Trade News

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DEPARTMENT OF FISHERIES OF CANADA • OTTAWA

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FEATURES

CANADIAN FISHERIES NEWS

COVER PHOTOGRAPH: Fishermen lifting fish from pound net on Lake Erie, Ontario.

INVESTIGATION & MANAGEMENT OF ATLANTIC SALMON & TROUT

EACH YEAR since 1955 reviews of the program of investigation and management of Atlantic salmon in eastern Canada have been published in "Trade News". From 1955 to 1958 the reviews were based on reports prepared for annual meetings of a Scientific Sub-committee of the Federal-Provincial Co-ordinating Committee on Atlantic Salmon that was formed in 1949. In 1959 the duties of that Sub-Committee were taken over by the Scientific Advisory Group of the Salmon and Trout Section of a new Federal-Provincial Atlantic Fisheries Committee. Until 1960-61 the reviews dealt only with work on Atlantic salmon. At the May, 1962, annual meeting of the FPAFC it was agreed that the present "Trade News" review should summarize highlights of both salmon and trout programs, as reported to the Scientific Advisory Group meeting held on March 13-16, 1962, in Quebec City under the chairmanship of Dr. J.L. Hart, Director of the Fisheries Research Board's Biological Station, St. Andrews, N.B.

Part I, on the research program, was compiled at the Fisheries Research Board of Canada's Biological Station, St. Andrews, N.B., from 1961-62 reports on salmon investigations by Drs. C.J. Kerswill, P.F. Elson, R.L. Saunders and Mr. J.H. Gee of the St. Andrews, N.B. staff, Mr. A.R. Murray of the St. John's, Newfoundland, staff of the Research Board; Dr. J.M. Anderson, University of New Brunswick, Fredericton, N.B.; Mr. R. W. Bourassa of the Department of Game and Fisheries, Quebec; Dr. A.J. Erskine of the Canadian Wildlife Service, Sackville, N.B.; and reports on trout (limnological) investigations by Dr. M.W. Smith and Mr. J.W. Saunders of the FRB Biological Station, St. Andrews, N.B.

Part II, on the management program was assembled by the Department of Fisheries, Ottawa, from reports submitted by the Department's eastern area headquarters in St. John's, Nfld., and Halifax, N.S. The Area Chiefs of the Fish Culture Development Branch, Mr. V.R. Taylor and Dr. R.R. Logie and their staffs were responsible for conducting the field programs and preparing the reviews appearing in Part II.

An outline of the typical life history of Atlantic salmon and trout and the common names of the different stages may be helpful.

For salmon, adults spawn in the autumn, burying their eggs wherever suitable gravel occurs between head of tide and the uppermost reaches of rivers. In spring the young emerge from the gravel as fry, and are called underyearlings during their first year. Older young salmon are called parr. Underyearlings and small parr are usually called fingerlings in artificial stocking operations by fish culture establishments. The young fish usually stay in the rivers for two to four years but sometimes longer, after which they migrate to sea in spring as silvery smolts after growing to a length of at least four inches. The adults may return to fresh water as grilse weighing up to six pounds after one winter at sea, or as larger salmon weighing about eight pounds or more after an additional year or longer at sea. Some adults enter fresh water in the spring, others do not enter until autumn, but all wait until October to spawn. Only a small fraction, usually under 10 per cent, of fish that have spawned once survive to return and spawn again. In the Maritime Provinces salmon commonly need six years to complete one full life cycle, but there is considerable variation among different areas.

The brook trout, like the Atlantic salmon, spawns in the autumn. The eggs are buried in suitable gravel, usually in streams, but on occasion in shallow gravel areas of lakes. The young emerge from the gravel in early spring. During their first year of life, the young are referred to as underyearlings (age 0), and during their second year as yearlings (age I). Few brook trout live beyond age IV.

The rainbow trout, in contrast, spawns in the spring, in the Atlantic provinces, also burying the eggs in gravel. The eggs develop rapidly and hatch later the same spring.

Not all but some brook trout in Atlantic coastal streams run to salt water after reaching a length of four to five inches, and these are commonly known as sea-trout. There is little evidence that these sea-running brook trout are a separate race. Rainbow trout are also known to run to salt water in the Maritimes Area, and may then be called "steel-heads".

Investigation and Management of Atlantic Salmon and Trout

Part 1 -- The Research Program

Summary of 1961-1962 Reports

ATLANTIC SALMON (Salmo Salar)

THE DEVELOPMENT of the research program, particularly since its expansion in 1949, has been described in previous reports, reprints of which are available free from the Biological Station, St. Andrews, N.B. The first few years of investigation after 1949, combined with evidence from earlier studies, indicated that the problem of providing enough salmon for an ever-increasing body of anglers cannot be solved simply by reduction of illegal fishing in rivers and curtailment of existing commercial fisheries. Generally spawning stocks and production of fry appear adequate for natural productive capacities of most rivers. It seems necessary to find practical ways of increasing the survival rates from fry to smolts in rivers, and for overcoming the harmful effects of man-made changes in the salmon's river environment.

CATCH STATISTICS

Data on angling and commercial salmon catches are obtained by the federal Department of Fisheries in the Maritime Provinces and Newfoundland and by provincial authorities in the Province of Quebec.

Catch statistics for the "Maritime Region" during the 1949-61 period are shown in Figure 1, as total commercial and angling catches for the region as a whole, and also broken down into the three component areas, "Gulf", "Atlantic" and "Fundy", which include rivers producing salmon with similar life-histories. The Gulf Area extends from Cape Gaspe, Quebec, around the Gulf of St. Lawrence to Fourchu, Cape Breton Island. The Atlantic Area extends from Fourchu around the outer coast of Nova Scotia to Cape Sable. The Fundy Area takes in the Bay of Fundy coasts of Nova Scotia and New Brunswick. Commercial landings for the Gaspe, Quebec, part of the Gulf Area were obtained from reports of the Quebec Bureau of Statistics.

Graph A shows that in 1961 the Maritime commercial catches totalled 1.2 million pounds, or seven per cent below the 1960 level, and continued the decline predicted as a result of DDT sprayings on survival of young salmon in the Gulf area. Catches in the Atlantic area, where no spraying has occurred, have risen steadily, though slightly, since 1955. Graph B shows that total Maritime angling, at 26,487 fish in 1961, was above the 1960 level by 13 per cent, but was still far below the average of the 1949-58 period. About three-quarters of the total angling catch comes from the Miramichi River, where supplies of adults during recent angling seasons have been subnormal, as expected from DDT effects. In Table 1 data for the past three years are compared on angling catches and fishing effort in rod-days in the Maritime Region, its three areas, and some individual rivers. The average catch per 10 rod-days of angling effort for the whole region was 2.1 in both 1960 and 1961, but the table brings out some interesting differences between angling success from one year to the next in the three areas and on individual rivers.

Commercial fishing in Newfoundland waters gave 2.0 million pounds in 1961, or two per cent below the 1960 level. In 1961 Newfoundland's recorded angling catches totalled 17,048 fish, or seven per cent fewer than in 1960 and average angling catch per 10 days' effort was 4.6 fish compared to 5.0 in 1960.

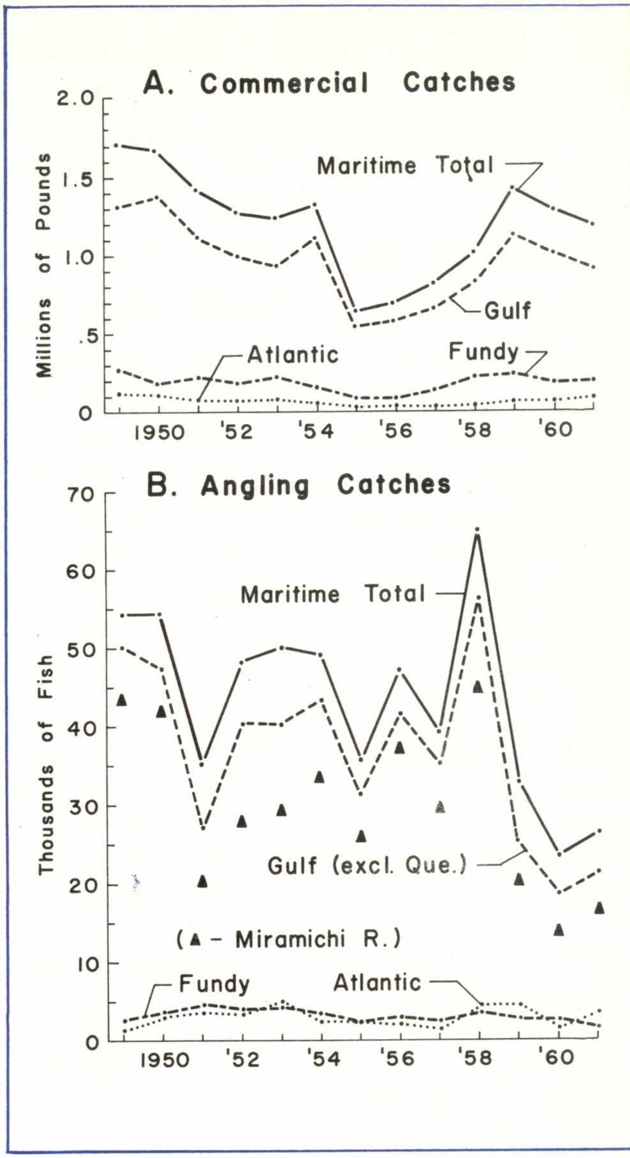


Figure 1. Atlantic salmon catches in Maritime Region, Canada, 1949-61.

In 1961 commercial salmon catches in Quebec waters reported by the Quebec Bureau of Statistics, totalled 0.54 million pounds, or nine per cent below the 1960 total of 0.59 million pounds. Statistics on Quebec angling are not yet available.

RESEARCH IN MARITIME PROVINCES

FRB Biological Station, St. Andrews, N.B.

Salmon investigations in the Maritime Provinces are mainly the responsibility of the Biological Station at St. Andrews, N.B.

Availability of adults

In 1961 research sampling traps and counting fences were operated as usual through the open-

Table I. Comparison of angling catches of salmon in 1959, 1960 and 1961, Maritimes Region

	1959			1960			1961		
	No. fish (C)	Effort Rod-days (E)	C/E x 10	No. fish (C)	Effort Rod-days (E)	C/E x 10	No. fish (C)	Effort Rod-days (E)	C/E x 10
Maritime Region Total	33,030	124,727	2.6	23,495	109,502	2.1	26,487	126,761	2.1
Gulf Area Total	25,499	56,368	4.5	18,748	46,427	4.0	21,526	43,569	4.9
Miramichi System	20,531	42,108	4.9	14,064	34,142	4.1	16,571	32,364	5.1
S.W. Miramichi	12,034	25,478	4.7	10,445	24,351	4.3	11,647	22,798	5.1
N.W. Miramichi	4,617	6,496	7.1	1,707	3,987	4.3	1,269	2,580	4.9
Little S.W. Miramichi	1,599	5,600	2.9	1,385	4,195	3.3	1,617	4,254	3.8
Renous	475	1,260	3.8	230	1,049	2.2	489	1,260	3.9
Cains	1,691	2,651	6.4	297	560	5.3	1,549	1,472	10.5
Restigouche System	3,396	6,077	5.6	3,102	4,991	6.2	3,432	5,480	6.3
Restigouche	2,824	3,699	7.6	2,278	3,555	6.4	2,405	3,750	6.4
Kedgwick	144	698	2.1	151	406	3.7	257	562	4.6
Upsalquitch	428	1,680	2.5	673	1,030	6.5	770	1,168	6.6
Nipisiquit	461	2,150	2.2	243	905	2.7	338	1,360	2.5
Tabusintac	605	1,845	3.3	717	1,730	4.1	752	1,260	6.0
Margaree	235	1,110	2.1	140	1,050	1.3	147	1,035	1.4
Atlantic Area Total	4,564	47,999	1.0	1,909	46,039	0.4	3,445	60,868	0.6
St. Marys	550	2,970	1.9	278	2,284	1.2	451	2,749	1.6
Moser	392	4,030	1.0	207	7,635	0.3	250	11,090	0.2
Sheet Harbour	455	8,160	0.6	167	9,715	0.2	333	14,605	0.2
LaHave	639	2,005	3.2	81	1,347	0.6	646	4,695	1.4
Medway	1,023	9,995	1.0	551	8,468	0.7	819	10,314	0.8
Fundy Area Total	2,967	20,360	1.5	2,838	17,036	1.7	1,516	22,324	0.7
Saint John (main)	1,753	9,116	1.9	1,827	7,226	2.5	892	4,506	2.0
Nashwaak	195	2,991	0.7	88	1,736	0.5	78	1,186	0.7
Tobique	355	650	5.5	377	1,190	3.2	170	1,151	1.5
Petitcodiac System	247	1,115	2.2	166	1,110	1.5	82	606	1.4

water period in the Miramichi area. Grilse entered the estuary in normal abundance, as expected from an estimated good smolt run from the river system in 1960. In 1961 two-sea-year salmon were scarce, as expected. On the Northwest Miramichi tributary there was noticeable recovery by 1959 from DDT sprayings in 1954 and 1956, but in 1960 mine pollution interfered with upstream migration of adults. In 1961 some improvement from mine pollution was noted in the ascent of good numbers of two-sea-year adults, but the grilse run was poor, perhaps an effect of mining effluent on survival of the 1960 smolts from this branch.

Production of young salmon

Studies since 1941 on the Pollett River, tributary to the Petitcodiac, were aimed first at best use of hatchery stock. For several years they have been directed to learning spawning requirements for best smolt production, with fish-eating birds controlled the year round. The latter studies, combined with regular observations on other Maritime streams, have led to useful information on survival rates of young salmon under environmental conditions ranging from poor to good. Under average conditions and in a stream having commonly a six-year life cycle, eight 10-lb adults (four male, four female) might produce 30,000 fertilized eggs, which in successive years might be expected to result in 1800 underyearlings, 1200 small parr, 500 large parr, 200 smolts, and finally 16 adults of which half would be available for fisheries and half for spawning. Under particularly poor conditions, as where streams are heavily developed for hydro-electric power or affected by insecticide spraying, there may be too few resulting adult salmon to completely fill spawning requirements, and none should then be taken by fisheries. If, however, average survival conditions happen to replace the poor conditions, even the low crop of adults is capable of returning the stocks to normal after a generation or so.

Distribution and use of salmon of Miramichi origin

Annually since 1950 efforts have been made to mark by fin-clipping large numbers of smolts as they descended Miramichi tributaries. The data on later recoveries have been needed for various purposes including estimation of annual total Miramichi smolt production, estimation of contributions of Miramichi stock to various Atlantic fisheries, and information on extent of homing. In years when trapping conditions were favourable, about 50,000 smolts have been marked. Summarizing all returns from 1950 to 1959 shows that angling and commercial fisheries plus counting fences have given total recoveries averaging 2.5 per cent from smolts marked in different years. Details of the experiments are now being prepared for publication.

In 1958 smolt tagging experiments were started in the hope of developing a tagging technique that might replace marking by fin-clipping, and so provide more precise information. Over 11,000 tagged smolts were released in the Miramichi by 1961, and adult returns range from one to 2.5 per cent, and cover commercial nets at sea from the Miramichi area to as far away as Greenland, Miramichi anglers and Miramichi counting traps.

Environmental changes

Improving natural conditions for better survival of young salmon up to the smolt stage is an important objective of research. One of the most promising methods is control of fish-eating ducks, whose presence can counteract useful management practices on many Maritime rivers. Earlier experiments showed that smolt production can be increased several times by thorough merganser control. It still remains to demonstrate that the benefits carry through to the adult stage and improved salmon catches. In 1961 a five-year baseline survey was completed for the Margaree River, N.S., indicating that smolt production is now limited by merganser predation. Available angling and commercial catch statistics show that future fishing success in the Margaree area can be used to gauge effects of merganser control. It is planned to start a five-year experimental merganser control operation there in 1962, to show whether or not it should, at this time, be considered for practical salmon management.

Harmful man-made changes affect salmon production in many streams. Much research effort has been needed recently in New Brunswick to evaluate effects of forest spraying with insecticides for control of an outbreak of budworms, and of copper and zinc effluents from mining operations. The objective is to learn the seriousness of the situation and be in a position to recommend suitable remedies.

In 1961 field studies were continued in co-operation with the Department of Fisheries, the Department of Forestry and Forest Protection Limited to assess effects on salmonids and stream insects (which are the main food of parr), of DDT spraying operations. Spraying involved a two-million acre operational area in central New Brunswick, as well as a small experimental area for fisheries studies on the Molus River in Kent County. They showed that single half-strength spraying (1/4 lb DDT per acre, as compared to normal New Brunswick dosage of 1/2 lb per acre) had less harmful effects than any other measures that have given effective budworm control so far. The evidence came from survival of young salmon and trout held in cages, autumn electroseining of native fish populations, intensive sampling of aquatic insects, and late season losses of parr in streams and in laboratory experiments. Part of the 1961 operational spray area received two half-strength applications about 10 days apart, and effects were judged to be about as severe as those of a single full-strength application as used commonly in earlier years. It has been recommended, therefore, that future operational spraying be restricted as far as possible to single half-strength applications. It is desirable also that resprayings of individual watersheds, even at lower DDT dosages, be as many years apart as possible. In 1962 research will continue with other insecticides in the hope of finding substitutes giving suitable budworm control but causing minimum damage to fish.

Also in 1961 there was continued follow-up of effects on stream insects of the 1954 and 1956 DDT sprayings over the Northwest Miramichi watershed. These sprayings quickly killed many kinds of stream insects, particularly those having larvae of large size, which are excellent food for salmon fry. Large numbers of some kinds of small-sized stream insects were produced soon after the sprayings, but they are best suited as food for very small stages of salmon, namely underyearlings. The scarcity of large insect larvae was reflected in a thin condition of salmon parr, which may have contributed to observed deaths of many parr in autumn of the year of spraying. Fortunately, by 1961 both the kinds and quantities of stream insects had almost returned to normal in the Northwest Miramichi River.

The salmon and pollution investigations of the St. Andrews Station contributed in 1960 and 1961 to the analysis of effects of sub-lethal pollution by zinc and copper in mine effluent entering the Northwest Miramichi via the Tomogonops tributary. In both years there was considerable delay of ascending adults at the Curventon counting fence 15 miles below the outflow. Many went downstream and some ascended other branches to be angled, or were unaccounted for. Following treatment of the effluent in 1961 there was partial recovery from shortages of young salmon observed in the affected area in 1960. Growth of young salmon was still poor, however, probably a result of observed scarcity of food insects. Underyearling salmon above the affected area were relatively scarce in 1961, confirming an estimated shortage of spawners in 1960 through reduction of upstream migration.

Physiological Studies

The ability to regulate buoyancy may be an important factor affecting survival of young salmon and trout in streams, and should be considered in artificial stocking programs. In 1961 preliminary field experiments showed parr collected from slow water were more buoyant than parr collected from fast water. Later laboratory experiments showed that young salmon can adjust rapidly to changing water speeds. Further studies are planned to compare buoyancy regulation in salmon and trout, and the relation between size of fish and ability to regulate buoyancy.

Other physiological studies started in 1961 included laboratory experiments on swimming performance of young salmon, as background for investigations of possible weakening effects of pollutants like DDT, copper and zinc.

In association with the St. Andrews Station, the Department of Biology, University of New Brunswick, has been under contract with the Fisheries Research Board since June, 1961, to investigate in its laboratory some effects of sub-lethal doses of DDT in young Atlantic salmon. Interesting results have come already from three projects aimed at localization of DDT and its fate in body tissues, effects on growth and activity, and on temperature response.

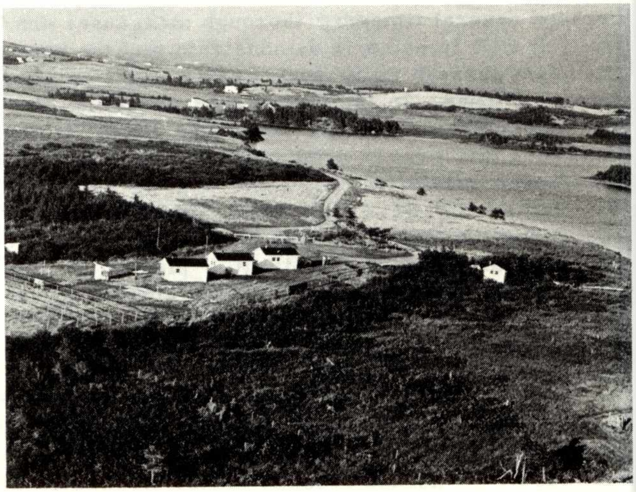
RESEARCH IN NEWFOUNDLAND

FRB Biological Station, St. John's, Newfoundland

Atlantic salmon of the Little Codroy River are being studied to learn details about their life history. Most of the research has been devoted to studying the relationship between descending smolts and returning adults. In addition, considerable work has been put into the study of the distribution of parr in the river. This project is part of a larger program of research and management being conducted in the Atlantic Provinces.

Much of the information on smolts and adults is obtained through the operation of a counting fence. The counting fence is located in the estuary of the Little Codroy River about one mile upstream from the place where it enters the sea. The fence is downstream from all tributaries and therefore it is possible to get complete counts of all fish moving in or out of the river. The fence is simply a barrier of heavily tarred small mesh netting stretched across the river. There are several traps located near the center of the fence where fish moving in or out of the river can be caught. The traps are visited several times each day in order to count,

Aerial view of salmon counting fence, Little Codroy River, Newfoundland; downstream is to right, and tide is running in, with on-shore breeze causing nets to billow upstream. Trap for seaward migrating smolts and stage for fish examination and marking are in middle distance; traps for upstream moving adults are in background to left of barrier nets and in foreground to right of barrier nets.



Aerial view of Fisheries Research Board's field station on north shore of estuary of Little Codroy River, Newfoundland, looking up the valley. The 6 buildings comprising the station are in middle. Racks for drying barrier nets are at rear of buildings. In background is the scarp of the Long Range, with average elevation of about 1800 feet above sea level.

examine, mark and release the salmon held in them.

Seaward migrating smolts have been marked at the counting fence by the removal of the dorsal and adipose fins. For every 100 smolts that go to sea from the Little Codroy, at least three, and possibly as many as six, survive to become adult salmon. Two to five of these are taken by the commercial fishery, and at least one returns to the Little Codroy River to spawn. Little Codroy adults have been caught in an area that stretches from Nova Scotia to Greenland. Most, however, are taken around Newfoundland.

RESEARCH IN QUEBEC

Department of Fish and Game, Quebec

In 1960 a research and management program was planned for the Nabisipi River, on the north shore of the Gulf of St. Lawrence, and a new station was operated there in 1961. Studies were confined mainly to the lower part of the river system, and preliminary investigations were completed on the morphometry and hydrography of the estuary. Adult salmon and parr were sampled to provide information on age, growth, sex ratio and feeding habits. Falls one and one-half miles above the river mouth are a partial barrier to migrating adult salmon, and to facilitate their passage a new fishway is being constructed. It is hoped that the new investigations will provide background information for effective management of north shore Quebec rivers of which the Nabisipi is typical.

TROUT (LIMNOLOGICAL) INVESTIGATIONS

Studies have been largely concerned with the native brook trout (Salvelinus fontinalis) and its habitat. Increasing attention is being paid to the introduced rainbow trout (Salmo gairdneri) which has now become established in a number of Maritime freshwaters.

Character of Maritime freshwaters

Investigations in Maritime streams and lakes have shown marked variation in their capacities to produce trout. Variations are closely associated with the character of the soils and underlying rock formations of drainage systems. Most Maritime lakes lie in hard rock formations, and their soft waters, reflecting drainage from infertile soils, are only capable of low to mediocre trout production. In contrast, streams that drain areas of sedimentary rocks, particularly those that contain a good lime content, are often highly productive of trout foods and trout. In general, the hard water and sedimentary rock areas are also the favourable agricultural regions of the Maritime provinces.

Basic problems and experimental approach

Among the basic problems of the trout fishery are those concerned with low fertility of soft waters, inadequate spawning conditions, competition for space and food between trout themselves and between trout and other species of fish, cannibalism and predation by fish, birds and mammals. In addition are the problems created by man's domestic and industrial use of freshwaters.

The principal experimental approach toward greater trout production in the Maritime freshwaters has been to overcome natural deficiencies by manipulation of environments and of fish populations. Research has mainly been directed to assessment of the possibilities and underlying principles of habitat alterations for increased production and effective utilization of trout. Such action is feasible in many of our freshwaters since their area and volume are sufficiently small for control necessary to result in desired improvement. Unless we alter natural environments for the well-being of more fish, or correct harmful action by man on fish life in his use of water and watersheds, then we must remain satisfied with what nature now provides. In general the view is taken in trout researches that to produce more trout, it is necessary to impose increasing control of both water and fish. This viewpoint is presented schematically in Table II. Taking actions in Table II leads to:

1. Increasing control of water and fish;

2. Domestication of fish;

Brook trout from Stevenson's Pond, Prince Edward Island. Average weight about one pound; age, two years.

Table II. Objectives in providing more trout for anglers

Action	Waters	Methods of action
1. Control of man	Natural waters (streams, lakes and estuaries)	(a) Regulation of angling (seasons, size limits, catch limits, modes of capture)
		(b) Control and correction of unfavourable actions by man (pollution, barriers, etc.)
2. Control of existing environment and fish	Natural waters (streams, lakes and estuaries)	(a) Manipulation of environment for improved fish-carrying capacity (fertilization, physical habitat improvement, predator control etc.)
		(b) Manipulation of fish populations (stocking, control of undesirable fish, control of fish movements for better harvest, etc.)
3. Creation of environments	Reservoirs, ponds	(a) Multiple use (farm fish ponds)
		(b) Primarily for fish production

3. Increasing need for effective cropping;

4. Need for increasing efficiency of diets;

5. Change from public to private endeavour for efficiency;

6. Demands for the angler to pay for production costs.

Some research findings

Stocking a number of Maritime freshwaters of low to high productivity with underyearling and yearling brook trout increased the supply for anglers to a minor degree, unless trout of angling size were planted and then fished during the year of stocking or early in the next.

Production and yields of brook trout have been increased by stocking lakes in which undesirable fish populations have been destroyed by poisoning, but only equal to the productive levels of the waters. Improvements were minor in soft-water, unfertile lakes.

Fertilization, control of fish-eating birds and mammals, and control of cannibalism, all carried out at the same time in a shallow non-productive soft-water lake, representative of many in the

Simpson's Pond, Prince Edward Island. An example of trout ponds formed by damming small Prince Edward Island streams.

Maritime area, resulted in a higher production level and a marked increase in yield of brook trout to anglers, catch per unit effort and survival of planted stock. Results attained at Crecy Lake, New Brunswick, are illustrated in Figure 2. Stocking was necessary to utilize the improved trout-producing capacity.

Artificial ponds formed on hard-water spring-fed streams (Prince Edward Island) give high yields of brook trout to anglers. Where brook trout move to salt water, artificial ponds markedly reduce sea runs. Such ponds improve the availability of the trout to anglers. Where the size of the pond is large in relation to size of the tributary stream and stock of young fish, the number of trout that move into the pond from the stream, with moderate angling pressure, is not sufficient to utilize fully the good trout environment created by the pond.

PRESENT INVESTIGATIONS

Annual fluctuations in standing crops of brook trout in a small stream (Ellerslie Brook, Prince Edward Island)

Climatic and environmental factors have contributed to annual fluctuations in standing crops. Annual variations in numbers were greater in the larger pool habitats than in the smaller, more stable habitats.

Following the formation of a pond in 1952, most of the trout, age II and older, moved into the pond in autumn or spring. There has been little return movement into the strea The reduction of older trout in the stream aft pond formation did not have any apparent effects on stocks of fingerlings (age 0).

Physical alterations of stream environments to improve brook trout production and utilization

Alterations of stream environments at present under study are (1) pond formation, (2) provision of more living space and hiding places by building low barriers and adding cover and (3) temporary barriers to control upstream movements of trout for retention in areas readily accessible to anglers.

(1) Pond formation markedly reduced the number of trout moving to salt water. Average annual number for five years prior to pond formation, 1775 trout; for eight years after pond formation, 311. The catch of trout from the Ellerslie system improved for a short time after pond formation. The potential of the pond as a rearing and holding area was not realized with the recruitment possible from the tributary stream. Additional recruitment to the pond from the stream is being attempted by stream improvement (see (2) in next column).

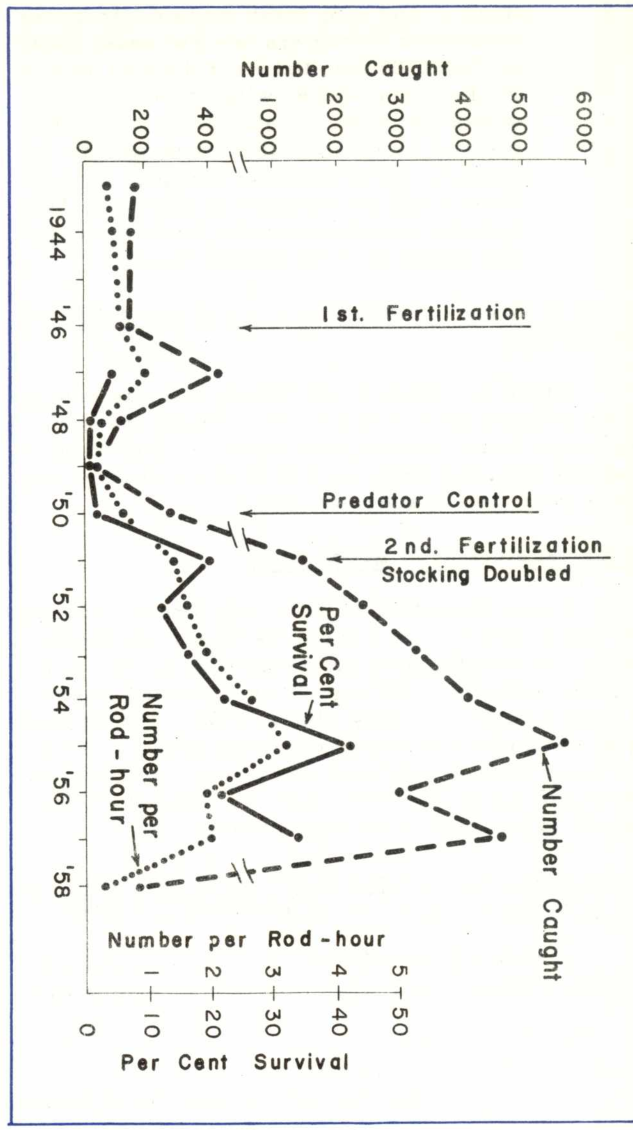


Figure 2. Anglers' catch, rate of capture, and survival of planted under-yearling brook trout to anglers' creels at Crecy Lake, New Brunswick, as affected by fertilization and predator control.

(2) Stream improvement was first investigated on Hayes Brook, a small stream tributary to Ellerslie Brook. In a section of the tributary the stream environment was altered by means of low dams, deflectors and covers, to create conditions known to be favourable to trout production. After one year the numbers of yearling trout in the altered area were about double the average of the numbers there over the previous 13 years. A stream improvement program is now underway in Ellerslie Brook to learn if this procedure will provide more recruits to the ponds.

(3) Retention of sea-running Brook trout, on

their return to fresh water, in areas accessible to anglers is now under study at Cains Brook, Prince Edward Island. Preliminary studies without barriers have shown that anglers catch from 15 to 18% of the sea-run trout that move up into the stream. More effective cropping of these trout might be expected if they were held by temporary barriers in readily accessible areas near the stream mouth.

Yields of Brook trout from natural and artificial recruitment

Hatchery-reared trout (age 0) survived poorly in an unfished pond, and did not increase the standing crops from native reproduction. Native populations are used more effectively by harvesting every year than in alternate years.

Estuarial stocking of Brook trout

Pond formation on Ellerslie Brook reduced the trout movements from the brook into the estuary. In an attempt to compensate, marked hatchery-reared brook trout (age 0) were planted directly into the estuary in early winter, 1962. The planted trout were of a size shown experimentally to tolerate adjustment to estuarial conditions. In the first two months of the 1962 angling season anglers caught 15 per cent of the planted stock.

Relative value of Rainbow and Brook trout in utilizing the productive capacities of Maritime freshwaters

In Crecy Lake, New Brunswick, the rainbow trout and brook trout, when not in competition with each other, provide about equal yield to anglers. With competition between the two species in a Prince Edward Island pond, initial results suggest that the rainbow trout, given equal opportunity for continued recruitment, could dominate, or even supplant, the brook trout. Rainbow trout appear to provide better mid-summer fishing than the native brook trout.

Stream improvement by construction of low dams to provide more living space (pool formation) for brook trout. Ellerslie Brook, Prince Edward Island.

Investigation and Management of Atlantic Salmon and Trout

The Management Program

Summary of 1961-1962 Reports

MARITIMES AREA

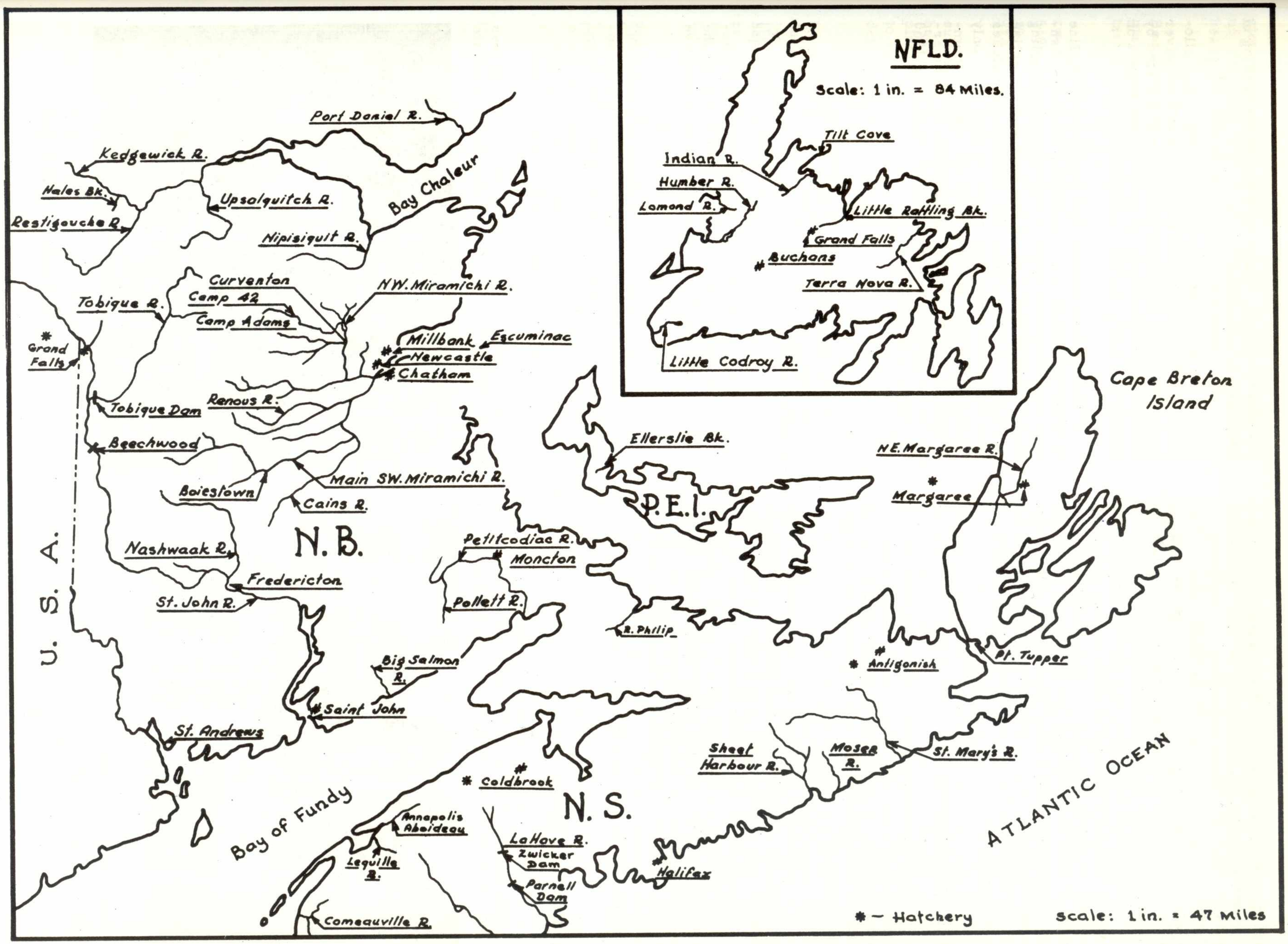
Hatchery and pond operations

THE FISH CULTURE establishments operated in the Maritime Provinces consisted of the following: thirteen hatcheries, four rearing ponds and three Atlantic salmon retaining ponds. In addition, collections of Atlantic salmon eggs were made on the Restigouche River and Margaree River, and landlocked salmon eggs were collected at Chamcook and Palfrey Lakes in New Brunswick. The collection of speckled, brown and rainbow trout eggs from the hatchery brood stock were very successful.

The total collection of eggs from all species for the year amounted to approximately 55,399,600. The total distribution of fish of all stages and species for the year amounted to 35,110,000 of which 600,800 were salmon yearlings and older.

The growth rate and survival of hatchery stock was, in most instances, about normal, al-

(Continued on page 14)



Streams and places involved in Atlantic salmon investigations, 1961 - 62.

though low water and high temperatures were encountered in many of the establishments. Of the 80,000 Atlantic salmon fingerlings overwintered in the spring-fed water supply at the Coldbrook Station, approximately 70 per cent had reached the smolt stage when liberated in the spring of 1961.

The pH of the water supply at Grand Lake Station reached such a low point during February and March that it was necessary to move all the stock to Coldbrook Station. In August all the stock on hand at the Grand Falls Station was killed from careless handling of pesticides by some farmers on the upper reaches of the stream supplying water to the hatchery.

Engineering Service

The engineering branch, consisting of two engineers and one technician, was concerned mainly with extension of present facilities at the various hatchery establishments, and maintenance of existing fishways.

Several new projects were completed during the year. A new hatchery was built at Coldbrook Fish Culture Station, and a reservoir was constructed at Margaree Fish Culture Station to stabilize temperatures and overcome sedimentation and anchor-ice problems. Also during this period a salmon holding pond was completed at Hales Brook, a concrete storage dam at Antigonish Fish Culture Station and a fish pass at Walton Dam on Big Salmon River in New Brunswick.

Biological Service

A heavy program committed staff to priority salmon and pollution studies, and hatchery problems, involving mortality studies, tagging, new site location, etc., again left the heavy backlog of lake surveys untouched.

A large part of the staff and time was allocated to the continuation of the Saint John River project where the objective, although complicated by DDT pollution effects, is to study the impact on fisheries of hydro-power developments.

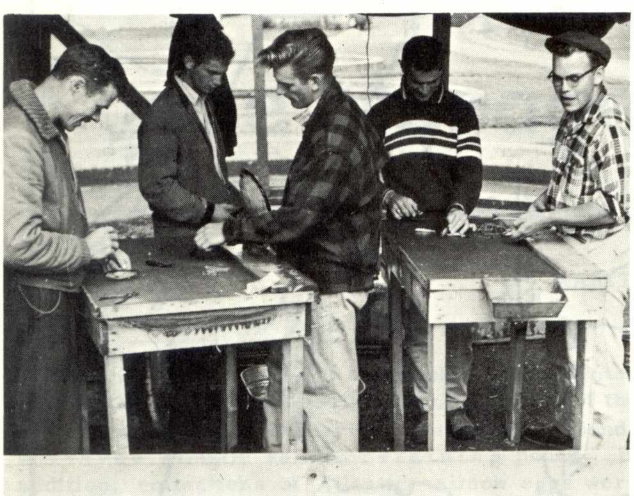
The upriver salmon run continued to decline as shown by counts of fish passing over the fishways at both power dams. The salmon angling catch was only half that of last year and the grilse run was extremely small. The commercial catches from the harbour and tidal river section were only slightly lower than last year but strong in comparison to upriver runs. Comparison of commercial and angling catches and fishway counts for 1960 and 1961 are listed below:

	1960	1961
Commercial catch (cwt)	1,559	1,365
Angling catch	2,303	1,140
Beechwood count	2,688	1,431
Tobique count	1,120 (1,089)	747 (197)

The figures in brackets referred to the number of salmon trucked from Beechwood to the Tobique River by the Tobique Fisheries Protective Association.

Entrance trials were continued at the Beechwood collection gallery but results were inconclusive because of unknown availability of salmon. Photographic counts of fish in the skip hoist were unsatisfactory, so it is planned to install an underwater electronic fish counter with camera in 1962.

Tests with tagged smolts showed that less than one per cent entered the Beechwood headgate



Tagging salmon yearlings for stocking Saint John River system, N.B.

Water sampling station and caged fish site, Northwest Miramichi River, N.B.

slots during heavy spillage and 17 per cent during no spillage. Other tests indicated that holdup in the headgate enclosures rarely exceeded a week.

Nursery assessment of the main river below Beechwood was repeated in 1961. Population estimates for both years are well below those ascertained for other salmon rivers.

From the quantitative survey of the Tobique rearing area, it was estimated that from 3400 to 5400 salmon would be required to fully utilize the water. The 1961 spawning escapement was only 874 salmon.

In order to speed up population recovery resulting from DDT spraying and hydro development, heavy plantings of salmon yearlings have been placed in the Saint John River. So far no benefits to the upriver runs from these plantings have been detected.

Three major projects were undertaken in Nova Scotia. Turbine mortality tests were conducted at Tusket River power plant. Mortality rate for adults ranged from 14.5 per cent to 18 per cent, depending on plant load. No delayed mortality could be obtained for adults. Juvenile mortalities, including delayed mortality, averaged 50 per cent for tests carried out over a three-month period.

Assessment of the efficiency of the two fish passes installed in the Annapolis Aboideau was continued in 1961. Although tagged returns to the upriver trap were low, most indications are that little delay is experienced by shad, bass, and salmon. It is hoped to tag the early salmon run in 1962 and improve upriver trapping facilities.

A survey was made of East River, Sheet Harbour to estimate its current productive capacity for salmon and to determine what problems will be involved to provide safe passage of both upstream and downstream migrants.

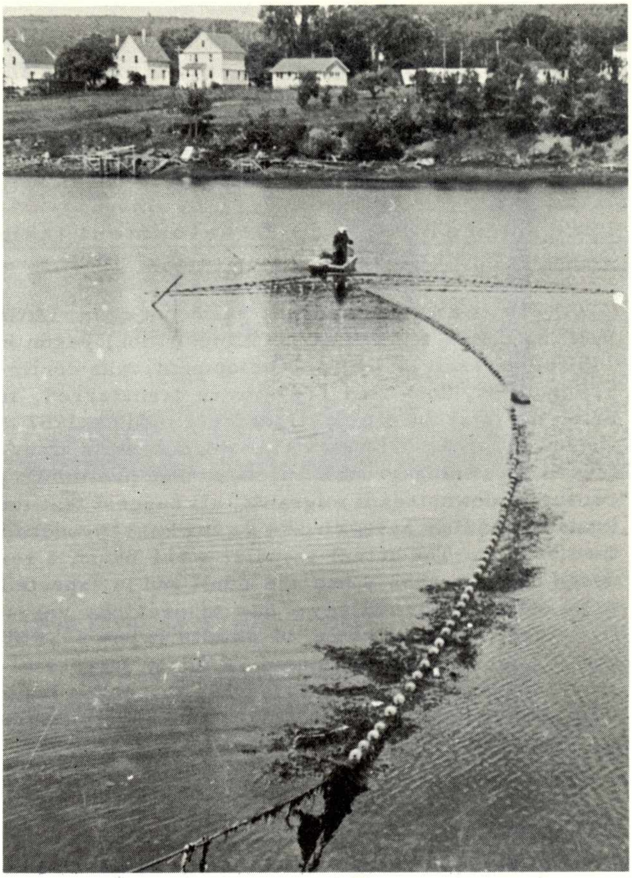
In the field of pollution assessment and control, the Maritime Fish Culture Development Branch participated in the following:

New Brunswick

1. Fishkill assessment resulting from DDT forest spraying operations
2. Base metal pollution, Miramichi River
3. Pesticide pollution, Grand Falls Fish Culture Station.

Nova Scotia

1. Industrial waste pollution, Hillaton
2. Sewage effluent, Bedford



Lower Basin float trap, Annapolis River, N.S.

Observations on returns from several years of planting marked early run hatchery fish were continued at River Philip. The object of the experiment is to ascertain whether or not the tendency of salmon to run into the river early is an inherited or environmental characteristic. A repeat experiment is underway at Big Salmon River, N.B.

The experimental merganser control was continued on the Miramichi watershed and the St. Mary's watershed by the Protection Service. The St. Mary's project has been extended to a year-round patrol.

Seven lakes and one river were surveyed to determine their suitability to serve as a possible water supply for an experimental fish hatchery.

At the request of the Hon. G.I. Smith, Minister for the Nova Scotia Water Act, a fairly comprehensive report on the Atlantic Salmon Fishery of Nova Scotia was produced.

No fish were caught or observed when a recheck of the Comeauville River system, poisoned with Toxaphene in 1960, was made. Assistance was given to the N.S. Department of Lands and Forests in the poisoning of Silvery Lake.

Other operations included checking several fishways for operational problems, tagging of yearling salmon for experimental projects and minor obstruction surveys.

NEWFOUNDLAND AREA

Little Rattling Brook Hydro Development (Adult Salmon Transfer)

The transfer of adult salmon from Little Rattling Brook to Great Rattling Brook, begun in 1957 as a result of hydro development, was continued in 1961. Some 254 fish were transferred, to bring the total number transferred since 1957 to about 2800 fish. Observations on adults transferred, spawning ground surveys, and preliminary census of downstream migrants, all suggest that the transferred fish have successfully reproduced themselves. The actual transfer will be on a reduced basis in 1962 since the adult run is expected to be one half normal size due to previous years' transfers, and passage of smolts (since 1958) through powerhouse turbines. A fairly large scale smolt operation will be carried out to census these migrants and mark a percentage for identification as 1963 adults ("grilse").

Construction of New Oil Refinery

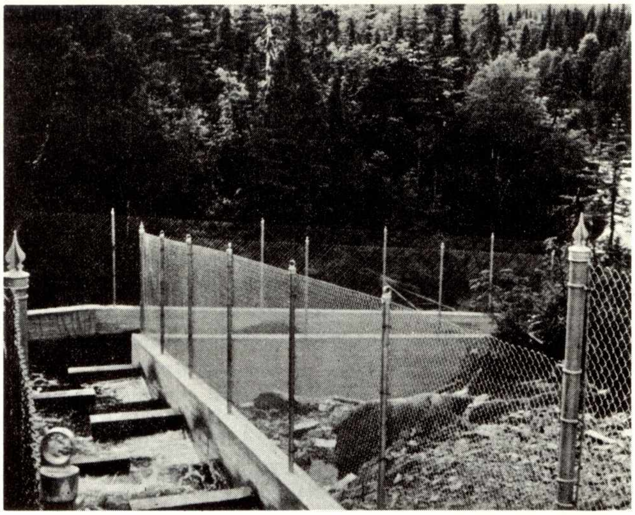
A 7000 barrel per day oil refinery went in operation near St. John's in late 1961. Negotiations have been held with the principals, and no significant pollution is anticipated from this source.

Proposed Construction of New Pulp Mill

Construction may begin in 1962 on a new pulp (and paper?) mill to be located on the isthmus of the Avalon Peninsula. Surveys are to be carried out in 1962 on rivers that may be affected by the proposed water supply for this mill. Negotiations will also be held re proposed logging operations at the appropriate time.

Salmon Net Mesh Size Experiment

Two "fleets" of gill nets, each composed of two 40 fm x 3 fm nets (one $4\frac{1}{2}$" stretched mesh, and one 5" stretched mesh) were operated in salmon fishing areas to determine the relative catching efficiency for salmon of each of these two mesh sizes. This was a "pilot" experiment to enable planning to go ahead on a larger experiment in 1962. The little evidence available from the "pilot" experiment suggests that there was little overall difference in catch by these two mesh sizes. A more comprehensive experiment is planned for the 1962 fishing season.



Fishway, Lomond River, Newfoundland.

River Reconnaissance Surveys

Brief reconnaissance surveys were carried out on eight salmon and trout streams on the Great Northern Peninsula of the Island. These surveys related particularly to size of salmon and trout stocks, and the presence or absence of stream obstructions.

Mine Wastes Disposal Studies

Brief studies of "tailings" disposal were carried out at Tilt Cove (copper mine), Little Bay (copper mine), Buchans (base metal mine), and in Labrador (Wabush iron ore development, and IOC iron ore development).

Exploits River Development

As a continuation of the Exploits River Development Program begun in earlier years, a pollution survey was carried out in the area between the town of Grand Falls and the sea, to determine if industrial and domestic wastes spilled to the river would impair its further development for additional salmon and trout production. Investigation and study of this aspect will continue in 1962. An attempt will then be made to collate all biological and engineering studies carried out on the Exploits since 1958 to determine whether development for Atlantic salmon should be recommended and, if so, a schedule for such development.

Lake Investigations - 1961

For the first time, a biological survey team was assigned the task to begin reconnaissance surveys of freshwater areas, and their fish populations on the island of Newfoundland. Some eight major lakes were surveyed briefly during the year. Other lakes will be surveyed in 1962. Results of these surveys will, we hope, indicate waters suitable for more detailed study to determine suitable management procedures for these waters.

Engineering Surveys

Detailed engineering surveys were carried out on physical obstructions on the Humber River (Big Falls, Main R. Falls, and Adies Lake), and at Bernard's Falls on Conne River, Bay D'Espoir. Miscellaneous minor surveys were carried out on several other locations on the Island.

Fishway Construction and Remedial Work

Major alterations were carried out on the lower half of an important fishway on the Terra Nova River. The fish entrance to this fishway, built in 1952 was poorly placed in relation to flow below it, and was too high at medium to low water levels. These defects have been remedied.

Stream remedial work (blasting and drilling) was carried out at Isle aux Morts River, on the south coast.

Miscellaneous other work, including minor fishway repair, was also carried out.

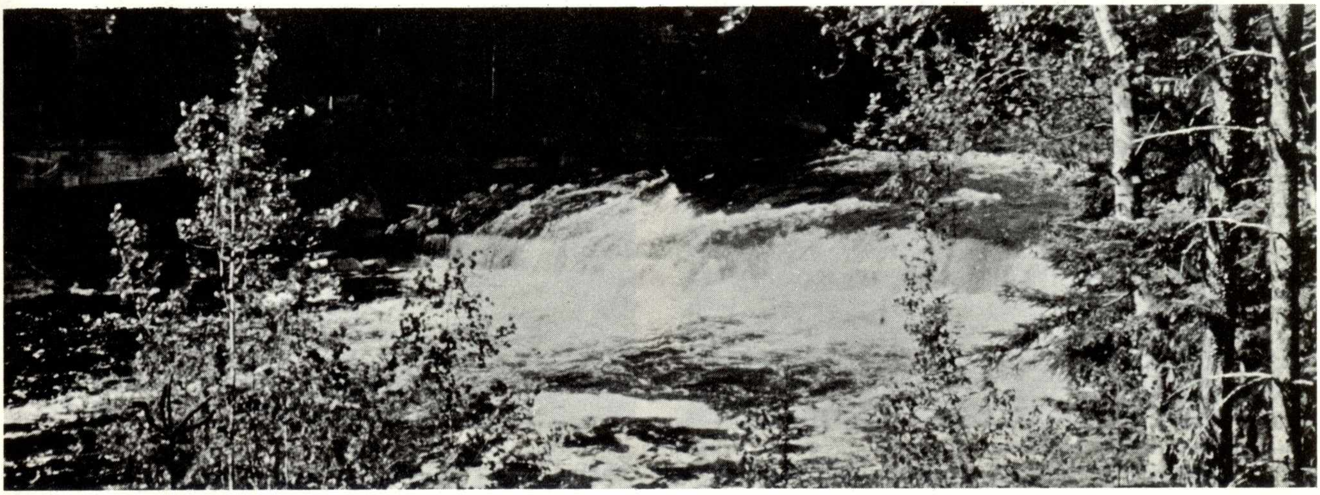
Placentia Water Supply

Discussion has been held with the principals relating to a proposed diversion of a major tributary of South East Placentia River as a source of additional water for the town of Placentia and Argentia Naval Base. The tributary referred to carries a good salmon run, and every effort will be made to preserve it. No firm plans regarding this diversion have yet been submitted for our study and recommendations.

Engineering Survey Crew, Big Falls, Humber River, Nfld.

Indian River Diversion Project

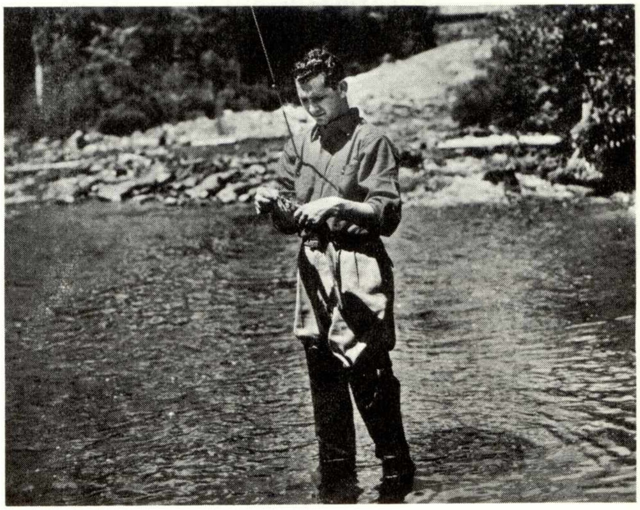
Agreement has been reached between Bowater's Newfoundland Pulp & Paper Mills Ltd. and the Department of Fisheries, having to do with remedial measures to be instituted to maintain the Indian River salmon run subsequent to diversion of a substantial part of its headwaters to the powerhouse at Grand Lake, Humber River. Very generally, a salmon run in the order of 1250-2500 fish is involved, some 75 per cent of which will be deprived of natural spawning area by this development. It has been agreed that the Company will (1) supply a minimum water flow below their Main Diversion Dam, (2) channelize the river below this dam as required to make best use of the reduced flow, and (3) pay one half cost incurred in construction of an experimental artificial spawning area to accommodate that part of the run that cannot utilize area below this dam. ✔



Point of delay to salmon migrants at Big Falls on the Humber River, Newfoundland.

"TAKE CARE OF YOUR CATCH"

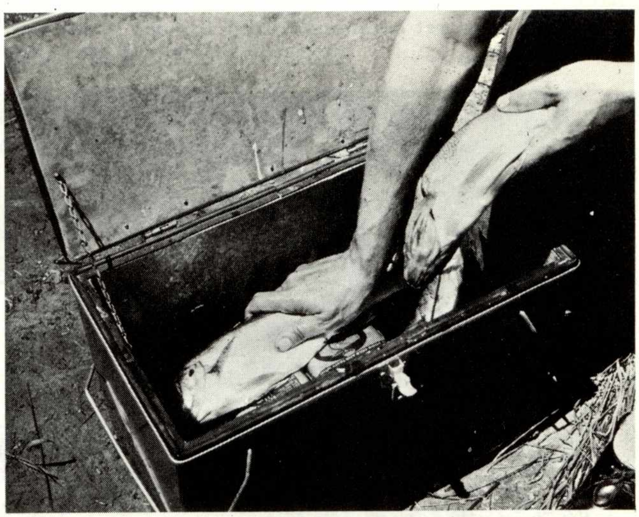
Fishing is great sport, and the catch can be delicious if the angler knows how to handle it properly.



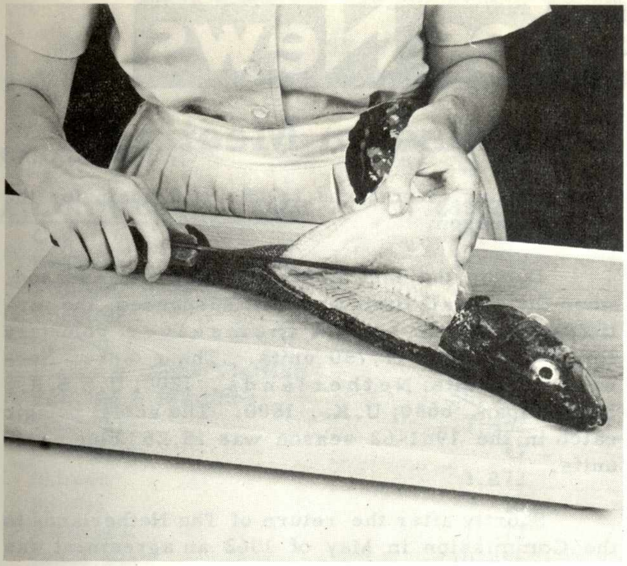
Kill the fish immediately and place it in a cool, shady place, wrapped in wet moss or a wet sack.

THE sequence of photographs presented here is taken from a Department of Fisheries filmstrip titled "Let's Serve Freshwater Fish." A booklet with the same title, containing a wide variety of recipes, is available from the Department's Information and Consumer Service in Ottawa. The filmstrip, which received the Blue Ribbon Award of the 1962 American Film Festival for the best in the Home Economics Class, was in competition with more than 50 other entries from Europe and the United States. It was produced for the Department by the National Film Board of Canada. In its continuing program to encourage Canadians to eat more fish the filmstrip, which is in colour, was adapted for the black and white television screen and made available to T. V. stations across Canada, many of which have reported a gratifying response to its showing.

Clean the catch as soon as possible, taking care to remove the gills, and flush the body cavity with clear, cold water.



Keep the fish well chilled until cooking time. A refrigerated cooler, with crushed ice, is highly recommended.



When you get your fish home, wash and dress it in the form desired for cooking, wrap carefully, and place in the refrigerator.

If the fish is not to be cooked right away, package it suitably and place in freezer keeping it at 10 degrees below zero.

Good quality fish, cooked with care, is a treat, whether caught at the lake or bought at your favourite food store.

Deputy Fisheries Minister George R. Clark (left) receives the American Film Festival Award from Guy Roberge, NFB Commissioner.

Silas W. Moores

A pioneer in Newfoundland's fresh frozen fish industry, Silas W. Moores, died on July 25, at the age of 61. Native of the Conception Bay town of Carbonear, he was president and managing director of Northeastern Fish Industries Ltd., owners and operators of a modern processing plant located in nearby Harbour Grace (one of the largest fresh frozen fish processing plants in Newfoundland). He also operated a plant at Fermeuse, and at the time of his death had two additional plants nearing completion at Old Perlican and Port de Grave. Mr. Moores was also president of Northeastern Fisheries Corporation, Gloucester, Mass. In other industrial pursuits he was a director of W.J. Moores Ltd., Carbonear, and President of Moores Industries Ltd. He was also a former Canadian representative on the International Commission for the Northwest Atlantic Fisheries.

International Whaling Commission Meeting

A REVIEW of catch limits and discussions regarding international inspection of factory ships highlighted the Fourteenth Annual Meeting of the International Whaling Commission held in London, England, early in July. G.R. Clark, Deputy Minister of Fisheries for Canada, was chairman.

Represented at the four-day meeting were the governments of Argentina, Australia, Canada, Denmark, France, Iceland, Japan, Mexico, the Netherlands, New Zealand, Norway, South Africa, Sweden, the United Kingdom, the United States, and the Union of Soviet Socialist Republics. In addition observers were present from the Food and Agriculture Organization of the United Nations, The International Council for the Exploration of the Sea, Chile and Italy.

In welcoming the delegates, W.M.F. Vane, Parliamentary Secretary to the British Ministry of Agriculture, Fisheries and Food, said that the return of The Netherlands to the Commission was viewed with much pleasure. He felt that the consequences of this action and the agreement made outside the Convention by the five Antarctic pelagic whaling countries for sharing the pelagic catch in the Antarctic were most important.

(In 1960, The Netherlands and Norway, two of the world's leading whaling nations, had withdrawn from the Convention as a result of a previous failure of the Antarctic whaling nations to reach agreement outside the Convention on a division of the quota established by the Commission. Norway had rejoined the Convention prior to this year's meeting.)

Mr. Vane stated that now that an agreement on catch-sharing had been reached outside the Convention by the five Antarctic pelagic whaling countries, he hoped it would be possible to limit the Antarctic catch to a level which the stocks could support. The forthcoming special scientific investigations on the condition of the stocks are of vital significance, and it was hoped that the meeting would decide on the details of the International Observer scheme, he said.

Through the years the Commission has limited the annual pelagic catch of whales in the Antarctic by establishing the number of blue whale units which may be taken each season. (A blue whale unit equals one blue whale or two fin whales or two and a half humpback whales or six sei whales). At its meeting in 1960 the Commission suspended the catch limit of 15,000 blue whale units for two seasons. As no change in this overall limit was suggested at the 1962 meeting, it returns to 15,000 again for the 1962-63 season.

During the last Antarctic whaling season, when the overall limit was still suspended, the participating nations had set themselves voluntary limits, totalling 17,780 units. These were: Norway, 5100 units; Netherlands, 1200; U.S.S.R., 3000; Japan, 6680; U.K., 1800. The actual pelagic catch in the 1961-62 season was 15,253 blue whale units.

Shortly after the return of The Netherlands to the Commission in May of 1962 an agreement was reached outside the Convention between the governments of the Antarctic pelagic whaling countries on the allocation of the total permitted Antarctic catch under the Convention. The catch is to be broken down as follows: Norway, 32 per cent; The Netherlands, six per cent; the U.S.S.R., 20 per cent; Japan, 33 per cent; the U.K., nine per cent. These arrangements are to be in force until the 1965-66 season.

The Commission discussed the setting up of an international inspection system of Antarctic pelagic factory ships. No decisions were reached but the Commission will convene a further meeting on the subject between the five Antarctic pelagic whaling countries later this year.

As a result of the recommendation of the Committee of Three Scientists and the Special Scientific Committee with which they worked, the preparation of data to allow a proper appraisal of the whale stocks of the Antarctic has been completed by the national research units. The expenditure necessary for the preparation of data cards by the Bureau of International Whaling Statistics, and processing of the data by an electronic computer has now been authorized by the Antarctic pelagic whaling countries. It is expected that another meeting of the Committee of Three and the Special Scientific Committee will be held in Seattle, U.S.A., before the end of the year. The Commission hoped that as a result of this meeting more precise information on the state of some of the Antarctic whale stocks would be available. From such data it should be possible to establish the level of the annual catch necessary for optimum yield.

Dr. W.M. Sprules, Special Assistant to Canada's Deputy Minister of Fisheries, was scientific adviser to the Canadian delegation at the London meeting. The other member of the Canadian delegation was D.B. Laughton of the London office of the Department of Trade and Commerce.

Fishery Figures For June

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-June 1961		May-June 1962	
	'000 lbs	$'000	'000 lbs	$'000
CANADA TOTAL	341,525	23,229	386,145	27,643
ATLANTIC COAST - Total	282,282	16,613	331,223	19,646
Cod	108,560	3,249	126,564	3,991
Haddock	15,738	561	16,665	703
Pollock, Hake & Cusk	13,543	290	20,840	584
Rosefish	3,106	82	8,473	242
Halibut	1,490	347	1,751	431
Plaice & Other Flatfish	34,464	1,083	31,729	998
Herring & Sardines	56,336	772	74,719	725
Mackerel	1,452	107	3,719	151
Swordfish	47	25	53	28
Salmon	1,272	613	1,242	646
Smelts	38	5	6	1
Alewives	7,172	137	7,311	127
Other Fish	10,496	149	7,351	120
Lobsters	24,667	8,397	26,817	10,044
Clams & Quahaugs	1,068	44	1,042	45
Scallops	2,776	750	2,878	808
Other Shellfish	57	2	63	2
PACIFIC COAST - Total	59,243	6,616	54,922	7,997
Pacific Cods	2,075	161	2,085	164
Halibut 1/	16,157	3,251	15,681	4,703
Soles & Other Flatfish	2,200	126	1,364	86
Herring	27,438	302	23,656	248
Salmon	7,435	2,500	6,851	2,484
Other Fish	945	32	2,050	52
Shellfish	2,993	244	3,235	260
BY PROVINCES				
British Columbia	59,243	6,616	54,922	7,997
Nova Scotia	96,304	7,329	93,386	8,421
New Brunswick	32,553	1,936	49,534	2,093
Prince Edward Island	10,595	2,060	12,777	2,539
Quebec	42,593	1,603	62,320	2,365
Newfoundland	100,237	3,685	113,206	4,228

1/ Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES, June 1962

		Montreal	Toronto
		$	$
Cod fillets, Atl. fresh, unwrapped	lb	.322	.367
Cod fillets, Atl. frozen, cello 5's	lb	.280	.320
Cod fillets, smoked	lb	.365	.430
Haddock fillets, fresh, unwrapped	lb	.424	.470
Herring kippered, Atl.	lb	.247	.290
Mackerel, frozen, round	lb	.218	.239
Lobsters, canned, Fancy	case 48-½s	42.324	42.782
Sardines, canned	case 100-¼s	8.915	9.211
Halibut, frozen, dressed	lb	.441	.453
Silverbright, frozen, dressed	lb	.558	.553
Coho, frozen, dressed	lb	.708	.740
Sockeye, canned, grade A	case 48-½s	24.527	25.392
Pink, canned, grade A	case 48-½s	14.620	15.104
Whitefish, fresh	lb	.405	.357
Lake Trout, frozen	lb	.466	.443

PRICES PER CWT. PAID TO FISHERMEN
(Week ending June 16th)

	1961	1962
	$	$
Halifax		
Cod Steak	4.50	5.00
Market Cod	4.00	4.50
Haddock	5.00	7.00
Plaice	3.75	4.00
Yarmouth		
Haddock	5.00	7.00
Black's Harbour		
Sardines	2.00	2.00
St. John's, Nfld.		
Cod	2.50	2.75
Haddock	2.25	2.25
Rosefish	2.00	2.00
Vancouver		
Ling Cod	10.00-12.00	12.00-14.00
Gray Cod	5.00- 6.00	7.00
Soles	5.00- 9.00	7.00- 9.00
Salmon (Rdspg)	40.00-65.00	42.00-75.00

Fishery Figures For June

STOCKS AS AT END OF JUNE 30TH

	1961 '000 lbs	1962 '000 lbs
TOTAL - Frozen Fish, Canada	64,140	59,249
Frozen-Fresh, Sea Fish - Total	42,376	38,398
Cod Atlantic, fillets & blocks	10,109	13,500
Haddock, fillets & blocks	6,343	2,252
Rosefish, fillets & blocks	502	1,204
Flatfish (excl. Halibut) fillets & blocks	4,780	3,096
Halibut Pacific, dressed & steaks	9,971	7,028
Other Groundfish, dressed & steaks	847	657
Other Groundfish, fillets & blocks	2,233	3,253
Salmon Pacific, dressed & steaks	2,501	2,044
Herring, Atlantic & Pacific	160	419
All Other Sea Fish, all forms	2,905	3,351
Shellfish	2,025	1,595
Frozen-Fresh, Inland Fish - Total	4,423	4,684
Perch, round or dressed	33	107
Pickerel (Yellow & Blue) fillets	729	233
Sauger, round or dressed	425	25
Tullibee, round or dressed	105	206
Whitefish, round or dressed	695	628
Whitefish, fillets	168	739
Other, all forms	2,268	2,746
Frozen-Smoked Fish - Total	1,868	1,874
Cod Atlantic	929	1,243
Sea Herring, kippers	300	229
Other, all forms	639	402
Frozen for Bait and Animal Food	15,473	14,293
Salted and Pickled Fish, Atl. Coast		
Wet-salted - Total	9,325	11,346
Cod	5,884	5,460
Other	3,441	5,886
Dried - Total	8,240	4,014
Cod	6,998	3,692
Other	1,242	322
Boneless - Total	217	251
Cod	182	217
Other	35	34
Pickled - Total (barrels)	19,263	25,812
Herring "	7,269	6,674
Mackerel "	399	2,866
Alewives "	11,595	16,272
Turbot "	-	-
Bloaters (18 lb boxes)	168,572	81,694
Boneless Herring (10 lb boxes)	7,417	-

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS MAY-MARCH

(Value in Thousands of Dollars)

	1961		1962	
Total Exports		131,071		138,266
By Markets:				
United States		95,500		100,189
Caribbean Area		15,519		14,758
Europe		15,475		20,984
Other Countries		4,577		2,335
By Forms:				
Fresh & Frozen		88,048		90,626
Whole or Dressed	34,570		33,388	
Salmon, Pacific	8,036		7,196	
Halibut, Pacific	5,180		5,579	
Cod, Haddock, Pollock, etc.	455		422	
Swordfish	1,848		1,704	
Other Seafish	4,879		4,003	
Whitefish	5,929		5,950	
Pickerel	2,917		2,982	
Other Freshwater fish n.o.p.	5,326		5,552	
Fillets	33,255		35,650	
Cod, Atlantic	13,148		13,452	
Haddock	4,492		4,797	
Rosefish, Hake, Pollock, etc.	2,343		3,248	
Flatfish	5,803		5,585	
Pickerel	1,546		1,811	
Other	5,923		6,757	
Shellfish	20,223		21,588	
Lobster (Alive & Meat)	17,262		17,962	
Other	2,961		3,626	
Cured		20,225		19,382
Smoked	1,241		1,205	
Herring	828		753	
Other	413		452	
Salted, Wet & Dried	16,647		15,853	
Cod	13,299		13,497	
Other	3,348		2,356	
Pickled	2,337		2,324	
Herring	1,400		1,514	
Mackerel	294		234	
Other	643		576	
Canned		16,792		19,741
Salmon	9,681		13,961	
Sardines	3,671		2,446	
Lobster	2,530		2,039	
Other	910		1,295	
Miscellaneous		6,006		8,517
Meal	2,985		5,209	
Oil	462		644	
Other	2,559		2,664	

Current Reading

"Fishery Statistics of the United States, 1960," by E.A. Power, (published by the U.S. Bureau of Commercial Fisheries, for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. $2.75).

The 1960 commercial fisheries of the United States yielded a catch of 4.9 billion pounds, valued at $353.6 million to the fishermen. Only in 1956, when a record 5.3 billion pounds were taken, and in 1959 (5.1 billion pounds), was the annual harvest greater. Compared with 1959, the catch was down 180 million pounds or four per cent while the value was up over $7 million or two per cent. The average price paid to fishermen in 1960 was 7.2 cents per pound, a little higher than in the previous year.

This report contains a review of the fishery statistics for 1960, including data on the volume and value of the catch of fishery products; employment in the fisheries; quantity of gear operated; number of fishing craft employed in the capture of fishery products, and information on the volume and value of the production of manufactured fishery products and by-products.

"Report of the Bureau of Commercial Fisheries for the Calendar Year 1957." (United States Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C.).

This is the first report of the Bureau of Commercial Fisheries, an agency established in 1956 within the United States Fish and Wildlife Service of the Department of the Interior. This, however, is not the first annual U.S. Government report on fishery activities, as these have been dealt with since 1940 in the annual reports of the Secretary of the Interior.

This report renews the original series issued by the U.S. Bureau of Fisheries prior to 1940, and presents a contemporary chronicle of an old branch of American industry as well as a condensed record of the administrative actions of a government bureau.

"Circular No. 4, Fisheries Research Board of Canada, Biological Station and Technological Unit, London, Ont." (The Fisheries Research Board of Canada, Ottawa. Available from the Board's Biological Station at 539 Richmond St., London, Ont.).

The contents of this circular include "Scale Reading -- What, How and Why", by Dr. W.A. Kennedy, and "Specialty Fish Products" (from freshwater fish) by A.W. Lantz.

"The Norwegian Approach to Regional Economic Development," (Atlantic Provinces Economic Council, 1591 South Park Street, Halifax, N.S.)

This pamphlet contains the text of an address by Mr. Eivind Erichsen, Permanent Secretary, Ministry of Finance, Oslo, Norway, at the annual meeting of the Atlantic Provinces Economic Council, held at Charlottetown, P.E.I., in September 1961.

The paper contains a description of the plans, programs and policies which have been adopted by the Norwegian Government to ensure a proper rate of growth in the national economy. The second part is devoted to an explanation of the special policies which are made available by the National Government to encourage the normal development of economically lagging areas. The concluding section discusses the lessons for other countries of the Norwegian experience.

"Abyssal Crustacea", by J. Laurens Barnard, Robert J. Menzies and Mihai C. Bacescu, (The Copp Clark Publishing Company, Limited, Toronto, Ont. $10.00).

This is the first volume of the "Vema Reports", a series of papers based on the work done aboard the Columbia University research vessel "Vema." The series is designed for the publication of papers whose length, requirements for illustration, or subject matter would make publication in existing journals difficult. The three papers collected in this first volume record important new discoveries relating to the orders Amphipoda, Isopoda, and Cumacea.

"Vema" is equipped for acoustic, seismic, gravity, magnetic and thermal studies and for chemical, physical, biological and geological oceanography. Her wide-ranging voyages have been planned to permit co-operation with the vessels and scientists of other nations, and the contributions to international understanding as well as to scientific knowledge from co-operative programs have been important. The book is beautifully produced and profusely illustrated.

"Proceedings and Technical Papers, General Fisheries Council for the Mediterranean" (Food and Agriculture Organization of the United Nations, Rome, Italy. $4.00).

The first part of this volume includes the proceedings of the sixth session of the GFCM, held in Rome in September 1960. The second part is made up of the 52 technical papers presented at that session.

G. R. Clark

Deputy Minister.

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