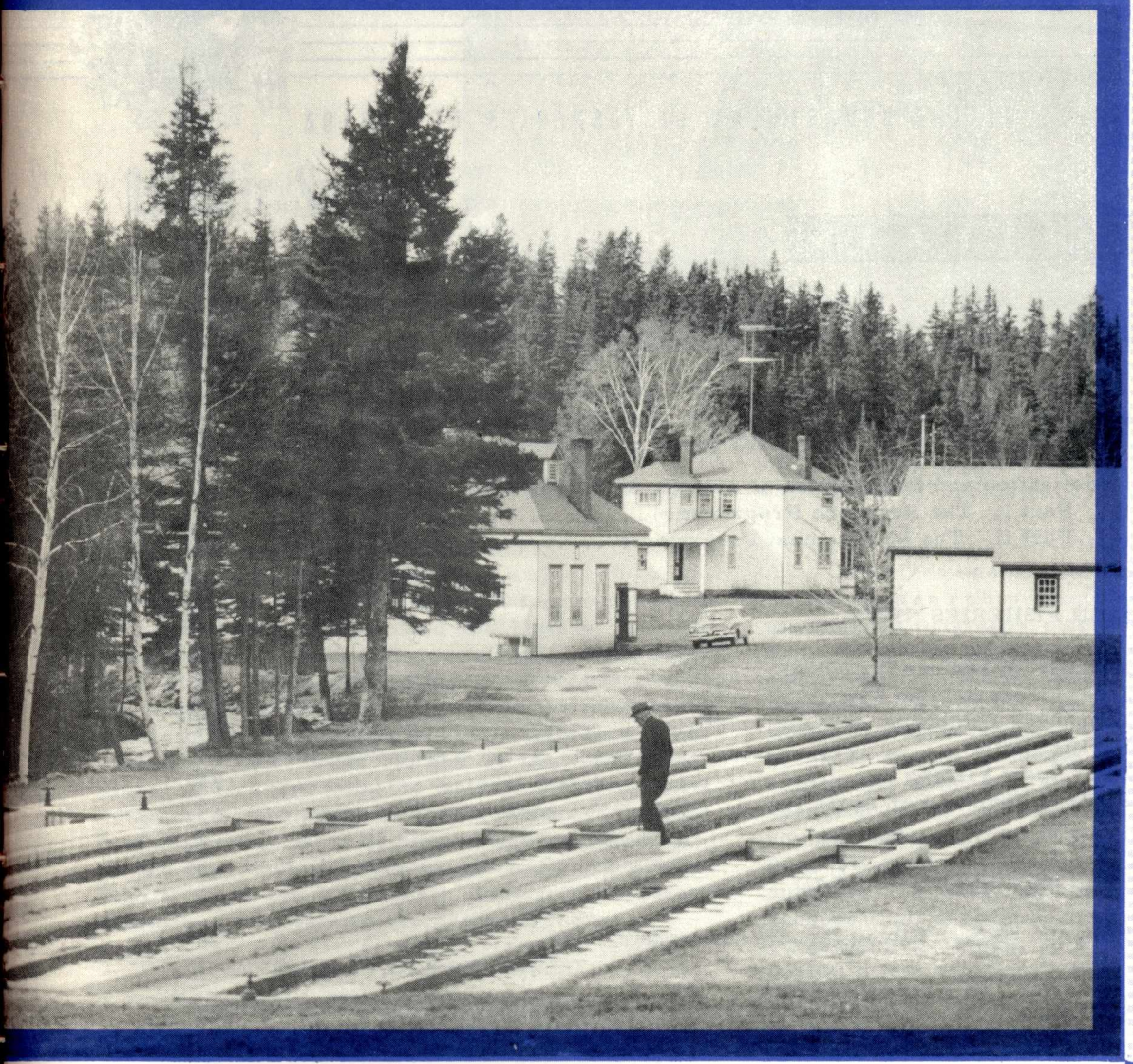
Trade News



June, 1958

EPARTMENT OF FISHERIES OF CANADA • OTTAWA

Trade News

PUBLISHED MONTHLY BY THE DEPARTMENT OF FISHERIES OF CANADA

CONTENTS

VOL. 10 NO. 12

FEATURES

Investigation and Management of Atlantic Salmon in 1957 3
Part I. The Research Programme 4
Part II. The Management Programme 19

CANADIAN FISHERIES NEWS

New Commissioner for ICNAF 24
Jones Creek Salmon Fry 24
Lunenburg Exhibition..... 24
Pacific Drifts 25
B.C. Sport Fishing 25
Fishery Figures For April 26

FISHERIES NEWS FROM ABROAD

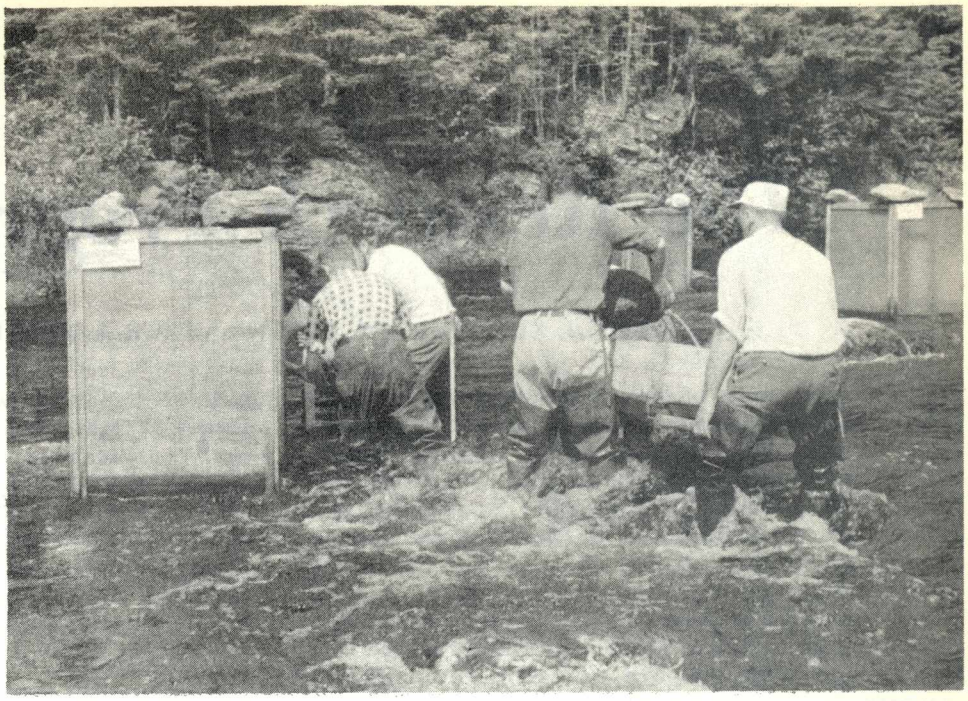
Norway: Export Table, January-December, 1957 28

CURRENT READING 29

COVER PHOTOGRAPH: Miramichi Salmon Hatchery at Southesk, New Brunswick. See report on Investigation and Management of Atlantic Salmon starting on page 3.

The contents of TRADE NEWS have not been copyrighted and may be reprinted although reference to the source would be appreciated. For further information regarding TRADE NEWS write to the Director of Information and Educational Service, Department of Fisheries, Ottawa, Canada.

Investigation and Management of Atlantic Salmon in 1957



Transferring stream insects on stones to Sevogle River from Millstream Brook, where many kinds of food-organisms for young salmon were killed off by DDT spraying in 1954 and 1957. Three cage-traps shown here.

TO GIVE worthwhile results research on Atlantic salmon must follow a long term plan, because of their complicated life history, long life span and the ever changing conditions under which they live. The investigations must cover a wide geographical area because salmon enter most of the rivers in eastern Canada and their tributaries, unless they happen to be blocked by impassable barriers. There are valuable salmon fisheries, both commercial and sport, in the Provinces of Quebec, New Brunswick, Nova Scotia and Newfoundland. Although few adult fish are caught in Prince Edward Island, there are late-season runs into its rivers and many young salmon are produced there.

INVESTIGATIONS REVIEWED

Fortunately, the present research programme is under the review of a federal-provincial Co-ordinating Committee which was first established in 1949 and reorganized in 1954. The Committee recognizes the value of all types of salmon fishing and the need for long term studies to provide a sound basis for management. At annual meetings of its Scientific Sub-committee the investigations in all areas have been reviewed critically to permit modification and expansion of projects as necessary. Reviews of the progress of research at annual meetings of the parent Committee have provided an opportunity for critical appraisal by the top administrators of all the Government agencies concerned, and by representatives of the industry.

In 1957 it was possible to carry forward most of the research projects of the long term programme as originally planned several years ago. Some diversion of effort by the investigators was required on problems which have recently become important. Examples are the aerial spraying of woodland with insecticide to control the recent outbreak of spruce budworm, and hydro-electric developments in the St. John River, N. B. Most of the research topics have been discussed in the annual reviews published in "Trade News", since 1954. Because of the wide variety of the projects it is impossible, and likely undesirable, to give a detailed account of all of them each year. Instead, the catch statistics are brought up to date and discussed annually, a few selected topics are given special attention, and briefer coverage is given to other projects. Over a period of a few years it can be expected that considerable detail will be presented in these annual reviews on all the main research topics.

The foregoing comment, and the more detailed report which begins on the following page, were prepared by C. J. Kerswill, P. F. Elson and M. H. A. Keenleyside of the Fisheries Research Board of Canada, Biological Station, St. Andrews, N. B. A report on the management programme, by E. W. Burridge, of the Conservation and Development Service, of the federal Department of Fisheries, begins on page 19.

Investigation & Management of Atlantic Salmon in 1957

Part 1--

The Research Programme

By C.J. KERSWILL, P.F. ELSON and M.H.A. KEENLEYSIDE

THIS year most of the report deals with the scientific programme of the Fisheries Research Board's Biological Station at St. Andrews, N. B. Extensive salmon research is now carried on also by staff of the Board's Biological Station at St. John's, Newfoundland, and by staff of the Marine Biological Station of the Quebec Department of Fisheries, at Grande Riviere on the Gaspe peninsula. Accounts of their contributions to the salmon investigation, which is also under review by the Co-ordinating Committee, are anticipated in future reports.

ATLANTIC SALMON STATISTICS

Statistics on salmon catches in the Atlantic Provinces by commercial fishermen and anglers in 1957 have been studied in comparison with those of recent years. These records are obtained for the Maritime Provinces and Newfoundland by protection officers of the federal Department of Fisheries and are forwarded for analysis to the St. Andrews Station. Details of commercial landings in Quebec are obtained from monthly reports published by the Provincial Government.

Commercial landings

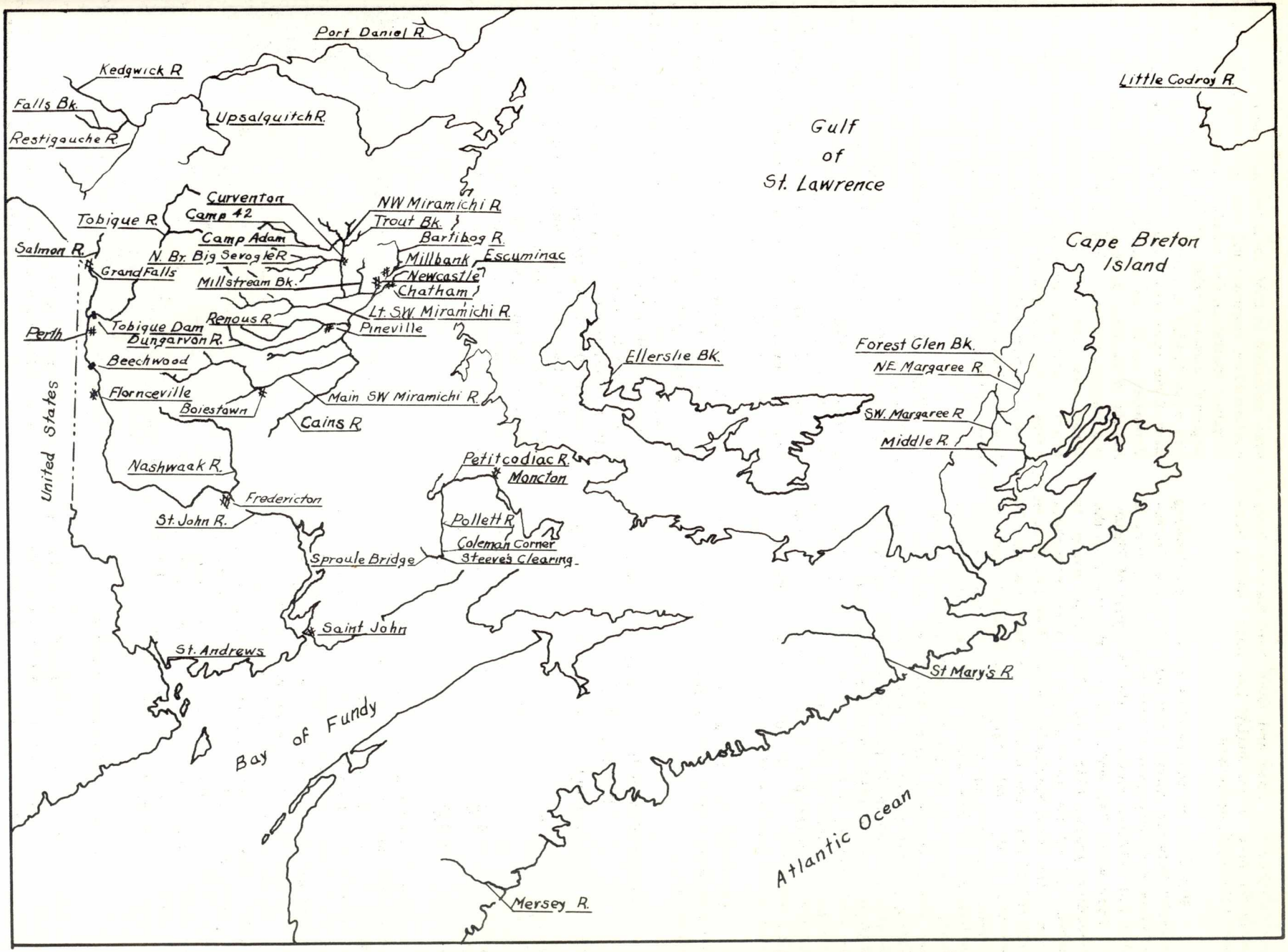
Figure 1 shows the total landings by weight since 1949 in salt water bordering Quebec, the "Maritime Region" and Newfoundland, as well as sub-totals for the several large areas which contribute them. The "Maritime Region" extends from Cape Gaspe, Quebec, around the three Maritime Provinces to the New Brunswick-United States border. The exact boundaries of its three areas have been stated in previous reports. Present regulations restrict commercial fishing to salmon over three pounds in Quebec, Prince Edward Island, and Nova Scotia, and to five pounds in New Brunswick. Thus many of the grilse (1-sea-year fish) are protected. In 1957 such restriction was not yet in effect in Newfoundland where salmon down to 12 inches in length could be retained.

The most significant feature of the 1957 landings from nets was the increase in the totals for the "Maritime Region" and Newfoundland by about 20 per cent over the 1957 totals. Although the 1957 catch was still only about half the 1950 level, most commercial fishermen were well pleased with the availability of fish. Newfoundland fishermen were seriously handicapped early in the season by ice which blocked the inlets for an unusually long time. The Quebec total was about 15 per cent below the 1956 level. This seemed to be associated with late arrival of salmon, so that June landings were unusually low. In July and August, however, salmon seemed to be unusually plentiful but by that time fishing effort had decreased somewhat.

Angling catches

The numbers of salmon caught by anglers from 1949 to 1957 in the "Maritime Region" as a whole and on the most important rivers within this region are shown in Figure 2.

The total catch of over 39,000 fish in 1957 was 20 per cent lower than in 1956, yet near the average of the past nine years. The decrease was mainly due to the lower catch in the Gulf Area where the Miramichi River is the chief contributor. Because of unusual enthusiasm of most Miramichi camp owners and anglers over the 1957 angling season, these statistics were surprising when first received in the fall. A breakdown of the Northumberland County fraction of the Miramichi catch by months and types of salmon, obtained later, has been made into a graph (Fig. 3). About three-quarters of the Miramichi watershed lies within Northumberland county; only the headwaters of the Southwest Miramichi tributary pass through Carleton and York Counties. A reasonable explanation of the lack of agreement between public opinion and the statistics is provided by these additional data. Apparently the Miramichi anglers, particularly those fishing the Main Southwest and its tributaries, were highly impressed by the 1957 season because more large salmon were caught during July and August than in the good 1956 season. Also, on the Main Southwest the catch of grilse in August, 1957, exceeded the 1956 catch by 30 per cent while the July catch of grilse was about the same in the two years. The unusually good angling during this mid-summer period was associated with above-normal river outflow in the Miramichi area. In September, reports from anglers and our research sampling and counting trap records showed that an abundance of salmon entered the river from the sea. It was, however, much



Streams and places involved in Atlantic salmon investigations.

more difficult to hook and land them than in 1956, likely because of unusually low water which prevailed through September.

Statistics on the catches of kelts or "spring salmon" between April 1 and May 24 in the Northumberland County part of the Miramichi system in 1956 and 1957 are shown in the left part of Figure 3. They were fish which entered the river in the preceding years, 1955 and 1956 respectively, to spawn. Of all the kelts angled in Northumberland County, the Main Southwest produced 88 per cent in 1956 and 85 per cent in 1957. On this tributary 20 per cent of the total angling catch of all kinds of salmon was made up of kelts in 1956, and the proportion was 35 per cent in 1957. On other Miramichi tributaries where the total catch of salmon was much smaller, kelts sometimes comprise a higher proportion of the total. The percentages ranged from 24 to 56 per cent in 1956 and from 26 to 90 per cent in 1957. The biological justification for such fishing of kelts is that a very small percentage (not over 10 per cent) can be expected to survive a further period in the sea and be found later anywhere. The fishing is of great economic value to the province of New Brunswick.

The following table gives statistics which recently became available on angling catches in Newfoundland.

Newfoundland Salmon Angling Catches in Numbers of Fish

Year	Newfoundland	Labrador	Total
1953	15,983	(Not recorded to this time)	15,983
1954	8,703	754	9,457
1955	8,462	3,191	11,653
1956	15,582	404	15,986
1957	20,449	1,587	22,036

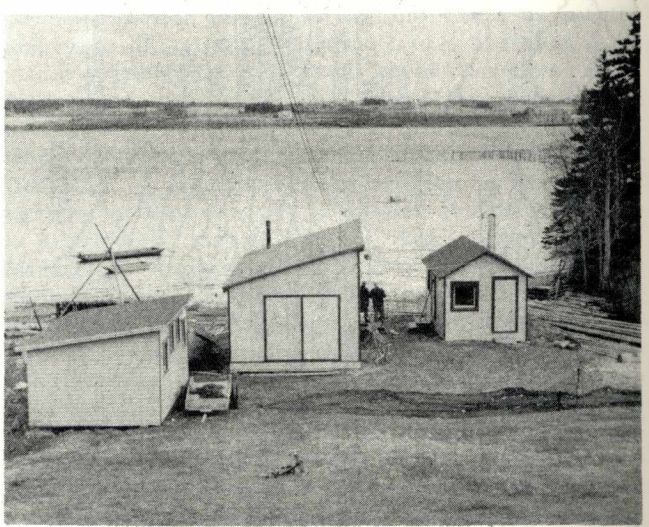
The Newfoundland fisheries officers have pointed out that the recent increases in reported catches do not necessarily reflect a greater abundance of salmon. They may indicate increased fishing effort associated with improving availability of streams and better facilities for obtaining statistics. In any case it is reassuring to know that at least 22,000 salmon were caught there by anglers in 1957. This, however, only approximates the 1957 catch of "bright" salmon in the Miramichi River, N.B. It is to be expected that the Newfoundland salmon angling industry can be developed considerably, since many extensive river systems in the province are populated by salmon.

MIRAMICHI SALMON RUNS

Every year an effort is made to assemble all available information on the runs of salmon through various parts of the Miramichi river system, which was selected in 1950 as a typical river supporting extensive commercial and sport fisheries. The regular statistics for public commercial nets and anglers' catches which have been reviewed above are very useful in this connection, but cover only part of the open water season. Also, they cannot be depended on for an accurate estimate of the availability of salmon, because often the fishing effort is not maintained at a constant level. To supplement these statistics, counting fences and special research sampling traps are operated by the Fisheries Research Board at strategic points, for as long as is physically possible each year. To obtain detailed information on the daily catches by drift nets off Miramichi Bay, a technician is stationed at Escuminac, N.B., throughout the fishing season.

Figure 4 summarizes all available data on (1) total counts of large salmon caught by commercial drift netters off Escuminac, and counts of small salmon (1-sea-year fish or grilse) and large salmon (2-sea-year fish and older) at (2) the sampling trap at Millbank in the estuary and at (3) the 2-way counting fence which goes right across the Northwest Miramichi at Curventon, about eight miles above head of tide.

The Millbank estuarial trap resembles local gear used by the public except for a smaller mesh size to retain grilse. After examination the fish are released, as at all other counting traps. Here the catches of both grilse and large salmon have almost doubled over the past four years, possibly as a result of experimental merganser control which was started in 1950 on the Northwest Miramichi and extended to the whole Miramichi system in 1954. A similar increase has occurred in the Escuminac drift net landings over the past three years, but these landings are all lower than those in 1953 and 1954. The latter may be the result of unknown dif-



Headquarters of salmon sampling in Miramichi estuary, Millbank, N.B. Adult sampling trap at upper right.

(continued on page 10)

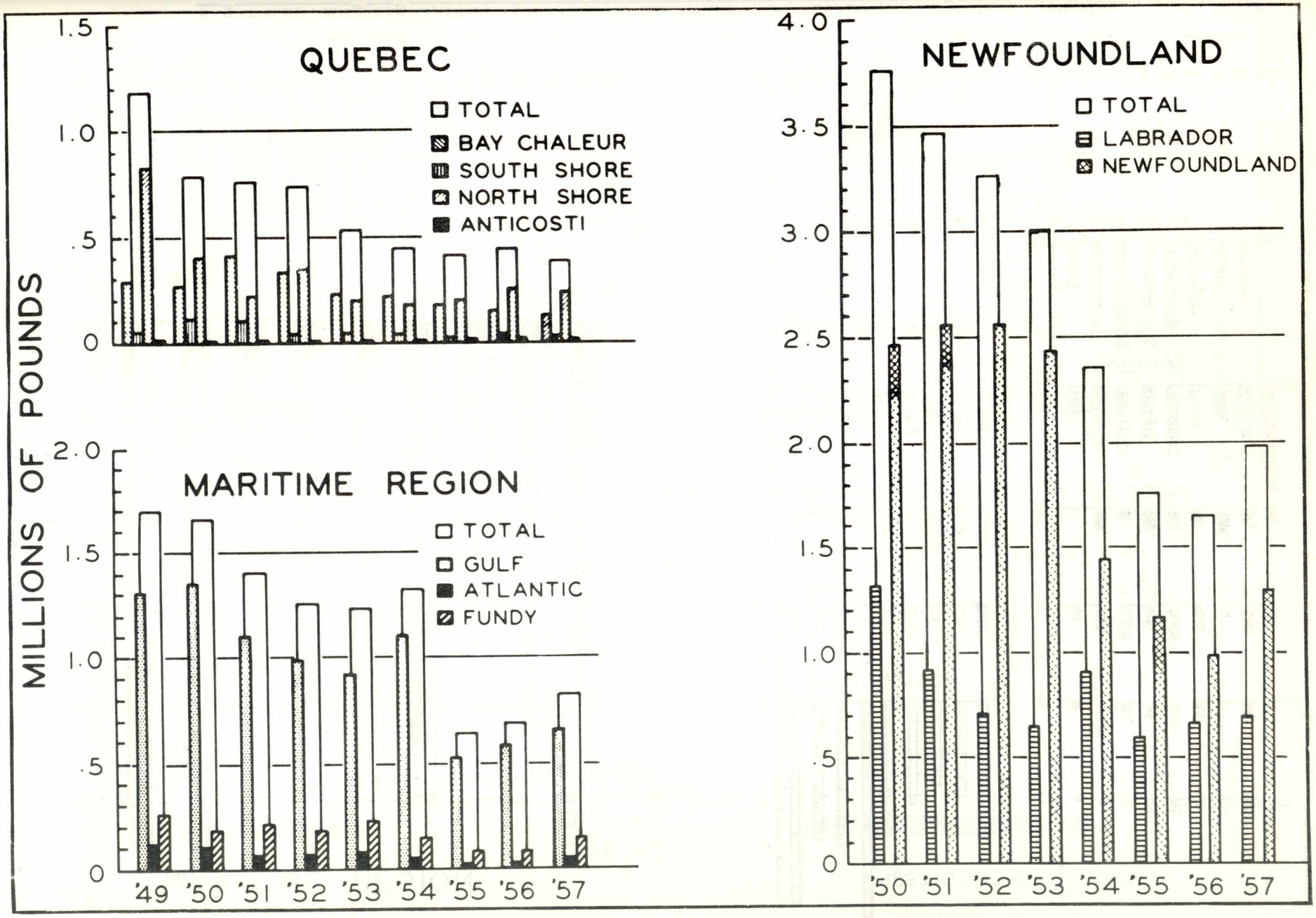


Figure 1. Commercial Landings of Atlantic Salmon in Canada.

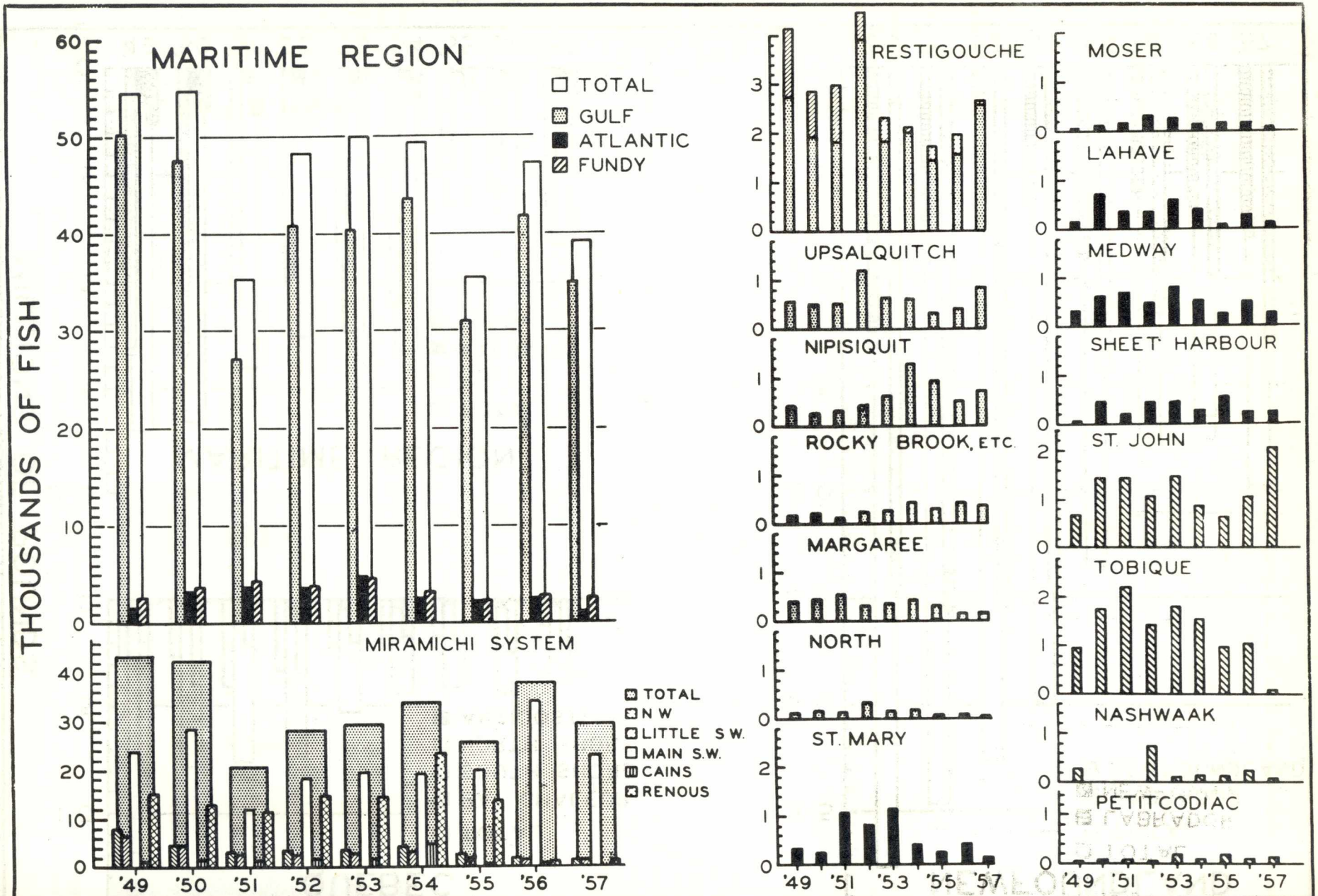


Figure 2. Angling Catches of Atlantic Salmon in the Maritime Region of Canada.

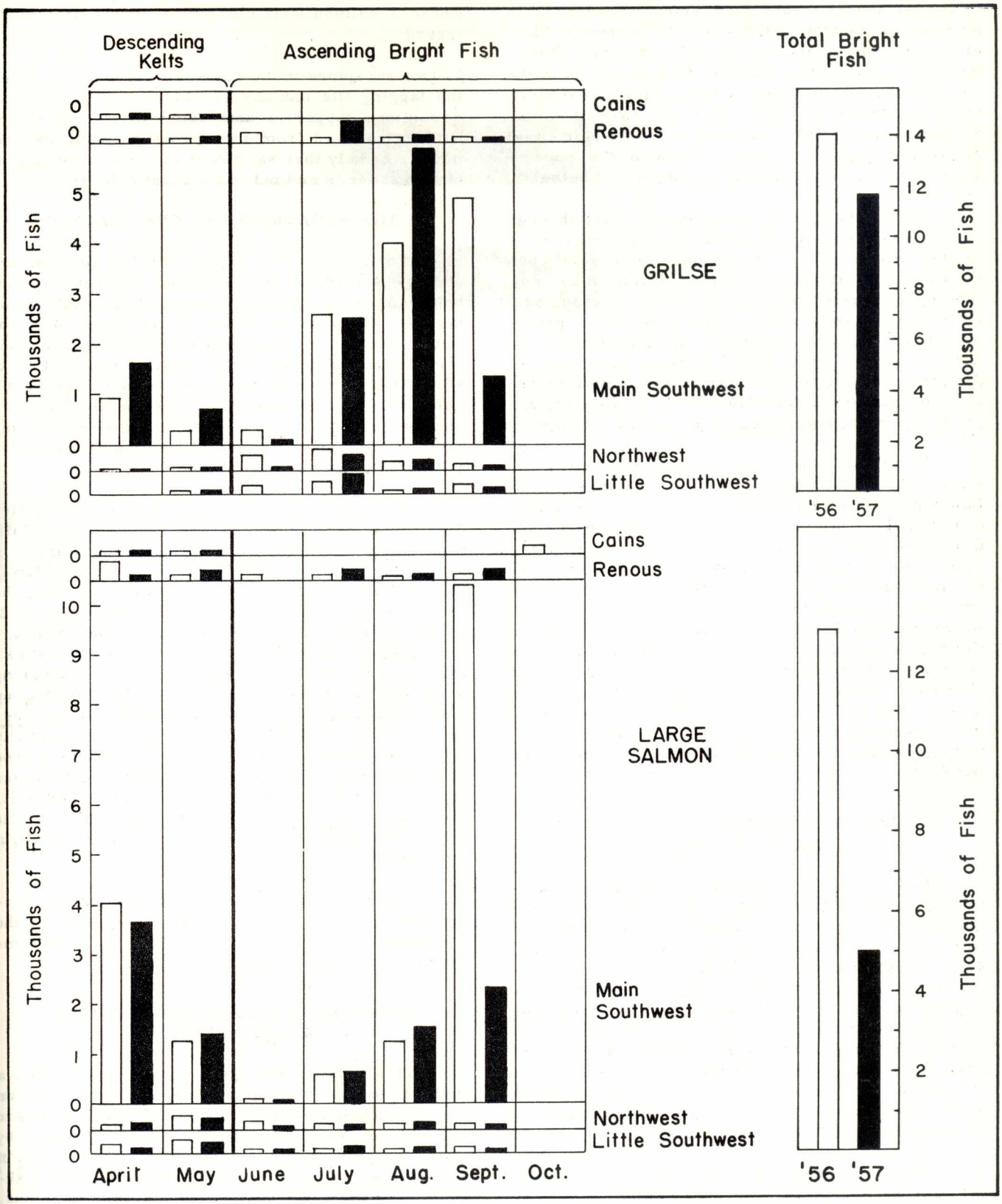


Figure 3. 1956 and 1957 catches of Atlantic salmon by anglers in the Northumberland County part of the Miramichi River system, N. B.

ferences in the behaviour and catchability of the fish in the open sea, rather than actual differences in abundance. In 1956 and 1957 on the Northwest Miramichi tributary, the run of grilse has fallen to about one-quarter the 1954 and 1955 level, while the runs of large salmon have also been the lowest since trapping started in 1950. This decrease is an expected result of DDT spraying over the Northwest Miramichi watershed, which reduced the populations of young salmon as will be described below.

In 1957 the 3,867 large salmon counted through the estuarial trap at Millbank were distributed as follows with respect to the regular commercial open season which extends from June 5 to August 31: before open season, three; during open season, 520; after open season, 3,344. This is typical of previous years, when an abundance of large salmon, as well as grilse, have come in from the sea from September 1 to mid-November. Many of them are taken by anglers before September 30 when the angling season closes in most of the Miramichi area.

In 1957 a new 2-way counting fence was installed across the upper Northwest Miramichi near Camp Adams, 40 miles above the Curventon fence, and it will be operated for the next few years. Comparison of records obtained at Curventon and Camp Adams has shown that a large proportion of the grilse and large salmon passing the lower fence are able to reach the upper one. Most of the fish which reached Camp Adams had gone through the Curventon counting trap before September 1. This confirms the common belief of local anglers that "late-run" salmon do not usually reach headwater areas. The 1957 season may not have been typical in this respect, because unusually low water conditions prevailed here through September and October.

RECOVERIES OF SALMON TAGS APPLIED IN 1957, MIRAMICHI AREA, N.B.

From May 21 to August 15, 1957, white button tags were applied to 145 large salmon taken and released at the estuarial trap net at Millbank. Of these, 15 recoveries were reported by November, 1957, in catches by commercial fishermen and anglers and one was recorded at the Northwest Miramichi counting fence at Curventon. Although the total number of tags applied was small, and tagging ended before the start of the plentiful late run of fish, the recaptures show many interesting features of salmon behaviour in the area. Some of these points have been indicated by previous tagging and marking data obtained here.

Significant points brought out by the tag recaptures are:

1. Salmon reached the upper waters of the Southwest Miramichi to be angled within four to five weeks of passing through the estuary. The longest journey was to Juniper, a distance of 115 miles, where a salmon was caught 41 days after being tagged.

2. One recapture in an estuarial trap net well below the tagging site and one recapture in a drift net off Escuminac support a conclusion about salmon behaviour derived from the recent marking experiments, namely that salmon of various river origins often wander in and out of different estuaries.

THE BEHAVIOUR OF YOUNG SALMON

During July and August, 1957, a preliminary study was made of the behaviour of young salmon held in aquaria. The purpose was to become familiar with the various kinds of activities shown by young salmon in undisturbed surroundings. This should eventually lead to a detailed description of all their behaviour patterns, including those of adult fish. This type of knowledge must be available before one can hope to understand the effects of unnatural, man-made conditions which are now facing salmon in more and more places.

The following are examples of several activities which were observed and recorded in detail: (1) Resting position. In general, young salmon in fast water rest facing the current with the lower fins, but not the lower body surface, touching the bottom and at some distance from other fish. (2) Social behaviour. Young Atlantic salmon are aggressive, territory-holding fish. An individual stays in a limited area most of the time, returning quickly to the same resting place after snapping up food or chasing away approaching fish. (3) Feeding. Under natural conditions living food is generally taken, but young salmon will take non-living food such as ground liver if it is kept moving by water currents, or if they have become conditioned to it. (4) Activity under low light intensity. Movements around the aquaria and feeding increase as the light intensity falls during the evening.

It is hoped to continue these observations during 1958 and to supplement them with work in the laboratory where conditions such as light and temperature can be controlled.

SMOLT MARKING AND RECOVERY OF MARKED ADULTS

This project was given high priority when a revised research programme for Atlantic salmon was developed in 1950. The main objective was to find out the extent to which the smolts produced by typical salmon rivers contribute to the catch of adult salmon in various commercial and sport fisheries over the whole coast, and to spawning stocks. It was believed that such information would be of fundamental importance in developing a sound management programme comprising fishery regulation and other practices.

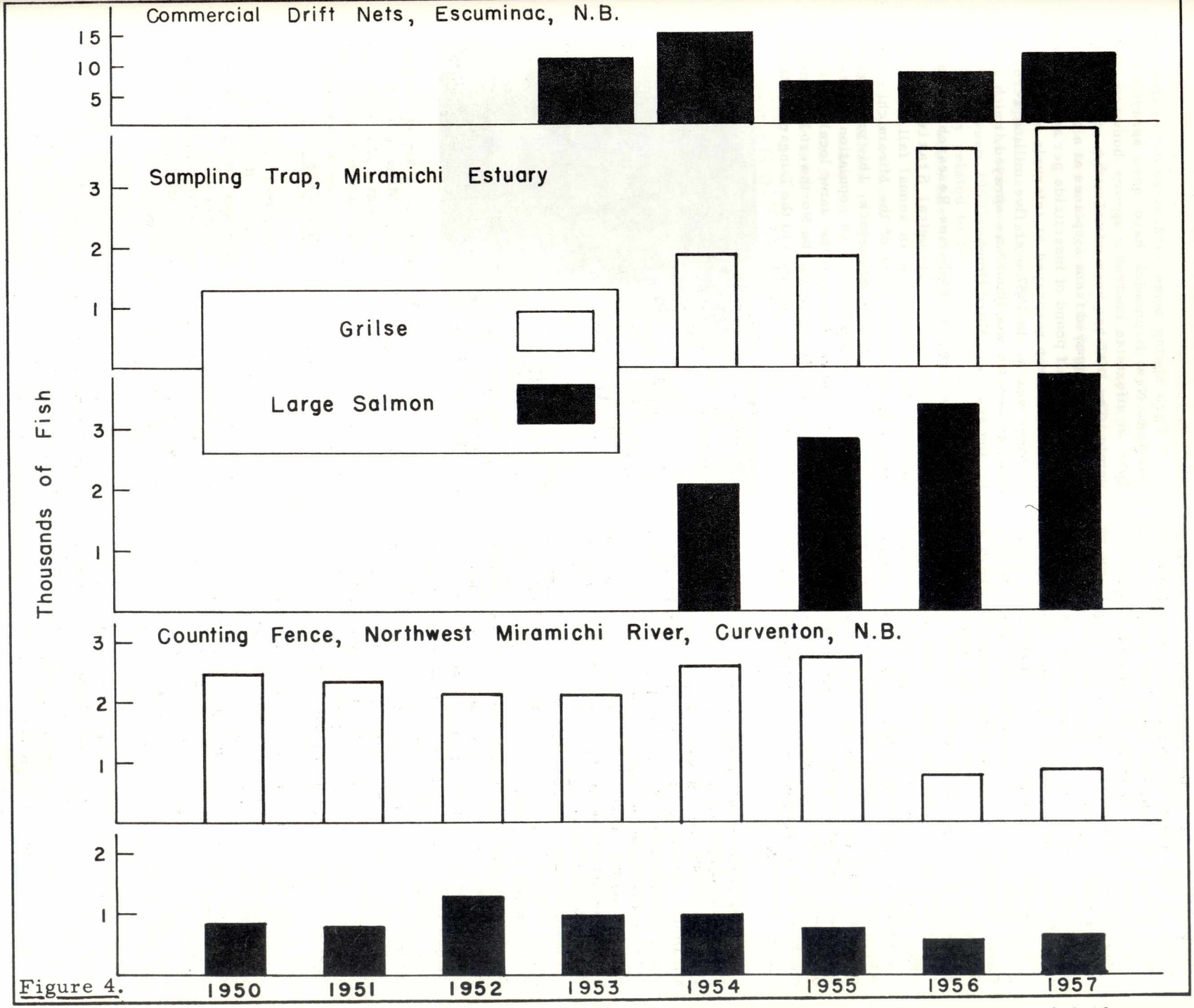


Figure 4. Variations in annual run of salmon in Miramichi area, N. B., as shown by counting traps and drift nets.

The necessary field work has been conducted energetically. It has comprised, (a) annual operation by the Board in the Miramichi River system, N.B., of two smolt and adult traps on tributaries since 1950, plus estuarial smolt and adult sampling traps since 1952, to provide estimates of total smolt runs and returning adults; (b) continued operation of a smolt counting fence on the Pollett River, N.B., used before 1950 in connection with earlier production studies, and an adult trap since 1952; (c) annual operation by the Quebec Government of a smolt and salmon counting fence on the Port Daniel River, Gaspe Peninsula; (d) annual operation by the Board's Station at St. John's, Nfld., of two-way smolt and salmon traps on the Little Codroy River; (e) a widespread search for marked adult salmon over the whole Atlantic area in commercial and sport fishing catches, organized at the St. Andrews Station where data are received and rewards are paid; (f) collection of scales from all marked salmon and from samples of unmarked salmon caught in various areas, with information on the proportion marked among samples of salmon which can be examined carefully.

The numbers of smolts marked from 1950 to 1956 at all places were tabulated in the report for 1956. In 1957, smolts were trapped on only one Miramichi tributary, the Northwest Miramichi, because the Dungarvon fence was discontinued in 1956 and transferred to the upper Northwest Miramichi. Only 799 native smolts could be marked on the Northwest Miramichi in 1957, owing to the combined effects of DDT spraying in reducing parr survival, and trapping difficulties caused by a heavy pulpwood drive. It was possible to mark here an additional 1,033 smolts resulting from an experimental planting of large hatchery fingerlings. On the Pollett, 10,157 smolts were marked, on the Port Daniel, 1,023 and on the Little Codroy, 4,450 (one-half the counted run). During the year, a total of 670 marked adult salmon taken in commercial and angling catches were reported to St. Andrews, N.B., accompanied by details of capture and scale samples. The total so reported since 1953 now exceeds 3,300. A reward of $1.00 has been paid for each of these reported captures of fin-clipped salmon.

Analysis of the scale samples and other laboratory procedures connected with the smolt marking experiments of the past few years are now nearing completion and a detailed report should be available shortly. Recent recoveries of marked adults confirm earlier observations, for example that many salmon from Maritime rivers are caught in trap nets off the east coast of Newfoundland.

In 1958 a temporary smolt trap will be operated on the Cains River, the only Miramichi tributary which has not been sprayed extensively with DDT against spruce budworms. Arrangements have been made with the spraying company to exempt this branch from spraying for several years.

EFFECTS OF SPRUCE BUDWORM CONTROL ON YOUNG SALMON

Each spring since 1952 large forest areas of northern New Brunswick have been sprayed with DDT in efforts to control a spruce budworm epidemic. The DDT has been mixed with a special solvent oil and sprayed from airplanes at a concentration of one-half pound of insecticide per acre. Some areas have been resprayed at intervals of one, two or three years. In 1957 over five million acres of New Brunswick woodland was sprayed, much of it for the second or third time.

Since 1950 the Fisheries Research Board of Canada, through its Biological Station at St. Andrews, has carried out an annual fall census of the young salmon in parts of the Miramichi River system of central New Brunswick. This programme has involved sampling the fish populations by seining with electro-fishing at the same localities each year. Censusing began on the Northwest Miramichi River in 1950, was extended to the Dungarvon River

Seining with electro-fishing at a young salmon sampling area in the Northwest Miramichi River, N.B. Each season a total of about 1,000 such collecting operations are made on ten areas in this one tributary, to give a reliable estimate of the number of young of various sizes.

in 1952 and to the Renous and Cains Rivers in 1955. In 1957 the work on the Dungarvon River was discontinued and censusing began on the Tobique River, the most important salmon angling tributary of the St. John River. A total of 34 census stations is involved: 10 on the Northwest Miramichi, six on the Dungarvon, five on the Cains, three on the Renous and 10 on the Tobique.

The abundance of young salmon in the Northwest Miramichi each year since 1950 is shown in Figure 5. Data from the first year of censusing (1957) on the Tobique River are included in the figure for comparison. All data are shown as numbers of fish per 100 square yards of river bottom.

The fish are separated into three groups on the basis of size. The smallest fish are fry, or under-yearlings. Parr less than 4 in. total length are classed as small parr; those over 4 in. as large parr. In general, but not in every case, these three size groups correspond to the first three years of life. In the Miramichi river system most young salmon go to sea as smolts at the beginning of their fourth year.

Populations of all three size groups of young salmon in the Northwest Miramichi increased gradually between 1950 and 1953. This increase is probably related to the experimental merganser control which has been carried out on the river since 1950.

In years when DDT was sprayed, populations of young salmon in streams within sprayed areas have been reduced. This reduction has been greatest among the fry. The year after the first spraying, with no further spraying in the same areas, fry were very abundant. Small and large parr have been scarce in the year after spraying owing to heavy mortalities among the smaller fish in the year of spraying. In areas where no respraying was done for two or three years fry populations were similar to pre-spray levels. Parr, however, were more numerous, reflecting growth and survival of the large fry class of the first post-spray year. Since much of the natural food of small and large parr is reduced by DDT spraying, these young salmon grow more slowly than usual. Thus, some parr in these areas may take longer than usual to reach smolt size and may be included in the same size class for two consecutive years.

EFFECTS OF DDT SPRAYING ON OTHER FISHES

During the annual censusing of young salmon several other kinds of fish are taken regularly. Changes in abundance of some of them have occurred following DDT spraying.

In the Northwest Miramichi trout are found mainly in the headwaters, a section of the river that was sprayed in 1954 only. Yearling and older trout were unusually scarce after this spraying but then recovered gradually until by 1956 they were more numerous than before spraying, and by 1957 were present in about average numbers again. These fluctuations have resembled those of salmon parr in this headwater section of the river.

Before spraying, eels were found in moderate numbers throughout the Northwest Miramichi. They appear to have been severely affected by the DDT spraying. Their numbers were reduced in 1954 and in 1956, and by 1957 none at all were found.

Four species of the minnow family are found in the lower part of the Northwest Miramichi River, where spraying occurred in 1954, 1956 and 1957. They are the black-nosed dace, the common shiner, the fallfish and the chub. All appear to be affected little if any by the spray.

CHANGES IN MIRAMICHI RIVER INSECT POPULATIONS AFTER DDT SPRAYING

Sampling of the insect fauna of several branches of the Northwest Miramichi River was continued in 1957. This programme was started in 1955, one year after the watershed of the river was sprayed with DDT for the first time. Collection and treatment of data were similar in 1957 to that of the two previous years. Adult insects emerging from the water were caught in square yard cage-traps and removed daily for five days a week, from early June to early September. Three traps were set out at each sampling station. One new station was established this year, bringing the total to four. These were North Branch Big Sevogle River, Trout Brook, Millstream Brook and Northwest Miramichi River at Camp 42.

A large part of the Northwest Miramichi watershed was sprayed in 1957. However, through an agreement between the Fisheries Research Board and Forest Protection Ltd. (the company responsible for spraying) three of the four sampling stations were left unsprayed. The North Branch Big Sevogle station was the only one inside the spray area this year. It was also sprayed in 1954. The Trout Brook station was sprayed in 1956 only and the Camp 42 station in 1954 only. Millstream is the control for this project. It has not been sprayed to date.

In 1954, the results of the previous two years' work have been confirmed. All groups of insects are adversely affected by the spraying. Diptera (blackfly, midge, etc.) larvae begin to recover one to two months after spraying, and then reappear in large numbers. The larger types of insect larvae recover much more slowly, if at all. This leads to a marked qualitative change in the insect fauna of sprayed streams. Whereas the insects emerging from a sprayed stream, particularly one or more years after spraying, may be more numerous than those from an unsprayed stream, the small forms (Diptera) are proportionately more abundant in the former. Thus, the total volume of insects emerging from the sprayed stream is less than that from the unsprayed. The resulting decrease in bulk of insect food available for salmon is obvious.

Among the larger insects the caddisflies are the most severely affected by spraying. This differential effect of the DDT on the various types of insect larvae was first noticed in 1955 and has been repeated each year since then. Very few caddisflies were taken in 1957 on the three streams that have been sprayed. At the Camp 42 station, unsprayed since 1954, recovery of caddisflies has been limited

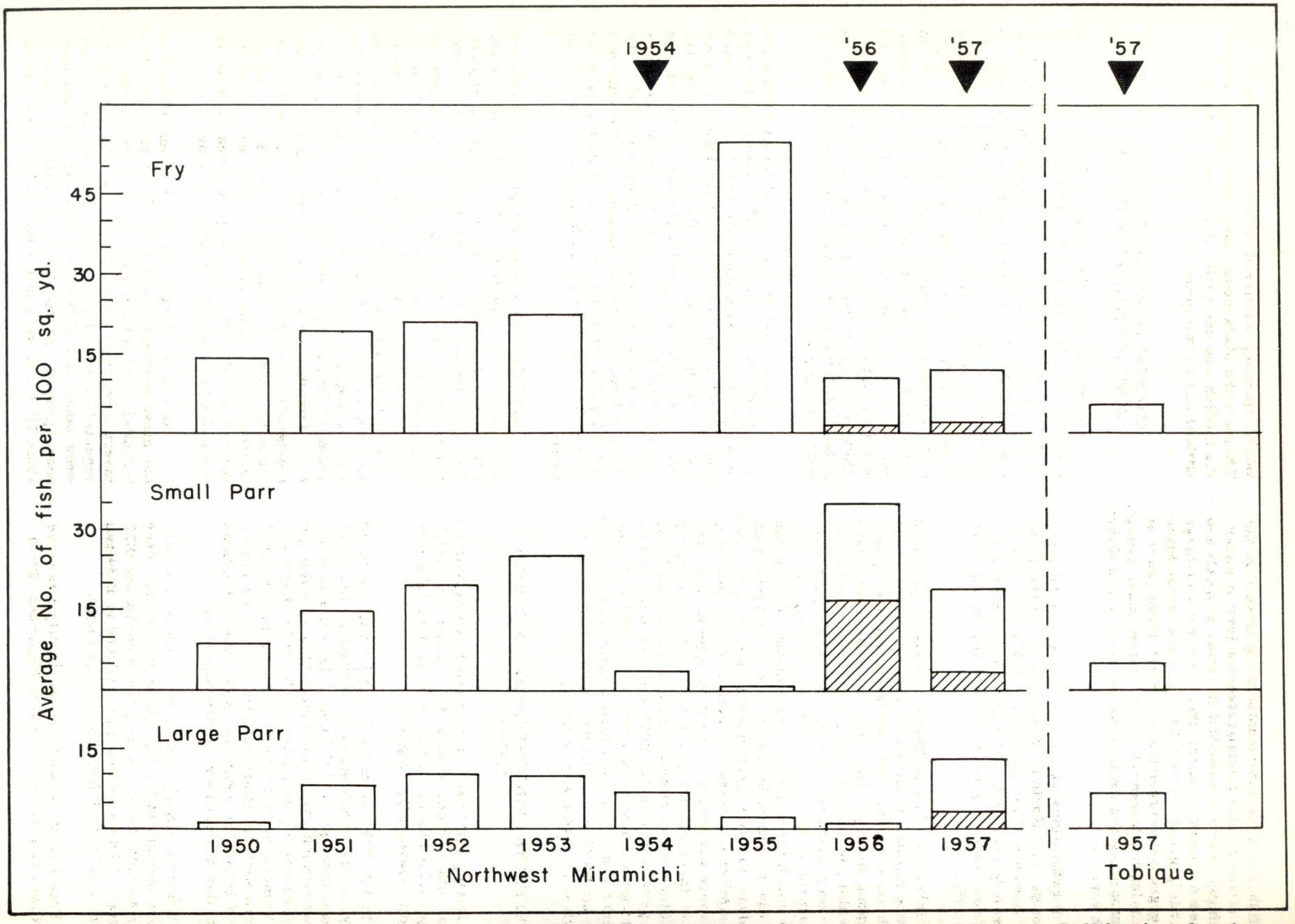


Figure 5. Abundance of young salmon in the Northwest Miramichi and Tobique Rivers. Solid triangles indicate years when DDT was sprayed in the area. Cross-hatching indicates proportion of fish found in sprayed part of the Northwest Miramichi.

to a few of the smallest types, and even they were scarce this year. This may affect the growth of salmon parr in this region since caddisflies formed an important part of their diet in the Northwest Miramichi River before spraying occurred.

OBSERVED EFFECTS OF DDT SPRAYING ON FOOD OF YOUNG SALMON

The effects of the 1954 and 1956 DDT sprayings of the Northwest Miramichi River on the food of young salmon living there were learned from stomach analyses of fry and yearling parr collected in the area. A total of 202 fish was examined. Some were collected in 1953, the year before the river had been sprayed, and the rest were collected three years later, in 1956. They were obtained in August and September each year. Of the six collection stations the upper four were within the 1954 spray zone and the lower three within the 1956 spray zone. Thus, one station was sprayed both years.

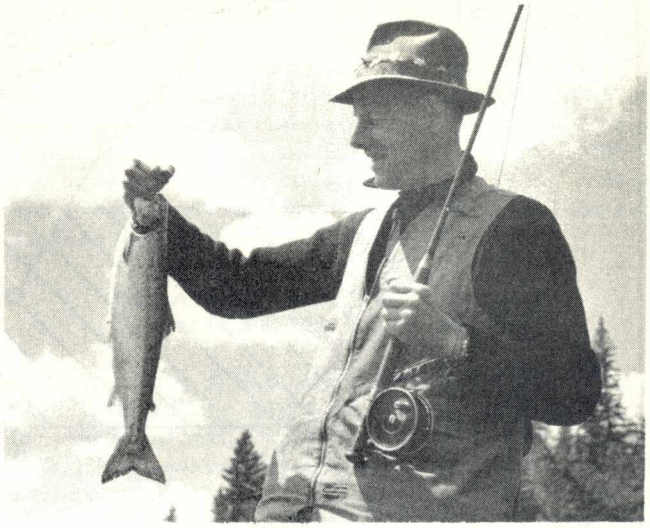
Among salmon fry the most noticeable change in diet between 1953 and 1956 was the lack of caddisflies and stoneflies in 1956. In 1953 fry from all stations ate caddisflies, as well as mayflies, stoneflies and midges. In 1956 mayflies and midges were still common in fry stomachs but no caddisflies were found in fish from stations sprayed in 1954 and very few in fish from stations sprayed only in 1956. Stoneflies were practically absent from the 1956 series.

Parr showed a more varied diet than fry, in both the pre- and post-spray years. Caddisflies were much scarcer in the 1956 stomach contents and those that were present were small types. Stoneflies were also scarcer in 1956. Mayflies and midges were plentiful in both years, the latter particularly so in 1956. The most striking change in the parr diet was the great increase in snails, water mites and worms eaten in 1956. These items were very scarce in the 1953 stomachs. The parr appear to utilize them as food after the larger insect larvae are reduced by DDT.

EFFECTS OF DDT SPRAYING IN NEW BRUNSWICK ON FUTURE RUNS OF ADULT SALMON

Research, mostly in the Miramichi River system, N.B., has shown that DDT spraying has had serious effects on young salmon and the stream insects which are their main food. It is important to attempt to use this information to forecast the effects of past sprayings on future stocks of adult salmon that will be available to commercial fishermen and anglers.

The problem of forecasting involves among other things: (1) the long life cycle of Atlantic salmon, commonly six years to give large salmon of eight to 12 pounds weight, of which the last two are spent in the sea outside the scope of investigation;



Young salmon caught in Southwest Miramichi

(2) error in using commercial and angling catches as the only available index of abundance of salmon for much of the affected area, since these are affected greatly by weather and water conditions, skill of fishermen, etc.; (3) absence of quantitative data on stocks of young salmon of various year-classes for affected rivers except the Miramichi where intensive sampling started in 1950, and the Tobique where similar work started in 1957.

A preliminary analysis of the situation for Miramichi, Restigouche and upper Saint John salmon has been made by (1) measuring on a map the total areas of watershed available to salmon; (2) measuring the proportion of each area affected by DDT in each year since 1952; (3) calculating the percentage kill of each of the three different size groups of young salmon on the basis of Northwest Miramichi observations, and thus obtaining the percentage survival to large (pre-smolt) parr in the various years; (4) converting these indices for large parr to adult grilse and large salmon, on the basis of trap records for the Miramichi and Tobique, and angling records for the Restigouche and upper main Saint John River. The results are shown graphically in Figure 6.

For the Miramichi the forecasts of stock abundance can be made with fair confidence because many data are available on young salmon, and runs of adults through sampling and counting traps. Conditions which affect catchability of adults while known at least in part, can scarcely be forecast. Because of spraying of the Northwest Miramichi in 1954 (1/3 the total Miramichi drainage) a decline in the stock of grilse originating here would be expected to start in 1956 and continue to 1959 for 2-sea-year salmon affected as fry in 1954. Later sprayings here and elsewhere on the system in 1956 and 1957 would contribute to continued drastic reduction and it is expected that by 1961 the adult stock will be only 25 per cent of the normal level

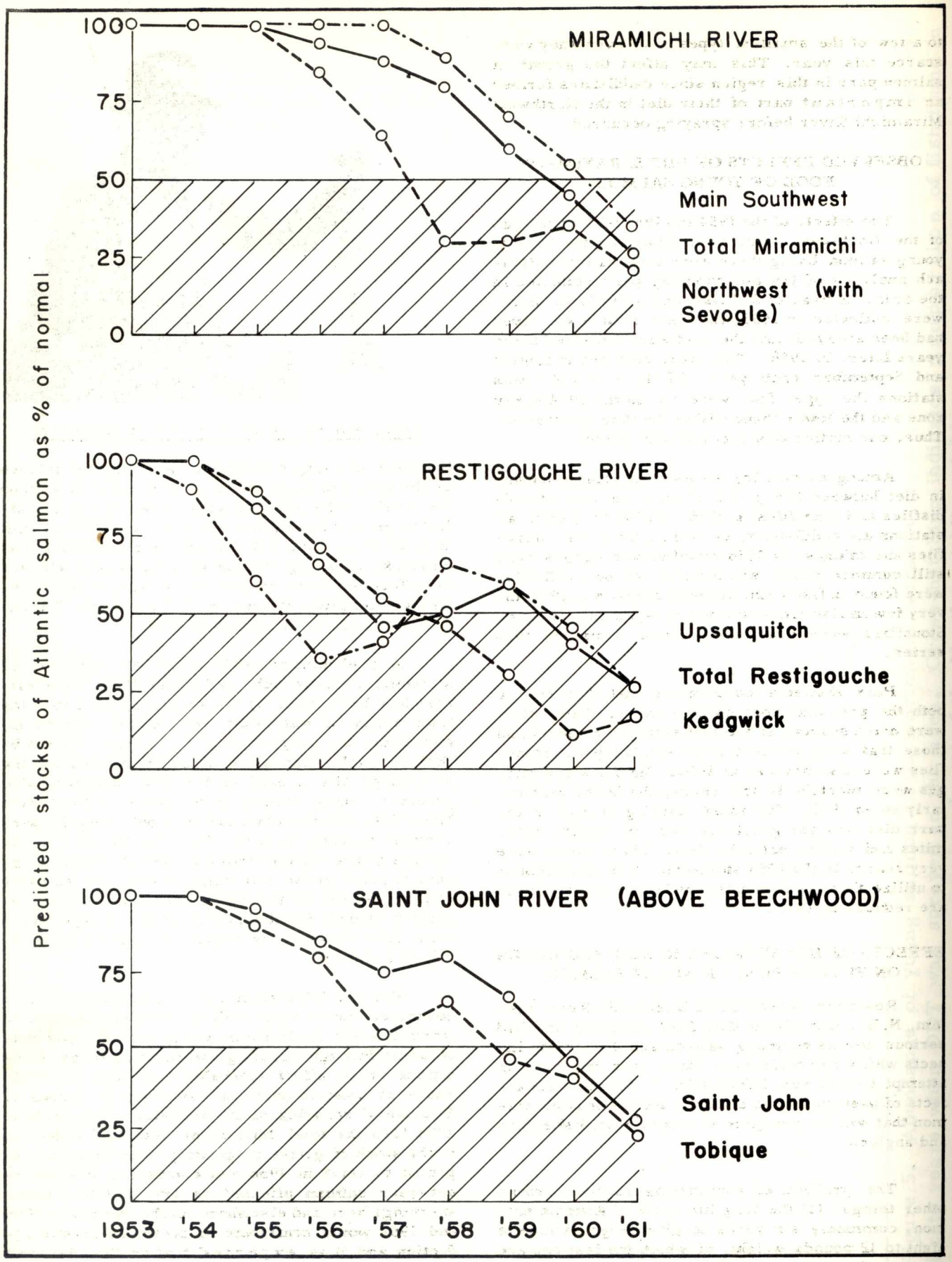


Figure 6. Probable decline of Atlantic salmon stocks caused by DDT spraying, 1952-1957, in three New Brunswick rivers.

prior to 1955. Here "normal" simply means the total annual catch, whatever it might be, without any effect of DDT on it. Because of variable conditions affecting fishing success, particularly in angling, it is expected that decreases in stock down to 50 per cent of normal level may not be apparent in catches. Thus the public may not be aware of the DDT effects on general Miramichi fishing until 1960. The effects of the 1954 spraying of the Northwest Miramichi have been obvious, however, in 1956 and 1957 trap records which are low by comparison with records for the whole system which showed increases in these two years (Figure 4).

In the Restigouche area a decline in adult stocks would be expected starting in 1955, with the level for the whole system falling to 50 per cent in 1957, recovering somewhat in 1958 and 1959 and then falling off to the 25 per cent level by 1961. For the upper Saint John above Beechwood a decline starting in 1955 should reach the 50 per cent-of-normal level by 1960 and the 25 per cent level by 1961.

It is important to realize that for two or three years yet the serious effects of recent DDT spraying on young salmon in northern New Brunswick are unlikely to be apparent in the level of fishing success enjoyed by the public in most areas.

The actual effects of spraying on returns of adult fish to any particular tributary of a river system depend on the history of spraying in that area, and many factors like weather conditions at time of spraying. It is possible that many important angling stretches within the rivers mentioned above may have escaped serious injury, and that worthwhile runs of adult salmon will continue to come to them. Since the commercial nets sometimes have a chance to catch salmon originating in many rivers, often far away, their catches may not be affected as seriously as anglers' catches in heavily sprayed areas of streams. Fortunately, the adult salmon that are available for capture in any year are not all of one age group, but are a mixture of several year-classes. This should allow some adult fish to be available continuously, even though individual year-classes of young salmon may have been practically eliminated. In this connection it is particularly unfortunate that the same areas of stream must be re-sprayed with DDT in closely succeeding years in order to preserve the trees.

The harmful effects of spraying can likely be overcome to some extent by judicious plantings of hatchery stock and transplantation of stream insects. Both these methods of rehabilitating salmon rearing waters are now receiving intensive study.

Both Government and forest industries are aware of this problem and anxious to find a solution. Forest Protection Limited, which does the spraying, and also the Forest Biology Division of the Canadian Department of Agriculture have facilitated our studies in many ways. At present no suitable alternative insecticide is known that is less toxic to fish than DDT. Recently, however, an inter-departmental committee was formed in Ottawa to promote more intensive research on the problem and to ensure that spraying projects are not undertaken without giving full consideration to all the resources that may be affected.

RELATIVE TOXICITY OF DDT AND MALATHION TO SALMON

Recently it was suggested that another insecticide, Malathion, might be less harmful than DDT to young salmon. In May, 1957, at Curventon, N.B., bio-assays were carried out with the two insecticides which were mixed with solvent oil in the same proportions as in the DDT spray used against the budworms. These mixtures were diluted with river water to required concentrations, placed in tanks and aerated. Samples of young salmon were held in them and observed, to learn the concentrations that killed one-half of them in a given time. It was found that 0.049 parts per million of DDT killed one-half the fish within 24 hours, whereas only 0.033 parts per million of Malathion had the same effect. Further experiments with Malathion were discouraged by these tests, but other alternative insecticides deserve testing.

INTRODUCTION OF AQUATIC INSECT LARVAE TO THE NORTH BRANCH BIG SEVOGLE RIVER, N.B.

As discussed above, spraying of the watershed of several branches of the Northwest Miramichi River with DDT in order to control an epidemic of spruce budworm has resulted in marked changes in the insect fauna of these streams. Compared to unsprayed streams the numbers of insects are relatively great, but the bulk, or total volume, is low. The Diptera ("fly") larvae and other smaller types of insects are affected less severely than most larger forms. Populations of many of the larger types, which are important in the diet of young salmon, are slow to recover from spraying. The North Branch Big Sevogle River is a good example of a stream affected in this way, due to two sprayings with DDT, one in 1954 and another in 1957. It was chosen as the site for an experimental introduction of insect larvae from Millstream Brook, an unsprayed tributary of the Northwest Miramichi, where the larger aquatic insects are abundant.

The transfer was made by taking stones to which numerous insect larvae were attached, from the bed of Millstream to the insect sampling station on the Sevogle River. At that point three cage-traps which had been sampling the emerging adult insects since early June provided a continuous check on the survival of the introduced forms. Three identical cage-traps were placed in the Sevogle 100 yards up-

stream from the first set to record any up-stream movement of introduced insects.

The transfer was made on August 2, 1957, 44 days after the Sevogle River watershed was sprayed with DDT. The stones were lifted carefully from Millstream, and placed in wooden racks which were then stacked in the back of a jeep. During the $1\frac{1}{2}$-hour trip to the Sevogle River the insect larvae were kept moist by sprinkling the stones regularly with water. Two such trips were made, the jeep carrying one cubic yard of stones per trip. At the introduction site the stones were placed in and around the lower set of three cage-traps.

Although it is too early to evaluate the long-term effects of the experiment, early results are encouraging. During the month following introduction, four types of insects were found in the lower cages where the Millstream stones had been placed. None of these had been found before at the Sevogle sampling site, but all were common at Millstream. They were a cranefly, a mayfly and two caddisfly species. The cranefly was the most abundant of the four, and therefore shows the best evidence of successful introduction. None of these four species was found in the upper set of cage-traps, indicating that no immediate up-stream movement of the introduced larvae occurred.

The introduction will be followed up in 1958 by continuous sampling at the two sites on the Sevogle River. This should give evidence on the success of the introduced forms in establishing themselves in their new environment.

HYDROELECTRIC DEVELOPMENTS AND ST. JOHN RIVER SALMON

In Europe hydroelectric developments on salmon streams have seriously curtailed, in many cases practically eliminated, local populations of Atlantic salmon. Recent developments on the St. John River in New Brunswick may now constitute a threat to St. John salmon. These now provide some 3,000 fish a year for anglers and also support a sizeable commercial fishery. This river system has, below Grand Falls, one of the largest areas in eastern Canada suitable for raising salmon. In 1957, through co-operative efforts of the Fisheries Research Board and the Department of Fisheries, steps were taken to open an investigation on the possible effects of these industrial developments on St. John salmon.

Results of the studies should eventually have significance also for evaluating any future proposals to convert other salmon rivers for hydroelectric purposes.

The co-operative study has involved during the past year: (1) preliminary observation of descending smolts at the dams; (2) counting and tagging adults at the dams; (3) assessment of young salmon in the Tobique system, the principal tributary which is above both the Beechwood and Tobique Narrows dams; (4) evaluation, based on consideration of both the St. John and other systems, of the potential of the St. John as a salmon-producing system and the probable effects of the impoundments.

Some of the 1957 activities and data are reported under "The Management Programme" in the following pages. Improvements in investigational techniques are planned for 1958, and by next year it may be possible to report a considerable increase in knowledge of salmon in this area.

STUDIES AIMED AT IMPROVING YOUNG SALMON PRODUCTION

These important studies were reviewed in considerable detail in the report for 1956. This year, all the projects were continued and some were expanded, but only some of the highlights will be mentioned.

The Fisheries Research Board has demonstrated, first on the Margaree River, N.S., in 1936-37 and later on the Pollett River, N.B., from 1947 to 1953, that intensive control of fish-eating birds, especially mergansers, on salmon streams can give greatly increased production of seaward-migrating smolts. Similar experimental bird control has been in progress on the Miramichi River, N.B., since 1950 and the St. Mary's River, N.S., since 1953, where removal of mergansers is being done by staff of the Department of Fisheries. Preliminary observations were made in 1957 on the Margaree River in the hope of finding a suitable experimental site where the effects of merganser control on abundance of returning adult salmon might be demonstrated.

A follow-up in 1957 of the survival of hatchery stock planted in the Pollett River in 1956 indicated that (1) native stocks of young salmon known to be deficient in quantity can be reinforced satisfactorily by planting hatchery underyearlings in carefully calculated numbers; (2) late autumn plantings of particularly large, healthy fish may give twice as good survival rates as regular fish planted in late autumn.

Experimental plantings, in the spring and fall of 1957, of hatchery stock, carefully graded for size, in the Pollett and upper Northwest Miramichi, showed that it is possible to reinforce smolt runs by plantings made before or during the normal season of smolt descent in the spring, but not late in the season. The minimum length of the fish to be planted appears to be four inches if graded in the preceding autumn, and $4\frac{1}{2}$ to five inches if graded in May of the year when they are to migrate as smolts. These experiments are to continue in 1958.

Investigation & Management of Atlantic Salmon in 1957

Part 2 - -

The Management Programme

By E.W.BURRIDGE

THE ATLANTIC SALMON during the past few decades has, in many areas of the eastern provinces, become the victim of man made changes in environment. The most serious of these changes have been introduced either by industries requiring large volumes of water or by those releasing toxic materials into rivers frequented by salmon. Mining, agriculture, manufacturing and logging through forest cover removal, river control and more recently insect control, are all responsible for the changes in salmon streams.

The decline in the salmon population due partially to the creation of less desirable conditions has necessitated the introduction of more stringent regulations and the acceleration of a general programme to study and improve the freshwater habitat of this species. While the execution of this work in Quebec is undertaken by the provincial Government, in the other Atlantic provinces it is under the federal Government's jurisdiction.

The following is a review of field projects included in the general programme undertaken by the Department to study and improve the salmon's freshwater habitat. When this joint programme was inaugurated several years ago the Department's section of the work dealt largely with exploratory studies of spawning streams and a continuation of the hatchery programme. With the completion of a large number of stream surveys more emphasis has been placed on the study of remedial measures at natural and man made obstructions and on experimental projects in connection with artificially reared salmon. In addition, recent developments have necessitated a greater concentration of effort on the study of problems associated with industrial expansion.

SALMON RIVER SURVEYS

Each year since 1953 a number of spawning streams in the important salmon producing areas of the Atlantic provinces have been examined by experienced field personnel. The desirable and undesirable features of each stream are considered in the assessment report and all pertinent data are recorded on a key reference map.

There was considerably less emphasis on this phase of the 1957 programme in the Maritime Provinces as a result of the increasing number of top priority projects. However, surveys of two Nova Scotia rivers, the Annapolis and the west branch of the Bear River, were completed. Preliminary analyses of these data have indicated that the latter stream should be considered primarily as a trout producer. The Annapolis River, however, was found to have many sections that lend themselves well to salmon spawning and rearing.

Salmon stream surveys in Newfoundland were discontinued during the 1957 season when other phases of the salmon programme required the full attention of all available personnel. This section of the programme will be continued when additional technical personnel become available.

In the province of Quebec salmon stream surveys were confined to the estuarial areas of the rivers. The mouths of 18 important salmon streams were surveyed and boundaries of their estuaries were established and marked.

ADULT SALMON ENUMERATION

1. Saint John River - Beechwood Dam

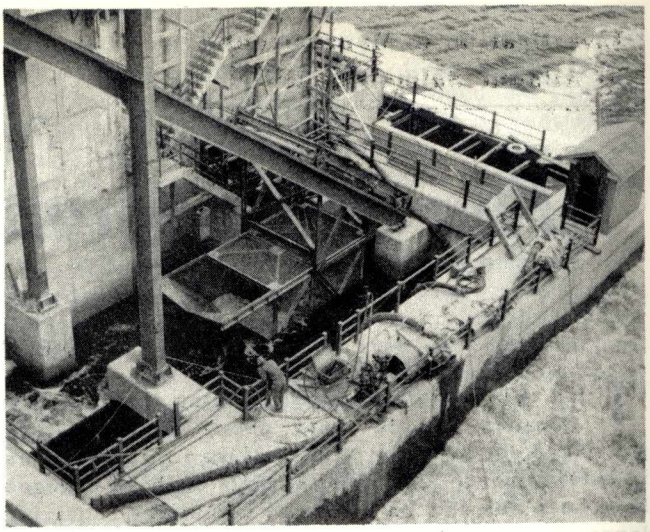
The new power installation at Beechwood, on the Saint John River, was nearing completion when the 1957 salmon run was scheduled to arrive. As a result of the importance of this run and of the possible complications that could develop, the Department assigned a two-man crew to the site from April through November. It was this crew's responsibility to record water conditions and any other factors that might influence the passage of salmon over the dam, to tag a percentage of the run and to count all the salmon and other species passed over the dam in the fish lift.

The first salmon was transported over the dam in the skip-hoist on June 15, approximately one month later than had been expected. Salmon migrants had arrived at Beechwood by late May, but unavoidable delays in the removal of a coffer dam below the power house made it almost impossible for these fish to reach the recently completed fish facilities. Once the removal of this material had been accomplished and arrangements for temporary attraction water had been completed, the salmon

run was satisfactorily passed over the dam. Permanent attraction water will be supplied to these facilities in the future by the turbines which were brought into production in the latter part of 1957.

Between June 15 and November 6 a total of 1,127 salmon were counted through the skip-hoist fish facilities. Approximately one-third of these fish were tagged before being released into the headpond above the dam. The results of this endeavour have provided the Department with basic information on the migration time through the future headpond area, lying between the Beechwood and Tobique hydroelectric installations. A study of migration rates through this area, under "near normal" river conditions, could only be accomplished in 1957 since this section of the river is now innundated. A comparison of these data with those from subsequent tagging programmes will indicate the presence or absence of any undesirable effects on the migration pattern of the salmon, created by this impoundment.

The obstruction created by the Beechwood Dam was originally held solely responsible for the failure of the 1957 run to pass this point in the expected numbers. In attempting to locate additional salmon migrants, down river sport catches were checked and spawning ground counts were obtained. The data from those sources indicated increases over previous year's figures, but by no means did they account for the vast difference between the expected and actual counts recorded at the Beechwood facilities.



Skip-hoist fish-lift at Beechwood dam.

A check of past records indicated that substantial areas in the upper Tobique drainage had been sprayed with DDT in 1953. As is indicated in the section on Research, Tobique stocks have been reduced by DDT spraying. This factor coupled with

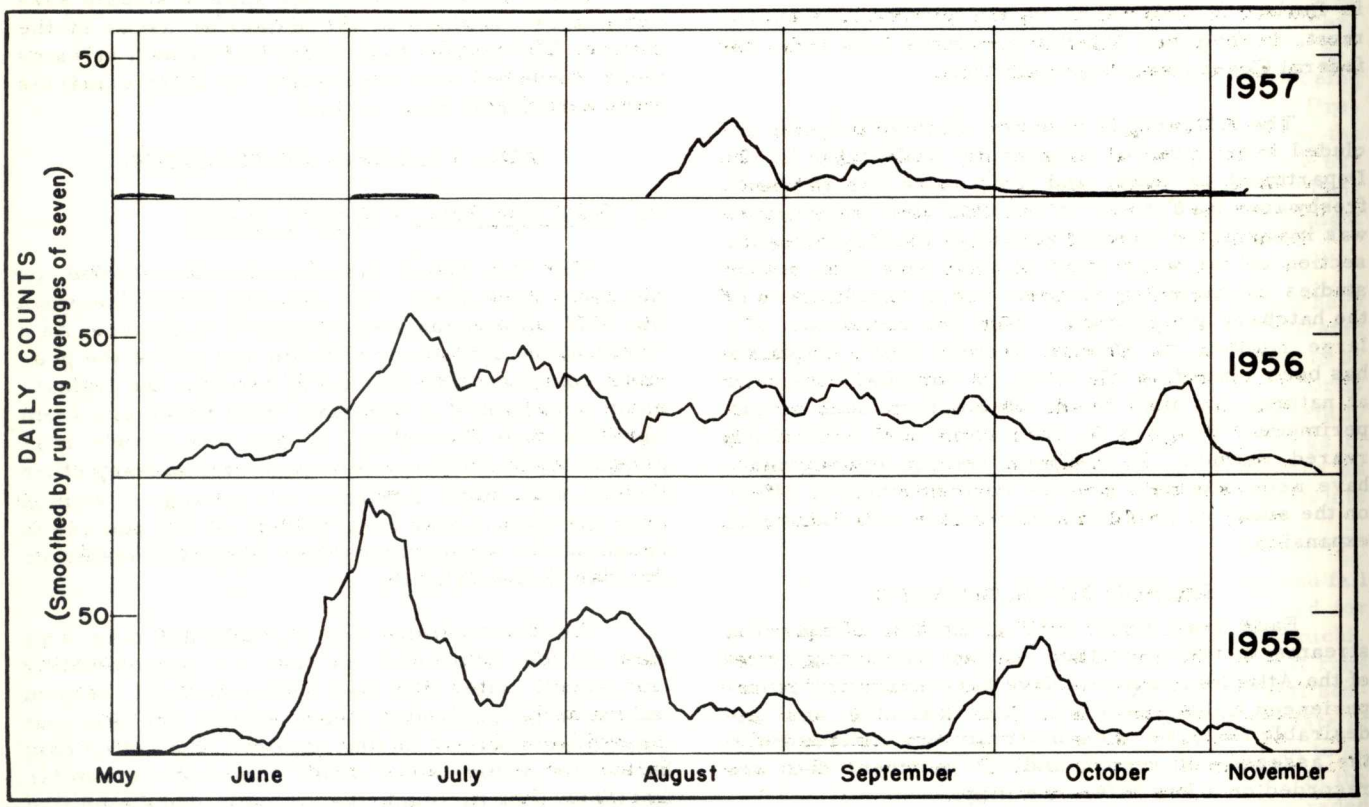


Figure 1. Daily counts of salmon at Tobique Narrows Fishway, 1955-1957. Data have been smoothed by Sevens to eliminate the effects of sudden rises and falls and to give a general picture.

the inability of some of the early arriving migrants to locate the fish facilities at the Beechwood Dam are considered responsible for the unusually light run in 1957.

2. Tobique River - Tobique Narrows Dam

Between June 20th and November 5th, 569 migrant salmon were counted through the Tobique Narrows fishway. In comparing the 1957 run with the former recorded Tobique runs, its late arrival and reduced size are the two outstanding characteristics (Figure 1). The four year average (1953-56) of 4,285 fish is seven and one half times that of the 1957 count. The reasons for the run's lateness and size have been dealt with in the preceding section.

Approximately one-third of the fish tagged at Beechwood Dam were recovered in the Tobique trap and released into the impoundment above the dam. The time required by these tagged salmon to travel from Beechwood to Tobique Narrows, a distance of approximately 20 miles, ranged from two to forty-two days.

3. Counting trap installations

An interesting item in Table I is the large escapement counted through the Big Salmon River trap in 1957. The total of 1,683 salmon entering the river is approximately seven times that of any previously recorded escapement.

A release of 1,250 young salmon, ranging in size from $1\frac{1}{2}$ to 4 pounds, into this system in December 1956 was a contributing factor for the increased return. Improved conditions at the mouth of the river, resulting from the completion of a new fishway in 1954 and the subsequent elimination of delay to the migrants, are also felt to have contributed to the enlargement of this run.

Although the young salmon planting has been described in previous reports, it is felt that a brief review of the programme may be of interest. The fish used were large three year olds, progeny of a selective breeding experiment which had been in progress at the St. John Hatchery for several years. The stock had remained in the hatchery for five generations. Prior to their release these three year old fish were all marked with loops of coloured plastic tubing inserted below the dorsal fin. Unfortunately many of the plastic markers were lost before the fish returned. A few marked fish and a larger number bearing scars where the marker had been inserted, were recovered in the trap at the river mouth. These data indicated that artificially reared fish, introduced into a strange river system will return to that stream, after having spent a short time in the sea. This occurred in spite of the fact that for five generations the stock had remained in the hatchery.

DOWNSTREAM MIGRANT SAMPLING

Saint John River - Beechwood - Tobique Area

A smolt sampling programme was undertaken between May 9 and June 11 at stations on the Saint John River system from above Tobique Narrows Dam to below Beechwood Dam. It was the purpose of this programme to collect preliminary informa-

Table I - Counting trap data from selected rivers in Nova Scotia, New Brunswick and Newfoundland.

Nova Scotia	1953	1954	1955	1956	1957
LaHave (Wentzells)	-	-	262	201	136
LaHave (Indian Falls)	-	-	73	44	47
Mersey (Cowie Falls)	206	65	32	42	5
Tusket River	24	74	24	17	7
New Brunswick					
Beechwood	-	-	-	-	1,127
Tobique Narrows	4,656	4,985	3,775	3,723	569
Big Salmon River	34	237	95	172	1,683
Rocky Brook	622	507	209	492	498
Magaguadavic River	58	580	51	22	33
Newfoundland					
Middle Brook	-	-	-	462	30*
Rattling Brook	-	-	-	746Ø	627
Terra Nova (lower)	-	-	-	594	182*
Terra Nova (upper)	-	-	77	76	22
Salmon Brook	-	-	-	-	965

Ø actual count plus 150 estimated to have moved upstream without entering the trap.

* conditions during 1957 made the collection of complete figures impossible at these traps.

tion on the duration of the smolt migration and the approximate timing of the peaks of this run.

Gangs of gillnets were operated above the Tobique installation and above and below the Beechwood Dam. St. Clair trap nets were also used in the flowage area well above Tobique Narrows.

Unsuitable river conditions and large accumulations of trash made fishing above and below the new Beechwood installation almost impossible. A greater degree of success was experienced at the stations above the Tobique Dam but too few migrants were captured to permit the establishment of any conclusions on the behaviour of the smolt run. Information and experience gained in the 1957 sampling project will be useful in planning the 1958 downstream migrant programme.

EARLY-LATE RUN EXPERIMENT

The first returns from the early-late run experiment were checked through the counting traps in River Philip, N.S. and the LaHave River, N.S. in 1957. These marked grilse arrivals were released as smolts in 1955 as the initial step of this project. The experiment was designed to provide fish culturists with information on the validity of the theory that early-run salmon give rise to early-run progeny and vice-versa.

Each year since 1955 the progeny of early-run stock have been released in River Philip, a late-run stream. Similarly the young of late-run parents have been released in the LaHave River, an early-run stream. Prior to their release all smolts were marked, by the removal of a fin, for future identification. When initiated it was felt that this programme would indicate whether the progeny retained the characteristics of their parents or if they would develop the characteristics of the native runs.

Eggs for the production of early-run stock are collected each year from Rocky Brook, N.B. and from the Nictauz River, N.S. All "late run" eggs are procured from the fall arrivals to the River Phillip, N.S.

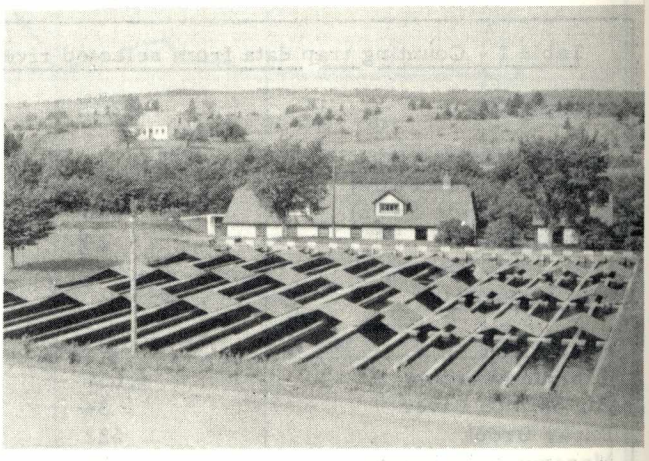
The 1957 season was the earliest any appreciable number of returns from these plantings could be expected. As a result of their increased importance, additional personnel were assigned to the counting traps on these two streams in order that all salmon migrants could be examined. Two marked, late-run fish, were identified in the trap at Wentzell's Dam on the "early-run" LaHave River, during the latter part of October. The lateness of the majority of the 1957 run to this river was felt to be due largely to the unsuitable water conditions prevalent throughout the area during the normal migration period.

A total of 29 salmon and 84 grilse were counted through the trap on the River Phillip. Sixty-six per cent of the grilse were positively identified, by the absence of the left ventral fin, as introduced stock. The appearance of a large number of early returning salmon was considered remarkable since grilse are rarely found in the River Phillip. The encouraging number of returns indicates the possibility of an answer to the early-late run question being obtained in the near future.

The programme involving the examination of all ascending large salmon and grilse, for identifying marks, at the LaHave and River Phillip counting traps is being continued in 1958. In addition the anglers' catches in several of the neighbouring streams will be examined regularly for the occurrence of marked salmon.

HATCHERY PRODUCTION

The 1957 salmon distributions by the Maritime hatcheries were the highest in the past five years (Table II). A total of over 9,300,000 fingerlings, 1,500,000 fry and over 600,000 post yearlings were distributed in carefully selected streams, throughout the three Maritime Provinces.



Ponds and subhatchery, Antigonish, N.S.

Table II - ATLANTIC SALMON HATCHERY DISTRIBUTIONS 1953-57

	Fry	Fingerlings	Post Yearlings	Total
1957	1,545,000	9,345,023	636,292	11,526,315
1956	2,172,500	7,388,439	376,283	9,937,222
1955	1,555,000	7,386,091	173,114	9,114,205
1954	1,693,208	9,693,429	74,426	11,461,063
1953	1,298,789	5,945,658	53,770	7,298,217

Each year hatchery reared salmon are distributed in areas where the runs have, as a result of natural or man made changes, been seriously depleted. In addition hatchery stocks are used in numerous short and long term experiments which are undertaken to improve present fish culture techniques and procedures. The early-late run experiment and the release of post smolts into the Big Salmon River, described in preceding sections, are examples of such experiments.

As a part of the 1957 Atlantic Salmon programme the Quebec Department of Fisheries took the initial steps in a plan for the production of an increased number of salmon smolts for distribution in that province. This work included the expansion of the facilities of their Gaspe Hatchery to accommodate up to 100,000 smolts. In this connection a total of 80,000 young salmon, set aside in 1957, will be distributed in the spring of 1959.

EXPERIMENTAL PREDATOR BIRD CONTROL

The experimental American merganser control programme, begun in 1954, was continued during the 1957 season on the Miramichi River, N.B., and on the St. Mary's River, N.S. A number of two-man crews composed of seasonal employees and under the direction of a permanent staff member, made regular patrols on these rivers, destroying as many American mergansers as possible. Each crew recorded the number of birds seen and the number killed. A significant decline in the number of birds destroyed in 1957, in spite of the constant shooting effort, suggested a further reduction in the size of the predator bird populations on the St. Mary's and Miramichi Rivers.

Table III - Birds destroyed on the Miramichi and St. Mary's River 1954-57.

	1954	1955	1956	1957
Miramichi River	1028	436	178	106
St. Mary's River	424	240	113	87

In addition to the continuation of the above two projects, initial steps were taken to introduce a cooperative American merganser control programme on the Margaree River, N. S., where the experimental bird control results would not be confounded by spruce-budworm spraying. This venture was undertaken jointly by the Fisheries Research Board, the Canadian Wildlife Service and the Department of Fisheries. Preliminary work included a census to determine the size of the merganser population, banding to permit accurate visual records of the birds on the river and salmon parr assessment at selected stations along the river. From the spring and fall census work it was estimated that the Margaree merganser population stood at approximately 200 birds. The marking programme resulted in leg banding 70 mergansers and attaching coloured plastic harnesses on an additional 46 birds. Parr assessment employed the recognized technique of sampling specific areas with electro fishing apparatus.

The engineering section of the Department's Fish Culture Branch continued in 1957 with an energetic stream improvement programme in Newfoundland and the Maritime Provinces. General stream improvement projects, fishway survey work, design, construction and repairs made up the greater part of the work undertaken by these groups.

General stream improvement work, in the way of remedial blasting, was accomplished at falls on Big Salmon River, N.B., Round Hill River, N.S. and at Harvey Falls on Great Rattling Brook in the province of Newfoundland.

The construction of a 120 foot long, reinforced concrete fishway at Indian Falls, on the Indian River in Newfoundland, highlighted the engineering programme in that province. Fishway work in the mainland provinces included the reconstruction of the Indian Falls facilities on the LaHave River, N.S., and repairs to the installation on the Magaguadavic and Bartholomew Rivers in New Brunswick. Preliminary engineering surveys were undertaken at a natural rock falls and storage dam situated on Great Rattling Brook, Newfoundland. The field surveys have been followed by the design of fish facilities capable of enabling adult salmon migrants to reach the river above this obstruction.

ADULT SALMON TRANSFER

Information received by the Department in connection with a power scheme on Rattling Brook in Newfoundland necessitated a study of the river, its salmon run and of the proposed development. As a result of these studies it was decided to attempt a transfer programme, which would involve capturing and transporting the entire run of salmon. The programme, envisaged by technical personnel in the Newfoundland office, involved trapping salmon migrants on Rattling Brook and transferring them by truck to Great Rattling Brook a tributary of the Exploits River. The nature of the power development of the former stream precluded the installation of fish facilities that would permit the perpetuation of this run of salmon.

A total of 635 fish were captured in a trap at the Rattling Brook counting fence between July 1 and September 7. Eighty-seven of the transferred salmon were tagged prior to their release in the Exploits River tributary. Four of the five recovered tagged fish were captured in pools above the release site where many other tagged and untagged fish were observed. The tag recoveries and observations indicated that a substantial number of the transplanted salmon proceeded up-stream following their release. This project will be continued for the next several years in an attempt to save the Rattling Brook run and to establish a successful run to Great Rattling Brook.

Canadian Fisheries News

New Commissioner

Hon. J. Angus MacLean, Minister of Fisheries, has announced the appointment of Silas W. Moores, Managing Director of North Eastern Fish Industries, Ltd., Harbour Grace, Newfoundland, as one of the three Canadian Commissioners on the International Commission for the Northwest Atlantic Fisheries. He replaces the Hon. J.T. Cheeseman, Minister of Fisheries of Newfoundland, who resigned as a Canadian commissioner.

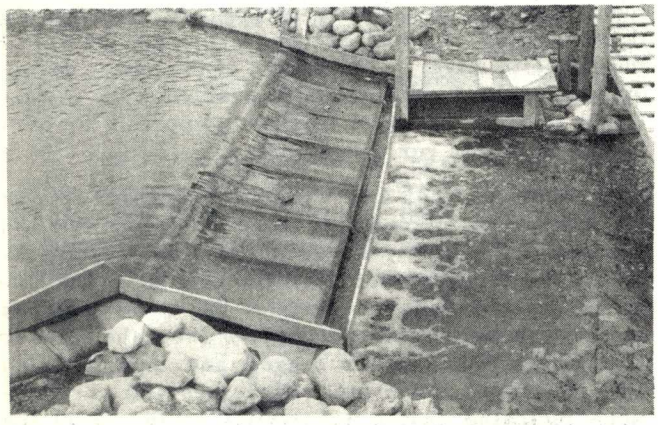
Mr. Moores, who has been prominent in Newfoundland's business life for many years, lives at Carbonear. His fish processing firm at nearby Harbour Grace is one of the largest in Newfoundland.

Deputy Minister of Fisheries George R. Clark heads the Canadian group. The third Commissioner is J. Howard MacKichan, of Halifax, N.S.

ICNAF's annual meeting this year will be held in Halifax beginning June 9. Other member countries are the United Kingdom, United States, Spain, Portugal, Norway, France, Italy, Iceland, Denmark, West Germany and the U.S.S.R. The Soviet Union became a member of the Commission within the past month.

Jones Creek Salmon Fry

Upwards of 363,000 pink salmon fry were checked through the counting fence at Jones Creek, British Columbia's man-made salmon spawning stream, this year, according to biologists of the federal Department of Fisheries.



Fry counting fence below camera house.

The 1958 seaward migration of pink salmon fry began March 19 and the last of the run passed into the Fraser River on May 23. This was earlier than normal and is attributed to unseasonably warm weather throughout May. The run originated from the 1957 fall spawning of 557 females and 499 males, giving a potential spawning deposition of 947,000 eggs. Survival was 38 per cent, one of the highest on record and much above the average expected from natural stream spawning conditions.

This year the normal fry counting methods were supplemented by photographic apparatus used in experiments to check its efficiency as a possible substitute for manual counting. A series of pictures was taken at regular intervals throughout hours of darkness by means of electronic flashlight photography. Biologists are hopeful this may soon replace manual handling and weighing now used to compute salmon fry populations; they state that when perfected the photographic method will permit the passage of a salmon fry run without handling or delay.

Lunenburg Exhibition

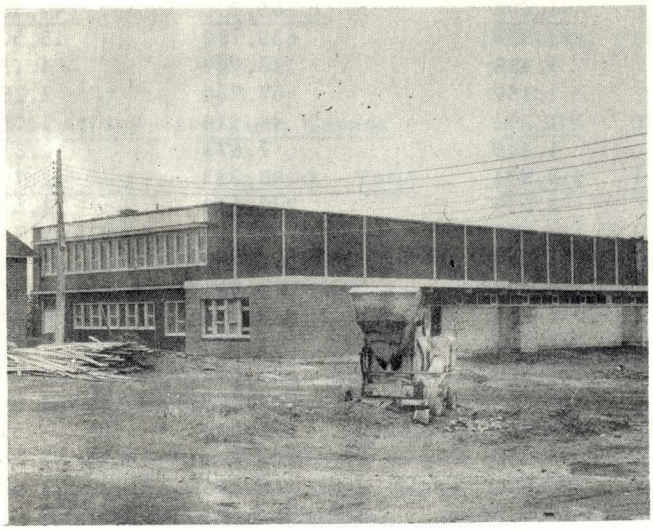
One of the most important exhibitions as far as the commercial fisheries of the Maritime Provinces of Canada's East Coast are concerned is the Nova Scotia Fisheries Exhibition and Fishermen's Reunion which is held annually at Lunenburg, N.S. This year the exhibition is being held from September 9 to 13. It focuses attention on the fisheries, and brings before the commercial fishermen of the Maritimes things of interest not only to them, but also to the general public.

A highlight of this year's exhibition will be the fact that the new Community Building will be in use for the first time. The building stands as a monument to those who have lost their lives in the call of the fisheries. In the mahogany-lined memorial chamber will be the names of the more than 100 Lunenburg vessels lost at sea -- about 40 with all hands -- and the names of fishermen who perished in these disasters. The building will be completed by the time the exhibition opens.

Over the years the federal Department of Fisheries has always taken a keen interest in this exhibition, and has been closely identified with it since its inception. This year the Department will have some phases of its display in the new building. These will be the fish products displays, which include products of practically every fish processor in the Maritime provinces, along with a special display symbolic of the fishery resources of Canada.

Departmental displays will also be housed in the curling rink building which has been the scene of many Department of Fishery exhibits over the

years. In this building will be a cooking school, which is aimed at educating the public in the many ways fish can be prepared, as well as displays of boning and cutting fish, and fish tanks. In the past the Department has usually exhibited live species of freshwater fish. This year in view of the interest



New Exhibition Building at Lunenburg.

created in the underwater investigations of live lobsters, it is planned to substitute live lobsters. In the tanks will be lobster traps, and visitors to the exhibit will have the opportunity of witnessing how lobsters enter the traps under water.

Fisheries Minister J. Angus MacLean will formally open this year's exhibition.

Apart from the Department's participation there will be displayed a wide range of equipment such as marine engines, fishing gear, barrels, hoists, winches, refrigeration units, sails, ropes and the latest electronic devices, etc.

Pacific Drifts

Salvador Gemeno found a bottle, March 23, on the beach at Kaneohe Bay, north of Honolulu on the Hawaiian Island of Oahu. Mr. Gemeno received one Canadian dollar and became a significant contributor to scientific research, since this was the first reported recovery on the Hawaiian Islands of drift bottles released by Canadian oceanographers in the Pacific Ocean survey programme instituted in 1956.

The Hawaiian recovery was the first from a release of 1,000 bottles made on August 26, 1956. Dr. John P. Tully of the Pacific Oceanographic Group, Nanaimo, said it was probably caught in the main stream of the southward flowing California current, which gradually turns at about latitude 30° north to form the north equatorial current flowing westward across the Pacific Ocean. From a lot of 1,000 bottles released one day earlier at a point 350 miles north, more than 100 bottles have been recovered, the earliest being in March, 1957.

The bottle found by Salvador Gemeno had drifted for 19 months in a hypothetical drift path of 2400 miles, but probably meandered over a much longer distance.

Oceanographers, taking into account known data on drift speeds in the area, said the bottle may have travelled as much as 4,500 miles before becoming beached.

Since the inception of the project in August, 1956, 25,000 drift bottles have been released at chosen locations in the northeast Pacific by the Pacific Oceanographic Group. To date 800 bottles have been recovered from locations ranging from the outer Aleutian Islands to the coast of Oregon. Bottles contain cards printed in English, Spanish, Japanese and latterly Russian offering one dollar to the finder for reporting discovery.

B.C. Sport Fishing

Sport fishermen took a record total catch of two million pounds of salmon from British Columbia coastal waters last year. Annual salmon sport fishing statistics state that upwards of 396,000 salmon, an increase of 30 per cent over the previous year, were reported. This figure is nearly twice the number of salmon reported in 1953, when the Department of Fisheries first began systematic checking and compiling sport fishing statistics.

Figures are based on details of catches and fishing effort supplied by Fishery Protection Officers in daily coverage of sport fishing centres and from boat rental operators, fishing lodges, auto courts and others catering to tidal water fishing enthusiasts. This was supplemented in 1957 by three specially organized sport fishing surveys carried out simultaneously in all coastal areas.

The Department of Fisheries reported excellent co-operation from all concerned, with a 70 per cent completion and return of questionnaires distributed to sport fishermen.

Details of the salmon catch taken by sport fishermen are: springs and jacks - 93,450; coho-131,075; grilse - 161,600 and pinks - 10,150 fish. The overall total of 396,275 compares with a total commercial fishing catch of the same species of 4,081,900 salmon.

The report points out that the percentage of sport fishing salmon catches in relation to the commercial catches of coho and spring has risen steadily from 4.85 per cent in 1953 to 8.82 per cent last year.

Fishery Figures For April

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May 1956 - Apr. 1957		May 1957 - Apr. 1958	
	'000 lbs	$'000	'000 lbs	$'000
CANADA- TOTAL	1,863,314	84,950	1,726,567	77,756
ATLANTIC COAST - Total	1,330,441	51,498	1,365,036	49,985
Cod	628,097	15,553	655,780	15,508
Haddock	144,223	4,488	116,969	4,152
Pollock, Hake & Cusk	68,497	1,159	67,900	1,251
Rosefish	55,390	1,211	48,314	1,059
Halibut	6,015	1,485	7,671	1,817
Plaice & Other Flatfish	81,154	2,534	88,743	2,735
Herring & Sardines	174,805	2,033	238,543	2,612
Mackerel	21,927	827	18,731	741
Swordfish	4,153	1,169	5,179	1,341
Salmon	2,608	947	2,936	1,026
Smelts	3,768	465	3,270	443
Alewives	16,194	160	11,791	169
Other Fish	39,926	470	34,511	460
Lobsters	51,068	16,759	44,592	14,667
Clams & Quahaugs	7,974	432	6,498	314
Scallops	2,826	1,188	3,314	1,266
Other Shellfish	21,816	618	10,294	424
PACIFIC COAST - Total	532,873	33,452	361,531	27,771
Pacific Cods	10,512	738	14,810	1,025
Halibut	22,988	4,954	22,122	3,625
Soles & Other Flatfish	8,768	399	7,819	454
Herring	357,280	5,565	166,913	2,769
Salmon	111,213	20,675	131,991	18,809
Other Fish	8,337	218	4,852	139
Shellfish	13,775	903	13,024	950
BY PROVINCES				
British Columbia	532,873	33,452	361,531	27,771
Nova Scotia	415,882	22,879	451,463	23,192
New Brunswick	180,438	7,481	180,730	6,802
Prince Edward Island	40,109	3,739	41,083	3,424
Quebec	116,866	3,508	135,052	3,457
Newfoundland	577,146	13,891	556,708	13,110

MID-MONTH WHOLESALE PRICES, Apr., 1958

		Montreal	Toronto
		$	$
Cod fillets, Atl. fresh, unwrapped	lb.	.299	.337
Cod fillets, Atl. frozen, cello 5's	lb.	.248	.272
Cod fillets, smoked	lb.	.316	.345
Haddock fillets, fresh, unwrapped	lb.	.402	.457
Herring kippered, Atl.	lb.	.250	.272
Mackerel, frozen, round	lb.	.170	.247
Lobsters, canned, Fancy	case 48-½s	43.30	43.56
Sardines, canned	case 100-¼s	9.04	9.11
Halibut, frzn., dr.	lb.	.374	.388
Silverbright, frzn., dr.	lb.	.443	.438
Coho, frzn., dr.	lb.	.574	.567
Sockeye, canned, gr. A	case 48-½s	22.30	21.90
Pink, canned, gr. A	case 48-½s	12.81	12.32
Whitefish, fresh	lb.	.446	-
Lake Trout, frozen	lb.	.428	.425

PRICES PER CWT. PAID TO FISHERMEN
(Week ending Apr. 19th)

	1957	1958
	$	$
Halifax		
Cod Steak	3.25	3.75
Market Cod	3.25	3.25
Haddock	4.00-5.00	5.00
Plaice	3.25	3.25
Yarmouth		
Haddock	5.00	5.00
Black's Harbour		
Sardines	2.00	2.00
St. John's, Nfld.		
Cod	2.00	2.25
Haddock	3.00	3.00
Rosefish	2.00	2.00
Vancouver		
Ling Cod	8.00-12.00	9.00-10.00
Gray Cod	3.25- 6.00	3.50- 6.00
Soles	6.00- 8.00	5.00- 9.00
Salmon (Rdspg.)	30.00-48.00	20.00-30.00

Fishery Figures For April

STOCKS AS AT END OF APRIL

	1957 ('000 lbs)	1958 ('000 lbs)
TOTAL - Frozen Fish, Canada	45,175	33,720
Frozen - Fresh, Sea Fish - Total	21,479	14,834
Cod Atlantic, fillets & blocks	3,894	2,070
Haddock, fillets & blocks	4,334	2,691
Rosefish, fillets & blocks	575	424
Flatfish (excl. Halibut), fillets & blocks	1,094	1,099
Halibut Pacific, dressed & steaks	2,982	1,047
Other Groundfish, dressed & steaks	1,107	1,536
Other Groundfish, fillets & blocks	680	1,269
Salmon Pacific, dressed & steaks	4,291	1,633
Herring Atlantic & Pacific	354	681
All Other Sea Fish, all forms	1,275	1,384
Shellfish	893	1,000
Frozen - Fresh, Inland Fish - Total	4,349	3,091
Perch, round or dressed	384	186
Pickerel (Yellow), fillets	109	157
Sauger, round or dressed	229	(1)
Tullibee, round or dressed	196	291
Whitefish, round or dressed	618	709
Whitefish, fillets	257	351
Other, all forms	2,556	1,397
Frozen - Smoked Fish - Total	2,387	1,634
Cod Atlantic	1,332	633
Sea Herring, Kippers	377	394
Other, all forms	678	607
Frozen for Bait and Animal Feed	16,067	13,161
Salted and Pickled Fish, Atl. Coast		
Wet-salted - Total	14,876	9,922
Cod	11,574	8,333
Other	3,302	1,589
Dried - Total	17,585	20,044
Cod	16,668	18,547
Other	917	1,497
Boneless - Total	915	82
Cod	902	53
Other	13	29

(1) Less than 3 firms reporting.

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - MARCH

(Value in Thousands of Dollars)

	1957	1958
Total Exports	122,237	125,204
By Markets:		
United States	88,441	91,001
Caribbean Area	15,500	17,167
Europe	14,077	12,960
Other Countries	4,219	4,076
By Forms:		
Fresh and Frozen	73,003	76,623
Whole or Dressed	26,887	28,806
Salmon, Pacific	5,401	5,589
Halibut, Pacific	3,495	3,466
Cod, Haddock, Pollock, etc.	664	755
Swordfish	1,683	1,827
Other Seafish	3,611	4,219
Whitefish	5,186	5,481
Pickerel	2,645	2,948
Other freshwater fish, n.o.p.	4,202	4,521
Fillets	28,775	31,619
Cod, Atlantic	9,639	11,613
Haddock	4,646	4,622
Rosefish, Hake, Pollock, etc.	2,746	2,325
Flatfish	4,632	5,101
Pickerel	3,752	3,202
Other	3,360	4,756
Shellfish	17,341	16,198
Lobster (Alive, Meat)	15,883	14,499
Other	1,458	1,699
Cured	20,784	23,906
Smoked	1,626	1,485
Herring	1,107	851
Other	519	634
Salted, Wet or Dried	16,097	18,971
Cod	14,184	16,261
Other	1,913	2,710
Pickled	3,061	3,450
Herring	1,552	1,962
Mackerel	816	854
Other	693	634
Canned	17,253	16,491
Salmon, Pacific	12,679	11,760
Sardines	2,084	2,310
Lobster	2,059	2,042
Other	431	379
Miscellaneous	11,197	8,184
Meal	6,253	4,328
Oil	1,455	815
Other	3,489	3,041

Norway

EXPORTS OF PRINCIPAL FISHERY PRODUCTS

January - December 1957

For Comparative Table see "Trade News", May 1957

Quantities in Thousands of Pounds — Value in Thousands of Kroners

DESTINATION	TOTAL EXPORTS		MAINLY COD					HERRING			CANNED FISH	FISH MEAL	OILS	
	Quan.	Value	Fresh	Frozen	Dry Salted	Wet Salted	Stockfish	Fresh	Frozen	Salted			Medicinal	Others
	th.lb.	th.kr.	th.lb.	th.lb.	th.lb.	th.lb.	th.lb.	th.lb.	th.lb.	th.lb.	th.lb.	th.lb.	th.lb.	th.lb.
Canada	3,705	8,431	-	-	-	-	-	-	-	739	2,752	-	214	-
U.S.A.	48,658	78,346	-	4,635	474	670	1,012	-	-	9,358	21,834	8,031	2,024	620
Other Western Hemisphere														
Argentina	60	68	-	-	-	-	-	-	-	-	-	-	60	-
Brazil	50,829	83,258	-	-	50,362	-	-	-	-	-	-	-	467	-
Columbia	79	92	-	-	-	-	-	-	-	-	-	-	79	-
Cuba	6,333	10,941	-	-	6,333	-	-	-	-	-	-	-	-	-
Mexico	1,564	2,513	-	-	893	-	-	-	-	-	-	-	115	556
Neth. West Indies	432	698	-	-	432	-	-	-	-	-	-	-	-	-
Peru	318	783	-	-	258	-	-	-	-	-	-	-	60	-
Venezuela	1,310	2,604	-	-	1,310	-	-	-	-	-	-	-	-	-
Europe														
Austria	11,354	6,993	-	2,922	-	-	-	-	-	1,782	-	6,165	110	375
Belgium	27,191	17,154	1,632		-	-	470	657	1,594	-	983	21,377	112	366
Czechoslovakia	38,568	18,241	-	4,313	-	-	-	7,528	17,596	3,310	615	-	1,314	3,892
Denmark	12,958	8,040	549	-	-	1,160	-	-	-	1,671	280	9,164	-	134
Finland	1,166	2,007	-	-	-	-	681	-	-	192	-	-	293	-
France	50,289	29,484	7,067	513	-	-	-	1,817	2,529	2,366	999	33,159	242	1,537
Germany (East)	96,158	35,741	6,516	-	-	-	-	32,583	35,392	15,078	6,388	-	201	-
Germany (West)	133,114	52,222	135	7,100	-	-	196	58,832	12,344	3,660	1,058	45,919	512	3,358
Greece	6,436	4,552	-	708	-	5,728	-	-	-	-	-	-	-	-
Italy	45,446	61,123	6,249	4,335	792	12,893	13,762	-	-	-	22	5,576	311	1,506
Netherlands	51,343	29,634	2,578	2,205	-	-	337	3,574	2,000	-	291	38,568	926	864
Poland	21,769	7,958	-	1,100	-	-	-	-	6,251	13,536	-	-	-	882
Portugal	17,768	19,999		-	17,768	-	-	-	-	-	-	-	-	-
Eire	289	657	-	-	-	-	-	-	-	-	289	-	-	-
Roumania	4,079	1,208	-	-	-	-	-	-	4,079	-	-	-	-	-
Spain	10,001	14,089	-	-	9,027	-	-	-	-	-	-	-	90	884
Sweden	48,182	42,959	2,656	5,045	-	937	1,854	2,635	-	14,288	419	19,940	-	408
Switzerland	19,609	10,974	-	1,929	-	-	-	-	-	-	-	17,466	214	-
United Kingdom	146,957	132,020	31,335	4,412	-	-	-	18,200	2,009	-	19,874	70,851	-	276
U.S.S.R.	89,632	35,900	-	6,615	-	-	-	-	11,418	71,599	-	-	-	-
Yugoslavia	115	132	-	-	-	-	-	-	-	-	-	-	115	-
Other Countries														
Australia	4,417	8,592	-	-	-	-	-	-	-	-	4,417	-	-	-
Belgian Congo	163	293	-	-	163	-	-	-	-	-	-	-	-	-
Br. West Africa	58,009	102,395	-	-	-	-	54,825	-	2,452	-	732	-	-	-
Egypt	-	-	-	-	-	-		-	-	-	-	-	-	-
Fr. Equat. Africa	5,881	9,464	-	-	-	-	4,761	-	-	-	1,120	-	-	-
Indonesia	73	80	-	-	-	-	-	-	-	-	-	-	73	-
India	66	94	-	-	-	-	-	-	-	-	-	-	66	-
Israel	8,751	4,318	-	-	-	-	-	-	1,102	-	-	7,649	-	-
Liberia	362	600	-	-	-	-	362	-	-	-	-	-	-	-
New Zealand	1,290	2,739	-	-	-	-	-	-	-	-	1,290	-	-	-
Portuguese Africa	3,398	5,603	-	-	3,398	-	-	-	-	-	-	-	-	-
Spanish Dependencies in Africa	146	231	-	-	146	-	-	-	-	-	-	-	-	-
Union of S. Africa	4,377	8,959	-	-	-	-	-	-	-	-	4,377	-	-	-
Others	35,859	32,492	137	9,652	1,680	534	1,208	163	1,971	1,078	2,683	13,144	2,152	1,457
TOTAL Jan.-Dec./57	1,068,504	894,681	58,854	55,544	93,036	21,922	79,468	125,989	100,737	138,657	70,423	297,009	9,750	17,115
TOTAL Jan.-Dec./56	1,238,999	968,383	60,589	54,944	113,608	8,600	77,466	128,940	97,380	182,032	66,397	418,353	12,496	18,194

Note: Not included in this table are 6,185 thousand pounds of Salted Cod Roe valued at 3,124 thousand kroner exported during the year 1956, and 3,058 thousand pounds of the same product valued at 1,709 thousand kroner for the comparable period of 1957.

Current Reading

"The Atlantic Almanac 1958," edited by D. Kermode Parr. (Published by The Atlantic Advocate, Fredericton, N.B. $1.50).

This is a concise and ready source of information about the Atlantic provinces, including institutions, population, judiciary, government at all levels, industries and products. The provincial sections are arranged in the order in which the Atlantic provinces joined Confederation: Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland.

A special section of the Almanac is a Trade Directory of the four above provinces. This includes all firms processing or packing fishery products, classified under ground fish, herring, bloaters, miscellaneous fish, packaged pre-cooked frozen fish sticks, shellfish, and fish by-products.

"Sea-fish Marketing in the Federal Republic of Germany," prepared by Klaus-Hinrich Krohn and Arnold Alewell. (FAO Fisheries Study No. 6, Food and Agriculture Organization of the United Nations, Rome, Italy. $1.50).

A survey of the supply and marketing conditions of the fish industry in the Federal Republic of Germany, this study considers in particular the promotion and expansion of marketing. It is a comprehensive report, of which the first chapter outlines the historical development of the sea fishery, describes its importance, outlines the aims of fishery policy, covers the main sources of supply, traces the pattern of landings, and reviews the utilization of catches, describing the final products. Chapter Two deals with technical facilities and the maintenance of quality fish from catch to marketing in all forms, and Chapter Three, headed "Demand for Fish," explains the relation between the consumer's income and the demand, competition from other foodstuffs, and other factors. Other chapters are on marketing channels and the structure of the fish trade, the organization of market research and advertising, and other means of promotion of fish marketing.

In the final chapter, a summary, it is stated that the fishing fleet has been restored and considerably modernized since the end of World War II, a development which has made most progress in the trawler fishery, which supplies most of the fish for the Federal Republic. In view of its up-to-date technical equipment and its low average age, the fleet may be considered one of the most modern in the world. Special measures have gradually relaxed the strained economic situation in the large herring fishery since the end of the war, and the coastal and small deep-sea fishery has changed its structure. Generally speaking, the report concludes that the fish industry has shared in the economic boom in the Federal Republic.

"The Canadian Fish Culturist," Issue No. Twenty-two, May, 1958. (Published by the Department of Fisheries of Canada, Ottawa.)

This issue of "The Canadian Fish Culturist" deals exclusively with the regulation of fisheries, and is made up of papers presented at the 1957 meeting of the Committee on Biological Investigations of the Fisheries Research Board of Canada. The papers are: "Some Principles Involved in Regulation of Fisheries by Quota," by W.E. Ricker; "Regulation of Atlantic Salmon Fisheries," by C.J. Kerswill; Regulation of the Lobster Fishery," by D.G. Wilder; "Some Sociological Effects of Quota Control of Fisheries," by J. L. Hart, and "Some Economic Aspects of Control by Quota," by W.C. MacKenzie.

"Canada at Brussels 1958," (Published by authority of the Honourable Gordon Churchill, Minister of Trade and Commerce, Canada. The Queen's Printer, Ottawa).

A handsomely produced book, designed for distribution from the Canadian Pavilion at the Brussels World's Fair, this volume itself tells much of the story of Canada; who Canadians are, how they live and how they work. In the last-named section, there are a number of excellent photographs of fishery scenes, including an exceptionally fine shot taken by Mr. L.G. Swann, British Columbia Area Information Officer of the federal Department of Fisheries, showing an early-morning scene on a purse-seiner. The text accompanying the photographs tells briefly of the value of the fisheries to Canada.

"Maritime Fisheries Statistics 1954-55," Province of Quebec. (Published by the Department of Trade and Commerce, Quebec).

The Quebec Bureau of Statistics has issued figures on the province's maritime fisheries for the first time as a separate publication. This booklet gives more detailed information than was published in previous years in the annual report to the provincial Department of Fisheries. The first part of the report provides an accurate description of the twenty-eight districts or fishing centres of the province. The two other parts contain statistics for 1954 and 1955: the first, on the quantities of fish caught and their value, the second, on the labour force and equipment.

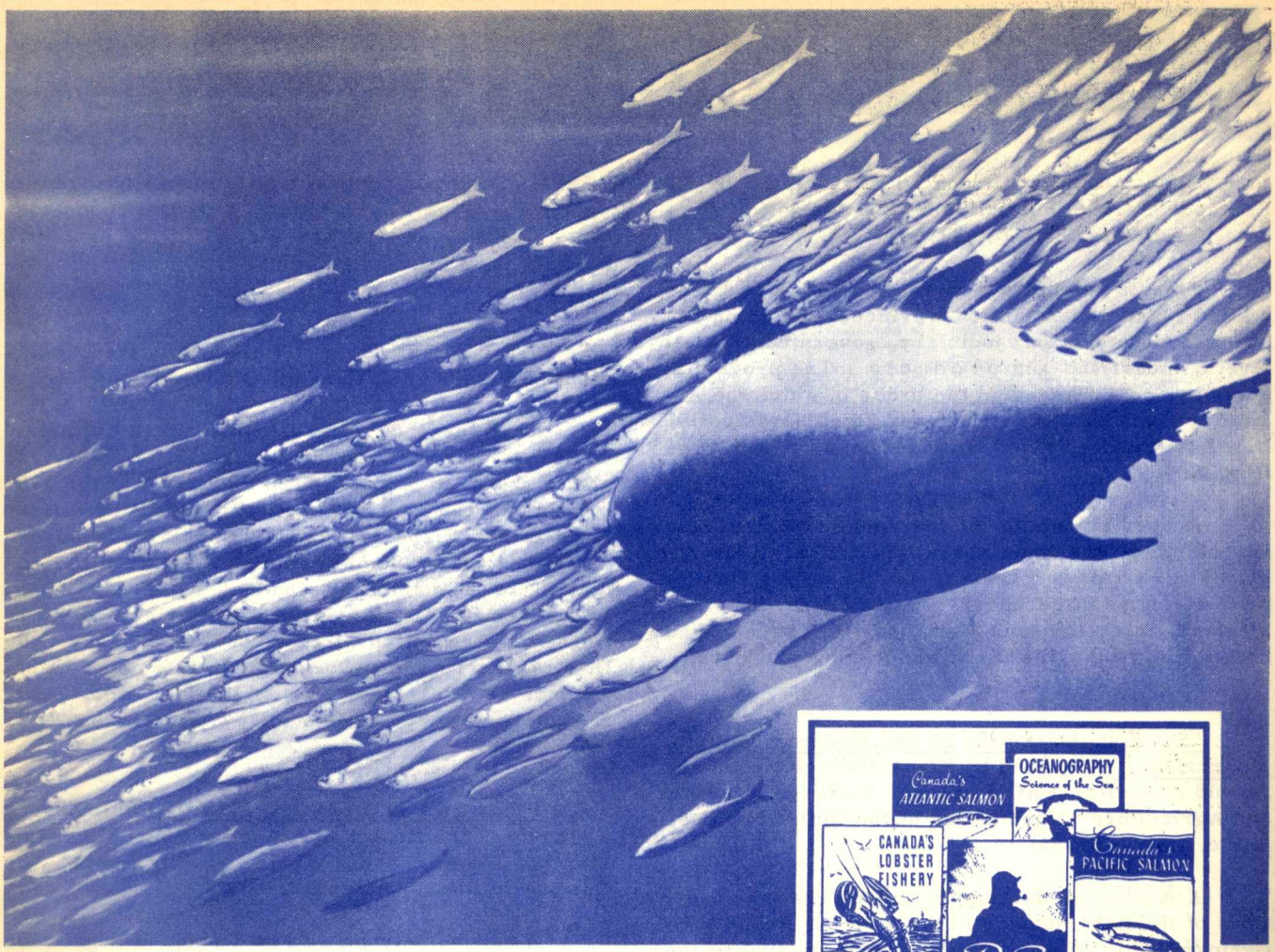


Photo from The Gallery of Canadian Fishes, Royal Ontario Museum, Toronto. Anyone interested in facts about fish can obtain informative booklets for 25¢ each, simply by writing to the Queen's Printer, Ottawa.

We've gone fishing for facts

Education and information is an important part of the Department of Fisheries' work—telling the facts about Canada's fishing industry.

Fish are a great national resource . . . vital to this country's economy. Canada's welfare—which means *yours*—depends on keeping them in plentiful supply. The educational program of the Department is designed to tell Canadians what's being done to preserve the nation's extensive fish stocks and how valuable they are as a basic food resource.

This work is carried out through the daily and weekly press; radio and television; magazines; educational publications; recipe pamphlets for housewives; exhibitions; permanent fishery displays; film and filmstrip showings; and illustrated educational talks to fishermen and consumers.

Canada's school children have a natural love of fishing and the great outdoors. The Department of Fisheries' publications teach them the important role the fishing industry plays in our country's economy.

DEPARTMENT OF FISHERIES

OTTAWA, CANADA

HON. J. ANGUS MACLEAN, M.P., MINISTER

GEORGE R. CLARK, DEPUTY MINISTER