Organization, World Health Organization, International Federation of Margarine Associations, International Organization of Consumers' Unions, and the Food and Drug Law Institute.

The Food Labelling Committee was formed by the Codex Alimentarius Commission which was established in 1962 under the joint sponsorship of the Food and Agriculture Organization of the United Nations and the World Health Organization. The existence of different requirements in many national labelling laws affecting pre-packaged food products has long created difficulties in international trade, and the formation of this committee was intended to provide a solution to this problem by developing labelling standards which could be adopted internationally.

Copies of the general labelling standard prepared at the committee's third session will now be distributed to all member countries of the parent Codex Alimentarius Commission for comment. Final review and ratification of the standard is to be considered at the Fifth Session of the Commission in February, 1968 at Rome, Italy.

Canadian delegates attending the session were: G.G. Anderson, Department of Fisheries; A. Hollett, Food and Drug Directorate, Department of National Health and Welfare; Dr. W.A. Moynihan and Dr. C.K. Hetherington, Department of Agriculture; and R.M. McKay, Department of Trade and Commerce. Advisors attended from the National Dairy Council of Canada, Fisheries Council of Canada, Canadian Food Processors Association, Confectionery Association of Canada, Consumers Association of Canada and the Economic Council of Canada.

Babine Lake Sockeye Salmon Development

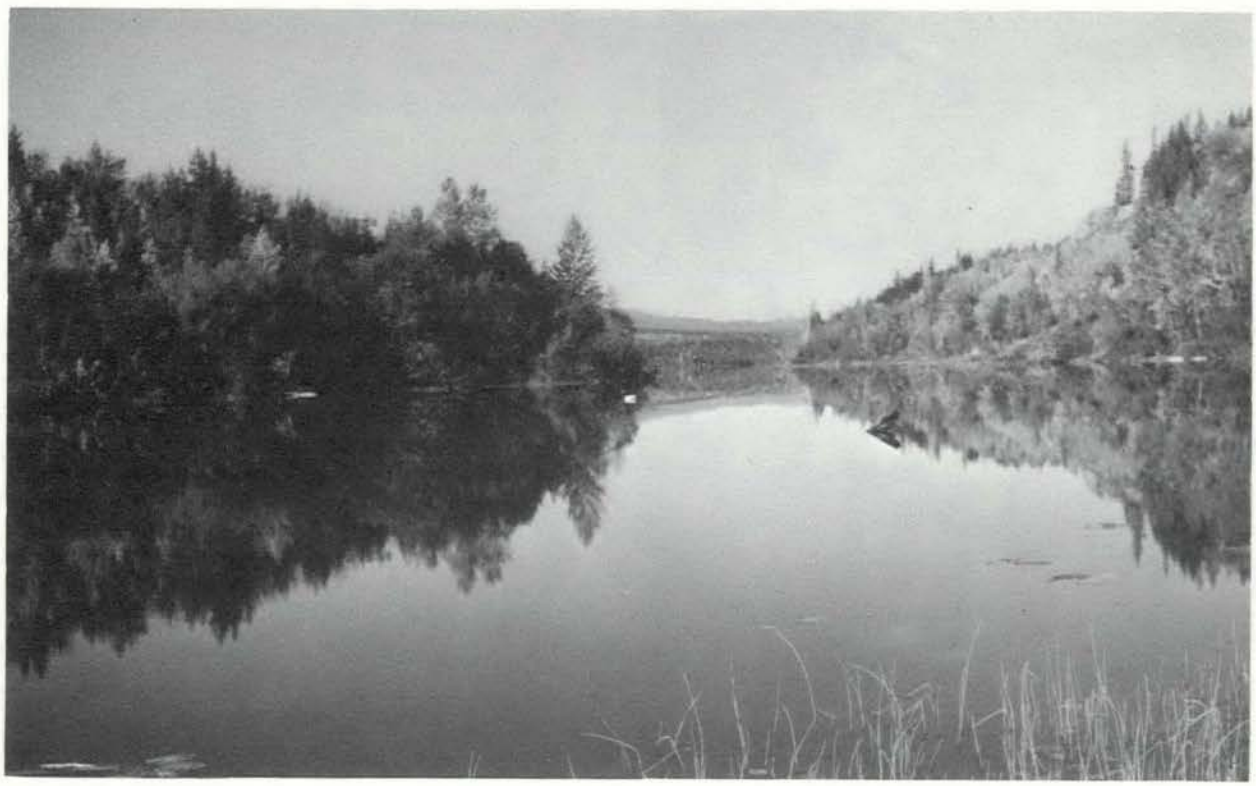
IN LONG and narrow Babine Lake fingering its way for a hundred miles through a landscape of mountain and forest in central British Columbia history is being made in the field of salmon research and development. There in this isolated lake system technologists with slide rules and biologists with microscopes are well into a sockeye salmon development project that has no parallel any place in the world.

In official papers and reports it is described as "The Babine Lake Development For Sockeye Salmon" and it is being pushed forward by scientists and technicians of the Resource Development Service of the Department of Fisheries of Canada. With five years still to go in the seven-year development program it will have cost, at current estimates, more than $8 million.

While it only takes a sentence to describe its objective as that of adding at least one million adult sockeye salmon annually to the Skeena River salmon fishery, it is a highly complex operation employing a wide range of scientific skills, the use of huge earth-moving machines and rock-drilling equipment and the employment of a sizeable labor force.

The Babine River system is a leading producer of sockeye salmon, and investigations by fisheries scientists disclosed that the main lake basin of Babine Lake wasn't measuring up to its potential as a sockeye nursery area.

Further studies indicated that major development of spawning grounds on two of the large tributaries to Babine Lake – Fulton River and Pinkut Creek – would substantially increase the salmon fry production of the system. The fry (newly hatched fish after they have emerged from their larval stage in the stream gravel) could then in turn fully utilize the available nursery area during their one-year residence in Babine Lake.



A view of Fulton Lake which is to be connected by tunnel and pipeline to a three-mile-long sockeye salmon spawning channel adjacent to the Fulton River.

Subsequently, the present program was initiated two years ago. It mainly involves stream flow control, stream improvement, and artificial spawning channels on the two main tributaries. As opposed to fish hatcheries where young fish are reared in an alien environment, spawning channels are simply additions and improvements to habitat provided by nature.

FASCINATING EXPERIENCE

While a visit to the Babine area is a fascinating experience for anyone watching men meet the challenges imposed by man's interference with nature, getting to Babine is an adventure in itself.

The adventure really begins when one boards a pontoon-equipped bush plane in the Fraser River at Prince George, the geographical hub of British Columbia. The writer, accompanying a trio of Resource Development scientists, boarded the single-engined Beaver aircraft bobbing alongside the dock at the sea-plane base on the riverbank.

Flying at about 4,000-feet on course northwest to Babine about 200 air miles away, the plane cruised over a carpet of green forest lands, patterned with lakes and streams which are part of the Fraser River system. Hazy in the distance from the port side were the snow-covered peaks of the Coastal Range stringing northward to Alaska. The airplane, incidentally, was the one in which the 39-year-old bush pilot, Robert Gauchie spent 58 lonely days marooned on frozen Samandra Lake in the Northwest Territories. With only the whine of the Arctic wind and the howls of wolves to break the silence, Gauchie's ordeal set a record for northern survival.



Meteorologic and hydrometric studies are an essential part of the scientific work being carried out at the Fulton River site.

STRETCHES HUNDRED MILES

The Sutherland River winding southeast from the southern tip of Lake Babine landmarked our crossing the divide from the Fraser to the Skeena River watershed, and our introduction to Babine Lake stretching over a hundred miles to the north to its outlet, the Babine River. Topley Landing, about 70 miles up the lake, was the destination. As the plane set down on the rippling water, glistening blue under the midday sun, members of the local population, including a beautiful, sad-eyed St. Bernard dog named Lady, hastened to the dockside to greet the visitors.

About a half mile from the settlement – characterized mainly by a small general store, log cabins and a few cottages for accommodating visiting fishing parties – is a cluster of bunk-houses, workshops and other buildings set up by the Department of Fisheries for the conduct of the big salmon project.

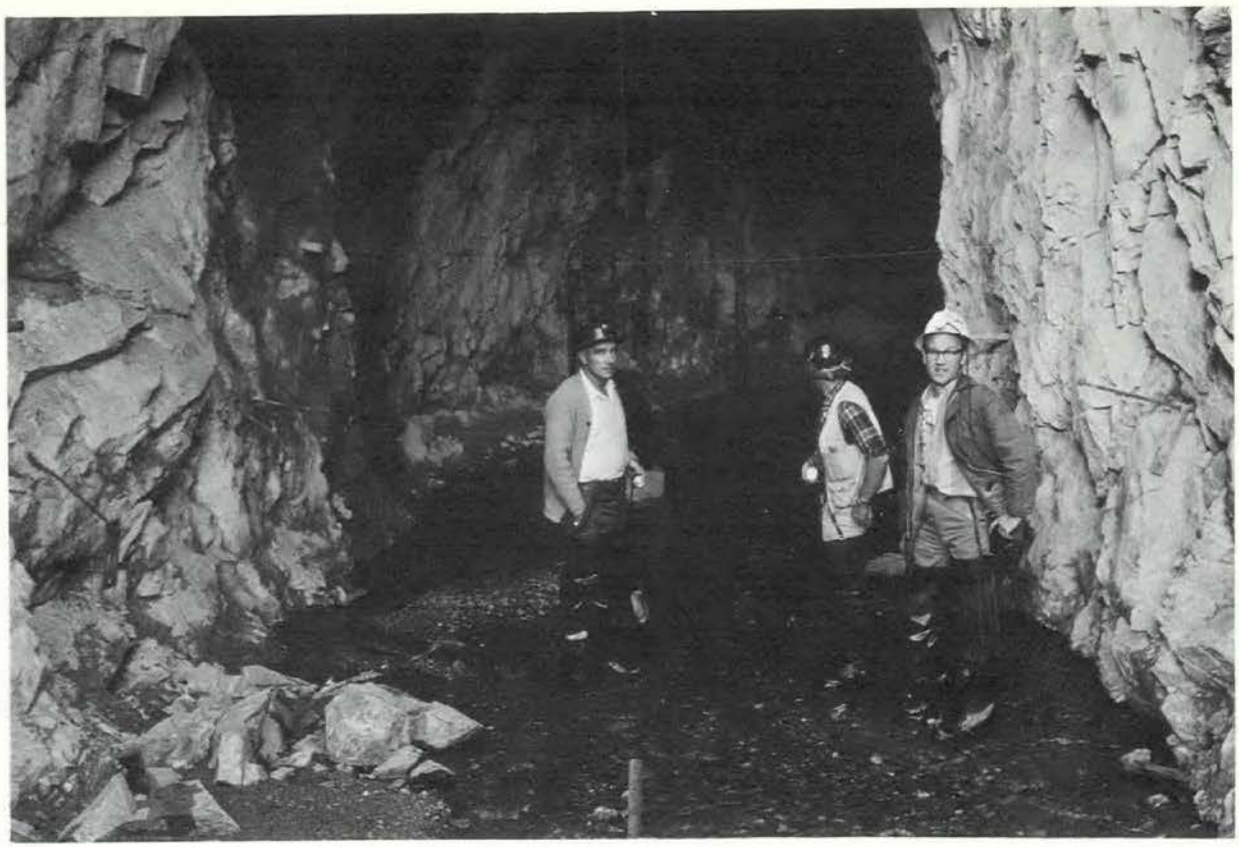
There under the guidance of Roger Kearns, biologist-in-charge at the site, and my Resource Development Service companions from the Department of Fisheries regional office in Vancouver – Chief Engineer Les Edgeworth and Chief Biologist Dixon MacKinnon – the writer spent the day examining all the existing physical aspects of this multi-million dollar project.

A brief review of the background of the sockeye salmon fishery shows that this fish has been historically the most valuable of the five species of Pacific salmon. Because of its high oil content and ability to hold its rich red color, it is used solely for canning of a high quality product. Sockeye generally spawn in streams tributary to lakes and the young fish spend from one to two years in the fresh water before migrating to sea.

After reaching the smolt stage (the period in the sockeye's life cycle when it is ready to head seaward), they start their migration seaward through the Babine River system and find their way to the Skeena River to taste salt water for the first time at the big river's mouth at Prince Rupert. The Skeena River sockeye salmon fishery, which is largely dependent on native runs to the Babine River system, has an annual value of about $1.1 million fishermen and more than $2 million as a processed product. Developers of the Babine project hope to add another million sockeyes to the Skeena fishery and increase the income to fishermen by almost two million dollars annually. The Skeena ranks second to the Fraser River as a sockeye salmon producer.

DIVIDED INTO TWO REGIONS

Long and narrow with a maximum width of about five miles, Babine Lake can be divided geographically into two general lake regions: the North Arm – Nilkitkwa Region, and the Main Lake Region which represents about 88 per cent of the total



To convey water to a proposed 3-mile-long spawning channel adjacent to the Fulton River a combined tunnel and pipeline is being constructed from Fulton Lake, two miles away. A section of the tunnel being blasted out of the rock is shown above.

lake surface area.

The upper and lower Babine Rivers in the North Arm-Nilkitkwa Region, provide 60 per cent of the total spawning for the entire Babine system. The main lake tributaries provide 40 per cent of the available stream spawning area, with Fulton River accounting for half of this.

Investigations of the distribution and growth of young sockeye in Babine Lake initiated some years ago by the Fisheries Research Board of Canada revealed that the overall average density of young sockeye in the North Arm-Nilkitkwa Region has been five times that observed in the Main Lake Region. The studies further indicated that the potential of the Main Lake Region as a lake nursery area is at least equal to the other region. The investigators concluded that the Main Lake area could support a density of sockeye equal to that of the North Arm-Nilkitkwa Region. To achieve this density, an additional output in excess of 350 million fry would be required in the Main Lake Region. It follows, therefore, that an increase in fry production must be obtained by supplementing the natural output of the limited spawning grounds available.

Based on this latter premise a development program was approved two years ago whereby a combination of projects on the Fulton River and Pinkut Creek would provide in excess of 100 million sockeye fry to the Main Lake Region. Projecting the present program, the development works at Fulton and Pinkut contain provision for future expansion and, with similar development projects at Morrison River across the lake, fisheries scientists feel there is a potential for producing sufficient numbers of fry to eventually create an average density of young sockeye in the main lake area approaching the optimum density. The initial development program started in the spring of 1965 with the construction of the first of two spawning channels on the Fulton River.

The Fulton River project provides water storage and the development of several artificial spawning channels. The swift-running river of crystal-clear water flows through tiny Chapman Lake and almost equally small Fulton Lake (3.5 square miles) and empties into Babine Lake at Topley Landing. The river drops down a 40-foot falls immediately downstream of Fulton Lake and then passes through a mile of rock canyon and about three miles of narrow valley to enter Babine Lake. Salmon spawn in the four miles of river between Babine Lake and the falls.

Spawning channel number one is 4,900 feet long and 30 feet wide; it can accommodate 22,000 spawning fish producing an estimated 12 million fry. It is located immediately adjacent to the Fulton River and utilizes the section of the river with a

relatively steep gradient in order to obtain the required velocity for successful operation.

The second channel proposed for Fulton will accommodate 135,000 spawners. This will be a very substantial undertaking necessitating much forest clearing and excavation to provide gravel-bottomed spawning beds extending a length of over 3 miles at a width of 50 feet. With the expected egg-to-fry survival of over 40 per cent, the channel will produce at least 68 million fry.

SITE IS IDEAL

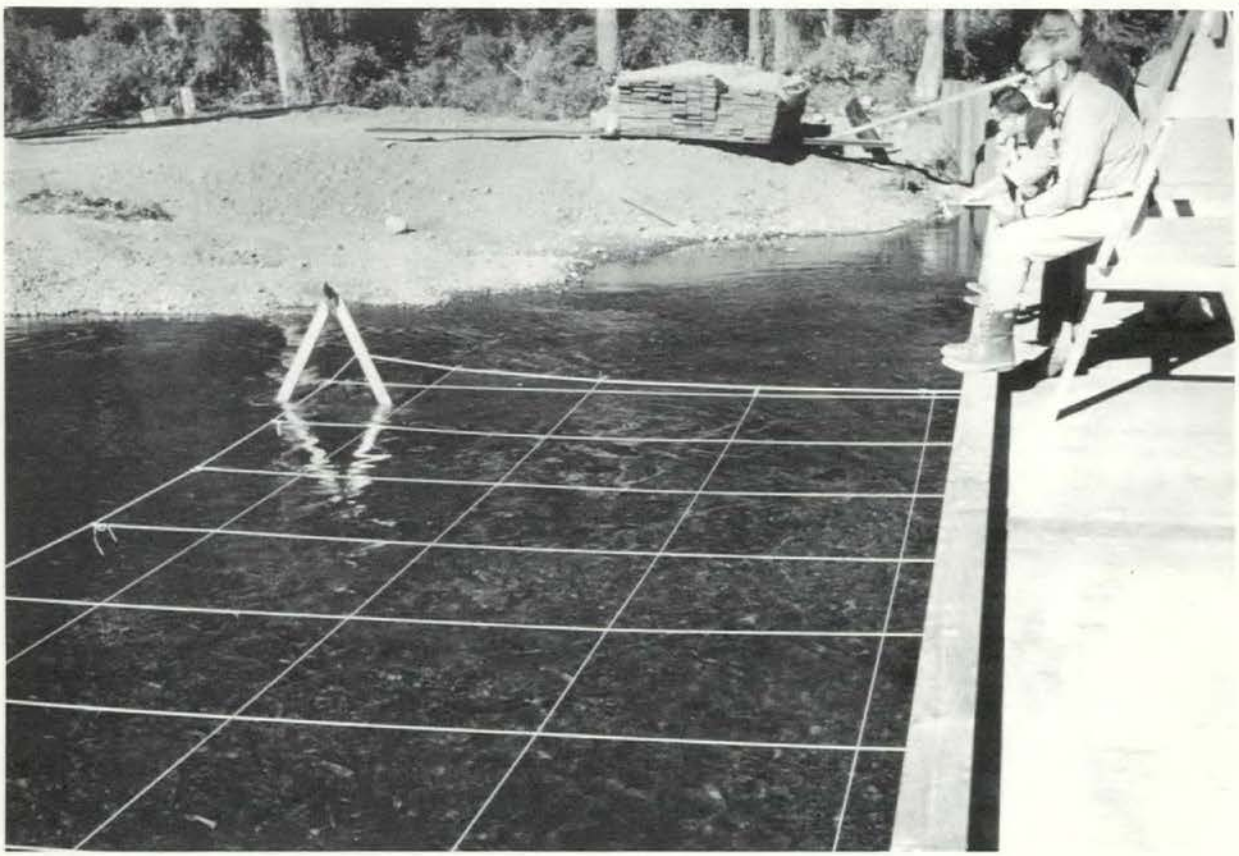
While the site selected is ideal for spawning channel construction, its elevation of 40 feet above the river channel presented some engineering problems. After examining a number of proposals, the engineers decided to convey water directly from Fulton Lake through a combined tunnel and pipeline approximately 2 miles long. A portion of the tunnel has already been blasted through nearly half a mile of solid rock face. The water supply tunnel has a 7.5 foot diameter with a horseshoe-shaped cross-section and is 3,800 feet long. It will originate from the regulating tunnel, approximately 75 feet from the gate structure. An added feature of obtaining water directly from Fulton Lake is the capability of providing cooler water from the depths of the lake to offset the heating effects of the sun during the start of the adult migration in lake August.

PINKUT CREEK

As part of the initial program at Pinkut Creek, a channel 8,000 feet long and 40-feet wide has been designed to accommodate 54,000 sockeye spawners with an expected fry production of 37 million. A second channel, 12,000 feet long and 40 feet wide, will be added later. The first channel at Pinkut Creek will be completed in time for the 1968 sockeye spawning run.

The Fulton spawning channel #1 is fully operational and a total of 21,000 sockeye salmon spawned successfully there last fall. Since late spring an assessment program has been underway to measure the success of the channel as a fry producer.

Assessment reports to date have been very gratifying. It is estimated that 34 million eggs were deposited during the 1966 spawning. Approximately 26 million sockeye fry resulted which is roughly 70 percent survival. This is the highest survival rate recorded from natural spawning in a channel. Production from the channel in its first year of operation was twice that estimated in the cost benefit study made to justify the program. These fry have now migrated into Babine Lake to join other fry produced in the natural river at a much lower survival rate.



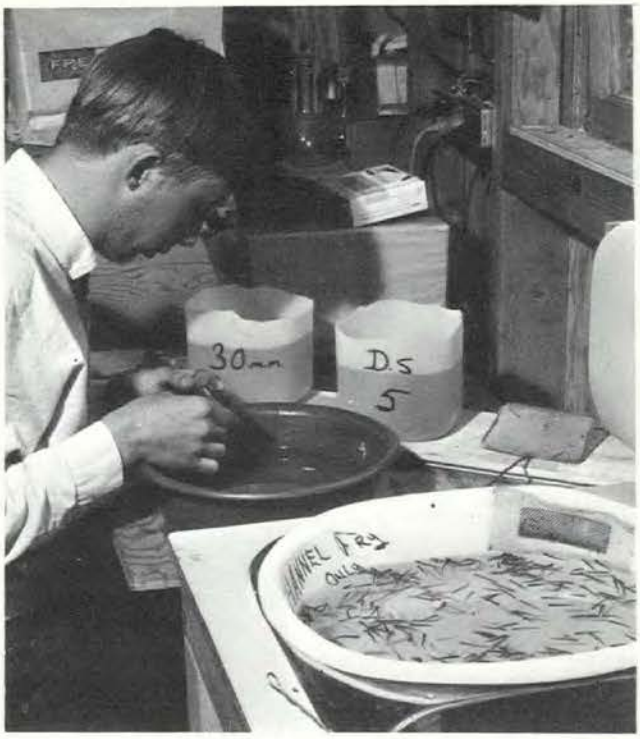
To assess the density of sockeye salmon spawning in the Fulton River a rope grid installed just above the surface of the water is employed.

Assessment studies of the fry population have been going all spring and summer. It is pretty much an around-the-clock job. Young salmon move mainly during the night, and that is the time when they are counted by crews of technicians as they run through sampling traps on their way downstream. It is by such counting that survival percentages can be established.

Another important aspect of the assessment program is the determination of the channel-hatched fry to adapt to their environments as opposed to the sockeyes hatched in river adjacent to the channel. Past experience has shown that fry hatched in experimental hatcheries in British Columbia were notably less viable than natural fry. Studies of adult populations have also revealed that the survival from hatchery fry-to-adult has been lower than the survival of natural fry-to-adult.

On the other hand, it has been observed that sockeye spawn incubated in artificial spawning channels produce fry which show the same characteristics as fry from natural spawning areas. That was one of the reasons for employing spawning channel techniques at Babine Lake.

The channel-hatched fry are undergoing rigorous laboratory tests. These are more or less endurance tests. The swimming speeds of channel and river spawned fry are compared, and they are also tested with regard to food requirements. The two types of fry are held in tanks. Some are fed and some are unfed, and



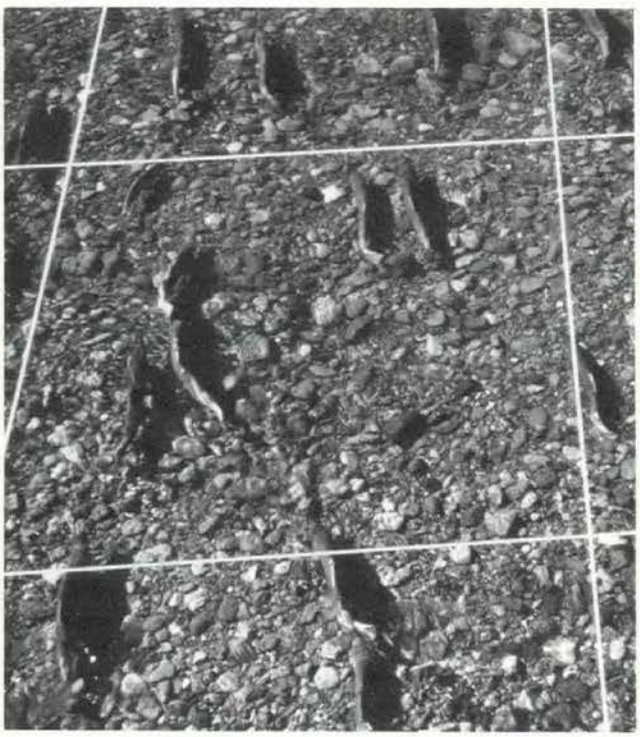
Channel-spawned fry are subjected to rigorous laboratory tests.

comparisons are made. In addition, sample quantities of channel fry are fin-marked so that they be distinguished from differently fin-clipped river fry after they enter the waters of Babine Lake.

Biologists regularly sample these fry populations in the lake with fine-meshed nets towed behind motor boats. Channel-born versus river-born fry comparisons can be made with respect to growth rate, general physical condition, etc. This fin-marking is a delicate procedure and is being done by a group of young Indian women brought in from Vancouver Island who appear to be particularly adept in this technique.

In addition to studies of fish, a full-fledged hydrometric and meteorological station is operated at the Fulton River site. There, data is recorded on water flows, wind velocity, effect of solar heat on water temperatures, rainfall and other pertinent information that could affect the environment of fish in the spawning channels and lake system.

Information collected so far indicates sockeye fry have responded well to the new environment in fish surburbia on the Fulton River. Egg-to-fry survivals exceed anticipated levels, and fisheries scientists feel that the project augurs well for an increased salmon catch in the Skeena River area. The acid test will be the successful upstream migration of channel-hatched sockeyes in about three years' time. By then the multi-million dollar Babine Lake project will have been about completed, and it may well be a revolutionary achievement in the history of salmon development projects throughout the world. ✔



Spawning salmon can be seen paired beneath a density grid in the Fulton River.

Canada's Water Pollution Legislation Began with Fathers of Confederation

CANADA OF a century ago, with a population of less than 3,300,000 and abounding with beautifully clear lakes and streams, did not need to worry about water pollution problems such as plague the present era. However, the Fathers of Canadian Confederation were not unmindful of the threat of pollution and framed laws to protect Canada's water resources.

These laws were embodied in the Fisheries Act which was instituted in 1868. It contained two sections devoted to the control of pollution in Canada's coastal and inland waters. The legislation was interested chiefly in pollution inasmuch as it affects fisheries, but it was Canada's first national act providing legal machinery to protect pure water.

Under the British North America Act the federal government was given blanket legislative authority over all fisheries matters in Canada. In years to follow several of the provinces were granted rights to administer their own fisheries in whole or in part, but the power to legislate with respect to management and control of the fisheries remains a federal power which is exercised on the recommendation and with the concurrence of the province concerned.

Federal responsibility for the administration of fisheries also carries with it certain responsibilities for the control of pollution in fish-bearing waters. Today the Department acts under the Fisheries Act of 1932 which has an entire section devoted to the "Injury of Fishing Grounds and Pollution of Waters". This section was revised about six years ago, but it has changed little from pollution sections of the first Fisheries Act of 1868.

FEW POLLUTION PROBLEMS

In the earlier days when Indians and buffaloes still roamed the western plains, Canada had relatively few towns and the industries were small and scattered. As a result there were few pollution problems to interfere with fish life, and the control legislation at that time was sufficient to provide the necessary protection.

Canada now has a population in excess of 20,000,000. Large cities dot the country from coast to coast; airplanes and automobiles have opened remote areas formerly accessible only to the adventurous.

The control of water pollution has now been extended to several other Canadian Government departments in addition to the Department of Fisheries. While the acts which they administer are exercised within the particular sphere of interest of each department, the fishery resource benefits indirectly from such legislation.

During the passing years the protection of inland waters has also become the concern of provincial governments. In provincial statutes are multi-purpose regulations providing public health protection and the maintenance of water quality for all water users, including the fisheries resource. Most provinces now have water pollution control agencies. Frequently the federal Department of Fisheries has collaborated with these provincial bodies where control of some pollution source was the common goal of all concerned. The co-operation existing between the Department and the provincial agencies has been exemplified many times in a united approach to successfully negotiate satisfactory pollution control measures with industrial developers. Of great assistance to the department and provincial groups has been the staff of the Fisheries Research Board of Canada whose increased participation in pollution research has been invaluable.

STUDIES ON TWO COASTS

The Resource Development Service of the Department of Fisheries has established technical sections on the Pacific and Atlantic coasts to deal with pollution problems. Its scientific staff has spread itself as effectively as possible in those areas to conduct field studies, monitor programs, and to negotiate with industrial operators and other water users who might, through their activities, alter water quality to the detriment of fish.

The Department's pollution control programs are divided into three basic categories –

1. Those dealing with continuing sources of pollution
2. Those dealing with ad hoc problems
3. Those dealing with known or planned developments

Classified in the first category are long established industries, abandoned mine operations and other sources that continue to release toxic substances to fish-bearing waters. These situations are difficult to deal with, since in many instances the source of pollution, perhaps a long-established pulp mill, may be in no condition physically or financially to introduce suitable effluent treatment facilities. However, certain provincial governments and the federal Government have offered financial inducements to such industries in the form of low cost

loans or partial payment of costs for treatment facilities. The Department of Fisheries continues to monitor these installations.

FRUSTRATING PROBLEMS

More frustrating to cope with are situations that arise unexpectedly. Typical of these ad hoc pollution problems are unadvertised pest control spray programs and accidental or other releases of toxic substances. These situations are awkward because it is impossible to plan the attack beforehand and the problems are rarely resolved to the satisfaction of the investigating teams. Many times evidence is hard to come by since the affected water runs off quickly and autopsies on fish are inconclusive. The main hope in preventing these surprise situations lies in a greater public awareness of water pollution dangers. To that end the Department is increasing its efforts to educate the public to these hazards. For instance, concerted efforts are being made to educate farmers in the proper handling of pesticides.

Problems dealing with known or planned developments are the most satisfactory to cope with. In these cases the Department's scientific and technical staffs can assess the situation, meet with local pollution control authorities and eventually negotiate with development company officials. The result is usually a satisfactory arrangement for effluent treatment.

MAN IS THE CAUSE

The chances of fish being killed by natural pollution are small. In practically all cases, pollution damage to fish and their environment is caused by some man-made change. Physical and chemical additives to fish bearing waters may alter the environment sufficiently to cause irreparable damage.

Under natural conditions limited quantities of silt and other materials are deposited in streams. However, most unaltered flowing waters are able to clear the bulk of this material through natural cleansing processes.

For countless centuries the purity of our waters was relatively undisturbed. The test came when the white man's civilization began to spread across the land. Logging operators stripped timber lands which resulted in rapid run-off and widespread erosion. Road builders contributed to an already serious situation through the alteration of river banks, careless disposal of waste materials and the release of gravel washing effluent to streams.

The productive capacity of fish spawning and rearing in streams can be drastically reduced or eliminated by such foreign materials. Bark deposits from logging operations and sawdust from mills stifle bottom dwelling fish food organisms. This combined with silt may blanket stream bottoms making them useless as fish spawning areas. Silt from road building and gravel washing may totally destroy spawning beds by cutting off essential oxygen supplies to incubating eggs.

CONTROL IS POSSIBLE

Satisfactory control of chemical pollution is possible in the majority of cases. Today new industries are generally aware of the dangers of pollution and are willing to co-operate with the Department of Fisheries and other control agencies by installing proper treatment facilities. However, the problem still remains with some of the long-standing industries that continue to pour toxic effluents into the lakes and rivers. The main hope for abatement rests with financial assistance to provide treatment facilities.

Fish are affected either directly or indirectly by toxic substances in waters. Many industries discharge waste products that are highly poisonous to fish. Others release "oxygen hungry" substances that are capable of reducing oxygen levels sufficiently to cause massive fish kills. Domestic sewage is one of the latter, but in limited quantities it does no real harm to fish. The trouble today is that enormous quantities of raw sewage are discharged. The great increase in the use of sewage treatment facilities augurs well for future improvement of the situation.

Probably, the Department's greatest concern today is pollution from the introduction of pest control chemicals to fish bearing waters. This is a relatively new danger that has increased many fold within the last 10 or 15 years.

Mine pollution is another cause for concern in several areas from Newfoundland to British Columbia. Mine drainage and process waters contain high concentrations of toxic components. Without treatment and care by mine operators the release of these substances plus quantities of tailings create havoc with fish in lakes and streams. These pollution problems grow in direct proportion to mine production rates. Until recently no effort has been made to improve methods of treating mine wastes. However, Canada's Department of Energy, Mines and Resources has taken measures to deal more effectively with direct and indirect sources of mine pollution.

Existing federal and provincial legislation provides pollution control agencies with sufficient authority to protect Canadian waters from deliberate contamination. ✔

INPFC Director

The International North Pacific Fisheries Commission has appointed Samuel J. Hutchinson as Executive-Director of the Commission's Secretariat, effective August 1. He replaces Wilvan G. Van Campen who resigned earlier this year to assume duties with the U.S. Department of State in Washington, D.C.

Mr. Hutchinson has been active in fisheries biology and fisheries administration work with the U.S. Bureau of Commercial Fisheries since 1931. From 1958 to 1965 he was Regional Director of the Bureau's Pacific Northwest Region with headquarters in Seattle, Washington.

The INPFC, established by convention between Canada, Japan and the United States, has its headquarters in Vancouver, B.C.

High Seas Tagging To Probe Movement Of Atlantic Salmon

By Bruce Woodland*
Fisheries Research Board of Canada

CANADIAN fisheries scientists are trying to find out how catches of Atlantic salmon near Greenland affect the numbers of salmon returning to home rivers in Canada and investigations have already been initiated by biologists of the Fisheries Research Board of Canada at St. Andrews, N.B., and St. John's, Newfoundland, as well as those of the Department of Fisheries of Canada.

The Greenland salmon fishery has provoked widespread concern in this country, and the progress of the commercial fishery there has been watched carefully by Canadian fisheries scientists for several years.

Salmon catches off Greenland are nothing new. As long as the oldest fishermen there can recall, some salmon were taken in gear set to catch cod or other species of fish. But the first significant landings were made as recently as 1959, when 27 thousand pounds were brought to plants. Good prices for salmon and general trends in the fisheries contributed to steadily-increasing effort by the Greenland salmon fishermen. By 1964, the annual catch had leaped to 3.0 million pounds. There was a drop to 1.5 million pounds in 1965, but last year, the catch again rose to 2.5 million pounds. This is roughly 20-per-cent of the world Atlantic Salmon landings excluding the Baltic area.

Greenland has just one known salmon-producing river, and this contributes a small part, if any, to the commercial landings. It has been demonstrated through tagging experiments that the salmon being taken by the Greenland fishermen originate in rivers as far away as Canada and the United States to the west, and England, Ireland, Scotland and Sweden to the east.

While Canadian salmon have been taken in Greenland waters, better information is desired as to whether or not these same fish would have returned to their home streams after the completion of this phase of their ocean life. This is one of the questions that Canadian biologists seek to answer.

They expect to do this through co-operating in a high-seas salmon tagging program that was started in 1965 by Scottish and Danish scientists. That year, 223 adult salmon were tagged while last year, 728 adult salmon were tagged and released. One of the 1965 tags was recovered in June 1966 by a commercial fisherman on the southwest coast of Newfoundland. Finding the tag earned a $25.00 reward for the lucky fisherman.

It is because information on the salmon tagged off Greenland is so important that the unusually-high reward has been set-up. The money is readily available to any fisherman returning tags together with a scale sample and a report on the place, date and method of the capture, and the length and weight of the fish. The tags are of yellow, oblong plastic attached flush with the sides of the salmon through the back near the dorsal fin. These tags are identified by a serial number preceded by the code "DA 4". There is no return address on the tags but they should be sent to the FRB biological station at St. Andrews, N.B.

Canadian scientists will start their high-seas tagging operation this year to get the facts needed to develop a more complete coverage of what is happening to our Atlantic salmon stocks. High-seas tagging will yield vital information on distribution and movements to and from Greenland and the rate of exploitation by the Greenland fishery. This new offshore adult tagging program will supplement the program of tagging seaward migrating smolts from Canadian rivers, on which efforts have more than doubled in the past two years.

New techniques of determining the origin of Atlantic salmon will also be applied to the problem. Some of these highly-sophisticated methods are being developed and tested here in Canada. Together the various approaches will assist Canadian scientists in telling us more about the marine life of salmon and whether or not the Greenland catches are harming the Atlantic salmon fisheries of eastern Canada.

A special joint committee has been established by the International Commission for the Northwest Atlantic Fisheries (ICNAF) and by the International Council for the Exploration of the Sea (ICES) to examine the whole problem in the light of scientific information to be gathered by Canadian scientists and others.

Of extreme importance in estimating the effects of the Greenland salmon fishery are the proportion of fish which actually return from these waters and the growth of fish during their homeward journey.

The significant fact, as far as Canadian fishermen are concerned, is that if Greenland fishermen catch any salmon that would otherwise return to Canadian waters, the Greenland fishery must cause some reduction in the number of fish available to be caught in Canada.

Determination of the size of this reduction and, in particular, whether or not it has an appreciable effect on our catches, is a

*Mr. Woodland left the Fisheries Research Board of Canada at the end of June this year to accept the post of Director of Public Relations and Alumni Affairs at Memorial University, St. John's, Nfld.

difficult task. The commercial catches of salmon in Canada have been relatively high in the past two years and, even without the Greenland fishery, the catches over the next few years could conceivably be expected to drop somewhat. Canadian scientists anticipate that several season's information will be necessary to support any claim that Greenland salmon catches are hurting the Canadian fisheries.

Once this information is available, then international negotiations may be necessary to protect the best interests of Canada's Atlantic salmon fishermen and our valuable resource. Since the Greenland fishery is within the territorial waters of that country, it can be regulated only by self-imposed restrictions. A far greater threat to the Canadian fishery is posed by the possibility of an expanded high-seas fishery for salmon in the North Atlantic. This has already been attempted, with some success, by European vessels. International regulation of such high seas fisheries is possible and has been done before, in the North Pacific ocean for example. It can only be achieved, however, when a substantial background of fact has been established to the fishery and the stocks that are exploited. Facts are what the scientists seek to provide. ✔

The Dogfish Shark

THE DOGFISH shark (*Squalus suckleyi*), bane of sport and commercial fishermen alike, is one of 10 species of shark found in British Columbia waters. It is readily distinguishable from other members of the shark family by the presence of a sharp spine at the base of each of its two dorsal fins.

In the eastern Pacific its range covers the temperate sea region from California to the Gulf of Alaska, but its greatest abundance occurs between the Columbia River and northern Hecate Strait. In the Strait of Georgia, local populations are known to move about extensively but these are more or less separate from populations which inhabit Puget Sound and waters along the open coast. Coastal populations demonstrate a seasonal movement, migrating northward in the spring and southward in autumn.

Fertilization of the eggs is accomplished internally and is believed to take place around December. The gestation period is approximately two years. Throughout the uterine life, each "pup" is nourished by a large yolk sac attached to the ventral wall of its abdomen. The number of young produced may vary from two to 17 per litter, averaging about eight.

Detailed information on growth rate is still lacking but it is apparent that the dogfish grows very slowly. Estimation of age from growth rings on the dorsal spines suggests that it takes 10 years to reach a length of 24 to 30 inches and 20 years to reach a length of 33 to 40 inches. Maximum age is unknown, but it doubtless exceeds 40 years. Females are believed to reach maturity in 15-20 years. The largest dogfish reported in Pacific waters is 5ft. 3 inches. There are no official records from B.C. waters of a dogfish exceeding four feet.

During the first few years of life, the dogfish feeds on small bottom organisms, but as growth proceeds the diet increases in variety and includes various species of fish. A typical diet is difficult to define, for the dogfish is an opportunist and much depends on the season and the locality.

In an examination of the stomach contents of more than 2,400 dogfish captured by trawls on various B.C. fishing grounds,



PACIFIC DOGFISH *(Squalus suckleyi)*

evidence of salmon was encountered only four times. Species of most frequent occurrence in the diet were herring, sandlance (needlefish), hake, flatfish, smelts, and various invertibrates such as shrimp, euphausiids (red feed), crabs, octopus and squid.

(Reprinted from the Sport Fish Bulletin issued by the Pacific Region of the federal Department of Fisheries).

Perch Support

The stabilization price of ten cents a pound for yellow perch caught in Ontario waters will be extended to Canadian fishermen to March 31, 1968.

The original stabilization program came into effect in August, 1966, and was to have run until August, 1967. During that period the Fisheries Prices Support Board underwrote a price of ten cents a pound for yellow perch, eight inches in length or longer of Number One quality. To maintain this price to Canadian fishermen, the Board purchased frozen round perch and perch fillets from Canadian processors at designated cold storage locations.

The commercial marketing of these products from the 1967 production would normally be completed before the 1968 spring fishing begins. The extension will stabilize the price to fishermen for yellow perch during the fall fishing season of 1967, and will allow the Board to clear its holdings during the normal commercial marketing season.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May - June 1966		May - June 1967	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	434,405	35,591	406,295	32,292
ATLANTIC COAST - Total	379,119	26,202	371,594	26,070
Cod	134,137	5,627	126,310	5,495
Haddock	18,666	1,331	17,945	1,123
Pollock, Hake, Cusk, etc.	14,367	534	8,745	294
Rosefish	22,952	619	14,511	378
Catfish	1,222	42	1,107	37
Halibut	1,219	381	981	341
Plaice & Other Flatfish	63,677	2,068	64,275	2,099
Herring & Sardines	75,078	959	98,237	1,061
Mackerel	6,157	247	5,153	199
Alewives	6,427	125	3,770	65
Salmon	2,125	1,113	2,504	1,403
Smelts	58	8	65	9
Swordfish	473	273	349	222
Other Fish	6,713	91	4,425	68
Lobsters	21,158	11,433	18,572	11,477
Clams & Quahaugs	1,199	71	1,174	76
Scallops	3,372	1,271	3,023	1,665
Other Shellfish	119	9	439	58
PACIFIC COAST - Total	55,286	9,389	34,701	6,222
Pacific Cods	8,314	670	2,845	232
Halibut (1)	14,288	4,909	8,504	2,092
Soles & Other Flatfish	1,951	125	791	62
Herring	18,928	326	11,130	196
Salmon	6,844	2,983	7,724	3,266
Other Fish	1,630	54	166	5
Shellfish	3,331	322	3,541	369
BY PROVINCES				
British Columbia	55,286	9,389	34,701	6,222
Nova Sco	111,482	9,993	97,670	9,876
New Brunswick	59,258	2,752	52,537	2,401
Prince Edward Island	13,706	3,018	7,434	2,699
Quebec	45,600	2,995	70,626	3,537
Newfoundland	149,073	7,444	143,327	7,557

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

MID-MONTH WHOLESALE PRICES - JUNE 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.373	.443
Cod fillets, Atl, frozen, cello 5's	lb.	.328	.383
Cod fillets, smoked	lb.	.420	.473
Haddock fillets, fresh, unwrapped	lb.	.477	.580
Herring, kippered, Atl.	lb.	.251	.337
Mackerel, frozen, round	lb.	.190	.267
Lobsters, canned, Fancy	case 48-½s	61.667	-
Sardines, canned	case 100-¼s	9.695	9.600
Halibut, frozen, dressed	lb.	.544	.533
Silverbright, frozen, dressed	lb.	.605	.627
Coho, frozen, dressed	lb.	.822	-
Sockeye, canned, grade A	case 48-½s	27.773	28.400
Pink, canned, grade A	case 48-½s	16.497	17.123
Whitefish, fresh	lb.	.450(1)	.477
Lake trout, frozen	lb.	.442	.523

(1) - Dressed.

PRICES PER CWT. PAID TO FISHERMEN

(Week ending June 17)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	5	5
Yarmouth		
Haddock	-	-
Black's Harbour		
Sardines	2	2
St. John's Nfld.		
Cod	2.5-3	-
Haddock	2.75-3.5	-
Rosefish	2.5	-
Vancouver		
Ling Cod	10-12	10-16
Gray Cod	6-7.5	6-7.5
Soles	6-9.5	7-10
Salmon (Rdspg)	45-77	45-75

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF MAY

	1966	1967
	'000 lbs	'000 lbs
TOTAL - Frozen Fish, Canada	63,076	62,429
Frozen - Fresh, Sea Fish -		
Total	40,428	38,204
Cod, Atlantic, Fillets & Blocks	10,283	5,799
Haddock, fillets & blocks	4,031	7,447
Rosefish, fillets & blocks	921	1,817
Flatfish, (excl. halibut), fillets & blocks	4,506	6,857
Halibut, Pacific, dressed & steaks	5,201	4,254
Other Groundfish, dressed & steaks	1,377	1,460
Other Groundfish, fillets & blocks	4,937	3,932
Salmon, Pacific, dressed & steaks	1,134	1,594
Herring, Atlantic & Pacific	548	350
All Other Sea Fish, all forms	3,667	2,940
Shellfish	3,823	1,754
Frozen - Fresh, Inland Fish -		
Total	4,819	8,576
Perch, round or dressed	553	(1)
Pickerel, (Yellow & Blue) fillets	61	1,005
Sauger, round or dressed	(1)	712
Tullibee, round or dressed	(1)	247
Whitefish, round or dressed	1,149	626
Whitefish, fillets	279	170
Other, all forms	2,777	5,816
Frozen - Smoked Fish - Total	1,884	1,479
Cod Atlantic	1,262	826
Sea Herring, kippers	308	145
Other, all forms	314	508
Frozen for Bait and Animal Feed	15,945	14,170

(1) Confidential, included with 'other'.

SALTED FISH STOCKS AS AT END OF JUNE

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		9,047	11,880
Cod		6,510	9,128
Other		2,537	2,752
Dried - salted - Total		2,404	6,444
Cod		1,895	5,742
Other		509	702
Boneless - Total		306	431
Cod		285	328
Other		21	103
Pickled - Total	(barrels)	17,014	14,392
Herring	"	3,811	3,896
Mackerel	"	5,585	4,335
Alewives	"	7,618	6,161
Turbot	"	-	-
Bloaters	(18 lb. boxes)	74,449	(1)
Boneless Herring	(10 lb. boxes)	(1)	(1)

(1) - Confidential.

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - MARCH

(Value in Thousands of Dollars)

	1965-1966		1966-1967	
Total Exports		203,455		216,463
By Markets:				
United States		143,611		141,474
Caribbean Area		17,113		18,385
Europe		36,759		48,830
Other Countries		5,972		7,774
By Forms:				
Fresh and Frozen		141,160		142,264
Whole or Dressed	42,956		45,921	
Salmon, Pacific	11,726		15,161	
Halibut, Pacific	7,075		6,495	
Cod, Haddock, Pollock, etc.	469		485	
	469		485	
Swordfish	4,073		3,926	
Other Seafish	6,266		7,691	
Whitefish	5,282		4,963	
Pickerel	3,089		2,600	
Other Freshwater Fish, n.o.p.	4,976		4,600	
Fillets	63,866		66,611	
Cod, Atlantic	23,284		20,390	
Haddock	4,709		6,395	
Rosefish, Hake, Pollock, etc.	6,232		9,219	
Flatfish	10,252		13,817	
Pickerel	2,616		2,984	
Other	16,773		13,806	
Shellfish	33,903		29,044	
Lobster (Alive & Meat)	23,347		20,277	
Other	10,556		8,767	
Frozen Fish & Shellfish, pre-cooked	435		688	
Cured		22,421		22,507
Smoked	1,935		2,299	
Herring	1,192		1,390	
Other	743		909	
Salted, Wet & Dried	17,264		17,348	
Cod	14,947		14,939	
Other	2,317		2,409	
Pickled	3,222		2,860	
Herring	1,979		1,786	
Mackerel	699		605	
Other	544		469	
Canned		24,173		35,254
Salmon	15,489		25,596	
Sardines	4,845		5,283	
Lobsters	2,455		2,678	
Other	1,384		1,697	
Miscellaneous		15,701		16,438
Meal	9,169		8,186	
Oil	1,730		797	
Other	4,802		7,455	

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A Centennial Report of the Federal Department of Fisheries

100 YEARS OF SERVICE TO THE FISHING INDUSTRY and to the CONSUMER

"To conserve and develop Canada's primary fishery resources, and to encourage the development of the fishing industry in the national economy".

That is the function of the Federal Department of Fisheries. Since its establishment on July 1, 1868 as the Department of Marine and Fisheries, the Department has over the past 100 years assisted the fishing industry to achieve steadily increasing yields and revenue from fishing activity on the Atlantic and Pacific and on inland waters, and steadily improved the fish product offered to the public. Fishermen, processors and the consumer have all benefitted from the Department's activities and since 1898 from the scientific investigations carried out by the Fisheries Research Board of Canada.



Inspection officers at fish processing plants across Canada, working with the scientists of twenty laboratories, help ensure a high standard of quality of fish and fish products.



Resource management procedures are carried out by Protection Officers ashore, afloat and in the air. They also supervise the enforcement of appropriate regulations and inspect and arrange clearance of spawning streams. Biologists and engineers enhance the environment to increase salmon and other fish stocks, undertake scientific investigations and conduct studies to provide answers to fisheries problems associated with pollution, floods, drought and multiple water use.



Printed material, films, radio, television and exhibitions, keep the public informed on the various aspects of the industry and the activities of the fisheries services. Departmental Consumer Consultants work to encourage increased consumption of Canadian fish products through demonstrations and lectures on preparation and cooking of fish and fish products.

Fishery economists are active in two related fields of responsibility: (1) They provide the government and the commercial fishing industry with current information, including statistical data, under the general heading of trade intelligence, and (2) carry out studies and investigations in the primary fisheries and in the processing and distribution of fish products.

In fisheries industrial development, the Department introduces and develops new and improved fishing and processing techniques and provides financial assistance for modernization and expansion.



The Department also represents Canada on many international Commissions concerned with the conservation of fisheries and marine mammals.

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, 1967

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In This Issue

- Tagging the Beluga in Hudson Bay
- St. John River Save-the-Salmon Project
- Costs and Earnings of N.S. Fishing Vessels

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

October, 1967

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COVER PHOTOGRAPH - Two Hudson Bay beluga, or white whales, break surface as they are driven into shallow water at the mouth of the Seal River, to be tagged by a Fisheries Research Board of Canada scientist. The net held by man in the bow of the boat was not needed. See article starting on page 3.

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TAGGING THE HUDSON BAY BELUGA



Photostory by James Kinloch

THE beluga, or "white whale", a creature mainly of arctic and subarctic waters, has long been a subject of interest to scientists and hunters, as well as an important item in the economy of northern lands. A source of food, oil and rawhide to Indians and Eskimos and, to some extent, to residents of the shores of the Gulf of St. Lawrence, it is one of the smaller members of the whale family, similar in many ways to the dolphin and porpoise.

Beluga have been hunted in various ways in Hudson Bay, the Mackenzie Delta and at many other points along Canada's arctic coast, always close to shore and usually in the mouths or estuaries of rivers, where in the summer months they go in with the tide twice a day, presumably to feed on small fish such as capelin. They have been harpooned, shot, netted or driven into the shallows.

In Hudson Bay the largest commercial beluga operation is based on a small processing plant at Churchill, Man., where the Indians, Eskimos and Metis who are summertime whalers use harpoons and rifles. In two-man, 20-foot canoes powered with 18 or 25 hp outboard motors, they can just outspeed the beluga at a rate of about six knots. The bowman, who is also the harpooner, sights the whale and signals the helmsman as they give chase. The harpoon, which does not kill, is attached to a buoy, usually an empty gasoline can, so that after it is harpooned the whale becomes an easy target for the rifle shot which finishes it off. The buoy also makes it possible for the team to recover the dead animal and tow it to the plant. If it sank in deep water it would be lost.

In July, 1967, Dr. D.E. Sergeant of the Arctic Biological Station of the Fisheries Research Board of Canada at Ste. Anne de Bellevue, Quebec, who has been studying the beluga population of Hudson Bay for a dozen years, organized a tagging expedition to the mouth of the Seal River, about 30 miles north of Churchill. With ten canoes and 20 whale hunters from Churchill, he directed the tagging of over 150 beluga. Some of the animals were driven into the shallows where tags were affixed to the dorsal ridge by hand; others were tagged by means of a special harpoon which could be withdrawn after the tag had been sunk into the hide of the whale.

It is hoped that eventually enough tags will be returned to the Research Board by hunters to indicate the movement of the beluga in the Bay and establish the fact either that there are separate populations in certain areas or that the white whales intermingle, moving up and down along the coast or into the deeper waters of the Bay. Dr. Sergeant's opinion, based on observations from the air and on the surface, is that in the eastern Arctic large numbers of white whales spend the winter in western and northern Hudson Bay, with at least some of them migrating through Hudson Strait in the fall, presumably returning in the spring. (The beluga of the St. Lawrence estuary are believed to be virtually cut off from the Hudson Bay and Baffin Bay populations, as there do not appear to be any great numbers in the area between them.)

Because beluga had never before been tagged, several methods were tried. The technique of herding the animals into shallow water, used on the shores of the Arctic Ocean and brought to a fine art in Newfoundland with pothead whales, was strange to the Cree and Chippewa hunters of the subarctic waters around Churchill. Their hunting habits were to seek out and chase individual whales and get practically on top of them before sinking the harpoon. This method, of course, was made to order

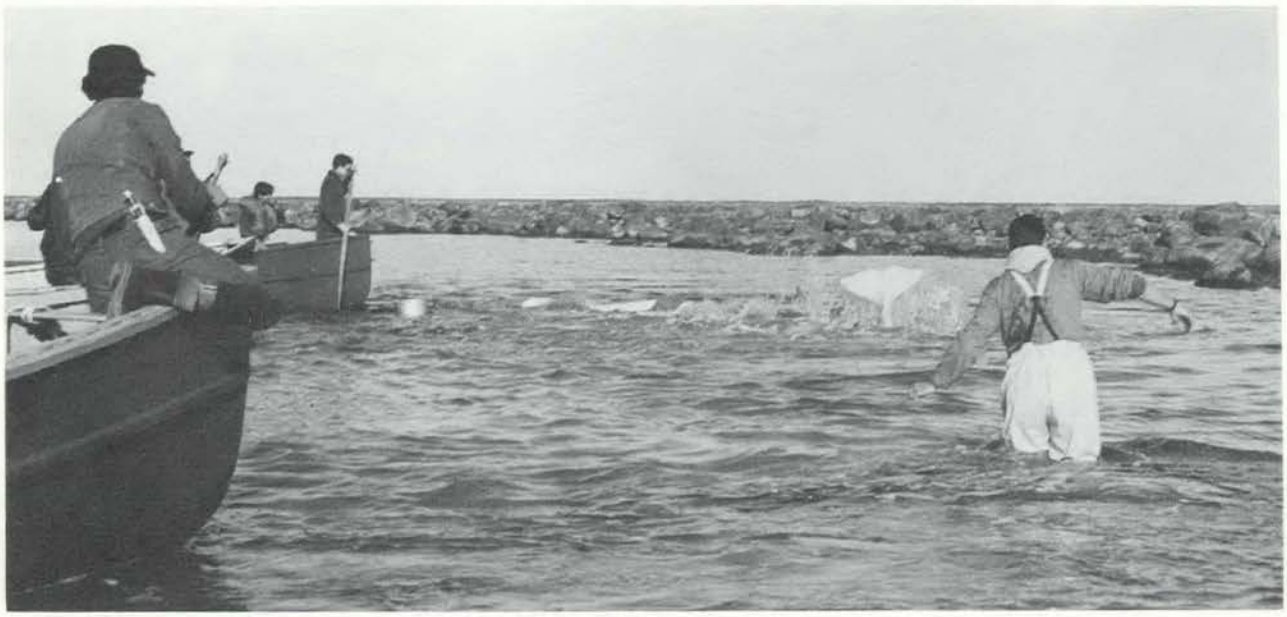


Tagging boats circle in search of beluga.

for the use of harpoon tags, and the scene then, with boats milling around at top speed above the swiftly dodging beluga, was just like a regular hunting scene in the Churchill River. The harpoons were made especially for the job by the Research Board so that the heads could be withdrawn, leaving the tags firmly placed.

Tagging by hand presented a greater problem, but after some instruction the Indians were able to restrain themselves from gunning their motors whenever they saw a whale or a pod of three or more. They learned to form an arc with their canoes and ease the whales slowly into the shallows, shouting, banging oars on gunwales and throwing pebbles into the water to keep the animals from turning back and escaping under the canoes to deeper water. Cast nets proved to be unnecessary for holding the whales while the tags were clamped on, but lassos were improvised out of bow ropes to hold the beluga fast by head and tail while the metal tags were fastened to the dorsal ridge by Dr. Sergeant. This meant jumping into the chilly water and evading the thrashing tail flukes of the frantic animals, but a team system was quickly worked out, and finally as many as 500 of the whales were herded into a shallow bay where there were no rocks. Here it was unnecessary even to rope them for tagging, as they remained stranded in shallow pool until the tide took them out. Beluga can survive short lengths of time in shallow water as long as they keep their bodies wet.

On the first day, after two or three whales had been tagged, a part-Eskimo named John Dick, who skippered the expedition's supply boat, straddled one of the whales, and from then on whale riding became a new Hudson Bay sport. The technique of beluga riding was further developed on the spot by Francis Spence, a Cree Indian who climbed on one of the whales as it was released and rode it like a cowboy for 30 feet or more into deep water. Francis and his brother Bennett, natural leaders of the Indians employed on the expedition and two of the most successful whale hunters at Churchill, did everything they undertook with a flair – whale spotting, boat manoevering, harpooning and shooting. They enjoyed the tagging project as a welcome change to their regular



Several whales trapped in shallows.

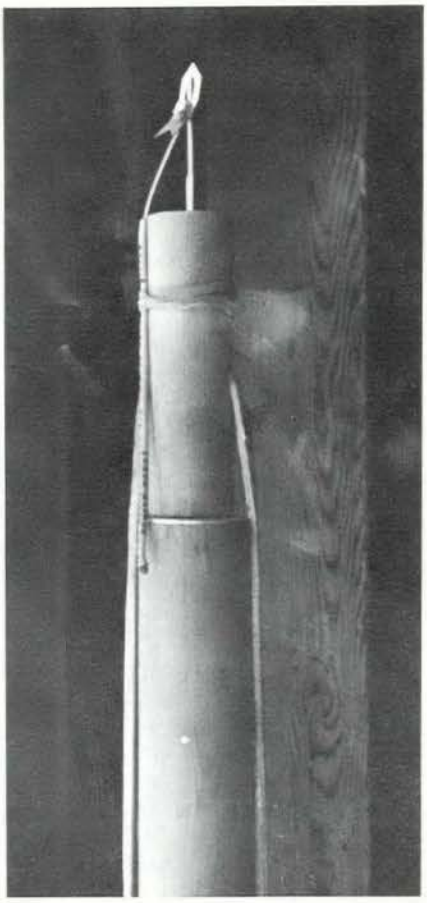
work and one day, after a strenuous five hours of whale chasing and tagging, Bennett quickly provided meat for the camp by going out and shooting a caribou. Francis skinned and butchered it with similar ease and speed.

The camp is about five miles by canoe from the estuary of the Seal River, where there were the greatest concentrations of beluga in the area. It is an outcamp of the main base, established at Churchill for big game sport hunters by the Indian Affairs Branch of the Department of Indian Affairs and Northern Development. Seventeen sportsmen, mostly from the United States, were at Churchill in 1966 and bagged 15 beluga.

PROTECTION REGULATIONS

The Beluga Protection Regulations, to permit controlled sport hunting of white whales as well as commercial operations, were written into the law in 1965, and are administered by the federal Department of Fisheries. Under them, sport hunters are required to engage local guides, who must be Indians, Eskimos or "persons of mixed blood" (i.e., persons having no less than one-quarter Indian or Eskimo blood). The sport hunters are allowed to keep 25 pounds of meat from each beluga killed (they are limited to one per day and two for the season), and may also take home the whale's jawbone as a trophy. The rest of the animal must be given to the guide, who may sell it to the whaling plant.

Licenses for the sport hunting of beluga are issued to area residents, other Canadian citizens and non-Canadians for $10, $20 and $40 respectively. Residents of the area who hold permits are not required to hire guides and are allowed to sell their catch to the factory themselves.



The tagging harpoon used at Seal River.



Seal River outcamp, Hudson Bay.



One of the Indian whale hunters.

The Indian Affairs Branch organizes all sport hunting both at the main reception area at Churchill, where living accommodation, guides, boats and equipment are available, and at the Seal River outcamp. Indians, Eskimos and Metis do not require a license to kill beluga anywhere in the North for domestic use, and members of the Royal Canadian Mounted Police may also kill them when food for themselves or their dog teams is needed. The commercial hunting of white whales in Hudson Bay, as carried out at Churchill and, to a lesser extent at Whale Cove, 150 miles to the north, is limited to 800 animals for the Churchill area and to 500 for the area north of the Manitoba - N.W.T. border. The sport catch is included in the quota, which is scientifically based on a safe sustainable yield from the large herds which have been seen from the air.

At the reduction plant the hunters are paid for the beluga on the basis of the animal's size, at the rate of $1.25 per foot. The average length is about 11 feet, with some animals going to 15 feet. An 11-footer weighs about 1,200 pounds. At Churchill fewer than 50 people each year obtain commercial licenses, and most of the hunting is carried out by about 20 experienced men. The 1966 catch at Churchill was 482, well below the quota. The processing plant has been owned for the past few years by Churchill Whale Products Limited, a subsidiary of the Hickok Belt Company of Rochester, N.Y., but in 1967 it was operated under lease by the Indian Affairs Branch, which rents boats and motors to the residents hunters when necessary.

BELUGA STEAKS

The meat of white whales is perfectly good for human consumption and beluga steaks could become a gourmet item. Eskimos are fond of muktuk, which is made from the skin of the animal and a one-inch thickness of the blubber next to it. Strips of this are dried in the wind and sun, cut up and boiled in water. Sometimes muktuk is marinated in blubber oil and stored for later use. It has also been canned. In addition to the blubber oil, the beluga is the source of meal for animal food, and the hide can be made into high grade leather. The head of the white whale contains very fine oil which has been used for watch and rifle mechanisms.

The commercial utilization of Hudson Bay beluga goes back to 1688, when the Hudson's Bay Company sent 28 casks of train oil (blubber oil) to London. Samuel Hearne, one of the company's most famous factors and explorers, reported that in some successful years in the 18th Century the post at Churchill sent home from eight to 13 tons of oil that had been "tried out" in large open kettles on the beach.

The Hudson's Bay Company was alone in the field until comparatively recent years. In 1714 the French, who were moving in on the fur trade in the territory, announced their intention of founding a settlement at Churchill to exploit the white whale fishery, but nothing came of this. There is no evidence that when the French did occupy Churchill in 1782, after sacking



Francis Spence prepares to ride tagged whale...



... a sense of balance is important...

Fort Prince of Wales, which guarded it, they did anything about the beluga.

The presence of the white whales every summer in the Churchill area was observed and mentioned by nearly all the early visitors to the mouth of the river. On July 17, 1717, Captain James Knight, H.B.C. factor at Churchill, was having trouble feeding his crew and tried to catch fish to replenish the larder. He wrote in his diary: "I sett six netts in the water but find here is not much fish as yet, although there is a pretty many white whales off in the channell." There is nothing to indicate that he caught any beluga.

There are, indeed, few records of beluga catches during the 18th and 19th centuries beyond the sporadic efforts of the Hudson's Bay Company. Charles R. Tuttle, author of "Our Northland," visited Churchill in 1885. He wrote then that exports of the products of the oil-bearing animals of the waters of Hudson Bay amounted to over $150,000 a year. However, the animals he referred to included the walrus and larger mammals like the Greenland whale. The latter are no longer hunted in the Bay. (During the 19th century American whalers from Nantucket and other whaling centres in New England made regular expeditions to the Bay; Roes Welcome Sound, between Southampton Island and the mainland, was once known as "The American Ground.")

On the river bank at Churchill, Tuttle noted, there was a large oil refinery. "This building contains large cast iron tanks, and is otherwise equipped for reducing blubber on a large scale". Apparently a Mr. Spencer, chief trader for the Hudson's Bay Company at Churchill, was developing a large white whale fishery, on the shores of the harbour. Tuttle noted that in 1884, using nets and traps, Spencer had taken 190 of these "mammals of immense size".

The H.B.C. hunters at this time used an ingenious method of taking beluga. A huge net was securely anchored on the river bed, so placed that when the tide was in it lay on the bottom and the beluga entering the river swam over it without hindrance. Just before the tide turned, the hunters raised one end of the net, and as the water spilled out of the river and the beluga went with it, they were trapped. Some were caught in the net to drown; others, as the tide reached its farthest ebb, were left high and dry on the mud, easy prey for riflemen.

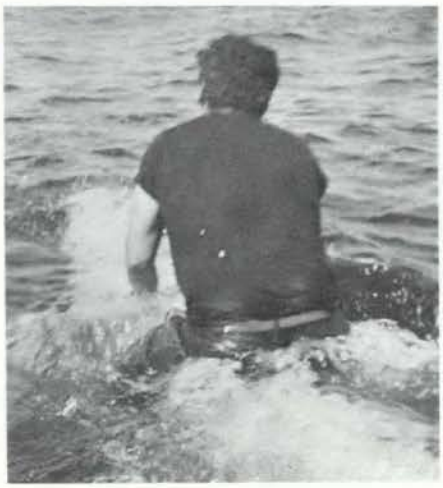


Indian hunter with tagging harpoon.

SEVERAL THEORIES

Beluga have been studied in many parts of the world and there are several theories about them which remain to be proved. One is that they have a keen sense of smell – Norwegian hunters are not allowed to smoke anywhere near a pod because the scent of smoke seems to drive them away. For the same reason Russian hunters in Siberia do not build fires on shore when they are after beluga.

The beluga is a toothed cetacean with the scientific name *Delphinaterus leucas*. The name was derived from the Russian word "belukha", which means white in colour. In the Gulf of St. Lawrence the white whale is known as "marsouin blanc", and the Eskimos call it "kellilughak". It is also known to those who



... steady as she goes...



... they're 'off and running'.



Preparing to tag trapped whales.

have heard it as the "sea canary" because of the plaintive sound it makes, even though it has no vocal cords. This sound has been compared to a thin whistle, a sigh and a grunt, and it can add an eerie quality to the night when emitted by a whole herd. When the sea canaries are singing in unison the noise can be mistaken for the faint putt-putt of a distant fleet of motor boats. Sometimes it is a grinding sound, and at others can be mistaken for someone shaking a large tin platter.

Vapour laden air, blown out at high pressure, forms the small spout by which hunters sometimes locate their quarry. The beluga's spout, however, cannot be seen from any distance, and the Eskimos and Indians of Hudson Bay usually find their catches simply by looking for white shapes in the water.



Low tide means a long carry to the water

Save-the-Salmon Project On the St. John River

BY G.J. GILLESPIE

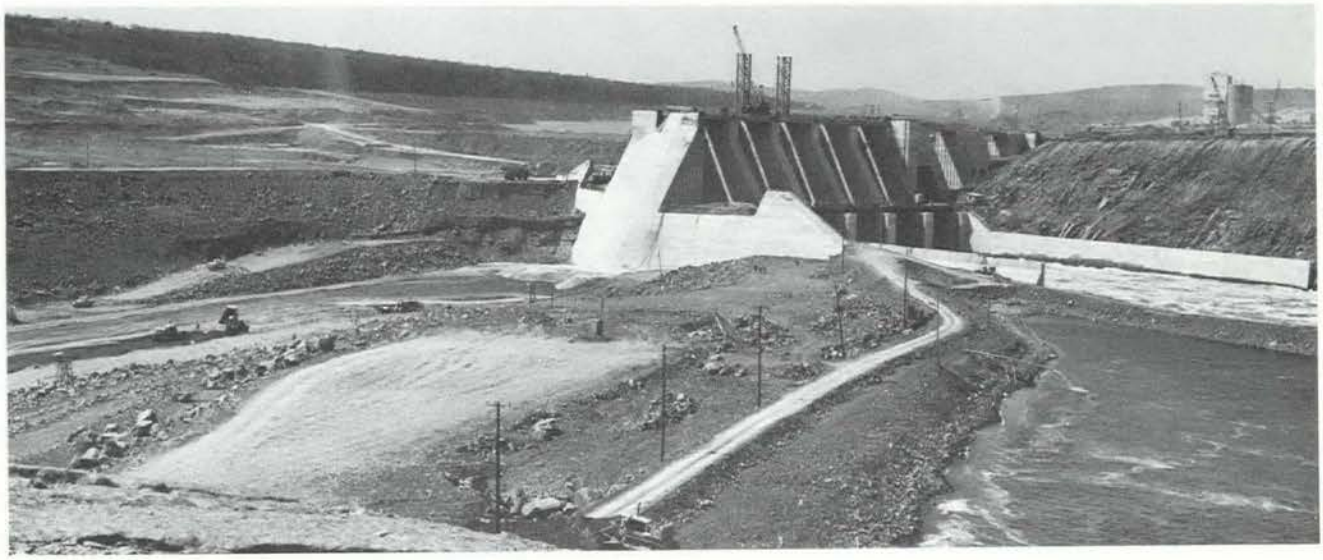
NO SPECIES of sport fish inhabiting the rivers of the Canadian eastern seaboard provinces has been given more attention by biologists and technologists than has the Atlantic salmon. This lively, silvery denizen of both fresh and salt water – a favorite of anglers and commercial fishermen – has been getting singular attention because of the problems created by man's interference with its environment.

Of special importance in these salmon investigations by the Resource Development Service of the federal Department of Fisheries are the projects on the St. John River. For years salmon studies have been a continuing program on this delightful and and historic river winding 450 miles from the international border to empty into the Bay of Fundy at the site of the famous Reversing Falls at Saint John. This program, however, has been brought into sharper focus during the last couple of years by the Mactaquac hydro electric power development.

Mactaquac – meaning "Big Branch" in the language of the native Maliseet Indians, one of the original tribes of New Brunswick – is the fourth hydro-electric development in the Canadian section of the river basin and by far the largest. This new 600,000 kilowatt development, creating a lake behind its dam, almost 59 miles long with a surface area of nearly 22,000 acres, will go into operation in 1968.

While this huge power development is of great significance to the industrial expansion of New Brunswick, it is equally significant in that it might mean the end of upstream migration of salmon to the spawning grounds beyond the dam site. The latter situation was unthinkable and dictated a solution. After a thorough study of all alternatives, the federal Department of Fisheries recommended a scheme that is unique in North America but one that has proven highly successful in Scandinavian countries.

The plan, accepted by the New Brunswick Electric Power Commission and provincial authorities, is simple. All upstream migrating fish are to be gathered in a specially constructed collection gallery built downstream and free of the powerhouse out-



A view of the partly-completed Mactaquac power dam on the St. John River, New Brunswick. The 600,000 kilowatt development is due to go into operation in 1968.

lets from the hydraulic turbines. Fish will swim into the openings spaced across the structure, guided by the attraction water released there, then swim up the passageways within the gallery to one end of the powerhouse where they will enter into the trapping or collection pools.

From the pools, the fish will be guided into submerged hoppers and transferred to large tank trucks for overland transportation to release points far above the dam site. From those points their upstream migration will continue and, beyond doubt, anglers will be awaiting them.

The St. John River salmon population has been sustained to date by the successful return of spawning, adult fish to the headwater reaches of the river. However, future production from the source will be uncertain after the completion of the Mactaquac project. Biologists explain there will be two reasons for this. First of all, mortality to seaward migrating smolts through the turbines at Mactaquac, added to the mortalities already occurring at the Beechwood and Tobique dams, could approach a substantial proportion of the total number of fish. Secondly, biologists believe that the seaward migration of smolts will be seriously affected by the 60-mile long reservoir created by Mactaquac.

FISH HATCHERY PLANNED

To counter the foregoing problems, a giant fish culture station is now being built downstream from Mactaquac to produce a half million two-year-old smolts annually. This, resource development scientists believe, will be sufficient to maintain the St. John River salmon stocks at the present level.

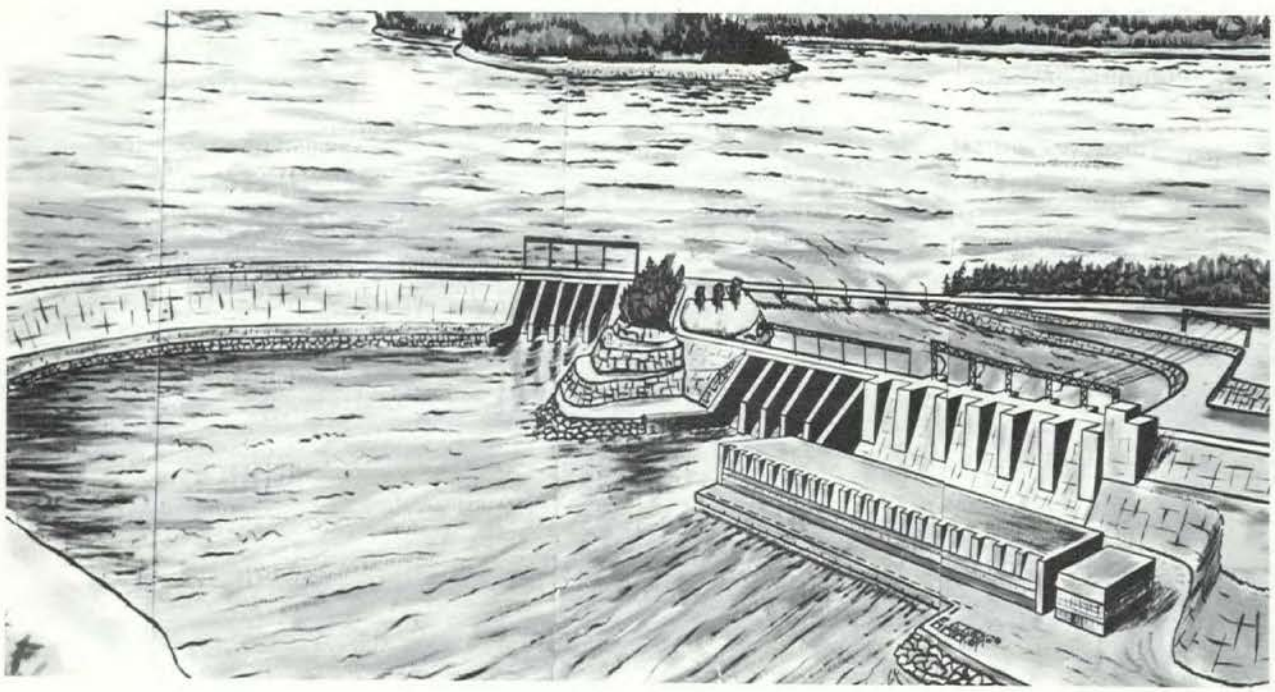
To provide salmon eggs to stock the fish culture station, about a thousand of the adult salmon trapped at the powerhouse fish collection facilities (about 10 per cent of the total upstream run) will be taken annually for propogation purposes. These selected fish will be held under controlled conditions until fall when their reproductive organs have fully matured. Then, the eggs will be stripped from the female fish, fertilized by the male and then hatched by the most modern techniques available at the new station.

After hatching the baby salmon will be held in rearing ponds and fed a controlled diet for almost two years. By that time most of them will have become smolt, the stage in the salmon's life when its body becomes strong and active and it develops the urge to migrate to sea. They will then be released into the lower St. John River to allow them to migrate to sea and to grow up into mature salmon.

While simple to explain in words, the save-the-salmon program is complex indeed. First of all, it involves intensive studies over several years by Resource Development Branch biologists to obtain background information for properly assessing management procedures to be initiated when the program goes into operation. In addition, Resource Development Service engineers to design the complex collection facilities at the dam, and design the smolt rearing station. Construction of the station is beginning shortly.

Last year and again this year fisheries biological teams have placed heaviest emphasis on a tagging and recovery project to investigate the size, distribution and timing of adult runs to the river.

Fisheries biologists have estimated that about 11,000 salmon pass the Mactaquac site each year on the upriver trek to



An artist's impression of the Mactaquac hydro-electric development when completed.



Punt is used to set the 500-foot net suspended from plastic buoys which guides salmon smolt into a fish trap operated by the Resource Development Service.

the spawning grounds. Before Mactaquac, the main obstacles to the spawning grounds were the Beechwood and Tobique power dams. At the former site salmon are hoisted over the dam by an electrically-powered elevator apparatus, while a fishway (a device akin to a stairway) enables ascending fish to by-pass the Tobique obstacle. The fishway technique is generally effective but in some cases, such as Mactaquac and Beechwood, it is not practical for financial or technical reasons. There is a fourth power development on the St. John River at Grand Falls. However, the main salmon spawning waters on the river lie between Grand Falls and Beechwood, and thus this development poses no problems.

This year, fisheries investigators have been operating along the river since spring. One of the main camps is situated a few miles below the Mactaquac. A mobile laboratory has been set up where salmon scales are read to determine age and other pertinent facts about the fish. Water analyses are being made constantly to determine quality, and tests are made to determine oxygen content.

A fish trap is in operation. This is a 500-foot long net suspended from plastic buoys to direct the fish, mainly salmon smolt, into the trap. Rod MacDonald, biologist in charge of the operation, said the investigators were mainly interested in the sizes and ages of the smolt as well as establishing a migration timing schedule. They are also studying the structure of the fish population with respect to sex ratios.

Salmon smolt are also being trapped at Beechwood as well as the Hartland (the site of one of the river's most famous angling pools) and also at Beckaguimec River. The name of the latter stream occurs frequently in the ancient lore of the Maliseets.

The captured smolt are marked by a technique similar to that used in branding cattle. This is one method of establishing a pattern of the natural downstream migration. The data collected add to the background of information necessary for the proper management of the salmon resource after Mactaquac gets into operation.

To get a complete picture of the timing and extent of the up-river run of salmon coming in from the sea, a field team is working at Westfield at the mouth of the St. John River. They are trapping and tagging adult salmon and then releasing them to continue their upstream migration.

The purpose of the whole salmon study program – both technologically and biologically – is to be ready to cope with the opening of Mactaquac and the subsequent blocking of the river. As a temporary measure during construction of the dam, the main river was diverted through sluiceway bays. Temporary fishing baffles, recommended by Resource Development Service engineers, were installed in one of the outside bays to allow salmon to pass during the construction phase. These facilities proved adequate and no fish were reported delayed below the structure last year.

While the Mactaquac development will be the biggest thing to ever happen power-wise on the flashy St. John River, the methods being employed by the federal Department of Fisheries in connection with this project are revolutionary in style and mammoth in scale in the world of fish conservation practices. The results will be watched with intense interest by biologists and fishermen alike, as the whole future of the St. John River salmon stocks depends on the judgment of the men of the federal Department of Fisheries in choosing the solution they did to the salmon problem at Mactaquac. ✔

B.C. Seiner Hunts Herring on East Coast

The motor vessel *Western King*, a British Columbia purse seiner on charter by the federal Department of Fisheries has moved to Southern Labrador to continue exploratory herring fishing following seven months of operation along the coast of Newfoundland.

The 89-foot vessel with a crew of eight including four Newfoundlanders commenced operations in Newfoundland late in 1966. Her mission was to search for herring in areas not previously exploited and on finding stocks of fish to set gear and catch herring, but not on a strictly commercial basis. Severe weather conditions during the winter hampered operations, but results of searches by the *Western King* proved extremely valuable to the commercial fleet.

The *Western King* concluded capelin fishing operations on July 15 and re-loaded her herring seine for the trip to Southern Labrador waters. She will terminate her contract with the Department in November, but will continue fishing for herring in Newfoundland and Maritime waters.

A local converted longliner *Agnes and Brenden H* also carried out herring seining operations during the early spring. The 56-foot vessel, owned by Ray Hickey of O'Donnell's was converted to a purse seiner from a long liner in October 1966, but the modifications did not destroy her effectiveness as a longliner.



Depth-sounder on the purse seiner Western King is used to locate schools of herring and show their proximity to the ocean floor.



Capelin seine on board the Western King which was substituted for the herring seine during exploratory fishing off Newfoundland.

The *Agnes and Brenden H* commenced operations as a herring seiner on March 20 and during the period up to May 25, she landed approximately 700 tons of herring. Most of her catch was absorbed in the frozen and salt fish market. The vessel engaged in the cod fishery following herring operations and was then fitted with her herring seine preparatory to starting herring seining operations in St. Mary's Bay.

From November, 1966, to May, 1967, the seiner covered all areas of the Newfoundland coast line from Trinity Bay on the east, to Port aux Basques on the west. The vessel was instrumental in discovering large schools of herring in St. Mary's Bay during the early spring and information gained from this operation gave the Department a good idea of what to expect in the future.

Very few herring in commercial quantities were seen in Placentia Bay despite the fact that gill netters were reporting fair catches. One set was made in the mouth of Long Harbour, Placentia Bay; however, the fish were very small and the catch was released.

The bottom of Fortune Bay was fished at regular intervals during the spring and herring were found in commercial quantities. While most areas of the South Coast of Newfoundland produced



The Agnes and Brenden H, a 56-foot Newfoundland longliner that has been converted for purse seining. The modifications do not destroy her effectiveness for longlining.

quantities of herring, no single area was consistent in production. St. Mary's Bay, where a reduction plant is operating, could have produced a fair to good catch, but for the first time in more than 20 years, heavy arctic ice moved into the Bay and large schools of herring previously detected by the *Western King* disappeared.

CAPELIN SEINE FITTED

Late in May, the *Western King* arrived in St. John's and exchanged her herring seine for a capelin seine. The vessel surveyed the area from Bay St. George to Port aux Basques and from Port aux Basques to Fortune Bay as well as Fortune Bay, Placentia Bay, St. Mary's Bay, Trepassey Bay, Grand Banks, Southern Shore, Conception Bay and Trinity Bay.

On June 21, the seiner caught 130 tons of capelin in an area one mile south of Motion Head near Bay Bulls and two days later located several large schools of capelin in the Bay Bulls area. Small markings of capelin were also noted close to shore in Trinity and Conception Bays, but sets could not be made due to prevalance of cod traps and gill nets.

Scientists Explain Poor Lobster Catch

Cold bottom water temperatures this summer are to a large extent responsible for the poor lobster catches in District 8 in Northumberland Strait.

Fisheries Minister H.J. Robichaud said that a report he had received from the Fisheries Research Board of Canada, who have continuing investigations to pinpoint the reason for the low catches in this District, indicated there was little doubt that the late and incomplete moulting of lobsters was due to the low temperatures, resulting in poor catches.

The report pointed out that the long-term trends in lobster landings have paralleled rather closely the trends in water temperatures.

This year the ice was so late leaving the Strait that the opening of the spring lobster season was delayed two weeks. The surface waters then warmed rapidly, but, with little wind to mix the waters, the deeper layers have remained cold. On August 18 water temperatures at ten fathoms off Richibucto were only 41°F and very few lobsters were being caught at or below that depth. Better catches were available in warmer water more inshore.

On the other hand at ten fathoms off Miminegash the temperature was about 50°F and lobsters were trapping better. The catch during the August 10 to October 10 season in District 8 depends to a large extent on the moulting and growth of sub-legal lobsters. One moult is usual during normal summers, but in cool summers many of the lobsters fail to moult and do not enter the catch as legal-sized lobsters.

Mr. Robichaud said that some improvement in this season's lobster fishery in Northumberland Strait is expected as the bottom temperatures continue to rise. However, even with improvement of temperature conditions as the season progresses, total landings from District 8 for 1967 are expected to be down.

It has been pointed out that even more drastic declines have recently occurred in the European lobster fisheries and similar but less-marked declines in the lobster fishery of the United States. This indicated "that widespread common factors are affecting the North Atlantic lobster fisheries".

The Fisheries Research Board report, said Mr. Robichaud, pointed out that such things as water temperature, currents, type of bottom, food, competition, predation, and possibly disease, play important roles in determining the catch of lobsters.

Intensified investigations are presently underway by fishery scientists in Northumberland Strait. Not only are they keeping a close check on temperatures, but skin-diving scientists are observing lobsters in their own environment to study the effects of changing conditions. Studies are also being carried out in several laboratories of the Fisheries Research Board for ways to increase lobster production and to make better use of available lobster stocks.

Studies in Northumberland Strait over a 15-year period show that the developing larvae suffer extremely high mortalities. On the average, only one per cent survives this period. Further studies have shown that when the larvae settle to the bottom, they are easy prey for countless small fish. Occasionally, when conditions are favourable, large numbers of larvae reach the settling stage. "This happened in 1952 when over 40 times as many larvae settled as in 1953. The big 1952 settlement may explain in part the good fishery in the late '50s when the lobsters were five to seven years old. On the other hand, recent low catches may be the result of the uniformly poor larval settlement from 1958 to 1936", the report said.

New Stern Trawlers Included

Report Compares Costs, Earnings Of Nova Scotia Fishing Vessels

INFORMATION ON operations of the new steel stern trawlers fishing out of Nova Scotia is included for the first time in a "Costs and Earnings of Selected Fishing Enterprises" report recently issued by the federal Department of Fisheries.

The preliminary report, prepared by John Proskie of the Department's Economic Services in co-operation with the Nova Scotia Department of Fisheries, contains brief operational and financial summaries of 29 fishing vessels operating out of Nova Scotia ports during 1966.

Records were obtained for samples of 54-to-60 foot wooden stern draggers, 92-to-97 foot wooden scallop draggers, 84-to-92 foot wooden longliners, 94-to-114 foot wooden herring seiners, 120-to-141 foot steel side trawlers and steel stern trawlers ranging in length overall from 117-to-155 feet. The following is a condensed version of the report:

All vessels were highly powered by diesel engines and were equipped with modern electronic equipment. The newest vessels were the 155-ft steel stern trawlers which were launched in 1966 and started operating late in the season. The oldest vessels, on the average, were the herring seiners (11 years old). The 57-ft stern draggers and the 96-ft scallop draggers were five years old, on the average, while the remaining vessels were under five years of age.

Landings of the 29 vessels totalled 107,591,572 lb., with a landed value of $4,407,528. Of this total, herring accounted for 50,467,500 lb., shucked scallops 1,317,928 lb., swordfish 860,267 lb., tuna 58,889 lb., shark 54,229 lb. and there were small quantities of sturgeon, squid and skate. The remaining landings comprised cod, haddock, pollock, hake, cusk, halibut, flounder, redfish, catfish and monkfish. The otter trawlers reported 1,763,647 lb. of poor quality fish which buyers normally classify "for fish meal production".

Table 1 details certain results of the fishing activities, such as average landings and landed values per vessel. These are related to size of crew, number of trips, days at sea, days fished and hours of fishing, where available.

In the comparisons in Table 1 it should be noted that the 155-foot steel stern trawlers went into production late in the

TABLE 1 – AVERAGE OPERATIONAL PERFORMANCE OF NOVA SCOTIA 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.	$
Stern draggers	57	3.4	43	92	92	861	1,058,720	59,485
Scallop draggers	96	16.1	16	186	154	2,635	329,482	136,071
Longliners	86	8.0	15	221	149	2,203	681,765	118,650
Herring seiners	110	8.0	62	(1)	(1)	(1)	16,822,500	175,296
Side trawlers	120	14.6	28	261	189	2,560	4,746,210	214,335
Side trawlers	141	17.6	31	287	250	3,511	4,648,982	281,736
Stern trawlers	135	15.4	25	242	199	2,911	4,217,008	216,642
Stern trawlers	155	17.6	7	64	59	756	859,877	51,229

(1) information not available.

TABLE 2 – OPERATIONAL EFFICIENCY OF NOVA SCOTIA 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.	$	$	$
Stern draggers	57	306,875	24,765	11,446	17,242	1,383	647
Scallop draggers	96	20,432	20,919	1,774	8,439	8,504	732
Longliners	86	84,797	46,696	3,085	14,757	7,910	537
Herring seiners	101	2,102,813	269,880	(2)	21,912	2,827	(2)
Side trawlers	120	324,527	169,508	18,184	14,655	7,655	821
Side trawlers	141	264,648	148,382	16,217	16,038	9,088	981
Stern trawlers	135	273,240	166,461	17,402	14,037	8,666	895
Stern trawlers	155	(1)	117,256	13,366	(1)	7,318	800

[1]Fishing for 64 days only, therefore, this comparison would have no significance.

[2]Days at sea not available, therefore it was not possible to make this calculation.

1966 season. The average in this class made seven trips with 64 days at sea and an average landing of 859,877 pounds of fish. For other classes of vessels, if the species-mix is taken into account, the average landings and landed values are related to the type of fishing and to the size of vessel. The groundfish vessels using otter trawls made a good showing in terms of volume and value of landings. The average 57-foot wooden stern dragger made an exceptional good showing, with an average landing of 1,058,720 lb., of fish valued at $59,485. For the large steel trawlers, the average 120-foot side trawler had the best results in terms of landings, 4,746,210 lb., but the average 141-foot side trawler had a higher landed value, $281,736 per vessel. This is explained by a better species-mix and higher average prices.

The 86-foot wooden longliners continued to maintain their high performance. However, the scallop draggers had on the average lower landings and landed values in 1966 when compared with previous years.

The comparative operational efficiency is illustrated further by data in Table 2.

The relationship between capital and output is another important consideration, especially where new types of vessels are introduced and recommended to fishermen or other vessel owners. In the case of owners, the important relationship is between net investment and output and this is related in Table 3.

The ratio of average landed value per man to average net investment per man in 1966 shows that for every $100 invested, the 57-foot wooden stern draggers produced $144 of fish, the 96-foot scallop draggers $134 and the 86-foot longliners $138. The ratio for the herring seiners was $79, for the 120-foot steel side trawlers it was $78 and for the 141-foot steel side trawlers $100. The very favourable ratio for the 141-footers is due to relatively low net investment per man ($16,065) and the value of landings ($16,038). In this regard the costlier 135-foot steel stern trawlers had the lowest ratio – $58 of fish landed for every $100 invested per man.

The quantity of fish landed is also of some importance, in that it generates employment in fish processing plants, while the optimum operation of a plant is governed not only by value

TABLE 3 – RELATIONSHIP BETWEEN NET INVESTMENT AND OUTPUT, NOVA SCOTIA, VESSELS, 1966

Type of Vessel	LOA	Average Net Investment per Vessel	Averages per Man			Ratio of Landed Value to Net Investment	Ratio of Landed Value to Net Investment
			Net Investment	Landings	Landed Value		
	ft.	$	$	lb.	$	%	%
Stern draggers	57	40,703	11,971	306,875	17,242	144.0	101.4
Scallop draggers	96	101,085	6,279	20,433	8,439	134.4	81.1
Longliners	86	85,603	10,797	84,797	14,757	137.9	88.7
Herring seiners	101	220,825	27,603	2,102,813	21,912	79.4	61.9
Side trawlers	120	274,899	18,829	324,527	14,655	77.8	39.1
Side trawlers	141	282,750	16,065	264,648	16,038	99.8	49.6
Stern trawlers	135	372,079	24,161	273,240	14,037	58.1	30.2
Stern trawlers	155	469,617	26,683	[1]	[1]	[1]	[1]

NOTE: [1]Fishing for 64 days only, therefore, this calculation would have no significance.

TABLE 4 – AVERAGE NET RETURNS TO LABOUR, NOVA SCOTIA VESSELS, 1966

Item	Stern Draggers	Scallop Draggers	Long-liners	Herring Seiners	OTTER TRAWLERS		
					Steel Side	Steel Side	Steel Side
LOA in feet	57	96	86	101	120	141	135
Men in crew	3.4	16.1	8.0	8.0	14.6	17.6	15.4
Days at sea	92	186	221	*	261	287	242
Crew Category	Average Net Earnings Per Man Per Season[4]						
	$	$	$	$	$	$	$
Captain	7,259	9,526	7,893	17,542	14,421	17,852	14,242
First Mate		4,559	5,845	10,287	8,202	9,419	8,338
Second Mate			5,699				4,664
Boatswain					4,974	5,830	4,925
First engineer		3,745	6,010	10,464	7,209	7,878	7,270
Second engineer		3,248		8,829	5,806	6,437	6,112
Cook		3,755	6,013	10,264	5,427	6,269	5,477
Checker					4,364		
Chief Fish-hold					4,621		4,538
Fish-hold					4,551		4,332
First icer						5,411	4,632[3]
Second icer						5,411	4,523
Shucker		3,153					
Third-hand					4,448		4,530
Deck-hand[1]					4,340	5,152	4,340
Deck-hand[2]	6,759	3,142	5,695	8,781	4,329	5,113	4,267

NOTES: [1]Deck-hands participating in refit; [2]Deck-hands not participating in refit; [3]Checker, icer and boatswain; [4]Job site earnings.
*Information not available.

of output but by quantity of output in relation to "capacity". In this regard, the quantity of landings for groundfish vessels is most favourable for the 57-foot draggers and the 120-foot side trawlers. For specialized production the herring seiners have had good results as well as that of the swordfishing longliners.

Average net earnings per man per season in 1966 by crew category varied greatly from one class of vessels to another, as is shown in Table 4.

The highest basic net cash crew share per man per season (or take-home-pay excluding commissions and wages) was recorded by 101-foot herring seiners at $8,781 per man. This was followed by 57-foot wooden stern draggers which reported earnings for the deckhands at $6,759 per man. The 86-foot longliners reported average deckhand earnings at $5,695 and 141-foot steel side trawlers at $5,113 per man. The scallop draggers reported quite a drop in 1966 earnings per man, which were reported at $3,142 compared to $5,049 in 1965. This was a result of lower output and lower prices experienced in 1966. The 120-foot steel side trawlers reported average earnings at $4,329 per man for the deckhands and the 135-foot steel stern trawlers at $4,267 per man.

TABLE 5 – AVERAGE NET RETURNS PER MAN PER DAY AT SEA, NOVA SCOTIA VESSELS, 1966

Item	Stern Draggers	Scallop Draggers	Long-liners	Herring Seiners	OTTER TRAWLERS		
					Steel Side	Steel Side	Steel Stern
LOA in feet	57	96	80	101	120	141	135
Men in crew	3.4	16.1	8.0	8.0	14.6	17.6	15.4
Days at sea	92	186	221	*	261	287	242
Crew Category	Average Net Earnings Per Man Per Day at Sea						
	$	$	$	$	$	$	$
Captain	78.90	51.22	35.71	*	55.25	62.20	58.85
First mate		24.51	26.45	*	31.43	38.82	34.45
Second mate			25.78				19.27
Boatswain					19.06	20.31	20.35
First engineer		20.13	27.19	*	27.62	27.45	30.04
Second engineer		17.46		*	22.25	22.43	25.26
Cook		20.19	27.21	*	20.79	21.84	22.63
Checker					16.72		
Chief Fish-hold					17.70		18.75
Fish-hold					17.44		17.90
First icer						18.85	19.14
Second icer						18.85	18.69
Shucker		16.95					
Third-hand					17.04		18.72
Deck-hand					16.63	17.95	17.93
Deck-hand	73.47	16.89	25.77	*	16.59	17.82	17.63

NOTE: * – information not available for "days at sea".

TABLE 6 – AVERAGE NET RETURNS TO CAPITAL, NOVA SCOTIA VESSELS, 1966

Type of Vessel	Averages per Vessel					
	LOA	Total Capital Cost	Federal Grant	Rented Equipment	Net Investment by Owner[1]	Net Profit
	ft.	$	$	$	$	$
Stern draggers	57	57,821	12,318	4,800	40,703	18,151
Scallop draggers	96	167,500	58,935	7,480	101,085	–473
Longliners	86	133,085	45,708	1,774	85,603	18,138
Herring seiners	101	283,200	53,510	8,865	220,825	25,816
Side trawlers	120	546,661	268,337	3,425	274,899	11,955
Side trawlers	141	569,500	282,750	4,000	282,750	43,113
Stern trawlers	135	715,115	331,783	11,253	372,079	–27,256
Stern trawlers	155	915,296	440,112	5,667	469,617	[2]

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

[2] – Fishing for 64 days only, therefore this calculation would have no significance.

The captains on 141-foot steel side trawlers averaged $17,852 per man per season, and on herring seiners the average was $17,542 per captain; on 120-foot steel side trawlers the average was $14,421 and on 135-foot steel stern trawlers, $14,242. Other specialized crew members on these vessels also did well.

As indicated in Table 5, the 57-foot stern draggers rank very high for the daily net earnings of the deckhands – $73.47 per man per day at sea. This was followed by 86-foot longliners at $25.77 per man per day at sea. For the other vessels the average earnings per man day at sea ranged from $16.59 to $17.95 for the deckhands. As shown the daily net earnings for the specialized crew members were well above the deckhand earnings.

The net earnings of the crew members discussed so far, were arrived at by subtracting the crew expenses from the gross crew earnings. The principal crew expense for the vessels studied is for food. Depending on the lay arrangement, other crew expenses, such as the cost of rentals for electronic equipment, casual labour used in unloading fish, cleaning the fish-hold, etc., are other contributing factors in reducing the net cash crew shares.

The average value of capital employed (investment from all sources as well as net investment by owner in boat, gear and deck equipment) is shown in Table 6 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 in Table 6 indicate that apart from the scallop draggers and the 135-foot steel stern trawlers, on the average, the other vessels made a profit in 1966. On the average, the 57-foot wooden stern draggers reported a profit of $18,151 per vessel or 44.6 per cent return on the average net investment by the owners. The 86-foot longliners reported an average profit of $18,138 per vessel or 21.2 per cent return on net investment. The figures for the herring seiners were $25,816 or 11.7 per cent. For the trawlers the 120-footers reported an average profit of $11,955 or 4.3 per cent return on the net investment; the figures for the 141-footers were $43,113 and 15.2 per cent. The average steel stern trawler reported a loss of $27,256 per vessel and the average scallop dragger reported a loss of $473 per vessel.

There are, of course, year-to-year variations in the profitability of the fishing vessels operated, as indicated in Table 7. These variations are due mainly to the quantity of landings, species-mix prices received for landed fish, costs of operating the vessels (including remunération to the crews and charges for depreciation). In addition a very important factor, but which cannot be measured accurately, is the management of the fishing vessel – principally by the captain and to some extent by the shore production manager in vertically integrated enterprises.

TABLE 7 – YEAR-TO-YEAR VARIATIONS IN AVERAGE PROFITABILITY NOVA SCOTIA, 1966

Type of Vessel	LOA	Average Profit Per Vessel						
		1962	1963	1964	1965	1966	Averages for Period	
	ft.	$	$	$	$	$	Yrs.	$
Stern draggers	57			5,010	3,843	18,151	3	9,001
Scallop draggers	96	18,767	13,170	8,892	20,286	–473	5	12,128
Longliners	86				14,204	18,138	2	16,171
Side trawlers	120			11,581	5,077	20,729	3	12,462

Concentrate Study on Irish Moss

With a rapidly increasing demand from industry for carrageenin, the current program at the Marine Plant Experimental Station at Miminegash, Prince Edward Island, is being concentrated on Irish Moss*, from which carrageenin is extracted.

Studies, in co-operation with the marine plants industry generally, are being made on Irish Moss from the time of harvest to the point prior to extract processing. Recommendations will be made as a result of this study and a commercial scale evaluation prepared.

The station, which went into operation last year, is operated by the Industrial Development Service of the federal Department of Fisheries. New markets for a number of marine plants are under investigation and where warranted programs will be set up to investigate the feasibility of marketing other plants.

As the future of the marine plants industry is dependent on the natural resources available, it is the intention of the station to include in its future program studies on conservation and cultivation.

The 1967 program of Irish Moss studies includes the following:

Pre-drying treatment

The most pressing problem with regard to upgrading storm-tossed Irish Moss, particularly in the Northumberland Strait area, is the large amount of sand and fine red clay in the product. To achieve more efficient washing, a vibrating screen in conjunction with showers, as well as other washing devices, are being tested. Tests are also being conducted on the most efficient methods of removing stones and other foreign matter from the product.

A packaging unit used in the peat moss industry will be tried with Irish Moss. The product will be packaged in a plastic bag and suitability for outside storage will be determined. Investigation will also be made of deterioration at various moisture levels.

Drying

Complete records as to evaporation rate, heat units required, etc. will be kept on all moss dried in the Heil dryer model SD75-22A. Studies will also be made on effects of air volume on drying efficiency, effects of dryer outlet temperature on efficiency and quality, effects of dryer drum rotation speed, and effect of atmospheric drying on moss through a wind tunnel.

Post-drying Treatment

A vibrating screen-conveyor will be evaluated for effectiveness in removing sand and dust immediately following drying. Various size perforated plates will be used in a 40 h.p. hammermill to determine the most desirable particle size for classification on a specific gravity separator.

Quality Control

It is intended to develop a standard method for determining percent yield of carrageenin in Irish Moss at the drying plant level. In addition a method for obtaining representative samples of moss for yield and moisture determination will be established.

Harvesting

A complete study of present harvesting methods will be made to better understand the problems involved. From this will evolve a program designed to assist both fishermen and the industry.

Surveying

A quantity survey and its evaluation will be made in the Miminegash area using one of the known methods. ✔

***Irish Moss (*Chondrus crispus*) is a small perennial seaweed found along the northwestern Atlantic coastline from New Jersey to Newfoundland. Harvesting in the Maritimes is generally performed with rakes. Irish Moss extract (carrageenin) is in demand largely because of its ability to thicken or stabilize various foods. It is used in the manufacture of such products as cheese, ice cream, pie fillings, chocolate milk, gravies, salad dressings, beer, laxatives, cough syrups, toothpaste and shaving cream. It is also used for sizing cloth, leather tanning and in paper making.**

Fish'n' Seafood Month

In endorsing the annual October Fish 'n' Seafood month, federal Fisheries Minister H.J. Robichaud has urged Canadians to enjoy fish and seafood products all year round.

With 1967 dedicated to things Canadian, the people of Canada owe it to themselves to savour our justly famed sea and freshwater delicacies, the Minister said.

"Canada's fishing industry produces a variety of products to delight every palate. Indeed, so varied is our production and so advanced our culinary arts that one could have fish every meal of the year without having the same dish twice" he added.

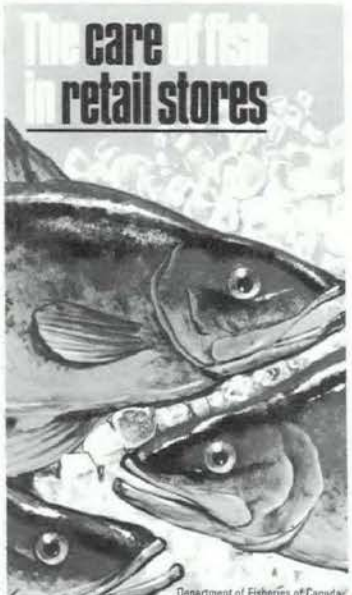
Giving employment to 100,000 Canadians, the fishing industry in 1966 reaped a record harvest of 2.6 billion pounds of fish for processing in 600 plants and sale to 80 countries. Worth $340 million in market value to our economy, the fisheries put $177 million into the pockets of fishermen.

The Minister's announcement added that not only is fish good to the taste, it is high in health-giving protein, vitamins and minerals, and it is generally low in calories. Fish is a food for pleasure, rather than penitence.

News Roundup

For Retailers

As part of a continuing campaign to bring top quality fish to the consumer, the federal Department of Fisheries has produced a booklet on fish handling aimed directly at the retailer.



Entitled "The Care of Fish in Retail Stores", the attractively-prepared 24-page booklet emphasizes the message that fish is a highly perishable product – but can be a profitable one if the customer can obtain top quality.

It tells the retailer how to distinguish between good and poor quality fish in both fresh and frozen forms, how to plan purchases, approved methods of storage and display, correct storage temperatures, stocking of freezer cabinets, and general merchandizing tips to increase sales.

Pointing out that October is the industry's annual "Fish 'n' Seafood" promotional month, federal Fisheries Minister H.J. Robichaud expressed the hope that all retailers who handle fish products will obtain a copy of the Department's new booklet. Copies are available free of charge from the Information and Consumer Service, Department of Fisheries, Ottawa, or from the Department's regional headquarters.

Canada Joins ICES

Canada's involvement in international fisheries has been further expanded through membership in the International Council for the Exploration of the Sea (ICES). Canada is now a party to eight international fisheries organizations.

Established in Copenhagen in 1902, ICES was entrusted with the task of co-ordinating international investigations of the sea, particularly those relating to the living resources of the eastern North Atlantic Ocean and adjacent seas, including Greenland waters.

A long-established and growing Canadian interest in the Council's activities will be further increased as the area is extended to the whole of the North Atlantic in accordance with the new Constitution adopted in 1964. Active Canadian participation can be expected to promote marine research off the Canadian Atlantic Coast and to avoid some duplication of effort.

There are 16 other member-countries of ICES, namely: Belgium, Denmark, Finland, France, Germany, Holland, Iceland, Ireland, Italy, Norway, Poland, Portugal, Spain, Sweden, United Kingdom and the USSR.

FPC Conference

Part of the answer to the world's increasing protein needs is expected by governments and the food industry to rest with a rapid growth in the development of fish protein concentrate (FPC).

Because of the urgent need for this and the interest which potential producers and users of the product have evinced, the Federal-Provincial Atlantic Fisheries Committee is sponsoring a conference on Fish Protein Concentrate to be held in Ottawa on October 24 and 25. The committee is made up of deputy ministers responsible for fisheries in the federal Government and the governments of the five Atlantic coast provinces. The chairman of the conference will be Dr. A.W.H. Needler, Deputy Minister of Fisheries of Canada, and moderators of the various sessions will be his provincial counterparts, Maurice Lessard of Quebec, Brian Meagher of Nova Scotia, Dr. Leonce Chenard of New Brunswick, Eugene Gorman of Prince Edward Island and Eric Gosse of Newfoundland.

More than 20 papers will be presented under the following headings for the five sessions of the conference: The World Protein Situation; Canadian Raw Material Resources; Processing Technology; Standards of Fish Protein Concentrate; and the Status of Fish Protein Concentrate Development.

Scientists and other specialists from various departments of government both in Canada and the United States, representatives of the fishing industry, and food and pharmaceutical experts from Canada, the United States and the Food and Agriculture Organization of the United Nations will participate actively in the conference, while many others interested in FPC development are expected to be present.

Papers to be submitted and discussed will cover a wide range of topics, including the composition and nutritional value of FPC, engineering aspects in its production, the need for quality standards, food and drug regulations pertaining to the product, its wholesomeness, its potential utilization by the cereal products and the pharmaceutical and diet foods industries, world fisheries and the protein gap, fish resources and their potential utilization for FPC, the objectives of the United Nations Protein Advisory Group (PAG), and Canada's future role in meeting world protein needs. Arrangements for the conference are being made by the Industrial Development Service of the Department of Fisheries of Canada.

Indemnity Plan

A total of $461,093 was paid to Canadian fishermen under the federal Government's Fishermen's Indemnity Plan for vessel loss during the fiscal year 1966-67. This is an all-time high, eclipsing the previous year's record of $366,739 by $94,354.

The Plan, which came into operation in 1953, offers fishermen the opportunity of obtaining insurance against total loss or partial loss of fishing vessels for a nominal premium of one per cent of the appraised value of the vessel per annum. Last year, of the 232 vessels for which claims were settled, 116 were total losses.

Indemnity paid during the 14 years existence of the Plan amounts to $2,974,819.

On February 1, 1966, a third measure was added to the Plan which provides low cost insurance on fixed fishing gear, shore installations and miscellaneous equipment used in a fishing enterprise.

Dr. Tully Honoured

Dr. John P. Tully, of the Fisheries Research Board of Canada, Ottawa has been honoured by the Committee for Advancement of the Oceanographic Institute of France with this year's award of the Medal Commemorative of Prince Albert I of Monaco (Manley-Bendall prize).

This is the first time a Canadian scientist has received this award, which was first presented in 1948. The medal is an acknowledgement of outstanding achievement in physical or biological oceanography.

Dr. Tully, is a native of Brandon, Man. He began his career in fisheries in 1931 with the FRB Biological Station at Nanaimo, B.C., following graduation from the University of Manitoba. He has remained with the FRB since that time, apart from the period 1942-45 when he was seconded to the Royal Navy for special duties. He was awarded an M.B.E. (Civil) in 1945 for his work with the navy. He obtained his Ph. D. degree from the University of Washington in 1948.



Oceanographic Institute's medal

Dr. Tully led the Board's oceanographic program on the Pacific coast for many years and from 1946 to 1967 he was Oceanographer-in-Charge of the Pacific Oceanographic Group. Since then he has served in Ottawa as Oceanographic consultant to the chairman of the Fisheries Research Board of Canada and secretary of the Canadian Committee on Oceanography.

Dr. Tully's outstanding contributions in the field of oceanography is reflected in the publication of more than 100 scientific papers and reports covering oceanographic surveys, chemistry of seawater, prediction of pollution, physical structure and behaviour of seawater, and military and fisheries oceanography. One of his most recent contributions was a paper delivered at the International "Water for Peace" Conference in Washington, D.C., earlier this year.

A member of several professional societies, he was named a Fellow of the Royal Society of Canada in 1964.

FRB Appointment

Ronald F. Gadsby, 54, Assistant Deputy Director of Public Relations for Expo 67, has been appointed Public Relations Officer with the Fisheries Research Board of Canada. Mr. Gadsby assumed his new duties September 15, succeeding G. Bruce Woodland who resigned recently to accept a public relations post with Memorial University of Newfoundland.

A native of St. Catharines, Mr. Gadsby graduated from St. Catharines Collegiate Institute and began his career on the editorial staff of the St. Catharines Standard. He served with the Royal Canadian Air Force during the Second World War, including three years overseas as a public relations officer. Following his discharge he worked in Toronto with the Canadian Press and the Globe and Mail before moving to British Columbia in 1947 to take a position with the Vancouver Sun.



Ronald F. Gadsby

In 1949, he was appointed Public Relations Officer in western Canada for Air Canada, and three years later he was promoted to Supervisor of the airline's Press Bureau in Montreal.

He resigned to return to Vancouver in 1954 as Executive Assistant to the Chairman of the Fisheries Association of British Columbia.

He was appointed Assistant to the British Columbia Deputy Minister of Recreation and Conservation in 1958 and worked extensively in the public relations and tourist promotion fields. In 1965, Mr. Gadsby joined the public relations staff for Expo 67, serving first as western Information Officer at Vancouver, and since 1966 as Assistant Deputy Director of Public Relations at Montreal.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May - July 1966		May-July 1967	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	803,576	68,434	836,460	66,044
ATLANTIC COAST - Total	648,702	40,960	736,128	43,965
Cod	258,759	11,222	261,987	11,321
Haddock	27,518	1,960	27,919	1,701
Pollock, Hake, Cusk, etc.	25,564	942	19,469	648
Rosefish	55,468	1,527	43,156	1,128
Catfish	1,997	67	1,822	59
Halibut	1,765	561	1,519	559
Plaice & Other Flatfish	93,418	3,031	103,389	3,348
Herring & Sardines	112,837	1,697	207,601	2,257
Mackerel	11,941	447	12,943	490
Alewives	7,520	137	6,472	104
Salmon	4,631	2,261	5,613	3,044
Smelts	187	16	107	14
Swordfish	2,257	1,119	1,601	842
Other Fish	11,554	162	9,416	195
Lobsters	24,312	13,220	24,796	15,366
Clams & Quahaugs	2,049	122	2,270	144
Scallops	6,431	2,441	4,795	2,646
Other Shellfish	494	28	1,253	99
PACIFIC COAST - Total	154,874	27,474	100,332	22,079
Pacific Cods	12,922	1,067	5,260	431
Halibut (1)	22,474	7,859	15,043	3,762
Soles & Other Flatfish	4,010	255	2,405	178
Herring	42,873	721	22,305	380
Salmon	65,649	17,041	49,709	16,770
Other Fish	2,495	78	732	17
Shellfish	4,451	453	4,878	541
BY PROVINCES				
British Columbia	154,874	27,474	100,332	22,079
Nova Scotia	193,397	15,629	211,004	16,175
New Brunswick	93,577	4,445	132,195	4,779
Prince Edward Island	23,344	3,974	18,361	4,912
Quebec	64,810	3,908	95,787	4,360
Newfoundland	273,574	13,004	278,781	13,739

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

MID-MONTH WHOLESALE PRICES - JULY 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.373	.443
Cod fillets, Atl, frozen, cello 5's	lb.	.329	.383
Cod fillets, smoked	lb.	.420	.473
Haddock fillets, fresh, unwrapped	lb.	.479	.580
Herring, kippered, Atl.	lb.	.251	.337
Mackerel, frozen, round	lb.	.190	.267
Lobsters, canned, Fancy	Case 48-½ s	-	-
Sardines, canned	Case 100-¼ s	9.695	9.600
Halibut, frozen, dressed	lb.	.540	.530
Silverbright, frozen, dressed	lb.	.605	.633
Coho, frozen, dressed	lb.	.835	.820
Sockeye, canned, grade A	Case 48-½ s	27.773	28.400
Pink, canned, grade A	Case 48-½ s	16.497 (1)	17.123
Whitefish, fresh	lb.	.438	.443
Lake trout, frozen	lb.	.446	.523

(1) - Dressed.

PRICES PER CWT. PAID TO FISHERMEN

(Week ending July 15th)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	5	5
Yarmouth		
Haddock	-	-
Black's Harbour		
Sardines	2	-
St. John's Nfld.		
Cod	3	-
Haddock	2.75-4	-
Rosefish	2.5	-
Vancouver		
Ling Cod	10-12	8-10
Gray Cod	6-7.5	6-7.5
Soles	8.5	6.5-9.5
Salmon (Rdspg)	45-75	45-78

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF JUNE

	1966	1967
	'000 lbs	'000 lbs
TOTAL - Frozen Fish, Canada	83,944	80,395
Frozen - Fresh, Sea Fish - Total	59,688	54,480
Cod, Atlantic, Fillets & Blocks	18,423	12,242
Haddock, fillets & blocks	4,179	7,389
Rosefish, fillets & blocks	3,747	3,365
Flatfish, (excl. halibut), fillets & blocks	4,889	8,391
Halibut, Pacific, dressed & steaks	8,178	7,569
Other Groundfish, dressed & steaks	2,455	1,366
Other Groundfish, fillets & blocks	5,983	3,835
Salmon, Pacific, dressed & steaks	2,425	3,488
Herring, Atlantic & Pacific	306	538
All Other Sea Fish, all forms	5,106	3,698
Shellfish	3,997	2,599
Frozen - Fresh, Inland Fish - Total	5,065	8,710
Perch, round or dressed	494	(1)
Pickerel, (Yellow & Blue) fillets	148	1,021
Sauger, round or dressed	(1)	735
Tullibee, round or dressed	111	290
Whitefish, round or dressed	1,507	633
Whitefish, fillets	270	165
Other, all forms	2,535	5,866
Frozen - Smoked Fish - Total	1,904	1,584
Cod Atlantic	1,327	801
Sea Herring, kippers	302	269
Other, all forms	275	514
Frozen for Bait and Animal Feed	17,287	15,621

(1) Confidential, included with 'other'.

SALTED FISH STOCKS AS AT END OF JULY

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		15,539	21,786
Cod		11,685	17,583
Other		3,854	4,203
Dried - salted - Total		4,398	6,032
Cod		3,802	5,388
Other		596	644
Boneless - Total		408	594
Cod		380	518
Other		28	76
Pickled - Total	(barrels)	26,763	19,155
Herring	"	9,742	5,576
Mackerel	"	7,503	5,966
Alewives	"	9,518	7,613
Turbot	"	-	-
Bloaters	(18 lb. boxes)	194,361	128,695
Boneless Herring	(10 lb. boxes)	(1)	(1)

(1) Confidential

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - APRIL

(Value in Thousands of Dollars)

	1965-1966 $'000		1966-1967 $'000	
Total Exports		215,611		231,673
By Markets:				
United States		153,017		150,560
Caribbean Area		18,415		20,371
Europe		38,023		52,441
Other Countries		6,156		8,301
By Forms:				
Fresh and Frozen		150,044		151,062
Whole or Dressed	45,421		48,864	
Salmon, Pacific	12,151		16,157	
Halibut, Pacific	7,324		6,852	
Cod, Haddock, Pollock, etc.	509		532	
Swordfish	4,161		3,963	
Other Seafish	6,772		8,014	
Whitefish	5,743		5,490	
Pickerel	3,361		2,876	
Other Freshwater Fish, n.o.p.	5,400		4,980	
Fillets	67,865		70,499	
Cod, Atlantic	24,388		21,289	
Haddock	5,769		7,013	
Rosefish, Hake, Pollock, etc.	6,451		9,578	
Flatfish	10,829		14,702	
Pickerel	2,683		3,121	
Other	17,745		14,796	
Shellfish	36,290		30,943	
Lobster (Alive & Meat)	25,026		21,406	
Other	11,264		9,537	
Frozen Fish & Shellfish, pre-cooked	468		756	
Cured		23,800		24,345
Smoked	2,165		2,452	
Herring	1,324		1,484	
Other	841		968	
Salted, Wet & Dried	18,300		18,948	
Cod	15,858		16,277	
Other	2,442		2,671	
Pickled	3,335		2,945	
Herring	2,042		1,830	
Mackerel	713		631	
Other	580		484	
Canned		25,108		38,557
Salmon	16,028		28,187	
Sardines	5,168		5,889	
Lobsters	2,479		2,684	
Other	1,433		1,797	
Miscellaneous		16,659		17,709
Meal	9,888		9,091	
Oil	1,756		842	
Other	5,015		7,776	

Current Reading

FRESHWATER FISHES OF EASTERN CANADA (Second Edition) by W.B. Scott (University of Toronto Press. Price: $2.25).

Since the first edition of this book was published in 1954 some drastic changes have occurred to the fish fauna inhabiting the lakes and streams of eastern Canada, particularly the Great Lakes. This fact, together with the additional knowledge of the various species that has been gained over the past decade, has involved considerable revision to the original work.

The book covers 154 species or kinds of freshwater fishes in the 1,000,000 square miles comprising the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland, although by far the greater number of species listed are native to the provinces of Ontario (135) and Quebec (101).

Dr. Scott's purpose in producing the 150-page volume is to provide sport and commercial fishermen, as well as others interested in fishes, with detailed information on freshwater fishes in the eastern part of the country and to assist in accurate identification. To this end, technical language has been avoided wherever possible. Also included are keys for easier identification of the individuals in the two largest and most difficult families – salmonidae and cyprinidae.

The author, who is curator of the Department of Ichthyology and Herpetology at the Royal Ontario Museum, refers in his introduction to the striking changes that have occurred to fish fauna in the Great Lakes in the space of ten years. He points out that the famous fishery on Lake Erie for blue pike, whitefish and cisco is gone; the blue walleye, unique to lakes Ontario and Erie, is apparently extinct; the sea lamprey has destroyed the trout populations of all but Lake Superior while the cisco populations, now unhampered by the predaceous lake trout, have apparently hybridized extensively and changed in form and habits.

There have been other changes. The white perch, unknown in the Great Lakes until about 1952, is now the dominant species in many parts of Lake Ontario; the alewife is firmly established in Lake Huron and has invaded Lake Superior; the gizzard shad and white bass are extending their ranges to the Upper Great Lakes; and the smelt has become established in Lake Simcoe and many lakes in the Muskoka district.

Referring to the effects on lakes' fish populations if industrial pollution is not curbed, Dr. Scott observes: "For a nation that courts tourist dollars with such undisguised relish, we are surprisingly blind to the continuing destruction of our one unique tourist attraction – an abundance of clean water, our lakes and rivers."

The excellent illustrations in the book are mostly the work of the internationally known Canadian photographer, W.H. Carrick.

PARASITES OF NORTH AMERICAN FRESHWATER FISHES by Glenn L. Hoffman (University of California Press, Berkeley, California. Price: $15.)

Representing the first comprehensive review of the parasites of North American freshwater fishes, this volume will provide a valuable guide for students, diagnosticians or researchers in identifying the parasites and finding published accounts of them.

The author, a parasitologist at the Eastern Fish Disease Laboratory of the U.S. Bureau of Sport Fisheries and Wildlife at Kearneysville, W. Virginia, has been studying fish parasites for the past 25 years and has had 18 articles published on the subject.

The following taxons are considered: algae, fungi, protozoa, helminthes, parasitic copepoda, parasitic mites, glochidia, sphaerid clams, linguatula and predators.

Identification keys are provided for the larger groups, most of the genera and a few species. Where necessary, the references steer the reader to the appropriate literature. Representative species of each genus are illustrated by a total of 252 drawings.

The species list contain references to nearly all the published literature to alert the reader to previous work done on morphology, taxonomy, life cycles, pathogenicity, physiology and disease treatment. An extensive host-parasite list is also included.

Dealing with the public health aspects of fish parasites, the author points out that most fish parasites would not develop in human beings even if eaten raw, but some are unsightly. Fish are often discarded by fishermen because of unsightly parasites, but none is harmful to man if the fish is thoroughly cooked before eating.

A GUIDE TO THE PROPERTIES, CHARACTERISTICS, AND USES OF SOME GENERAL ANAESTHETICS FOR FISH by Gordon R. Bell. (Bulletin No. 148 of the Fisheries Research Board of Canada. Price 75¢).

The revised edition of the original bulletin published in 1964 has been prepared to meet an ever-increasing demand for information on general anaesthetics used in fisheries research.

Two additional anaesthetics have been included and the information on others has been brought up to date in a handy fold-out chart at the back of the bulletin. For the convenience of readers, the numerous references have been annotated.

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A Centennial Report of the Federal Department of Fisheries

100 YEARS OF SERVICE TO THE FISHING INDUSTRY and to the CONSUMER

"To conserve and develop Canada's primary fishery resources, and to encourage the development of the fishing industry in the national economy".

That is the function of the Federal Department of Fisheries. Since its establishment on July 1, 1868 as the Department of Marine and Fisheries, the Department has over the past 100 years assisted the fishing industry to achieve steadily increasing yields and revenue from fishing activity on the Atlantic and Pacific and on inland waters, and steadily improved the fish product offered to the public. Fishermen, processors and the consumer have all benefitted from the Department's activities and since 1898 from the scientific investigations carried out by the Fisheries Research Board of Canada.



Inspection officers at fish processing plants across Canada, working with the scientists of twenty laboratories, help ensure a high standard of quality of fish and fish products.



Resource management procedures are carried out by Protection Officers ashore, afloat and in the air. They also supervise the enforcement of appropriate regulations and inspect and arrange clearance of spawning streams. Biologists and engineers enhance the environment to increase salmon and other fish stocks, undertake scientific investigations and conduct studies to provide answers to fisheries problems associated with pollution, floods, drought and multiple water use.



Printed material, films, radio, television and exhibitions, keep the public informed on the various aspects of the industry and the activities of the fisheries services. Departmental Consumer Consultants work to encourage increased consumption of Canadian fish products through demonstrations and lectures on preparation and cooking of fish and fish products.

Fishery economists are active in two related fields of responsibility: (1) They provide the government and the commercial fishing industry with current information, including statistical data, under the general heading of trade intelligence, and (2) carry out studies and investigations in the primary fisheries and in the processing and distribution of fish products.

In fisheries industrial development, the Department introduces and develops new and improved fishing and processing techniques and provides financial assistance for modernization and expansion.



The Department also represents Canada on many international Commissions concerned with the conservation of fisheries and marine mammals.

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, 1967

FISHERIES

(formerly Trade News) OF CANADA

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★ Group from Russia Tours Canada

Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
(formerly Trade News)

Editor
E. H. HEARNDEN

November, 1967

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COVER PHOTOGRAPH - The MV *Burin Bay*, latest addition to the federal Department of Fisheries' patrol fleet in the Newfoundland Region, was launched at Port Union September 20. The 66-foot vessel is equipped with radar, depth recorder and radio telephone and is reinforced for navigation in ice.

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Resource Development in the Maritimes and Newfoundland

Maritimes Region

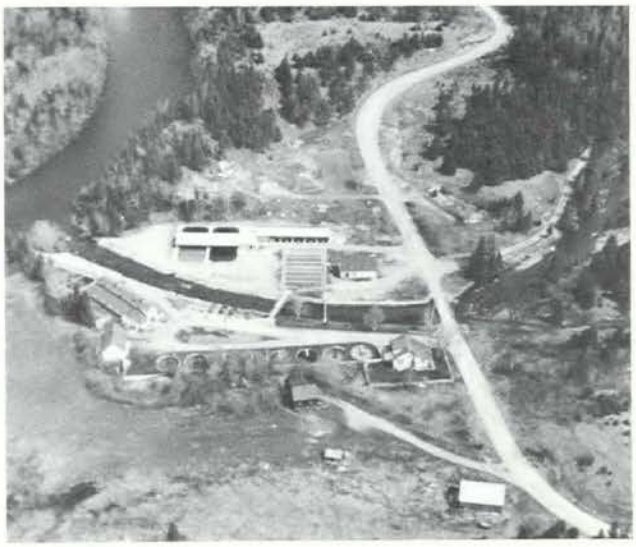
IN 1966 the biological section of the Resource Development Branch, Maritimes Region, continued to collect basic background data necessary for the rational development of the salmon and trout resources of the Maritimes. The extensive salmon program on the Saint John River is beginning to provide the type of knowledge necessary for successful management of this river in the face of hydroelectric development.

At East River, Sheet Harbour, good progress was made securing some insight into the biological factors necessary for future salmon production in this system. An arduous summer of stream inventorying on the Northwest Miramichi has filled a gap in the knowledge of this important salmon river.

In 1966 the estuarial trapping program at Millbank was taken over from the Fisheries Research Board and should continue to provide valuable data on the salmon runs to the system. The tagging experiments involving early and late run stocks provided significant results during the past year. The trout investigation at Lake Ainslie has begun to assemble the type of information necessary for the scientific management of this important fishery.

Pollution investigations continue to measure the hazard to fish life posed by various types of pollution all over the Maritimes. In addition, laboratory bioassays are determining the threat of future potential poisons.

The biological summaries are divided into four major sections: Salmon Investigations, Trout Investigations, Resource Development and Pollution. The summaries provide a cross-section of the work conducted in 1966 and the important results as interpreted to date.



Aerial view of the Department of Fisheries' fish culture station at Margaree, Nova Scotia. A new salmon smolt producing station and redesigned salmon holding ponds are now in operation.

SALMON INVESTIGATIONS

Miramichi River

This is the thirteenth consecutive year of smolt and adult salmon sampling in the Miramichi estuary. This consistent sampling provides an annual index of the timing and magnitude of migrating salmon runs. A total of 11,423 large salmon and grilse were counted during the upstream migration. This is the fourth highest catch over the past 13 years. Grilse made up nearly 86

percent of the run. Prior to 1958 large salmon made up about 49 percent of the run. A total of 889 salmon and grilse were tagged and released at Millbank. Sixty-nine tags have been returned to date from this operation.

A smolt trap was also operated in the spring at Millbank. Of the 11,648 smolts counted, 366 had previously been tagged at Curventon on the Northwest Miramichi River. The year's catch ranks among the lowest recorded since 1954.

A descriptive study of the Northwest Miramichi River system was undertaken with a view to assessing the potential of this area for Atlantic salmon. Concern was expressed regarding the future of Atlantic salmon in this river in view of base metal mining activities. The survey indicated that the Sevogle River had more nursery area but considerably less spawning ground than the main river and also had good juvenile salmon populations. Redd counts during the fall however were low in the main river and high in the Sevogle River. It may be that many fish now entering these tributaries were formerly destined for the upper waters of the main Northwest Miramichi and that the runs have been dispersed by mining pollution.

Big Salmon River

Investigation of the early-late run phenomenon of salmon by using tagged hatchery reared smolt of known early and late run origin, was continued at Big Salmon River. Since 1964 all adult returns to the river have been examined for tags. The salmon run of 4,566 was the largest on record. Tentative conclusions drawn from the recaptures of tagged fish are that heredity is an important factor governing the timing of the return to the river of one sea-year fish.

Smolt trapping facilities were operated near the mouth of the Big Salmon River and 14,465 native smolt were counted. In addition a check was made on the downstream movement of 18,000 tagged hatchery reared smolt. Although the downstream movement of tagged smolt was already underway when the fence commenced operating 7,596 tagged smolt were counted.

River Philip (early-run)

Salmon brood stock collected in the Bay of Chaleur are taken in salt water during the spring and early summer but their time of entry to freshwater is not known. To determine if these fish exhibit early or late run characteristics, tagged progeny from this collection were planted as smolts in River Philip in May 1964. In 1965 and 1966 all salmon returned to the river were examined at the trapping facilities. During the two years of observations tagged fish entered the river during the July to November period. The 1965 returns of one sea year fish were scattered over the five month period with a slight peak occurring during August. The 1966 recaptures of two sea year fish showed a definite peak in July when the majority of tagged fish returned over a ten day period. In both years the peak period of the native run occurred in October. Because of the early returning characteristics exhibited by the majority of tagged fish recaptured at River Philip, it is concluded that the Bay of Chaleur brood collection is taken from a predominantly early run stock.

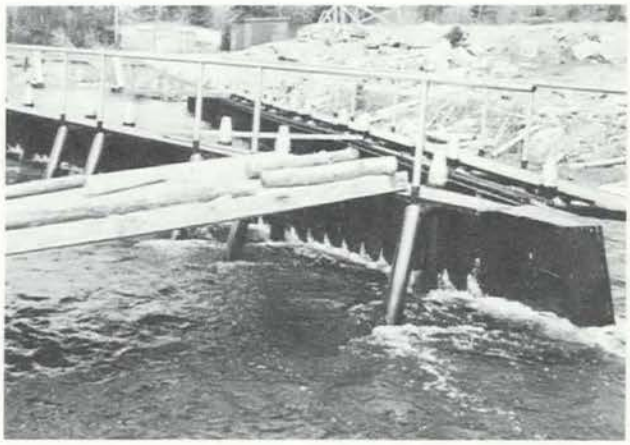
Saint John River

Atlantic salmon studies were continued on the Saint John River to obtain background information for assessment of management procedures that will be initiated on completion of the Mactaquac hydro plant. Emphasis was placed on a tagging and recovery project to investigate the size, distribution and timing of the adult runs to the river.

A total of 2,485 salmon and grilse were tagged and released in the lower river, 808 of these were obtained from commercially operated weirs in St. John Harbour and 1,677 fish were tagged



Estuary of the East River at Sheet Harbour, Nova Scotia, showing the louver system for deflecting salmon smolts in the power canal.



A close-up of the louver deflecting device on the East River.



Adult salmon collection facilities at East River, Sheet Harbour. The specially-designed tank truck used to transfer salmon to the upper reaches of the river can be seen in the background.



Barrier dam erected immediately upstream of the Ruth Falls hydro plant to prevent access by anadromous fish to East River below the Falls dam.

at Westfield. To date 298 tags were returned from this operation. This is considerably lower than the 1965 recovery and can be partly attributed to the fact that the runs to the river were late which appears to have resulted from low flows which aggravated existing pollution and dropped the dissolved oxygen levels below 5 p.p.m. above Beechwood for extended periods. The tagged fish were therefore not available to the fishermen until late in the angling season and near the end of the commercial season. When water conditions improved late in the fall the bulk of the late fish had little time remaining to reach the upper areas of the system before the spawning season with the result that counts in these areas were low.

Commercial salmon fishermen had a record catch of about 2,754 c.w.t. A large portion of this catch was taken in the Bay of Fundy drift net fishery off the river's mouth. The angling catch of 1,420 fish, although higher than the 1965 catch, was much below expectation. A generally small escapement to the river was evidenced by unusually small numbers ascending the Beechwood, Tobique Narrows and Monquart River dams.

A number of tags placed on adult salmon in this area in 1965 were recovered this year off the Atlantic Coast of Nova Scotia and Newfoundland.

Mactaquac Project

The solution to the fisheries problems associated with the New Brunswick Electric Power Commission's Mactaquac project on the Saint John River required a considerable amount of staff effort during the year. The diversion of the main river through the sluiceway bays was accomplished in August. Temporary baffles, recommended by Branch engineers, were installed in one of the outside bays in order to pass anadromous fish. These facilities were adequate and no fish were reported to be delayed below the structure.

Close liaison was maintained with the Commission and its consultants on the design of the permanent fish collection facilities at the Mactaquac powerhouse. It is proposed to capture and transport all anodromous fish, with the exception of the adult salmon required as brood stock for the smolt rearing station, to the upper reaches of the Saint John River System.

Branch engineers and fish culture personnel are continuing to work with the Commission in the design of the proposed smolt rearing station to be constructed below the dam. Initial production of the station will be 500,000 smolts which is the minimum number considered necessary to compensate for the anticipated high losses of naturally produced fish as a result of the power development.

TROUT INVESTIGATIONS

A survey of Lake Ainslie, Cape Breton Island, was carried out to provide information on the biology and ecology of speckled trout in Nova Scotia. The survey of the lake and several of its tributaries concentrated on water quality and fish populations in the lake and its major tributary streams. The lake is located on the headwaters of the Southwest Margaree River, and covers an area of 13,440 acres. Although speckled trout comprised a small percentage of the total catch it was high in relation to samples collected from other Maritime lakes.

RESOURCE DEVELOPMENT

East River – Sheet Harbour

One of the main objectives of the Branch in recent years has been the initiation of an active development program. This objective is being partially realized with the completion of several phases of the rehabilitation program of the East River System, Sheet Harbour, which is being undertaken to re-establish

a run of salmon which was virtually eliminated by the construction of several hydropower installations in past years.

The rehabilitation program includes the construction of a barrier dam immediately upstream of the Ruth Falls powerhouse, the lower most hydro plant, to eliminate access to anadromous fish to that reach of river below the Ruth Falls dam; the construction of salmon collection facilities in the immediate area of the power house to capture salmon for transportation to spawning areas in the upper reaches of the river system, and the construction of a louver deflector in the Ruth Falls power canal to divert smolts and other fish back into the main river and thus prevent turbine mortalities from occurring at the hydro plant. This louver installation, which was developed in California and tested extensively in British Columbia, is unique in that it is the first practical installation of its kind in Canada.

The following projects were undertaken during the year as part of the rehabilitation program of this system: steel barrier racks were installed at the barrier dam which was constructed in 1965; salmon collection facilities were constructed at the Ruth Falls power house; louver deflection facilities were installed in the Ruth Falls power canal; a truck was equipped to transport captured fish to the headwater areas; site surveys were undertaken for the construction of a smolt counting fence on Fifteen Mile Stream which is a major tributary of the East River. Studies are being undertaken to determine the feasibility of constructing a control dam on Fifteen Mile Stream to ensure that an adequate supply of water will be available to operate the fish facilities. This dam would also provide a degree of flow control for spawning and rearing areas.

In conjunction with the East River project a trapping and counting fence was constructed on the West River, Sheet Harbour to capture adult salmon required for stocking the East River. This will provide valuable information for an assessment of the program in future years.

In 1965 a biological survey of East River was conducted, and construction was started on adult trapping facilities.

In 1966 a more comprehensive study of West River was initiated, an adult transfer from West to East River was conducted and the salmon angling fishery was sampled. The smolt sampling station on West River indicated that the smolt run took place during May with a peak occurring on May 15. Of the 318 salmon angled on West River 95 percent were grilse with a ratio male: female of 1:3.6. Age determination indicated that these salmon spent two (45 percent) to three (55 percent) years in freshwater and one to three years at sea.

To secure adult salmon stock required to establish a salmon run in East River, 77 adult fish were transferred from West to East River. A spawning survey in the fall indicated that the fish had moved many miles below the dumping sites and the many large redds observed all contained eggs.

POLLUTION

Forest Spray Studies

The spruce budworm control program in New Brunswick was continued in 1966 on the Miramichi and Saint John River watersheds. Studies on juvenile salmon populations in the area indicated that the hazard from aerial spraying to young Atlantic salmon was reduced below levels of previous years. A population census indicated that juvenile salmon in spray area streams were about two-thirds as abundant as the unsprayed control streams, but that large parr in rivers exposed to their third successive annual spraying was about one-third the control population density. Very low populations were found where a double one-third pound of DDT had been sprayed over the drainage area, and with Phosphamidon (a chemical non toxic to fish) buffer strips along the stream.

Fall mortality studies indicated that salmon parr died in spray area streams when the water temperatures dropped below 5°C. Most of the dead parr had a poor condition factor and were sexually active males. Chemical analysis showed that both live and dead parr from spray area streams contained about 50 times the amount of DDT and DDT metabolites than were found in parr from control streams. The dead parr contained more DDT as metabolite.

Field tests with Sumithion indicated that salmon parr and fry were not killed at a dosage rate of one half pound per acre. Stream bottom organisms, however, were reduced by about two-thirds their pre-spray number.

Agricultural spray studies

In order to assess the toxicity of agricultural chemicals to fish life, bioassay tests were conducted this year at the Cardigan Fish Culture Station on several of the chemicals used for crop protection on Prince Edward Island. The materials tested were Thiodan, Nabam, zinc sulphate, Dowpon, Sinox PE and Reglone. The insecticide Thiodan, the fungicide Nabam + zinc sulphate and the herbicide Sinox PE were found to be very toxic to speckled trout juveniles.

Industrial effluent studies

Negotiations were carried on with Fraser Companies Ltd., Scott Paper Company and Acadia Pulp and Paper Company concerning effluent disposal for their mills. Fraser Companies, Ltd., new 500-ton bleached kraft mill at Newcastle N.B. went on line during the summer. Caged fish tests carried out in the Northwest Miramichi River to determine the effect of the effluent



Counting fence on the Indian River, Newfoundland, completed in 1966, is used to count salmon smolts and adults as they move up and downstream.

on salmon migration indicated that pollution was severe during August but had improved during the fall. The Company is carrying out tests to isolate the toxic components so that the toxicity can be reduced by chemical treatment. The effluent from the Scott Paper Company mill at Pictou, N.S., will be treated in Boat Harbour Lagoon. Tests indicate that Boat Harbour effluent should not have a detrimental effect on the lobster population in the area. Acadia Pulp and Paper Limited will install two Ingersol-Rand Centripress units to remove fine bark and fiber from the effluent of their groundwood mill.

The untreated effluents from food processing plants continue to be troublesome in some areas. Plans for treatment facilities at some of these plants are presently being reviewed by pollution control agencies.

The pollution condition that existed in the Saint John River during August was of grave concern. Dissolved oxygen concentrations were inadequate for fish life in most of the river from Edmundston to Florenceville. Thousands of young gaspereau and a few large Atlantic salmon died, and the upstream salmon migration was blocked for several weeks below Beechwood. The two main sources of pollution are the Fraser Companies, Ltd. pulp mill at Edmundston and McCain Foods Limited at Florenceville.

Base metal mine wastes continue to cause concern in New Brunswick. Toxicity readings were low in the Northwest Miramichi River below the Heath Steele Mine during the salmon migration but were high during the remainder of the year. This indicates that the company is still unable to effectively control pollution during periods of heavy runoff. Heavy metal readings were extremely high in the two brooks that drain the Brunswick #6 development. Readings several times the lethal level occurred during the test period. The mine water treatment facilities when completed should help to lower the toxicity level in this area. A serious acid pollution problem still exists in Little River below the Brunswick Mine. The pH of the river water remained about 3.5 which is well below the lethal range for salmon and trout. The development of the Restigouche Mining Company gives cause for concern because it will be the first base metal mine in the Restigouche River drainage.

Marine seismic operations were conducted in the coastal waters of the Maritime Provinces by two oil companies and the Department of Energy, Mines and Resources. Shell Canada

Limited conducted a gas-exploder as well as a conventional seismic program; Mobile Oil Company conducted a small gas-exploder program; the Department of Energy, Mines and Resources carried out a second sonobuoy survey. No appreciable fish mortality occurred during these surveys.

FISH PASSAGE PROJECTS

Extensive repairs were undertaken at the Bartholomew fishway at Blackville, New Brunswick by the Miramichi Forest Products Ltd. under the supervision of departmental personnel.

Close liaison was maintained during the year with the Nova Scotia Power Commission regarding the design and construction of adequate fish facilities at the MacAskill Brook dam near Glace Bay, Nova Scotia and the Middle River and Pictou Harbour causeway crossings. Fishways have been incorporated in these structures to pass anadromous fish into the upper reaches of the rivers.

The storage dam and fishway on the St. Croix River at Vanceboro, Maine were reconstructed by the St. Croix Paper Co. Ltd. in accordance with plans approved by the International Joint Commission. Resource Development engineers were instrumental in the design of the fishway. Negotiations are continuing with the St. Croix Paper Co. Ltd. for adequate fish facilities to be incorporated in the reconstruction of the Forest City dam which is located on the same system.

Considerable staff effort was directed towards the provision of adequate fish facilities in dams proposed by the Department of Forestry and Rural Development under the ARDA program. Fishway designs have been completed for the Petitcodiac River dam at Moncton, New Brunswick and for control structures on Front and Large Lakes, Westmorland County, New Brunswick.

Negotiations are continuing with that Department regarding suitable fish facilities to be constructed in dams at the following locations: South Branch, Musquodoboit River, Halifax County, N.S.; Great Village River, Colchester County, N.S. and several small streams in Prince Edward Island.

The engineering staff advised on and approved the installation of water intake screens at the Anil Company of Canada Ltd. pumping station on the East River, Lunenburg County, N.S. and the Middle East Pubnico pumping station on the French River System, Yarmouth County, N.S. Negotiations have also been undertaken to provide suitable fish passage facilities at the latter site.

Engineering surveys were undertaken on the Medway and the LaHave River Systems, which have been subjected to critically low summer flows in recent years, to determine the feasibility of developing flow control and the resulting benefits to the existing runs of anadromous fish.



Fishing the middle section of the smolt sampling trap at the estuary of the Miramichi River, New Brunswick.

FISH CULTURE DIVISION

Below average precipitation in many regions of the Maritimes in 1966 created serious problems for fish culture work and prevented fish distributions from being made until late in the season. Very satisfactory salmon egg collections resulted from good runs of fish following improved water conditions in the autumn.

The culture of fish has progressed steadily until now less than one percent of the fish stocked in this Region are released in the fry stage. The balance are reared to advanced fry or smolt stage. In 1966 salmon smolt production in the Maritimes exceeded one-quarter million fish. This program will be extended in the future to those fish culture stations which can be adapted to this procedure.

The breeding of selected stock has been practised in the Maritimes fish culture stations for many years and as a result much improvement has been made in egg production, rate of growth and stabilising time of spawning. A limited amount of work has been done on the breeding of hybrids, such as tiger trout and brownbow. A fast growing strain of Atlantic salmon was developed from late run stock but the strain was later abandoned in favour of a breeding program utilizing an early run strain of salmon. The early run strain developed is now in the third generation and remarkable growth has been achieved. This particular strain of Atlantic salmon has been raised completely in freshwater and spawned in 1965 as two-year-old fish. It would now appear that the progeny from this spawning will mature as large smolts in one year under conditions that normally produce two-year smolts.

The distributions of fish produced at the 16 fish culture stations operated in 1966 amounted to 23,681,000 fish of all species with a total weight of 207,000 pounds. The total fish

production was up slightly from the 1965 level of 23.6 million to 25 million with a total weight of 270,000 pounds up from 204,000 pounds.

The estuarial stocking program was continued and a creel census was carried out on the tagged fish released in 1965. Returns are encouraging and the program will be continued in 1967. The tagging program has been expanded and includes four lakes and one estuary in New Brunswick, three lakes and two estuaries in Nova Scotia, and two estuaries in Prince Edward Island. In addition, 5,000 tagged rainbow yearlings and 4,000 tagged Atlantic salmon smolts were released in brackish water in Bras d'Or Lakes.

Tests suggest that satisfactory dry food diets are available for Atlantic salmon, rainbow and brown trout, but not for speckled trout. Several different dry foods were tested during the year but none were completely satisfactory for speckled trout. Prolonged feeding of dry food resulted in a severe scoliotic condition in the speckled trout. About 25 percent of all fingerlings on the dry diet were affected. An experimental diet of capelin was tested at Cardigan. It was shown that capelin must be supplemented with meat to provide a complete diet.

Salmon holding ponds incorporating new and improved features for handling fish were built and placed in operation at Miramichi and Margaree fish culture stations. These ponds simplify seining operations and the design gives greater protection to the fish. They were designed for holding early run Atlantic salmon which are captured in June and must be held until fall for spawning.

The salmon smolt producing station at Margaree has been completed with the exception of the fry nursery tanks and the installation of dry feed automatic feeders. Production in the large smolt ponds has been very satisfactory and, after slight modification, the smolt release transportation channel functioned extremely well. This design provides the basis for the design of the ponds for the proposed Mactaquac smolt rearing station.

Newfoundland Region

Ten years ago the Resource Development Branch (Fish Culture), Newfoundland Region, comprised four permanent staff members (1 biologist, 1 engineer and 2 technicians) who were assisted by 3 or 4 seasonal employees. At the time one project in a season was all that could be handled. As a consequence all but the most critical jobs were deferred.

Today the Branch has an establishment of 12 biologists, 4 engineers and 11 technicians. This staff is strengthened by a dozen or more seasonal assistants during the field season. With this larger staff it is possible to undertake several major projects and dozens of minor ad hoc problems each year. Projects include studies associated with a variety of pollution sources, hydro electric and other industrial installations, Atlantic salmon development projects and river improvement work including fishway installations.

Exploits River

A proposed development program on the Exploits River is directed towards establishing Atlantic salmon in the 1400 square miles between Grand Falls and the Red Indian Lake dam. Biological investigations of the area in 1965 resulted in the selection of two streams for use in experimental fish introductions. Adult salmon will be transferred to these tributaries from other watersheds. In one stream, fish will spawn in a controlled flow spawning channel; in the second, spawning will take place in a natural stream. Noel Pauls Brook was chosen for spawning channel investigations and, in 1966, a channel was constructed. Mary Ann Brook was chosen for the natural stream spawning experiments. Adult introductions to both streams were postponed to 1967 to permit the collection of electrofishing data on landlocked fish populations.

Major engineering investigations associated with this project were directed towards the construction of the controlled spawning channel and field accommodation. Surveys of several falls and a logging dam on Noel Pauls Brook were undertaken to determine the degree of obstruction that these might present to migrating Atlantic salmon.

Pollution studies on the Exploits River consisted of analysis of mine waste from the Buchans operation, pulp and



Automatic feeders being tested at rearing ponds at the St. John, N.B., fish culture station.

effect on salmon populations during years of low flow and high temperatures. Results of water analysis from Red Indian Lake show concentration of copper and zinc in certain areas to be at serious levels as far as fish life is concerned.

The proposed development program for the Exploits must include control of all wastes entering the river to levels that are acceptable for aquatic life.

Industrial Developments

The Bay D'Espoir hydro electric development was commenced in 1965. It is located on the South coast of Newfoundland and will utilize the watersheds of four rivers – the Salmon, Grey, White Bear and upper watershed of the Exploits. The "on power" date will be late April or early May, 1967. Arrangements have been completed with the power commission to provide adequate water to the Grey River, the only major salmon river involved.

The Newfoundland and Labrador Power Commission has also submitted a proposal to develop the Terra Nova River, and several others, in a project that will produce something in excess of 100,000 h.p. Preliminary fisheries studies have been initiated in the rivers in question to insure protection of all valuable fish runs.

In late 1966 it was announced that work on the Churchill Falls hydro development would start before the end of that year. This project will produce 6,000,000 h.p. and the target date for "on power" is 1971 or 1972 depending on the demand. The Churchill River is the largest river in Newfoundland – Labrador. It does not carry any anadromous fishes beyond Muskrat Falls. However, several other rivers will be affected by headwater diversions to the Churchill system. Only the Naskaupi diversion is expected to affect any significant salmon populations. Discussions have been held with Churchill Power Corporation Ltd. concerning the Department's requirements for fish protection facilities.

Proposed industrial developments in the Come-by-Chance and Stephenville areas have necessitated extensive bio-engineering studies to determine possible effects on existing salmon and trout populations. Studies are currently being continued at a reduced rate in these areas because of deceleration in the activity rate by industrial developers.

In connection with the Greenland salmon studies, it was decided that the Resource Development Branch, Newfoundland Region, would select a river in Labrador for long term smolt tagging and adult enumeration operations. In 1966 reconnaissance surveys of twenty rivers located on southern Labrador and northern tip of the Great Northern Peninsula of Newfoundland were conducted to choose a site for the proposed facilities. Since no site with necessary requirements was located it was decided to continue further with surveys of Newfoundland and Labrador rivers and undertake smolt marking in the spring of 1968 at temporary facilities.

Little Rattling Brook

A hydro electric development, which began on Rattling Brook in 1958, made it economically impossible to maintain the existing Atlantic salmon run in that stream. As a conservation measure, the Department undertook to relocate the run to Great Rattling Brook. A transfer of adult fish commenced in 1958 and continued until 1965, during which time approximately 3,000 salmon were transferred.

Evaluation of the project based on: (1) tagging data, (2) redd counts, (3) smolt migrations (4) numbers of adults returning to Great Rattling Brook, (5) marked smolts returning as adults, and (6) statistical analyses of size distribution of adult fish, suggests that the Little Rattling Brook run was successfully relocated in a stream not formerly utilized by salmon. An annual run of 1,200 salmon has been established in Great Rattling Brook.

Indian River Spawning Channel

A controlled flow spawning channel was constructed on Upper Indian River in 1962-63, as an effort to offset loss of spawning grounds brought about by hydro electric development. This has been reported on previously. Since 1963, salmon have have been accommodated in the channel and assessment of the project shows that the egg to fry survival rates have ranged from 25% to 56%.

Kelt tagging programs were carried out in 1964, 1965 and 1966. Returns of 49% to the commercial fishery and 1.9% to Indian River as spawners were recorded in 1965. In 1966, returns of 31% and 1.9% respectively were recorded.

Pollution Investigations

Pollution problems during 1966 were many and varied. Investigations continued on the effects of mining and pulp and paper mill operations on the Exploits River and Red Indian Lake. In addition, investigations were conducted at Wabush Lake iron ore operations in Labrador, and Rambler Brook mine in Newfoundland proper. Investigation at Wabush Lake was a joint effort by the Fisheries Research Board (St. Andrews) and the Department. Discussions and negotiations continued with several industrial concerns (a) to find ways of reducing or eliminating it in case of existing pollution or (b) to prevent them from becoming problems in case of new developments. ✔

Mutual Problems Discussed

Fisheries Group from U.S.S.R. Tours Canada

FROM SEPTEMBER 18 to October 2, Mr. A.A. Ishkov, Minister of Fisheries of the USSR, accompanied by a group of Russian fisheries specialists and scientists, visited Canada at the invitation of the Hon. H.J. Robichaud, Minister of Fisheries of Canada. It was an exchange visit following one which Mr. Robichaud, together with Deputy Fisheries Minister Dr. A.W.H. Needler, and a group of Canadian fishing industry representatives, made to the USSR earlier this year.

Mr. Ishkov was accompanied by I.P. Shinkarev, Chief of the Main Fisheries Department for the Western Region; M.I. Drozdov, Chief of the Main Fisheries Department for the Far East Region; Dr. A.S. Bogdanov, Director of the Central Research Institute of Marine Fisheries and Oceanography (VNIRO); Dr. S.A. Studenetsky, Director of the Atlantic Research Institute of Marine Fisheries and Oceanography (Atlant NIRO); A.A. Volkov and V.M. Nikolaev, Ministry of Fisheries, USSR.

Following their arrival in Montreal, Mr. Ishkov and the members of the Soviet delegation spent a day in Ottawa and then left for Canada's west coast, visiting Winnipeg en route. In British Columbia they visited Vancouver, Nanaimo, the Big Qualicum River and the Babine Lake area. They were accompanied by Mr. Robichaud and other Canadian Government officials.



The U.S.S.R. Minister of Fisheries, Mr. A.A. Ishkov, and his group of fisheries scientists and specialists are greeted at Montreal airport by Canada's Minister of Fisheries, the Hon. H.J. Robichaud. Left to right are: Dr. S.A. Studenetsky, Dr. A.S. Bogdanov, I.P. Shinkarev, Mr. Ishkov, A.A. Volkov, Mr. Robichaud, M.I. Drozdov, W.D. Pierce (interpreter), and S.V. Ozere, Assistant Deputy Minister (International and Jurisdictional), Department of Fisheries, Ottawa.

Returning east, Mr. Ishkov and members of the Soviet delegation began a tour of Canada's Atlantic Coast area with visits to Halifax and Lunenburg, Nova Scotia, and St. John's and Marystown, Newfoundland.

The whole tour concentrated on visits to establishments and talks with persons concerned with the Canadian fisheries. Visits were made to fisheries research centres and to universities, to fish processing plants, and to sites of resource development projects undertaken by the federal Department of Fisheries.

Discussions between Mr. Ishkov and Mr. Robichaud were directed mainly to consideration of the interests of both countries in the fisheries of common concern, their conservation and problems arising out of fishing operations by vessels of the two countries in close proximity in areas of the high seas with emphasis on operations in the North Pacific. Unlike the situation in the North Atlantic, where Canada and the USSR are parties to multilateral fisheries conventions such as the Northwest Atlantic Fisheries Convention and the International Council for the Exploration of the Sea, which cover all species of common concern, Canada and the USSR are parties to only two fisheries conventions which apply to the North Pacific and these are concerned with marine mammals only.

The two Ministers agreed that detailed discussions between fishery administrators and scientists of the two countries be undertaken within the next few months at a mutually convenient time and place with the view of submitting to the governments of the two countries a draft agreement which would provide for co-operation in scientific research, exchange of scientific data and personnel, solution of problems of conservation, the avoidance of conflicts between the vessels and gear of the two countries and other problems related to fishing operations of the two countries on the high seas.

The Ministers agreed that there is much to be gained from increased collaboration in the fisheries investigations carried out by the two governments. Better communication in technological research on fish products is also recognized to be desirable and this will be encouraged by both Ministers.



Enjoying a snack in the Ottawa test kitchen of the Department of Fisheries.



Canada's Deputy Minister of Fisheries, Dr. A.W.H. Needler, greets Mr. Ishkov.



Mr. Ishkov contemplates a tempting array of fish delicacies at Winnipeg.



Canned fish catch the eye of the Russian minister in a Vancouver supermarket.



Halibut being prepared for processing at a Vancouver plant.



Studying a fish stick production line in Vancouver.



Inspecting installations at the Big Qualicum River salmon development project in British Columbia.

Respirometer holds Mr. Ishkov's attention at the FRB Biological Station at Nanaimo, B.C.





Mr. Ishkov at the wheel of the fisheries protection vessel *Laurier*.



Mr. Ishkov and Mr. Robichaud sample grapes at a vineyard in the Niagara peninsula.



Boat building instruction at the College of Fisheries, Navigation, Marine Engineering and Electronics, St. John's, Nfld.



Sign at St. John's, Nfld., motel greets Mr. Ishkov and party on their arrival.



Visiting the phycorium of the recently-built Marine Sciences Research Laboratory at Logy Bay, Nfld.



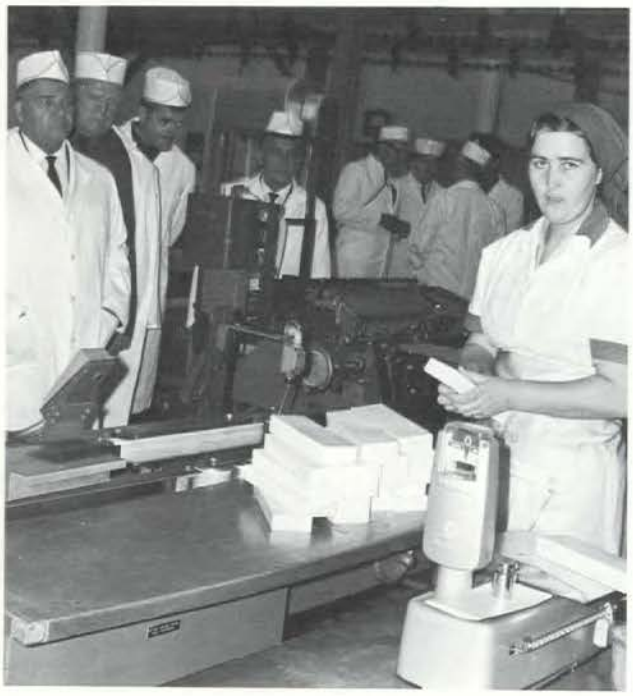
Dressed for the occasion for a visit to Niagara Falls, Ont.



Inspecting a new shipyard at Marystown, Newfoundland.



Peering into the hold of a stern trawler docked at Marystown, Nfld.



A modern fish processing plant at Marystown.



Watching processing operations at a Lunenburg plant.



Mr. Ishkov bends for a closer look at a fish while touring a Lunenburg plant.



Aboard the patrol vessel Cape Freels. With Mr. Ishkov is the Hon. Aidan Maloney, Minister of Fisheries for Newfoundland.

Russia Planning Automated Fishing

Completely automatic fishing vessels which could cruise and catch fish without a single person on board, under remote control from a mother ship miles away, are being planned by the the Soviet Union as part of its expanded fisheries program.

Plans for such crewless vessels for deep ocean fishing are described in the newly-published report of an international group fellowship seminar held in Moscow last year and arranged jointly by the Soviet government and the Food and Agriculture Organization of the United Nations.

Dr. N. Andreev, a Soviet fisheries expert, told the meeting the Soviet plans for expanding world-wide fishing operations envisioned the full use of automation aboard vessels to decrease the number of crewmen and increase labor productivity. To this end, the Soviet government eventually hoped to build experimental vessels that could be operated and navigated by radio and other tele-apparatus from a base ship stationed in the area. The vessels would be of various sizes, Dr. Andreev indicated, and would be equipped with the latest electronic gear for detecting fish down to depths of 2,500 feet, for the larger vessels, and to depths of 1,000 feet for the smaller ones. He did not say how many would be built or when the first would be launched.

Dr. Andreev said the project formed part of the general Soviet fisheries program which emphasizes larger fishing vessels capable of operating farther and longer at sea and of processing directly all fish caught.

Larger vessels, Dr. Andreev claimed, showed indisputable advantages over smaller ones. He said the Soviet Union would continue to emphasize oceanic fishing, which in 1965 accounted for almost 85 per cent of the total Soviet marine and inland catch and that further increases were planned for oceanic catches.

New Harbour Facilities

A $57,013 federal government contract for harbour improvements at Ferryland, Nfld., has been awarded to Glen Construction Co. Ltd., of St. John's, Nfld. Ferryland is a fishing community on the south shore of the Avalon Peninsula, 54 miles south of St. John's. The work consists of reconstructing the present timber pile wharf and constructing an 100 ft. by 36 ft. extension to provide additional space for handling fish.

Hold Training Courses in Fish Processing

Across Canada the federal Department of Fisheries, the provinces and industry are co-operating in a continuing program to improve the quality of fish products.

Recently, the Vocational Educational Division of the Province of Prince Edward Island, in co-operation with the federal Department of Manpower, and assisted by the federal Department of Fisheries, conducted two training courses in the principles of fish processing at the plant of Gulf Garden Foods Limited, Georgetown, P.E.I. The courses which each extended over three weeks, are designed to provide trained personnel for fish processing operations at Georgetown.

Bacteriologists and fish quality specialists from the Department's Fish Inspection Laboratory, Charlottetown, presented lectures on good fish plant sanitation and personal hygiene practices. They also conducted demonstrations on the identification of species of fish, grading fish for quality and approved methods of handling and processing, including icing, filleting and packaging of various fishery products.

Trawlers from U.K.

A third trawler for the new fishing base set up in Newfoundland by a joint company involving the Grimsby (Eng.) based Ross Group has left England with her emigrant crew.

The ten-man crew will join the 24 British fishermen who are already working from St. John's, Newfoundland, as the nucleus of crews aboard the *Ross Kelly* and *Ross Kipling*.

The 163 ft. *Ross Kartoum* will be the third of six Grimsby-based trawlers scheduled for transfer to St. John's, which is within a few hours' steaming of rich cod fishing grounds.

Ross Group and the Newfoundland fish processing concern of Steers Ltd. have set up the multi-million dollar operation which incorporates new processing factories on the quayside at St. John's. (British Information Services).



Federal Department of Fisheries Inspector W.E. Pierce (middle) of Souris, P.E.I.. demonstrates how fish are identified by species and how they are graded for quality during a training course in fish processing at Georgetown, P.E.I.

News Roundup

Midwater Trawling

The recent introduction of midwater trawling for herring off Canada's east coast has provided a striking demonstration of the effectiveness of the technique. As much as 30 tons of herring have been taken in a single haul of 30 minutes by a converted scallop dragger, the 102-foot *Lady Anna*, off the west side of Digby Neck in the Bay of Fundy.

The experiment has been carried out jointly by the federal Government and the Government of Nova Scotia, which chartered and converted the vessel. The project, which is continuing, is directed by W.W. Johnson, of the Industrial Development Service of the federal department, and is designed to test the feasibility of one-boat midwater trawling for herring. It is the first time that large quantities of this species have been taken by a Canadian trawler off the Atlantic coast, and the early success of the project is arousing the interest of the fishing industry.

Nearly all the catches have been made in the daytime, when the herring usually are too deep and dispersed for successful purse seining operations. The results are considered to be exceptional because the initial trials have been conducted on what are considered to be poor showings of fish, as identified by echo sounding, in comparison to the dense quantities required for good fishing by purse seiners.

During the last week of August the *Lady Anna* had a total catch of about 200 tons. The vessel fished mainly in depths ranging from 25 to 40 fathoms and with the net from one to 20 fathoms off the bottom.

The *Lady Anna* is a typical Nova Scotia scallop dragger, converted for this project to midwater trawling. She is a wooden vessel powered by a 765 hp diesel engine and rigged for stern trawling. The net is shot and hauled over the stern but the codend is emptied from the starboard side. When fishing, the midwater trawl measures about 70 feet in width, 40 feet in depth and 300 feet in length, and is spread by steel hydrofoil otter boards, each of which weighs close to 1,400 pounds.

Midwater trawling, using two vessels, was invented in Denmark and has been adopted by several other European countries. The one-boat midwater trawl was developed in Canada several years ago by Mr. Johnson. He also observed a number of herring trawling methods in Europe last year before the present federal-provincial project was undertaken.

Home Economist

Miss Odette Doucette has recently assumed duties as Home Economist for the Maritimes Region of the federal Department of Fisheries.

With headquarters at Halifax, Miss Doucette will be responsible for the operation of the department's experimental test kitchens and will provide public demonstrations of fish cookery throughout the Maritime Provinces.

Miss Doucette was born and educated in Dartmouth, receiving her degree of Bachelor of Science and Home Economics from Mount Saint Vincent College. She was previously a dietitian at the Royal Victoria Hospital, Montreal.



Miss Odette Doucette

Japan's Fisheries in 1966

Preliminary estimates show that the total Japanese catch from salt and inland waters in 1966 reached a new record volume of 7,076,000 metric tons, excluding whales. This was an increase of 3 per cent or 168,000 metric tons over the previous year's record high of 6,907,000 metric tons. The increase was due chiefly to larger catches of flounder, Alaska pollock and skipjack in the Pacific Ocean.

Of the total catch, 95 per cent or 6,717,000 metric tons came from the Pacific, 262,000 metric tons from the Atlantic Ocean and 98,000 metric tons from the Indian Ocean.

The total number of whales caught in 1966 fell by 16 per cent from that of the previous year, amounting to 22,784 (3,445 blue whale units). This decline was caused mainly by smaller catches of fin and sperm whales in the Antarctic, although the catch of sei whales continued to increase.

Pacific Fisheries

A wide range of topics of importance to Canada's Pacific coast fisheries were discussed at a recent meeting in Ottawa of the Federal-Provincial British Columbia Fisheries Committee. Dr. A.W.H. Needler, Deputy Minister of the federal Department of Fisheries, was chairman of the two-day conference attended by representatives of the Department, the British Columbia Department of Recreation and Conservation, and the Fisheries Research Board of Canada.

Recent revisions in federal Fish Inspection Regulations were reviewed by the Committee and agreement reached on the drafting of complementary provincial regulations.

The need for improved methods for the economic evaluation of the tidal sport fishery in British Columbia was emphasized, and several alternative systems will be examined. Proposed amendments to regulations governing the canning of sport caught fish were also discussed.

Consideration was given to a number of special projects proposed for the Pacific coast under the federal Fisheries Development Act, including oyster cleansing, offshore herring exploration and trawl gear experiments.

The Committee also received progress reports on aquatic plant industries on Pacific and Atlantic coasts, and heard a review of and discussed the operations of fishermen's loan boards.

Dr. D.B. Turner, Deputy Minister of Recreation and Conservation, headed the British Columbia delegation, which included R.G. McMynn, Director, Commercial Fisheries Branch, and E.H. Vernon, Chief Fisheries Biologist, Fish and Wildlife Branch.

Federal Government representatives included Dr. Needler, W.R. Hourston, Pacific Regional Director, Department of Fisheries, Vancouver, and K.R. Allen, Director, Fisheries Research Board Biological Station, Nanaimo, B.C. Also attending were senior officials of the Department and the FRB from Ottawa and the Pacific region.

Sport Fishing Survey

The 29th annual Salmon Derby sponsored by the Vancouver Sun was the occasion for a special sport fishing study by the federal Department of Fisheries in British Columbia.

It was estimated that 12,000 fishermen took part in the event on August 20, operating out of 4,600 boats. Field assistants of the Department interviewed some 1,400 participants and this was followed up by a questionnaire sent to 700 of those interviewed requesting information on costs and fishing success on Derby Day. A total of 317 questionnaires, or 42 per cent, was completed and returned.

On the basis of these returns it was calculated that the total amount of money spent on the Derby by the 12,000 fishermen participating was $143,000. Boat owner and operator expenses were estimated at $13.78 each, while the cost to other fishermen averaged $10.77. Boat operating costs, including rentals, gas, launching, etc., totalled $38,000. Fishing tackle purchased or rented was $46,000 with $11,000 spent on bait, $27,000 on food, $20,000 on other refreshment and $1,000 on accommodation.

A total of 408,000 miles was travelled by all fishermen, or an average of 34 miles per person. The total number of salmon caught – chinooks, cohoes, pinks and grilse – was estimated at 7,200 or an average of .6 fish per person.



The Department of Fisheries vessel *Marila* patrolling on Great Slave Lake, N.W.T. Built at Vancouver in 1955, the 45-foot vessel was shipped overland to Waterways, Alberta, to reach its base at Hay River.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-August, 1966		May-August, 1967	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	1,086,532	94,082	1,183,837	88,834
ATLANTIC COAST - Total	853,297	49,754	1,025,944	53,356
Cod	336,477	14,641	334,301	14,493
Haddock	35,176	2,499	36,182	2,176
Pollock, Hake, Cusk, etc.	32,656	1,174	28,693	950
Rosefish	85,804	2,372	71,892	1,880
Catfish	2,690	88	2,467	79
Halibut	2,023	645	1,888	690
Plaice & Other Flatfish	116,998	3,784	132,719	4,272
Herring & Sardines	156,805	2,215	337,505	3,591
Mackerel	15,806	554	14,539	546
Alewives	7,901	140	6,492	104
Salmon	5,143	2,506	6,105	3,283
Smelts	227	21	147	18
Swordfish	2,977	1,404	2,551	1,252
Other Fish	12,015	189	9,653	221
Lobsters	26,124	14,160	25,912	16,085
Clams & Quahaugs	2,954	170	3,194	205
Scallops	8,149	3,102	6,021	3,312
Other Shellfish	3,372	90	5,683	199
PACIFIC COAST - Total	233,235	44,328	157,893	35,478
Pacific Cods	14,885	1,255	7,070	577
Halibut (1)	29,693	10,632	18,950	4,746
Soles & Other Flatfish	5,367	342	3,831	265
Herring	46,206	776	22,338	382
Salmon	128,437	30,712	98,539	28,816
Other Fish	3,642	113	1,368	44
Shellfish	5,005	507	5,797	648
BY PROVINCES				
British Columbia	233,235	44,328	157,893	35,478
Nova Scotia	240,062	18,371	334,659	19,807
New Brunswick	139,012	6,070	187,880	6,188
Prince Edward Island	31,750	4,421	24,547	5,356
Quebec	85,000	4,626	124,317	5,343
Newfoundland	357,473	16,266	354,541	16,662

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

MID-MONTH WHOLESALE PRICES - AUGUST 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.378	.443
Cod fillets, Atl, frozen, cello 5's	lb.	.326	.383
Cod fillets, smoked	lb.	.420	.473
Haddock fillets, fresh, unwrapped	lb.	.484	.580
Herring, kippered, Atl.	lb.	.253	.337
Mackerel, frozen, round	lb.	.190	.267
Lobsters, canned, Fancy	Case 48-½ s	-	66.587
Sardines, canned	Case 100-¼ s	9.695	9.600
Halibut, frozen, dressed	lb.	.534	.530
Silverbright, frozen, dressed	lb.	.615	.640
Coho, frozen, dressed	lb.	.848	.863
Sockeye, canned, grade A	Case 48-½ s	27.430	28.400
Pink, canned, grade A	Case 48-½ s	16.497	17.123
Whitefish, fresh	lb.	.425 (1)	.443
Lake trout, frozen	lb.	.446	.523

(1) - Dressed.

PRICES PER CWT. PAID TO FISHERMEN

(Week ending August 12th)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	5	5
Yarmouth		
Haddock	8	-
Black's Harbour		
Sardines	2	2
St. John's Nfld.		
Cod	3.50-4	-
Haddock	2.75-4	-
Rosefish	2.5	-
Vancouver		
Ling Cod	8-10	8-16
Gray Cod	6-7.5	5-7.5
Soles	7-9.5	6-9.5
Salmon (Rdspg)	47-75	40-79

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF JULY

	1966 '000 lbs	1967 '000 lbs
TOTAL - Frozen Fish, Canada	99,443	97,211
Frozen - Fresh, Sea Fish - Total	73,596	68,532
Cod, Atlantic, Fillets & Blocks	24,181	12,861
Haddock, fillets & blocks	3,086	7,049
Rosefish, fillets & blocks	5,081	6,634
Flatfish, (excl. halibut), fillets & blocks	5,359	9,274
Halibut, Pacific, dressed & steaks	9,998	8,886
Other Groundfish, dressed & steaks	2,709	2,435
Other Groundfish, fillets & blocks	7,112	6,435
Salmon, Pacific, dressed & steaks	7,733	7,116
Herring, Atlantic & Pacific	363	669
All Other Sea Fish, all forms	4,038	4,538
Shellfish	3,936	2,573
Frozen - Fresh, Inland Fish - Total	6,085	9,335
Perch, round or dressed	460	(1)
Pickerel, (Yellow & Blue) fillets	138	1,118
Sauger, round or dressed	32	(1)
Tullibee, round or dressed	110	290
Whitefish, round or dressed	1,945	1,234
Whitefish, fillets	307	185
Other, all forms	3,093	6,508
Frozen - Smoked Fish - Total	2,077	1,814
Cod Atlantic	1,301	766
Sea Herring, kippers	445	551
Other, all forms	331	497
Frozen for Bait and Animal Feed	17,685	17,530

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

SALTED FISH STOCKS AS AT END OF AUGUST

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		28,142	37,284
Cod		22,904	33,044
Other		5,238	4,240
Dried - salted - Total		7,170	7,077
Cod		6,507	6,518
Other		663	559
Boneless - Total		608	419
Cod		553	375
Other		55	44
Pickled - Total	(barrels)	30,333	29,057
Herring	"	11,195	9,433
Mackerel	"	10,306	11,705
Alewives	"	8,832	7,919
Turbot	"	-	(1)
Bloaters	(18 lb. boxes)	206,295	304,830
Boneless Herring	(10 lb. boxes)	7,952	-

(1) Confidential

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY

(Value in Thousands of Dollars)

	1966 $'000		1967 $'000	
Total Exports		15,643		15,190
By Markets:				
United States		10,938		10,129
Caribbean Area		2,190		2,249
Europe		2,211		2,549
Other Countries		304		263
By Forms:				
Fresh and Frozen		10,967		9,872
Whole or Dressed	3,148		2,526	
Salmon, Pacific	1,179		993	
Halibut, Pacific	620		392	
Cod, Haddock, Pollock, etc.	33		23	
Swordfish	158		137	
Other Seafish	362		373	
Whitefish	211		162	
Pickerel	189		131	
Other Freshwater Fish, n.o.p.	396		315	
Fillets	4,615		4,648	
Cod, Atlantic	1,321		1,288	
Haddock	829		784	
Rosefish, Hake, Pollock, etc.	312		422	
Flatfish	1,077		921	
Pickerel	40		143	
Other	1,036		1,090	
Shellfish	3,181		2,639	
Lobster (Alive & Meat)	2,269		1,753	
Other	912		886	
Frozen Fish & Shellfish, pre-cooked	23		59	
Cured		2,342		2,185
Smoked	140		101	
Herring	81		38	
Other	59		63	
Salted, Wet & Dried	2,012		1,797	
Cod	1,756		1,473	
Other	256		324	
Pickled	190		287	
Herring	152		195	
Mackerel	8		84	
Other	30		8	
Canned		646		1,912
Salmon	139		1,399	
Sardines	365		455	
Lobsters	105		6	
Other	37		52	
Miscellaneous		1,688		1,221
Meal	1,023		784	
Oil	37		246	
Other	628		191	

Current Reading

SHARKS, SKATES AND RAYS edited by Perry W. Gilbert, Robert F. Mathewson and David P. Rall (The Johns Hopkins Press, Baltimore. Distributed in Canada by Copp Clark Publishing Co. Price: $15).

This book is a sequel to a symposium entitled "Current Investigations Dealing with Elasmobranch Biology" held at the Lerner Marine Laboratory, Bimini, Bahamas, early in 1966. The 39 papers presented and discussed at the symposium have been put together to form the 624-page volume.

The sharks, skates and rays are elasmobranch fishes that belong to the group *Chrondrichthyes*, all characterized by the possession of a cartilaginous skeleton, dermal placoid scales and separate gill slits.

Of the group, sharks are the most important from the biologist's point of view as they have served in increasing numbers as experimental animals to resolve problems related to the biology of the higher vertebrates, including man, and have contributed greatly to our knowledge of kidney function, pharmacology and immunology.

The papers given at the symposium cover such aspects of elasmobranch biology as evolution, shark tagging, social organization of shark populations, osmoregulation, identification of fish by biochemical means, the teeth of sharks, biochemistry and physiology of the nervous system, dark adaptation, electric organ physiology, drug metabolism, and immunization and immunochemistry. Together they provide a comprehensive compendium of present knowledge of elasmobranch biology.

SONAR IN FISHERIES – A FORWARD LOOK by D.G. Tucker. Fishing News (Books) Ltd., London, Eng. Price $5.75.)

This book follows logically from the volume *Underwater Observation Using Sonar* produced by Professor Tucker in 1966, in which he outlined in simple language the basic principles on which sonar is based.

The aim of the latest volume is to enlarge understanding of the possibilities inherent in advanced sonar technology, particularly in relation to narrow-beam sector scanning, but more generally also with a view to obtaining more information about what is in the sea, at longer ranges and with finer detail, and with smaller and cheaper electronic equipment.

This book represents an extended and somewhat more technical treatment of the subject than that given in his previous volume; but the technical material has been kept simple and to and to some extent isolated from the purely descriptive material. The author has taken much trouble to describe in simple terms the points he is making rather than using the mathematical and often abstract terms of modern engineering. This adds clarity to the explanation but it does not remove the need for suitable mental effort to fully appreciate the instruction and guidance given.

It contains numerous diagrams and photographs.

FISHERIES YEARBOOK & DIRECTORY 1967-68. British-Continental Trade Press Ltd., 222 Strand, London, W.C.2. Price 40 shillings.)

This year's edition of the popular Fisheries Yearbook and Directory contains enlarged sections of many of the regular features, including those on fishing vessel construction and equipment, processing of fish, research in fisheries, and fish preservation and handling. This issue also includes chapters on such topical subjects as the mechanical handling of fish on board ship and the transport of fish by air.

The reference section contains the Fish Supply Calendar, Dictionary of Fish Names in eight languages, organizations and trade associations in the industry and related trades, and lists specialized publications.

The World Directory contains particulars of nearly 6,000 companies engaged in fishing, processing and distribution of frozen and canned fish and other seafoods, suppliers of fishing vessels, machinery, equipment and materials used in the industry, as well as a classified Buyers Guide for all types of fish. The World Survey gives facts and figures on fish catches, exports, imports, consumption and developments.

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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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In This Issue

- Conference Discusses Future of FPC
- Straight Baseline Policy Announced

Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
(formerly Trade News)

Editor
E. H. HEARNDEN

December 1967

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COVER PHOTOGRAPH - A bird's eye view of the second salmon spawning channel at Seton Creek, B.C., which was officially opened recently. Built by the International Pacific Salmon Fisheries Commission at a cost of $250,000, the new channel is 20 feet wide, 9,800 feet long and has a capacity of 21,000 pink salmon. It is the latest in a series of projects designed to preserve the Fraser River sockeye and pink salmon runs which this year produced $41,000,000 worth of canned salmon.

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Conference Discusses Future Uses Of Fish Protein Concentrate

THE POSSIBILITY of a break-through in the commercial production of fish protein concentrate in Canada was envisaged by federal Fisheries Minister H.J. Robichaud, when he officially opened a conference on that product October 24-26 in Ottawa. Sponsored by the Federal-Provincial Atlantic Fisheries Committee, the conference drew over 250 participants from the fishing and food processing industries and government agencies.

Mr. Robichaud said he was impressed by the way the Committee was approaching the development of fish protein concentrate, better known as FPC. The idea of bringing together research people, processors and ultimate manufacturers, he said, made common sense.

Dr. A.W.H. Needler, federal Deputy Minister of Fisheries and General Chairman of the conference, said that serious consideration of FPC development was needed not only because the world's need for increased supplies of animal protein was becoming acute, but also because there was a growing fishery in Canada for species such as herring for reduction purposes. The conference, he said, was not primarily to promote FPC but to explore its potential and assess its development from the standpoint of the fisheries and the world's nutritional needs.

The conference attracted nutrition experts, food processors and fishery specialists not only from all parts of Canada but from the United States and Europe, as well as representatives of the FAO/WHO/UNICEF Protein Advisory Group, from New York and Rome.

Twenty-two papers were presented at the conference covering six main topics: the world protein situation, Canadian raw material resources, processing technology, standards of FPC, development of the industry and markets for the products.

The place of fisheries in plans for battling malnutrition was defined in papers by Dr. R. Kreuzer and R. Hamlisch of the Fisheries Department of the Food and Agriculture Organization of the United Nations, Rome. Mr. Hamlisch, in his references to fish protein concentrate (FPC), said that while it is recognized that the greatest potential markets are in the developing countries, much of the impetus of protein concentrate development work comes from the interests of the industries of developed countries. Fishermen are concerned about flagging demand for their traditional production, and food processors want inexpensive ingredients for the manufacture of a large variety of food products.

The introduction of FPC in developing countries can be achieved, said Mr. Hamlisch, by foreign aid, foreign commercial sources, or from domestic producers producing with or without government subsidies. He said, however, that feasibility studies must be carried out in the countries to be assisted and it must be made certain that food supplies are used in the most advantageous manner. Mr. Hamlisch said that most pioneers in FPC development are skeptical that there will be sizeable commercial markets in developing countries in the more immediate future.

Mr. Hamlisch quoted a leading South African scientist, who recently stated: "South Africa has produced and used for human consumption about 2000 tons of fish flour, and is the only country in the world to have produced and used more than 1000 tons of fish flour for human consumption. It is the only country to have actually sold fish flour on the open commercial market. It seems very doubtful to me, however, whether there will be sufficient demand for this product in the economic sphere. It can be used to feed the most needy malnourished babies and children of under-privileged parents only by subsidization by

government or charitable organizations or by industries employing such sections of the population."

The manner in which problems of malnutrition in many developing countries are being met was outlined by Dr. Z.I. Kertesz, New York, Secretary of the FAO/WHO/UNICEF Protein Advisory Group, which has been assigned a significant role in plans for intensified work to provide more cheap, nutritious and acceptable protein foods to the millions in need of improved protein diet.

L.D. Hudon, Assistant Director General of Canada's External Aid Office, said fish protein concentrate has a potential that, if realized, would make a basic contribution to the efforts of the developing countries to satisfy minimum nutritional needs. Remarkable advances have been made in refining FPC production and thereby lowering production costs in the past two or three years, and this continuing research will be followed closely by the External Aid Office.

AVAILABILITY OF FISH

Availability of raw materials will not be a limiting factor in the development of a Fish Protein Concentrate industry in Canada, according to Dr. W.R. Martin, Assistant Chairman of the Fisheries Research Board of Canada.

The world catch of aquatic products has doubled during the last decade to a current annual yield of more than 50 million metric tons, and even the most conservative biologists predict that landings can double again by the end of this century, Dr. Martin said. An aggressive fisheries development program should enable Canada to double its present level of annual production (approximately one million tons) within the same period.

The Northwest Atlantic Ocean, with its huge continental shelf, offers the greatest opportunities for steadily increasing landings, and expansion is also anticipated in the Northeast Pacific. The FRB scientist said the potential is "great" for expanding production of small fishes, particularly herring, capelin and sand-launce. Annual landings of Atlantic herring have sharply increased to more than 400 thousand tons, and further expansion appears certain. Abundant also are such under-exploited species as silver hake, capelin, argentines, grenadiers, dogfish, squid and lantern fish.

Foreseeing little prospect of substantial increases in production of cod and other large species, Dr. Martin was confident that exploitation of new resources should not seriously affect the availability of raw materials for traditional fisheries. Costs of raw materials for FPC production can be kept to a minimum by using inshore resources which are now exploited for fish meal, and by saving the trash fish currently discarded by trawlers, he suggested.

The fishing industry of Canada is keenly interested in the possibility of the development of a fish protein concentrate commercial operation, stated E.L. Harrison, vice-president of British Columbia Packers Ltd. of Vancouver, and a director of the Fisheries Council of Canada. The industry believes that the raw material for FPC production is available in quantity – some at fairly reasonable cost – and that an economical manufacturing process can be developed, but that the market is not yet defined.

Mr. Harrison noted that the nations in the greatest need of protein are those least able to pay for it, and least likely to buy it. There would be a vast difference between the problems of creating an industry to maximize the production of protein from the sea as part of an aid program, and the establishment of an industry which must seek its own way to a profitable market amidst world competition, he suggested.

A. Cunningham, President of Atlantic Fisheries By-Products Association, Halifax, N.S., felt that a satisfactory and acceptable FPC product could be manufactured from fillet trimmings of cod and haddock by cooking, sterilization, separation, drying and refining, without the use of solvents.

He said that some leading authorities contend that a good quality "white fish meal" produced from fresh raw material to food factory standards should meet the general requirements of food for human consumption. The price of the product when worked out would presumably be lower than that of products made from whole fish. At the same time Mr. Cunningham said he was not implying that other satisfactory and wholesome FPC could not be made by other species of fish that are filleted, such as pollock, hake, cusk, redfish, catfish, flounders and soles.

SPARKED INTEREST

A report issued by the Military Government in Germany in 1945 was responsible for stimulating the interest of Canadian fisheries scientists in developing what is known as the Halifax Process for production of fish protein concentrate. Dr. D.R. Idler, Director of the Halifax Laboratory of the Fisheries Research Board of Canada, said the report described the preparation of a synthetic egg white from codfish and shrimp.

Dr. Abraham Guttman, the man responsible for this important beginning, went on to lead further research in the early 1950's to develop a defatted and deodorized fish protein concentrate suitable for human consumption. Scraps from the commercial filleting of cod were used to produce a tasteless and odorless product, and by 1958 the process was adapted to a pilot plant scale, and some improvements were effected. The process was later modified for application to fatty fish species.

Using the Halifax process, FPC has now been prepared



The Hon. H.J. Robichaud, federal Minister of Fisheries, addresses delegates at the opening of the Fish Protein Concentrate conference in Ottawa. Seated at the head table are, left to right: R. Hart, conference general secretary; L.S. Bradbury, chairman of Conference Co-ordinating Committee; Dr. A.W.H. Needler, general chairman, Maurice Lessard, Brian Meagher, Dr. Leonce Chenard, Eugene Gorman and Eric Gosse, respectively Deputy Ministers of Fisheries for the provinces of Quebec, Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland.

from cod fillets, filleting line scraps, cod filleting line scrap press cake, whole cod, whole capelin, whole skate and whole dogfish. All these products are of satisfactory colour, flavour and odour. Since 1961, approximately 300 samples of FPC have been supplied to universities, food manufacturers, pharmaceutical companies, formulators of animal rations, government agencies and others.

Projections on production costs of products made by the Halifax Process were given by H.E. Power of the Halifax Laboratory, which had commissioned a cost study of FPC production. The lowest cost per pound, based on 1966 building material costs in the Halifax area, was estimated at 17 cents. This could be achieved in a plant able to handle 75 tons of raw material per 24 hours, based on a total production of 5.85 million pounds of FPC. The total yearly charges and capital outlay for such a plant would be $996,910 and $1,305,440 respectively. Costs in smaller plants would range upward of 30 cents per pound.

Donald G. Snider, of the College Park, Maryland, Laboratory of the U.S. Fish and Wildlife Service spoke of the work of the U.S. Commercial Fisheries in solving the problems of FPC manufacture. He briefly outlined the Bureau's research and engineering program to this end, and said that the prize for a final solution would be rewarding beyond the reaches of imagination.

The story of the "exciting development" of fish protein concentrate processing methods has only started to unfold, and the field is wide open for new ideas and revolutionary concepts, said Dr. E.R. Pariser, Chief Scientist and Director of Engineering, Division of Marine Resources, Avco Corporation, Wilmington, Mass., Dr. Pariser reviewed various physical, biological and chemical processing methods which have been used in FPC manufacture.

Chemical solvent extraction processes have so far attracted the greatest general attention and prompted the most numerous process designs. Among the major processes developed to date, Dr. Pariser mentioned that of the Halifax Fisheries Research Laboratory on which much of the subsequent work has been based, the process developed by E. Levin of VioBin Corporation of Illinois, and the work performed by the U.S. Bureau of Commercial Fisheries which gained approval from the Food and Drug Administration for the production and sale of FPC made from whole fish. Other processes outlined were developed in countries of Europe, Africa and North and South America.

In touching upon the history of FPC experimentation, Dr. Pariser noted that the attempt to produce protein concentrate from fish for human consumption is by no means a new idea. In 325 B.C., Alexander the Great came upon a people called the "Fish Eaters" whose food consisted largely of flour ground from sun dried fish.

High quality protein made from fish could be incorporated into a number of convenience foods to increase their nutritional values, reported Dr. B. Weinberg of the Food Products Branch, Department of Industry. These would include baby foods, pro-

cessed meat products, cereal products and dried food mixes such as soups, desserts, and diet meals.

"The limited past experience indicates that various food products could usefully contain between 1% and 10% FPC, while the maximum seems to lie around 20%."

Assuming a maximum wholesale price at 25 to 30 cents per pound, at a minimum protein content of 80%, FPC would be cheaper than other animal proteins at the present time. However, at these values FPC would also have to compete with oilseed proteins and possibly with cereal proteins, fortified with synthetic amino acids. Dr. Weinberg said that at the given price levels, an initial market, mainly in Canada, of up to 3,000 tons a year was well within reason.

Dr. Weinberg suggested that there was no sufficiently large market for FPC to warrant the expenditure on a plant exclusively manufacturing this product. As an alternative, an intermediate fish meal or fish flour should be made, to be sold as a specialty animal feed supplement, and whenever the market warranted it this intermediate product could be further extracted to make FPC.

USE IN CEREAL BLENDS

Mandatory action by government to fortify cereals with fish protein concentrate is needed before a market can be developed for human use of FPC, a U.S. food corporation executive contended. Ezra Levin, President and Director of Research for for VioBin Corporation, Monticello, Illinois, suggested the use of FPC in cereal blends shipped from the "have" nations to the "have not" nations to meet their protein needs.

Mr. Levin said his firm has been producing FPC for many years, sending it to all parts of the world for controlled experiments with children and adults. He produced samples of FPC made from three oily fish species, herring, anchovies and menhaden, and stated that plants can be erected to produce FPC from herring to be sold at a fraction of the cost of milk protein. There is an unlimited demand for such a product to replace milk in feeding young animals, he added.

He predicted that plants capable of producing 250 tons of FPC daily will be in operation in 1968 to 1969, producing FPC for animal use until a market develops for human use of the product. All species of fish can now be processed into FPC, and any animal life that lives in the sea can be dehydrated, defatted and deodorized, Mr. Levin said. "FPC can be added to a host of foods in any country in the world. It cannot be detected by the consumer in the small quantities supplementing grains that will provide a quality of protein in the total mixture equal to milk or meat itself."

An FPC plant can be built in Canada within 12 months after a commitment to buy its production is made, at a cost that would be liquidated in four years, if the product is sold for less than one-half the cost of milk. This product would be a complete nutritional replacement for milk protein, Mr. Levin stated.



A section of the lobby display at the conference, with pictures showing the nutritional effect of FPC.

FUTURE OF INDUSTRY

The development of a fish protein concentrate industry in North America, in spite of technological, political and social problems associated with the manufacture and acceptance of the product, was seen as a certainty by Dr. W.M. Chapman, Director of the Division of Resources of the Van Camp Sea Food company of San Diego, California. In Dr. Chapman's absence, his paper was submitted by R. Hart of the Federal Department of Fisheries.

Dr. Chapman said that any prediction of the future of fish protein concentrate (FPC) was somewhat complicated in the United States by the fact that at present there is no such product available for sale and also by the fact that much of what has been written and spoken on the subject could be characterized as "balderdash".

Dr. Chapman stated that fish meal producers in the United States, whose business is most closely comparable to FPC production, have shown no interest at all in investing in plants to make FPC, presumably because they saw no reasonable chance of normal profit from it. Moreover, the dried skim milk industry in the United States "seems almost desperately frantic in its activities to prevent the use of fish protein concentrate for direct human consumption."

Dr. Chapman's own view was that a commercial market

for FPC will develop first in North America and will spread from there to the less developed countries. "I believe that this will grow gradually into a market that will dwarf the traditional edible fish market in size and consumption of raw material eventually, and that this will get started nicely within the next five years in North America", he said. "I also believe that this product will move into the market occupied by dried skim milk, despite the best efforts of that industry to prevent it, and that it will do little if any economic damage to that industry in the process."

Samples of fish protein concentrate have successfully undergone intensive testing for wholesomeness conducted by the United States Bureau of Commercial Fisheries, according to Professor Leo Friedman of the Department of Nutrition and Food Science, Massachusetts Institute of Technology.

The nutritive value of FPC has been studied in great detail, and in tests of protein efficiency has consistently been as good as, or better than, casein (milk protein). It can effectively supplement vegetable proteins so that the protein quality of FPC-cereal mixtures is equal to that of animal protein. Short-term nutritional studies have produced no evidence of the presence of potentially harmful substance in the new product.

Professor Friedman described experiments in which weanling rats and mice were fed for 28 days on a diet consisting of 50 per cent fish protein concentrate and FPC extracts. Intensive examination of the animals revealed no biologically active substance (i.e., those harmful to health) had been detected. To establish confidence in the results of the extract feeding experiment, a full-scale lifetime, multi-generation study of the hake FPC in rats and mice was also underway.

WHOLESOME, SAFE

The Food and Drug Directorate of Canada's Department of National Health and Welfare is satisfied that fish protein concentrate can be made from whole fish, and that such a product can be wholesome, nutritious and safe, according to Dr. D.G. Chapman, the Directorate's Assistant Director General (Food).

He prefaced his remark by saying that in Canada, as in the United States, the presence of the viscera, intestines and other portions of fish that are not normally used in the preparation of a food for human consumption was at one time considered to be objectionable to some people. That section of the Food and Drugs Act which states that no person shall sell any article of food that consists in whole or part of any disgusting material has been pointed to as being the authority under which the sale of a food containing these portions of the fish could be prohibited. However, the current thinking of officers of the Food and Drug Directorate is that it is possible to manufacture FPC from whole fish which would not be in violation of the section he referred to.

Dr. Chapman said an amendment will be needed to one section of the Food and Drug Regulations which says in effect that fish preparations are adulterated if any organ or portion of the fish is present which is not commonly sold as an article of food. Certain portions of some fish suggested for use in the preparation of whole fish protein concentrate are 'not commonly

A Revolution in Eating Habits

Food habits in the United States are in a swirling change that is little short of revolutionary, Dr. W.M. Chapman, a U.S. food company executive, told the Fish Protein Concentrate conference in Ottawa.

The change, Dr. Chapman said, is from natural to formulated foods. "The standard diet item of United States children is a hamburger and milkshake. Both are formulated foods. This is only the beginning of things to come," he went on.

"Ice cream and cheese-type foods, TV dinners, prepared meals of all sorts in the frozen food locker, canned meals and a whole host of such atrocities are taking over the United States dinner table, and for breakfast and lunch purely formulated foods that were originally marketed for diet faddists are crowding out cereal breakfast foods and ham and eggs. Cakes, cookies and such things come in packages that you mix with a liquid and pop into the oven for a bit, and increasingly the whole thing is already done for you in an aluminum throwaway pan. It may not thrill the gourmet but it is filling, nutritious and easy to prepare."

Convenience, appearance, texture, taste and fragrance are what sell foods, said Dr. Chapman. "But having said all of this I must admit that the resulting diet upon which my children subsist is better balanced nutritionally than the one on which I was raised, or than most people in the world dream of."

It is this growing market for formulated, nutritionally well balanced foods into which he thought fish protein concentrate would naturally flow.

sold as an article of food', but no difficulty is foreseen in making an appropriate amendment to this section to exclude whole fish protein concentrate.

Referring to United States procedure, Dr. Chapman said that in that country the Food and Drug Administration, in its clearance of whole fish protein concentrate, handled it as a food additive. In Canada, he explained, the machinery for the handling of food additives has been established in the Food and Drug Regulations, and he added: "I do not feel that whole fish protein concentrate should be considered to be a food additive. Rather, I feel that it should be considered to be a food or food ingredient in its own right,"

Those attending the conference heard Dr. A.B. Morrison, Director of the Food and Drug Directorate's Research Laboratories, outline the type of data the Government would like to see with regard to the safety of whole fish protein concentrate when it is considering such a product for human use.

Referring to Dr. Morrison's paper, Dr. Chapman explained: "We are just as interested as those who are more closely associated with the fish industry in assisting in every way that we can in making available, with as little delay as possible, a safe and nutritious whole fish protein concentrate to any who may wish to use this food item."

The Directorate would like to have available an outline of conditions under which processing is to be carried out, and would also like to know what species of fish are to be used and what materials, such as solvents, will be used in the processing of the final product.

"When whole fish protein concentrate becomes available and has been cleared for use in Canada, it may be added to unstandardized foods and listed among the ingredients declared on the label." Dr. Chapman continued. "If it is intended to be used in a standardized food, it will be necessary to submit to the Directorate a request to amend the standard to provide for its use. While, generally speaking, standardized foods are not required to carry a list of ingredients on their labels, the Directorate will be exploring the desirability of requiring a declaration of whole fish protein concentrate on standardized foods."

QUALITY GUIDELINES

Some guidelines in the formulation of a quality standard for FPC were suggested to the conference by H.V. Dempsey, Director of the Inspection Service of the federal Department of Fisheries. While toxic factors must be taken into account in any standard once agreement on content has been reached, he said, any comprehensive standard for the manufacture, storage and distribution of FPC should include appropriate hygienic and sanitary provisions similar to those which apply to any other food product. Mr. Dempsey listed the chemical properties of significance in FPC products made from various species of fish and in view of storage possibilities and other factors. He said, too, that any standard for FPC should include a provision for protein value in view of the wide variations in values which reflect different manufacturing processes.

Mr. Dempsey thought that an international standard for FPC would be desirable, and might well be developed by the Joint FAO/WHO Codex Alimentarius Commission which is, at present, actively engaged in preparing world-wide standards for a large number of agricultural and fisheries products.

A paper on marine biotoxins was presented by Dr. Ross F. Nigrelli, Director, New York Aquarium and Osborn Laboratories of Marine Sciences, Brooklyn, N.Y.

Many of the basic problems of fish protein concentrate production are being solved, and the problems of marketing the product at an acceptable price to consumers and in sufficient





Cookies and sandwiches containing amounts of FPC were available to delegates attending the conference.



Federal Fisheries Minister H.J. Robichaud was host at a reception for conference delegates held in the Confederation Room of the West Block, Parliament Buildings, Ottawa.

quantity to support a commercial operation are due for serious study, stated C.D. Holder, engineering economist with Resource Engineering of Canada Ltd., Toronto. Mr. Holder reported on a solvent-extraction process developed by the United States Bureau of Commercial Fisheries.

The assessment, assuming Canadian costs and conditions for harvesting, processing and marketing of FPC, indicated the "inherently attractive economics of FPC as a basic protein source," Mr. Holder said. The single most critical cost factor governing the production cost was the landed cost of fish. A comparison of the estimated consumer cost of FPC with sample Canadian consumer costs for other high-protein foods showed that FPC is potentially a very economic source of animal protein.

Some benefit may be attained if Canada's first commercial fish protein concentrate plant is integrated with an established fishing and fish-processing operation, engineering consultant A. Carsten of Surveyer, Nenniger and Chenevert, Inc., Montreal, suggested in a paper dealing with engineering aspects of commercial FPC production.

A meal plant located close to the FPC plant would be "almost essential" for the disposal of surplus raw materials. FPC production facilities, moreover, could permit considerably improved utilization of fishing vessels by retaining trash fish on groundfish trawlers, by employing herring seiners in off-seasons to go out for specific species, and by adapting small boats to fish immediately offshore. Use of these fishing facilities would also assure the FPC plant of a reasonably steady supply of raw material.

Solvent recovery and purification systems are among the major engineering aspects of FPC production to be studied, Mr. Carsten noted.

The nutritive values of various cereal foods can successfully be enhanced by significant amounts by supplementation with fish protein concentrate without detrimental effects on other characteristics, reported Dr. John Holme of Ogilvie Flour Mills Co. Ltd., Montreal.

While at the present state of development, immediate application of FPC in the cereal industry for the domestic market is limited, "definite possibilities are present for further refinements" to make the product more suitable, Dr. Holme said. This situation is no different than that faced by suppliers of many other pretein materials in the past, he added.

The potential applications of FPC in foods which would



Informal study sessions interspersed addresses and discussions at the FPC conference.

be acceptable and would provide added protein of high essential amino acid content were represented in sample products containing two to ten per cent FPC exhibited to conference delegates. These included bread containing two per cent FPC, macaroni with five per cent FPC, and various bakery products including cookies, brownies, cakes and puddings.

Dr. Holme mentioned the possibility of developing new cereal food products incorporating FPC: "Pasta products could be modified in texture to more closely resemble rice; porridges and gruels could be precooked and flavoured in an acceptable way; drink powders could be prepared of high nutritive value and favourable taste." The industry's development possibilities could also increase with a change in eating habits of people to cereals other than rice.

Tagged Beluga Travels 500 Miles

The first positive indication that the white whales of Hudson Bay travel great distances has been obtained by the capture of one of them at Repulse Bay, about 500 miles north of where it had been tagged. This at least partly clears up a marine mystery which has hampered efforts of the Fisheries Research Board of Canada to determine what recommendations to make to those concerned with the exploitation and survival of the white whales, or beluga, of arctic and subarctic regions.

Until now scientists, who need to know whether the populations of beluga are purely local or whether they intermingle and move up and down the coast and deep into the Bay, had no means of finding this out except by guesswork based on such uncertain factors as the size of the animals and limited observations of their movements from aircraft.

Late last July Dr. D.E. Sergeant of the Research Board's Arctic Biological Station at Ste. Anne de Bellevue, Quebec, organized a tagging expedition to the estuary of the Seal River, 30 miles north of Churchill. About 150 white whales were tagged, some by special harpoons which could be withdrawn when the tag had been affixed to the hide of the animal, others by tags attached by hand to the dorsal muscle after the beluga had been driven into the shallows, where they could be held by ropes during the tagging operation.

The recovered tag, one of the harpoon type, was taken from a beluga captured in a net by an Eskimo hunter three miles from Repulse Bay, showing that it had travelled about 500 miles in two months, moving in a northwesterly direction. This tends to confirm the previously held belief of Dr. Sergeant and other scientists that beluga of the Eastern Arctic spend the winter in western and northern Hudson Bay, moving south in the summer.

Straight Baseline Policy Announced For Canada's Fishing Zones

ESTABLISHMENT of straight baselines along the coast of Labrador and along the eastern and southern shores of Newfoundland, which will have the effect of extending Canada's territorial sea and fishing zones in that area, was announced October 26 by the Hon. Paul Martin, Secretary of State for External Affairs.

Mr. Martin stated that the Government intended issuing lists of geographical co-ordinates establishing straight baselines for other sections of Canada's coastline within a matter of weeks.

The full text of Mr. Martin's statement to the Standing Committee on External Affairs at its meeting of October 26, 1967 on the Law of the Sea is as follows:

"The Committee will recall that on July 15, 1964 a law was enacted respecting the Territorial Sea and Fishing Zones of Canada. The main effect of this legislation was to create, beyond the already existing three-mile territorial sea off the shores of Canada, a further nine-mile zone within the limits of which Canada would exercise exclusive fishing rights. This legislation was, of course, immediately enforced, the twelve-mile zone having as its inner limits the sinuosities of the coast line of Canada, except for certain bays, such as those of Newfoundland, which were already part of Canadian internal waters. The only exceptions that were made to this general Canadian jurisdiction were in favour of certain European countries and the United States of America whose fishermen had for a substantial number of years, and in certain cases for centuries, been exercising their activities within the zones described in the 1964 legislation.

"It was then decided, and Parliament was informed of this decision, that pending the termination of negotiations with the countries involved, the fishermen of these countries would be allowed to continue the activities they had been carrying out previously in those areas where they had traditionally fished.

"At the same time, however, the 1964 Act provided that the Governor-in-Council, and I quote Section 5, paragraph 1, of the Act:'may, by Order-in-Council, issue one or more lists of geographical co-ordinates of points from which baselines may be determined and may, as he deems necessary, amend such lists'. The effect of that section was that the Government was empowered to establish along the coasts of Canada a system of straight baselines which would, in those areas where they were proclaimed, replace the sinuosities rule. This process would permit an extension of the internal waters of Canada and, by consequence, an extension of the territorial sea and fishing zones of Canada.

BILATERAL NEGOTIATIONS

"The Canadian Government entered into a series of bilateral negotiations with those countries that would eventually be effected by any such establishment of baselines to ascertain whether or not the proposed straight baselines would be acceptable to them from the point of view of International Law. Although the drawing of straight baselines is a matter that can only be undertaken by Canada, such a system cannot be implemented unless it is carried out in accordance with the applicable rules of International Law. Thus if Canada could obtain the agreement of countries most directly affected, there could be no doubt that the application of the system of straight baselines would be legitimate in the eyes of the world community. If, on the other hand, such agreement could not be obtained, implementation by Canada could give rise to protests and possibly to international litigation.

"These questions were discussed with seven European countries, namely, the United Kingdom, Norway, Denmark, France, Portugal, Spain and Italy and with the United States of America. It will be recalled that on a number of occasions the Minister of Fisheries and I have explained some of the difficulties relating to these negotiations. I am now in a position to report further on this matter and to indicate the action that the Canadian Government now proposes to take.

"Within the next few days, the Government will issue a first list of geographical co-ordinates of points, which will permit the immediate enforcement of a straight baseline system along the coast of Labrador and along the eastern and southern

shores of Newfoundland. This will be only the first such list that the Government intends to issue within the next few weeks. Other lists will follow for other areas.

"The main reason for beginning to implement this policy in Labrador is that the coast of Labrador is the one that most readily lends itself to an application of the rules of International Law as they are laid down in the 1958 Convention on the Territorial Sea and Contiguous Zones and in the decision of the International Court of Justice in 1951 in the Anglo-Norwegian Fisheries case. As a matter of fact, the configuration of the Labrador coast is similar to that part of the Norwegian coast line that was the subject of the International Court decision of 1951.

"As to the eastern and the southern coast of Newfoundland, the members will recall that the Canadian Government committed itself in 1949, under the terms of the Union of Newfoundland and Canada, to preserve the historical internal character of the bays of Newfoundland. Although this commitment has already been fulfilled in practice through the assertion of our exclusive rights over these bodies of water ever since 1949, there have been, thus far, no special provisions made in our legislation to cover this situation. From now on, all bays of Newfoundland will clearly and definitely be defined as internal waters of Canada.

"The intended line along the Eastern and Southern coasts of Newfoundland will be a continuous one with only one exception – in the vicinity of the French Islands of St. Pierre and Miquelon, pending a definitive settlement of the demarcation line in that area between the two countries. This question is now the subject of negotiations with France.

"As I mentioned, further lists of co-ordinates will shortly be issued. Our negotiations concerning closure of various bodies of water off our coasts have continued. I also wish to inform the House that the Canadian Government is at present discussing with other countries possible additional means of protection for coastal fisheries, looking to the eventual establishment of a rational regime of conservation and exploitation of the living resources of the sea through which coastal states would receive greater protection; under such a regime, it should also prove possible to provide for the interests of long distance fishing fleets.

"I hope to be in a position to make an announcement on this matter in a few weeks time. I will be tabling an appropriate Order in Council in the House of Commons."

Shrimp Survey in B.C.

An assessment of commercial shrimp potential in three areas along the continental shelf of British Columbia was completed recently by scientists of the Fisheries Research Board of Canada in co-operation with the Industrial Development Service of the federal Department of Fisheries.

During a 68-day period ending September 9, the motor vessel *Ocean Traveller* under the command of Capt. Frank Gale, surveyed grounds in southern Hecate Strait, Queen Charlotte Sound and the east coast of Vancouver Island.

Using a 70-foot heavy duty semi-balloon Gulf of Mexico shrimp trawl with plastic roller ground line, the *Ocean Traveller* made 145 tows averaging 30 minutes. The most promising area was in Queen Charlotte Sound off Pearl Rocks. Working in a depth range of 70 to 105 fathoms, the catches averaged 300 pounds of mixed shrimp, 95 per cent smooth pink averaging 134 to the pound.

A small area off Kains Island near the entrance to Quatsino Sound produced good results – as it did in 1954 and 1964. The tows averaged 335 pounds of shrimp – 87 per cent smooth pink at 77 shrimp to the pound, and 13 per cent side-striped at 32 shrimp to the pound.

U.S. Research Vessel

The *Miller Freeman*, largest and most modern of the U.S. Bureau of Commercial Fisheries research vessels was recently commissioned in Seattle, Washington.

The $4 million, 215-foot vessel, assigned to the BCF regional office in Seattle, will range over the North Pacific Ocean and the Bering Sea, collecting scientific information on groundfish (flounders, halibut, cod, and other species), ocean distribution of salmon, and oceanography. Quarters aboard the vessel accommodate 10 scientists and a crew of 26. The *Miller Freeman* has a cruising range of 13,000 miles at speeds of 14 to 15.5 knots, and her displacement is 1,782 tons.

Among the unique features incorporated in the vessel are: a centre-board like those used on sailboats which can be raised or lowered to 12 feet under the keel, thus reducing vessel roll; two evaporators that distill 3,600 gallons of seawater a day into freshwater for cooking and bathing; a large tank (about the size of an ordinary living-room) for maintaining living marine specimens; a shipboard irradiator, used to preserve fresh fish through an atomic energy process.

The Early Days of Freshwater Fishing



Fishing camp of the McInnes Fish Company at Buffalo Lake, Saskatchewan in 1918.

BY J.G.K. BARRIE

IT WAS in summer, two years before Canada could celebrate fifty years of Confederation, that a bridge builder from Spokane, Washington and a carpenter from Lunenburg, Nova Scotia met in Northern Alberta. They soon became fishermen friends, for W. (Bill) Schlader, the bridgeman from Spokane, had fished Lake Superior in his youth and J.D. (Jack) Publicover, the carpenter, was no stranger to the famous fishing grounds of the Maritimes. This friendship was to last a lifetime. It founded a company, and introduced the Alberta fishing industry to United States markets.

Their first meeting arose from a common interest in a box of fish Jack Publicover had brought back from a trip to Lesser Slave Lake, Alberta. Together, they decided to complete their immediate projects of building a bridge and constructing an elevator, and put full time into commercial fishing in this new productive lake area of Alberta.

In July, 1915 the two men shipped ahead ten dollars worth of lumber and with determination backed by enthusiasm they arrived at Wagner, on the shores of Lesser Slave Lake, and set up their first fishing camp. This was the start of the company to be known later as the McInnes Products Corporation Limited, Edmonton, Alberta.

The fishing was more than satisfactory but the market for their whitefish and pickerel was far less than the potential productive capacity of this new lake. In September 1915, a salesman from a packing company arrived on the site offering to buy a full carload of fish, if it could be shipped immediately. Here was the challenge that Bill Schlader and Jack Publicover had sought. They put their full efforts into fishing until the car was almost filled but in order to ship on time they had to solicit help and the balance of the quantity from another fish company nearby.

With the revenue from this first big sale they managed to continue their small operation throughout the winter of 1915, shipping three or four carloads of whitefish and pickerel to market.

THIRD PARTNER

It was not long before word of their efforts reached a certain Malcolm McInnes, a fisherman in the Georgian Bay district of Ontario. He was using a fleet of large lake boats and had as his steady customer, Booth Fisheries. Mr. McInnes became interested in the productivity of these new lakes and rivers in Northern Alberta now made accessible by rail. He came to western Canada and immediately sought out Bill Schlader to learn more about the Lesser Slave Lake operation. After looking over the set-up, he joined Mr. Publicover and Mr. Schlader in their promising enterprise. In February 1916, the McInnes Fish Company was a growing business with new capital and an experienced new partner.

Mr. McInnes felt they should upgrade their boats or even better, build new ones. He recommended a competent carpenter from the Georgian Bay district who might be willing to come to to Wagner, Alberta, and build fishing boats for the company. It was soon agreed and shortly after the carpenter arrived with his kit of carpenter tools . . . one hand axe!

Said Bill Schlader: "We were very suspicious of any boats he might build, but after Malcolm convinced us he was a real craftsman and could construct the sturdy type of boat we needed, I agreed to go with Malcolm to Edmonton and buy a set of proper tools for the man." It turned out well. In record time the McInnes Fish Company was operating the six new fishing boats the carpenter built for them that season.

By May 1916, the partners decided that they should seek new markets in addition to their present ones in Alberta and



To overcome an ice supply problem in the early days of the McInnes fishing enterprise, natural ice was cut in blocks and stockpiled at certain points during the winter. An ice house was then constructed over the stacked ice.

adjacent provinces. "Someone said Chicago should be a ready market for the quality of fish we were producing, so we decided to send Malcolm McInnes. He was a bit more experienced in this line of selling and besides that, he dressed well," said Mr. Schlader. Mr. McInnes made the trip, only to be told by the Chicago buyers that a proposal to ship fish all the way from Alberta to Chicago was a "crazy venture." The fish would be rotten when they reached Chicago, they said.

Mr. McInnes felt very discouraged but still believed in the idea. He decided on his return trip to stop off in Winnipeg to see a Mr. Armstrong, who was not only in the provincial government but was also active in the commercial fishing industry of Manitoba. Mr. Armstrong was intrigued with the bold pioneer idea and after a thorough check of the company's fishing facilities and railway shipping schedules, told the partners to express a car consigned to him in Chicago and he would see what he could do with his established contacts with the buyers in Booth Fisheries.

"It took us three hard working days to fill that car in order to have the Grand Trunk Railway send it by their fast express to Chicago . . . then we waited!" Mr. Schlader recalled, "When word did come back that the fish arrived in good quality, we were asked to ship two more cars as soon as possible. This was what we needed and we worked to make sure the best fish were included in those two cars. Of course we were getting a top price of 3¼¢ per pound on board, so it was very encouraging to all of us."

The next message from Chicago was a standing order for one car per week; soon to be followed by two cars a week, and finally Booth Fisheries bought all that could be packed and shipped to them in Chicago, which finally levelled off at two cars per week. This was the beginning of shipping and the export of Alberta fish to Chicago. Today, 51 years later, McInnes Products Corporation Limited still ship to Booth Fisheries in Chicago.

With the increased production, the problem of an adequate ice supply for shipping purposes became apparent. Ice was



A shipment of fish about to be sent to Chicago by express over the Alberta and Great Waterways Railway and connecting lines from Edmonton, Alta.



The late Grant McConachie's plane – an assemble-it-yourself Henry Ford model called The Tin Goose – at Buffalo Lake about to take on board a load of fish from a dog sled. Mr. McConachie later became president of Canadian Pacific Airlines.



One of the modern fleet of aircraft used by the McInnes Products Corporation Ltd., flying out of Edmonton and northern airports transporting fish. The group standing in front of the aircraft includes Mr. W. Schlader, general manager, and Mr. Roy A. Schlader, president.

readily available from the lake in season, but to transport and store it at one central point was both laborious and expensive. They solved the problem by stockpiling the ice at various locations close to their source, then building an ice house around the supply of stacked ice.

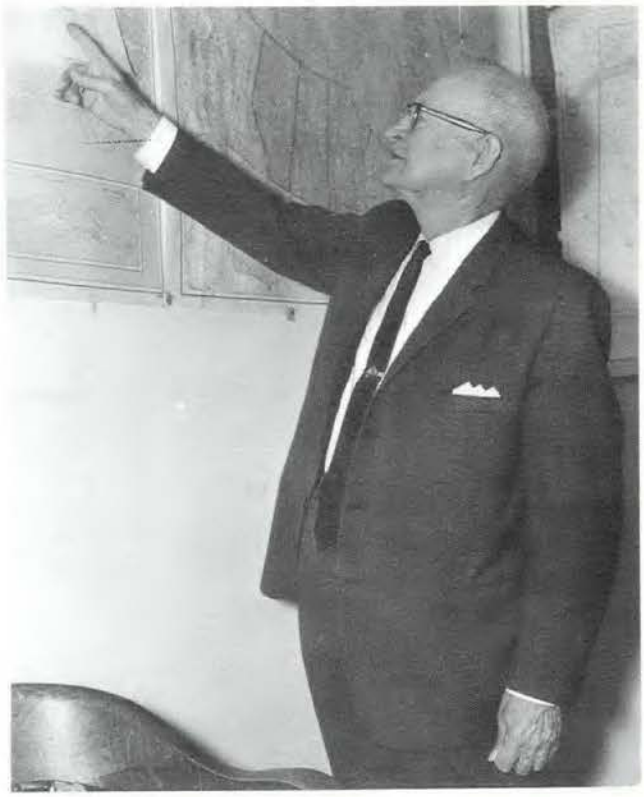
The principals of the McInnes Fish Company took a forward look at the future market and source of supply in the year 1918. With this in mind, Bill Schlader set out on a trip to evaluate Peter Pond Lake (Buffalo Lake), Saskatchewan. He wanted to blaze an economical route for the fish to be brought for shipment over the Northern Alberta Railway, then being built to Fort McMurray, a settlement far to the northeast of Lesser Slave Lake.

"That was some trip," said Mr. Schlader. "I spent several days trying to get a route into Peter Pond Lake from practically every direction. The dense forest and hilly terrain was most discouraging but the fishing prospects of that area were worth every effort and further exploration. I went to Cheecham, Alberta, which was at that time the end of the steel on the new Northern Alberta Railway. Being an old bridgeman for the Grand Trunk, I naturally enjoyed talking railway construction with some of the workers and engineers on the job. When I told them of my findings around Peter Pond Lake, one worker told me a surveyor had just returned from the Peter Pond district and had remarked it would be feasible to build a road through to there."

Mr. Schlader immediately learned as many details as possible, outfitted himself with pack horses, and set out to follow the path of the surveyor from the rail line to Buffalo Lake. This later became the access road they used, over which all the fish were transported to the railway at Cheecham from Buffalo Lake (Peter Pond). The McInnes Products Corporation operated and fished Buffalo Lake from 1918 to 1939.

With the decrease of production on Lesser Slave Lake, the company phased out of fishing this lake and ceased summer operations entirely. In 1926, they moved to Lake Athabaska. Here, at Crackingstone Point they established their present plant. Using modern techniques of transport, they now ship their fish by rail from Waterways, Alberta.

"It was much different in those days when we had to set up our supply and transport lines by horse drawn sleighs" said



Mr. W. (Bill) Schlader, who at 83 is still active as general manager of McInnes Products Corpn. Ltd.

Mr. Schlader. "We established stopping points along the route where teams would haul supplies in, be unhitched and transferred to a sleigh load of fish going out. In this way, we had fresh teams and fresh supplies moving over a constant relay route that allowed us to meet our shipping contracts and at the same time provide supplies and comforts for our employees.

"Today, of course, we make use of aircraft as much as possible. I well recall the day the late president of Canadian Pacific Airlines, Grant McConachie, who was 24 years old at that time, came to me and asked for a contract to fly our fish out of Buffalo Lake to Edmonton. When I asked him what kind of plane he had he said he 'didn't exactly have one.' I told him to get a suitable plane (never believing he would) and he would get a contract."

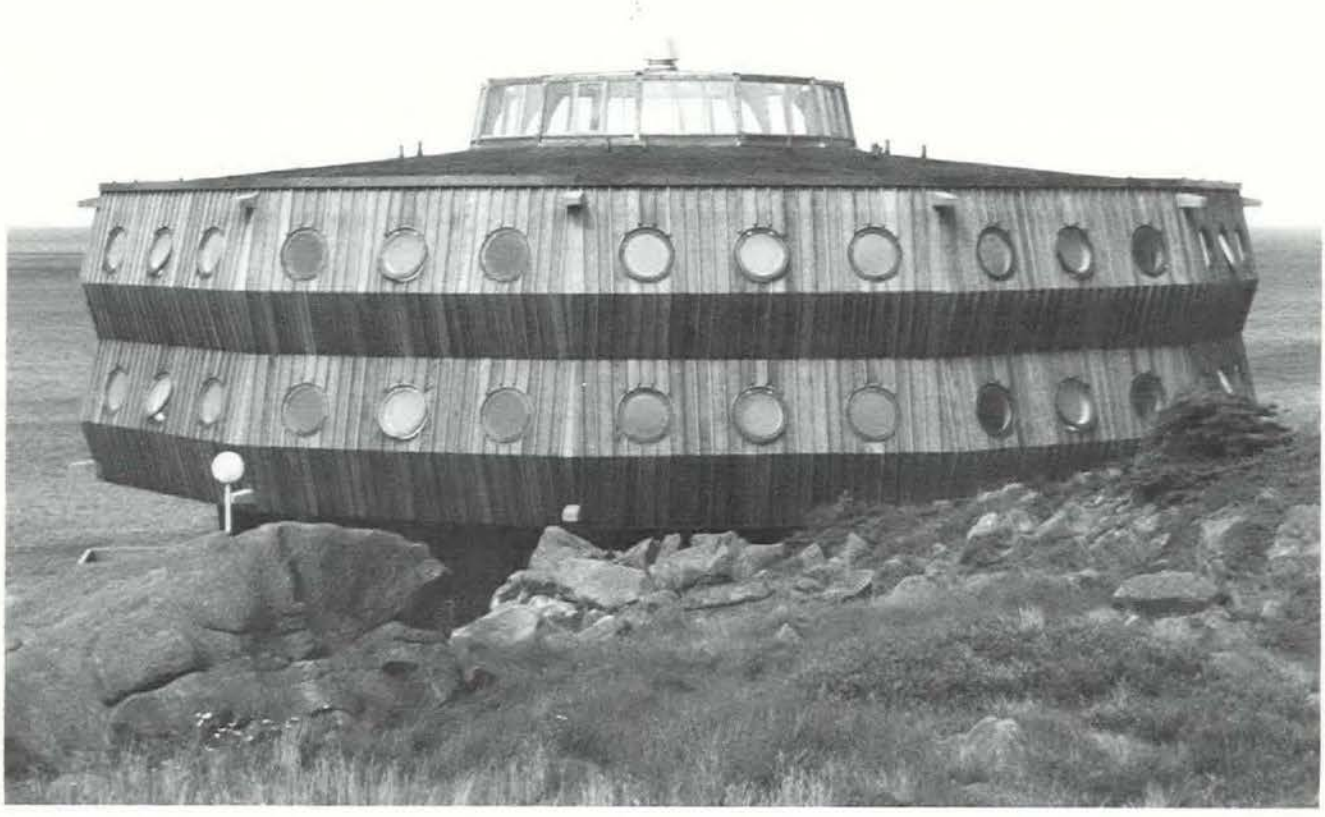
DO-IT-YOURSELF PLANE

Mr. McConachie, through his connections and several Alberta backers including an aircraft mechanic, raised $3,500 to buy a do-it-yourself airplane kit from Henry Ford in Detroit and assembled a three-motor plane called "The Tin Goose." After flying it to Edmonton from St. Hubert, Quebec, he again approached Mr. Schlader for the contract to fly fish from Buffalo Lake to Edmonton.

"That was in 1933, and of course I gave him the contract. This was a big break for his aviation career in the freight carrier business. Grant brought in a lot of fish that winter. I figure it weighed more that all the air cargo handled by any other airport in North America," said Mr. Schlader.

As Canada celebrates its 100th year of Confederation, Mr. Schlader, at 83, is still active as general manager of the company but leaves the problems of today's complex marketing and business administration to his son Roy A. Schlader, president of the Corporation. McInnes Products Corporation Limited maintains their head office in Edmonton carrying on their fishing industry at Cracklingstone Point, Lake Athabaska, and a winter production from Pigeon Lake, Alberta.

Newfoundland's Impressive Marine Laboratory



Giving the impression of a vehicle from outer space, the $1.6 million Marine Sciences Laboratory of Memorial University of Newfoundland occupies a commanding position on the rugged shore of Logy Bay, near St. John's. Laboratories equipped with running seawater will enable researchers to conduct year-round studies on the flora and fauna of the Northern North Atlantic. A large aquatic greenhouse, known as a phycorium, is located atop the laboratory.

Salmon Transplant in East River Shows First Signs of Success

BY G.J. GILLESPIE

PICTURESQUE East River winding through the woodlands of eastern Halifax County and emptying into the sea near the village of Sheet Harbor is again in the fisheries news as results of last year's Atlantic salmon transplanting operation are becoming manifest. For the first time in more than 40 years adult salmon are running downstream on their return to the ocean after spawning and spending the fall and winter in the upper reaches of the East River system.

This unusual event is a sequel to the transfer of adult salmon last year to East River by the Resource Development Service of the Department of Fisheries of Canada. For more than four decades in-running salmon were barred from the river because of a series of power dams that had almost eliminated East River as a salmon fishing stream.

The East River project – the first of its kind in the Maritime Provinces – is aimed at restoring East River to its status as a salmon river it enjoyed decades before man's quest for electric power. It may be considered as a pilot project since, if successful, the technique will be applied to other streams lost to salmon because of man-made obstructions.

Most encouraging to the biologists and engineers in charge of the program was the downstream migration of salmon that were transplanted last year in the Fifteen-Mile Brook area, miles upstream from the mouth of East River. The salmon were tagged and some were recaptured and examined on their way to the sea.

Even more encouraging was evidence that the transplanted salmon spawned successfully last fall. During a follow-up survey of the transplanted fish, biologists located many of the salmon on their new spawning grounds upstream in East River. The colored disc tags attached to the salmon made them easy to spot in the shallow waters. The salmon were sighted many miles above the release site, later they were seen on the spawning grounds in pairs. Further inspection revealed many large redds (hollows in the gravel bed of the river where the female deposits her eggs) all containing eggs. Salmon hatched from the eggs will remain in the fresh water up to three years and go seaward to continue their destiny.



Aerial view of East River, Sheet Harbour, showing a power station in foreground. Remnants of wooden jetties are shown below the power plant, reminiscent of the days of sailing ships when Sheet Harbour was a big lumber exporting centre.

The story of the East River project goes back two years. A biological survey of the river system indicated the feasibility of a program to rehabilitate the Atlantic salmon. The plan involved three main steps in management to be carried out over a period of years.

The management techniques include the trapping of adult salmon in nearby West River and trucking them overland to the upper reaches of East River; the installation of a deflecting apparatus known technically as louvers at the upper end of the power canal near the dam at Ruth Falls on the East River, and the stocking of the river not only with adults trapped in West River but also with juvenile salmon reared in the Department of Fisheries hatcheries. The louver systems divert smolts or young salmon from going the whole length of the 8,000 foot



Skilled technicians trained as scuba divers are employed by the Resource Development Service to assist in maintenance of the louvers on East River.

power canal. This diversion enables smolt to enter the main river below the dam and by-pass the power plant.

Two years ago preliminary ground work was commenced with a biological survey of East River to determine the extent and relative proportion of spawning and rearing areas. A study was made of native fish populations in both East and West rivers to provide some means of comparison, and a start was made on the construction of salmon trapping facilities.

In 1966 a more comprehensive study of West River was initiated, and transfer of adult salmon from West to East River was conducted and the salmon angling fishery was sampled.

A smolt sampling station was installed in 1966 in the West River above the Sheet Harbor lakes about five miles from the salt water. This station was set up to determine the time of migration and the age and size of the smolts. The smolt run took place in May and nearly 1,500 smolts were captured. To estimate the efficiency of the gear, hatchery reared smolts were marked and released above the trapping site. The recaptures ranged from 75 to 90 per cent of the original number released. To determine age and other pertinent facts about the native fish, scale samples were taken along with weights and lengths.

Salmon angled in the West River were examined to obtain life history data on this run. The angling yield last year was 318 fish, most of which were grilse. The age determination of the fish caught indicated that some salmon in the West River system spend from two to three years at sea.

To secure the adult salmon stocks required to initiate the salmon run in East River a counting fence was erected across West River just above the Sheet Harbor lakes. After coming from sea in the spring the salmon remained in the lakes for some weeks before resuming their ascent to the spawning grounds. A total of 327 fish were counted, and 77 salmon, about 25 per cent of the West River run, were transplanted to East River. Care was exercised to provide an even male-female ratio among the transplanted fish. The salmon were transplanted in a fish trucking unit with a capacity of 600 gallons of water and equipped with re-circulation, re-oxygenation and aeration systems.

This summer more adults were transplanted in East River by the same method. In addition, several thousand smolts reared in fish hatcheries will be introduced into the East River system. A counting fence will be built upstream beyond the dams in East River on Fifteen Mile Brook so that data can be accumulated on the down-river movements of smolts and spent adults.

Rehabilitation of East River will not be a short-term affair. Four or five years will have elapsed before it could be hoped to have successful salmon angling. Ultimately it is expected that the East River salmon run will be of sufficient size to maintain itself.

Set Lobster Trap Limits in Maritimes

As a result of a general demand among lobster fishermen, a program of limitation of the number of lobster traps per boat will be introduced in all of the lobster fishing districts in the Maritime provinces, commencing with the 1968 lobster fishing seasons, Fisheries Minister H.J. Robichaud announced in November. The numbers of traps will be reduced further in most districts in 1969.

A limit of 375 traps is to be applied in Districts Nos. 1, 6B, 7A, and 7C, and in that portion of District No. 4 between Burns Point and Baccaro Point off the southern coast of Nova Scotia. In these districts the limit is to be reduced to 300 traps at the commencement of the 1969 lobster fishing seasons. This year there was a 500 trap limit set in the northern portion of District 7B.

In District No. 3 there will be a limit of 300 traps, and this will be reduced to 200 in 1969.

In District No. 5, and in that portion of District No. 4 between Baccaro Point and Cole Harbour a trap limit of 250 has been set for 1968, with a reduction to 150 in 1969.

In District No. 6A there will be a limit of 300 traps in 1968 with a reduction to 200 for the 1969 season.

In District No. 7B there will be a limit of 400 traps in 1968 and this will be reduced to 300 traps in 1969.

In District No. 8 there has been a lobster trap limit of 250 for the past two years, and this will remain for 1968.

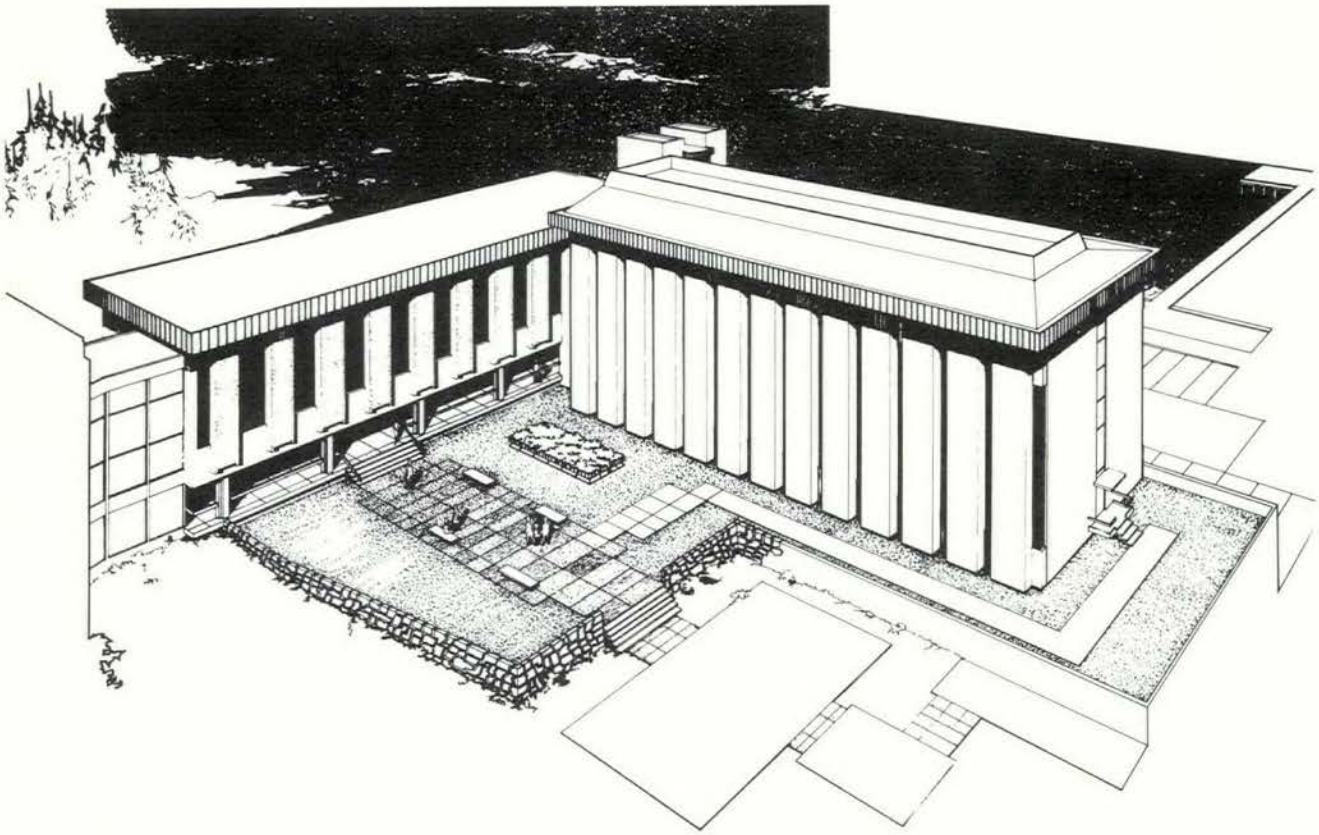
These lobster trap limits are based on extensive studies by both the Department and the Fisheries Research Board of Canada. Mr. Robichaud pointed out that the majority of lobster fishermen in all districts favour some limitation of the numbers permitted to engage in the fishery and, in addition to the trap limits, consideration is being given to means of restricting entry into the lobster fishery in an equitable manner.

Earlier this year Mr. Robichaud pointed out that lobsters are a vital resource for thousands of Canada's inshore fishermen. This made it imperative that this resource be managed as wisely as possible to ensure its continuance on a profitable basis to the fishermen.

The lobster fishing effort has greatly increased in the past several years, and thousands of small boats are engaged in harvesting this lucrative crustacean. Last year there were 25,000 lobster fishing licences issued. This was 200 over the the previous year. In 1966 more than 30 million pounds of lobster were landed, and a total of $18,000,000 was received by fishermen.



Participants in the Federal-Provincial British Columbia Fisheries Committee meeting held recently in Ottawa are shown in front of the Sir Charles Tupper Building. Left to right (front row): G.L. Grant, Dr. A.W.H. Needler, Dr. D.B. Turner, W.R. Hourston, R.G. McMynn, K.R. Allen, E.H. Vernon; (back row) A.L.W. Tuomi, W.C. MacKenzie, J.S.M. Harrison, T.F. Rothery, C.R. Levelton, M.P. Houghton, J.G. Carton, B.A. Campbell, Dr. W.R. Martin.



Architect's sketch of the $3,500,000 addition to the Fisheries Research Board of Canada Biological Station at Nanaimo, B.C. Work on the addition is starting immediately and is expected to take two years to complete.

Start Addition to Nanaimo Biological Station

Work on major additions and alterations to the Fisheries Research Board's biological station at Nanaimo, B.C., got underway in November.

A $3,509,000 contract awarded to D. Robinson Construction (1952) Ltd. of Nanaimo provides for the addition of two new wings to the station which was constructed in 1949 to study marine resources off the Pacific coast.

One wing will house laboratory facilities for marine research and the other will provide administrative space for the station. Total net working area will be almost tripled to 41,000 square feet from 14,000 by the additions on the seaward side of the existing four-storey structure. Funds are being provided by the Fisheries Research Board of Canada and work will begin immediately with a target for completion in 24 months.

Dr. F. Ronald Hayes, Chairman of FRB, said the new addition will enable the Board to greatly extend its research activities in the North Pacific.

In order to simulate various environmental conditions in the laboratory wing, 14 networks of non-toxic plastic piping will carry such services as chilled sea water, chilled dechlorinated water, and heated sea and dechlorinated water. A basement mechanical room will control temperature and rate of flow of such services.

Interiors have been designed for flexibility, using walls of steel stud construction with plaster board finish permitting easy removal. Interior columns and bearing walls have been eliminated by the use of long-span precast concrete "tees".

Functional requirements of a modern laboratory building have determined the design. Mechanical services are carried to the laboratories by vertical concrete ducts which form the exterior walls. Windows and curtain walls separate the ducts, providing a vertical accent to the building, which rises from a base of rough brown stone from native quarries.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May - Sept. 1966 '000 lbs	May - Sept. 1966 $'000	May - Sept. 1967 '000 lbs	May - Sept. 1967 $'000
CANADA - TOTAL	1,454,033	110,338	1,469,028	104,128
ATLANTIC COAST - Total	1,169,993	60,324	1,271,488	62,447
Cod	388,961	17,028	389,863	17,038
Haddock	46,411	3,264	45,159	2,711
Pollock, Hake, Cusk, etc.	41,407	1,477	36,110	1,220
Rosefish	114,583	3,193	104,263	2,727
Catfish	3,197	107	2,837	91
Halibut	2,352	775	2,288	842
Plaice & Other Flatfish	146,335	4,708	153,039	4,948
Herring & Sardines	327,044	4,568	444,773	4,747
Mackerel	19,160	649	18,368	689
Alewives	7,906	140	6,501	104
Salmon	5,176	2,525	6,128	3,298
Smelts	302	28	207	25
Swordfish	5,438	2,346	5,104	2,168
Other Fish	12,455	246	10,091	274
Lobsters	27,561	15,026	27,210	16,919
Clams & Quahaugs	3,656	204	3,729	242
Scallops	9,880	3,768	7,272	4,010
Other Shellfish	8,169	272	8,546	394
PACIFIC COAST - Total	284,040	50,014	197,540	41,681
Pacific Cods	16,453	1,435	8,312	679
Halibut (1)	30,673	10,990	21,740	5,480
Soles & Other Flatfish	6,298	401	4,630	314
Herring	69,892	1,167	28,478	483
Salmon	149,584	35,244	125,114	33,851
Other Fish	5,301	173	2,588	102
Shellfish	5,839	604	6,678	772
BY PROVINCES				
British Columbia	284,040	50,014	197,540	41,681
Nova Scotia	410,312	23,319	445,984	24,176
New Brunswick	200,485	7,768	239,668	7,627
Prince Edward Island	40,969	5,018	27,181	5,709
Quebec	101,942	5,862	146,288	6,085
Newfoundland	416,285	18,357	412,367	18,850

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

MID-MONTH WHOLESALE PRICES - SEPT. 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.381	.457
Cod fillets, Atl, frozen, cello 5's	lb.	.325	.383
Cod fillets, smoked	lb.	.420	.473
Haddock fillets, fresh, unwrapped	lb.	.488	.593
Herring, kippered, Atl.	lb.	.253	.337
Mackerel, frozen, round	lb.	.188	.267
Lobsters, canned, Fancy	Case 48-$\frac{1}{2}$ s	-	66.587
Sardines, canned	Case 100-$\frac{1}{4}$ s	9.695	9.600
Halibut, frozen, dressed	lb.	.520	.530
Silverbright, frozen, dressed	lb.	.622	.647
Coho, frozen, dressed	lb.	.868	.927
Sockeye, canned, grade A	Case 48-$\frac{1}{2}$ s	27.430	28.400
Pink, canned, grade A	Case 48-$\frac{1}{2}$ s	16.663	17.313
Whitefish, fresh	lb.	.412 (1)	.443
Lake trout, frozen	lb.	.444	.523

(1) - Dressed

PRICES PER CWT. PAID TO FISHERMEN

(Week ending Sept. 16th)	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	-	2
Vancouver		
Ling Cod	10-12	10-16
Gray Cod	7.5	6.5-7.5
Soles	7-9.5	6.5-9.5
Salmon (Rdspg)	35-77	40-79

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF AUGUST

	1966 '000 lbs	1967 '000 lbs
TOTAL - Frozen Fish, Canada	118,529	108,317
Frozen - Fresh, Sea Fish - Total	91,626	77,669
Cod, Atlantic, Fillets & Blocks	26,225	12,299
Haddock, fillets & blocks	4,129	6,925
Rosefish, fillets & blocks	7,635	8,464
Flatfish, (excl. halibut), fillets & blocks	5,678	10,372
Halibut, Pacific, dressed & steaks	12,607	11,231
Other Groundfish, dressed & steaks	2,681	1,975
Other Groundfish, fillets & blocks	10,380	5,561
Salmon, Pacific, dressed & steaks	11,641	11,524
Herring, Atlantic & Pacific	437	815
All Other Sea Fish, all forms	5,736	6,158
Shellfish	4,477	2,345
Frozen - Fresh, Inland Fish - Total	6,694	9,810
Perch, round or dressed	383	(1)
Pickerel, (Yellow & Blue) fillets	204	1,185
Sauger, round or dressed	(1)	(1)
Tullibee, round or dressed	233	247
Whitefish, round or dressed	2,183	1,528
Whitefish, fillets	284	305
Other, all forms	3,407	6,545
Frozen - Smoked Fish - Total	1,995	1,843
Cod Atlantic	1,161	626
Sea Herring, kippers	550	726
Other, all forms	284	491
Frozen for Bait and Animal Feed	18,214	18,995

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

SALTED FISH STOCKS AS AT END OF SEPT.

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		35,881	44,876
Cod		30,457	39,320
Other		5,424	5,556
Dried - salted - Total		12,389	10,614
Cod		11,324	9,878
Other		1,065	736
Boneless - Total		553	884
Cod		506	851
Other		47	33
Pickled - Total	(barrels)	22,787	17,283
Herring	"	7,480	6,034
Mackerel	"	7,226	6,045
Alewives	"	6,789	4,344
Turbot	"	1,292	860
Bloaters	(18 lb. boxes)	207,916	142,806
Boneless Herring	(10 lb. boxes)	9,416	-

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - JUNE

(Value in Thousands of Dollars)

	1966 $'000		1967 $'000	
Total Exports		34,644		33,295
By Markets:				
United States		27,221		24,864
Caribbean Area		3,206		3,430
Europe		3,677		4,345
Other Countries		540		656
By Forms:				
Fresh and Frozen		26,399		23,867
Whole or Dressed	6,815		5,408	
Salmon, Pacific	2,215		1,802	
Halibut, Pacific	1,407		706	
Cod, Haddock, Pollock, etc.	77		46	
Swordfish	454		396	
Other Seafish	857		1,006	
Whitefish	586		533	
Pickerel	453		331	
Other Freshwater Fish, n.o.p.	766		588	
Fillets	11,016		9,734	
Cod, Atlantic	3,326		2,690	
Haddock	1,430		1,466	
Rosefish, Hake, Pollock, etc.	783		714	
Flatfish	2,755		2,277	
Pickerel	317		314	
Other	2,405		2,273	
Shellfish	8,527		8,630	
Lobster (Alive & Meat)	6,680		6,613	
Other	1,847		2,017	
Frozen Fish & Shellfish, pre-cooked	41		95	
Cured		3,542		3,279
Smoked	254		183	
Herring	101		56	
Other	153		127	
Salted, Wet & Dried	3,006		2,737	
Cod	2,637		2,176	
Other	369		561	
Pickled	282		359	
Herring	223		232	
Mackerel	11		104	
Other	48		23	
Canned		1,613		
Salmon	274		2,427	
Sardines	660		825	
Lobsters	473		06	
Other	206		89	
Miscellaneous		3,090		2,602
Meal	1,952		1,515	
Oil	92		268	
Other	1,046		819	

News Roundup

Great Lakes Fishery

The appointment of E.W. Burridge of Ottawa as a member of the Great Lakes Fishery Commission has been announced by Fisheries Minister H.J. Robichaud. Mr. Burridge, Assistant Director of the Department's Resource Development Service, becomes the fourth Canadian member of the Commission, which has been expanded from six to eight members, four each from Canada and the United States.

A native of Vancouver, Mr. Burridge joined the Department of Fisheries in 1949 following graduation from the University of British Columbia. He transferred to Ottawa as Divisional Biologist in 1957 and three years later was named Chief of the Fish Culture Development Branch. He assumed his present duties upon the establishment of the Resource Development Service in 1966.



E.W. BURRIDGE

Mr. Robichaud also announced the re-appointment as Commission members for further two-year terms of Dr. C.H.D. Clarke, Chief, Fish and Wildlife Branch, Ontario Department of Lands and Forests, Toronto, and Dr. A.O. Blackhurst, Manager, Ontario Council of Commercial Fisheries, Simcoe, Ont. The remaining Canadian Commissioner is Dr. A.L. Pritchard of Ottawa, former Director of Conservation and Development with the Development with the Department of Fisheries.

The Great Lakes Fishery Commission, organized in 1956, has two major responsibilities: (1) to develop co-ordinated programs of research in the Great Lakes and to recommend measures which will permit the maximum sustained productivity of fish stocks of common concern; (2) to formulate and implement a program to eradicate or minimize sea lamprey populations in the Great Lakes.

Crab Processing Study

The federal Department of Fisheries is starting a series of studies in its Halifax Fish Inspection laboratory with a view to laying down guidelines for the processing of Queen Crab in the Maritimes.

Dr. C.M. Blackwood, Assistant Regional Director, said since the Department first interested itself in the market possibilities of the Queen Crab over two years ago, experts in the Industrial Development Service have discovered ways to harvest this crustacean. Now, by means of the new series of studies, the Department hopes to solve problems connected with producing a quality product for the consumer.

Dr. Blackwood went on to explain that the studies would involve finding the best processing procedures for boat and plant handling of live crabs, cooking, shucking, packaging, to ensure the production of a top quality product at minimum production costs. Included will be studies on plant layout and equipment designed by Departmental engineers. The Queen Crab is to be processed for fresh, frozen and heat processed packs to evaluate product quality during storage.

The Queen Crab *(Chionoecetes opilio)* is a member of the Spider Crab family and is found in depths of up to 350 fathoms from West Greenland to Maine and from Alaska to Siberia. In the Canadian Atlantic it is limited mainly to the Gulf of St. Lawrence where it is known to occur off Anticosti Island, along the Gaspe coast and between Cape Breton Island and the Magdalen Islands.

Oceanographic Vessel

A contract for the construction of a 65-ft. oceanographic research vessel for the Fisheries Research Board of Canada has been awarded to Atlantic Shipbuilding Co. Ltd. of Mahone Bay, N.S. The company's successful tender of $91,280 was the lowest of four submitted.

The wooden research vessel is to be operated by the FRB's Atlantic Oceanographic Group located at the Bedford Institute of Oceanography in Dartmouth, N.S. Designed for all-weather biological oceanographic research work in inshore waters, it will have a standard longliner hull and normal propulsion unit. Special winches, net fishing equipment and laboratory facilities will be installed for the taking and examination of marine life samples.

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A Centennial Report of the Federal Department of Fisheries

100 YEARS OF SERVICE TO THE FISHING INDUSTRY and to the CONSUMER

"To conserve and develop Canada's primary fishery resources, and to encourage the development of the fishing industry in the national economy".

That is the function of the Federal Department of Fisheries. Since its establishment on July 1, 1868 as the Department of Marine and Fisheries, the Department has over the past 100 years assisted the fishing industry to achieve steadily increasing yields and revenue from fishing activity on the Atlantic and Pacific and on inland waters, and steadily improved the fish product offered to the public. Fishermen, processors and the consumer have all benefitted from the Department's activities and since 1898 from the scientific investigations carried out by the Fisheries Research Board of Canada.

Inspection officers at fish processing plants across Canada, working with the scientists of twenty laboratories, help ensure a high standard of quality of fish and fish products.



Resource management procedures are carried out by Protection Officers ashore, afloat and in the air. They also supervise the enforcement of appropriate regulations and inspect and arrange clearance of spawning streams. Biologists and engineers enhance the environment to increase salmon and other fish stocks, undertake scientific investigations and conduct studies to provide answers to fisheries problems associated with pollution, floods, drought and multiple water use.



Printed material, films, radio, television and exhibitions, keep the public informed on the various aspects of the industry and the activities of the fisheries services. Departmental Consumer Consultants work to encourage increased consumption of Canadian fish products through demonstrations and lectures on preparation and cooking of fish and fish products.

Fishery economists are active in two related fields of responsibility: (1) They provide the government and the commercial fishing industry with current information, including statistical data, under the general heading of trade intelligence, and (2) carry out studies and investigations in the primary fisheries and in the processing and distribution of fish products.

In fisheries industrial development, the Department introduces and develops new and improved fishing and processing techniques and provides financial assistance for modernization and expansion.



The Department also represents Canada on many international Commissions concerned with the conservation of fisheries and marine mammals.

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

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