Fisheries and Environment Canada
Pêches et Environnement Canada

DEPARTMENT OF FISHERIES AND THE ENVIRONMENT

NEWFOUNDLAND REGION

NEWFOUNDLAND FISHERIES IN 1977

Newfoundland seafish landings in 1977 amounted to 850.5 million pounds up 13.7 per cent from the previous year's catch of 748 million pounds (preliminary statistics). The gross value of $81,630,000 is up 30 per cent from the landed value for 1976.

The federal Fisheries and Environment Department reports that groundfish landings amounted to 607.9 million pounds. Cod landings increased 18.3 per cent from the 1976 catch of 263.5 million pounds to 312 million pounds in 1977. Flounder catch decreased from 158 million pounds in 1976 to 146 million pounds in 1977. Greysole landings in 1977 amounted to 30 million pounds compared to 23.9 million pounds in 1976, for an increase of 25.5 per cent. The redfish catch of 67 million pounds is down 24 per cent from the 1976 figures. Landings of Greenland turbot in 1977 amounted to 41.5 million pounds compared to 21.5 million pounds in 1976 for an increase of 93 per cent. Other groundfish species amount to 10 million pounds, compared with 7.3 million pounds the year before.

Landings of pelagic and estuarial species amounted to 159.4 million pounds, this compares with 147 million pounds landed in 1976; herring landings totalled 112 million pounds compared to 108 million pounds in the previous year. Salmon landings amounted to 4.2 million pounds compared to 4.4 million pounds in 1976. The capelin catch amounted to 22.3 million pounds compared to 21 million in 1976, and mackerel landings totalled 17.4 million pounds, compared to 11.7 million the previous year.

Landings of Molluscs and Crustaceans amounted to 83.1 million pounds compared to 36 million pounds in 1976. The lobster catch amounted to 4.8 million pounds as opposed to 5 million pounds in 1976. Crab landings increased from 5.9 million pounds to 8.4 million pounds. Squid landings in 1977 amounted to 65.4 million pounds compared with 21.9 million the previous year.

The total number of licenced fishermen exceeded 20,000 in 1977, with over 18,000 involved in the inshore fishery and 2,000 in the offshore fishery.

Salted Cod

Salted cod production decreased to 153,585 quintals dry weight in 1977 from 206,338 quintals in 1976. The percentage of the total cod landings used for salting decreased to 26.4 per cent from 39.7 per cent the previous year. The trend of the last 10 years is shown in the following table:-

Percentage of Total Cod Landings used for Salted Production 1968-1977

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
TOTAL	43.3	36.9	32.3	25.6	21.2	20.2	27.8	41.5	39.7	26.4
Light	19.1	17.6	11.7	7.7	4.5	4.3	7.3	6.5	4.2	4.6
Heavy	24.2	19.3	20.6	17.9	16.7	15.9	20.5	30.0	35.5	21.8

Frozen Groundfish

Production of frozen groundfish increased from 128 million pounds in 1976 to 142 million pounds in 1977. Frozen cod products accounted for 41 per cent of the frozen groundfish production, followed by flounder at 29 per cent, redfish at 12 per cent and turbot at 9 per cent.

ECONOMICS AND INTELLIGENCE BRANCH

The introduction of the extended fishing zone this year has highlighted the need for additional economic input into the Region's fisheries management and development initiatives. As a consequence, the manpower resources within the Division have increased considerably to five Economists, two Economic Support Technicians and two Commercial Analysts. The bulk of these positions will not be filled until early 1978.

The objectives and activities of the Division are basically three-fold:

(1) To provide a comprehensive economic advisory function in support of the Region's responsibilities in fisheries management (licence limitation, optimum size and composition of the domestic fleet, optimum allocation of access to resources between domestic and foreign fleets etc.).

To this end, the Division has in the past years completed several major studies of specific fisheries, most notably, An Economic Assessment of the Nfld. Shrimp Fishery - 1976 and a supplementary study An Economic Study of the Groundfish Operations of the Nfld. Shrimp Fishery, 1976. A similar study of the crab fishery is nearing completion. These studies show that additional measures should be imposed regarding licence limitation and that the number of licence holders in each fishery should be further reduced, notwithstanding current efforts to limit new entrants. In these fisheries it was found that the optimum number of vessels would be less than the present fleet size, based on the analysis of the economic performance of the fleet during the 1976 fishing season.

A paper on the Theoretical Aspects of Economic Rent and Its Possible Extraction under Extended Jurisdiction, was prepared as an input to the recently announced fee structure imposed on foreign vessels within our zone. The Division provided economic advisory support on various committees, for example, Lobster Advisory Committee, Newfoundland Queen Crab Advisory Committee, Shrimp Advisory Committee, Inshore Groundfish Advisory Committee and Salmon Advisory Committee.

(2) To provide economic support to the Region's responsibilities in fisheries development (Government and Industry investments in the primary and secondary sectors of the fishing industry in terms of establishing, expanding or modernizing fish processing facilities, assessing processing and harvesting capacity and marketing etc.)

In the past year the Division's Public Investment Analysts dealt with 30 development project assessments valued at $13.5 million submitted to DREE under the RDIA Program, to the Provincial Department of Rural Development under the ARDA Program and applications submitted to the Nfld. and Labrador Development Corporation for development grants and loans. Involvement with the Canada Works Program in respect of assessing programs related to on-shore processing provided the Division with an avenue for economic input into developmental projects sponsored by the Canada Employment and Immigration Commission. Research was also conducted into fleet development to ascertain phases or stages of development in relation to future fishing fleet design and size. The Division was represented on several committees to provide economic input into, for example, Canada Works Program Co-ordinating, Joint Federal/ Provincial Committee on ARDA Grants and Loans, and committees dealing with fleet development.

(3) To assess the commercial advantages for the Atlantic Coast fishing industry of effective administration of extended jurisdiction, of controlling foreign fleets, and ensuring through evaluation, that co-operative fishing arrangements with foreign companies are approved and carried out in accordance with Ministerial Policies for such ventures.

To this end, the Division has produced investigative reports concerning foreign arrangements, for example, a summary of Canadian/Foreign arrangements, the legal procedures, possible areas of involvement, bilaterial difficulties, etc., and an indepth report on The Northern Cod. The Division also monitored joint venture and bilateral agreements taking place in fisheries elsewhere as sources for national policy guidelines. Representation on a Regional Canada/ Foreign Arrangements Committee by the Division provided for an assessment and evaluation of commercial advantages for Canadian interests in administering a 200-mile fishing zone, monitoring foreign fleets, and, co-operative fishing ventures. The Division also had representation at the U.S./Canada negotiations on management and allocations of transboundary and other stocks on the Atlantic Coast.

FISHING AND INDUSTRY SERVICES

INSPECTION & TECHNOLOGY BRANCH

General

As with other Regions in Canada, the commercial processing of fish in Newfoundland must be done in approved plants which have been registered by the Inspection and Technology Branch of the federal Fisheries and Environment Department. At the end of 1977, the Newfoundland Region had 147 registered plants in which approximately 224 registered operations were carried out. A breakdown by District is as follows:-

DISTRICT 1	-	ST. JOHN'S	- 54 plants	- 80 operations
DISTRICT 2	-	GRAND BANK	- 12 plants	- 15 operations
DISTRICT 3/4	-	GRAND FALLS	- 25 plants	- 53 operations
DISTRICT 5	-	CORNER BROOK	- 56 plants	- 76 operations

During the year, upwards of 18 million pounds of fish, including shellfish, had to be disposed of for other than human food purposes. Comprising part of this amount, denial of subsidy for other than 1st quality fish was made by Inspection Officers as the Temporary Groundfish Assistance Program continued in its third year in an attempt to upgrade final product quality.

Routine inspections were carried out on most products considered to fall within the four different classes of fish products - namely, fresh/frozen, pickled, salted and canned. Figures show approximately 150 million pounds produced in fresh/frozen plants, in excess of 20 million pounds was pickled, another 26 million pounds was salted and approximately 600,000 pounds was canned.

During 1977, the reorganization of the Inspection & Technology Branch continued with the appointment of three Regional Inspection Specialists, one at each of the following locations: St. John's, Grand Bank, and Grand Falls. These specialists will increase uniformity in all aspects of fish product inspections within the Region concerning fresh/frozen, salted and pickled fish and will provide expertise in their field of specialty when contentious issues arise with industry or when training programs are conducted for field staff.

Engineering

In 1977, the Engineering Section began implementation of the $13 million containerization system designed to make more efficient the unloading, holding and transportation of inshore fish throughout the Region. To date, some fifty jib cranes have been installed and other equipment has been ordered, including 3100 large, insulated containers, for installation in 1978/79 when over 100 complete systems will be in operation. The four-year program will provide facilities in some 200 landing sites in Newfoundland and Labrador, representing 27% of landing sites but 85% or more of total inshore landings.

A new Fish Chilling Assistance Program has been well received. Seventeen applications have been approved to date covering an additional 200 tons of ice per day at a total estimated cost of $1.1 million and grants totalling $0.5 million. Pending applications would provide a further 40-50 tons of ice per day.

The Engineering Section continued to provide consulting services to industry in such matters as plant layout, equipment selection, etc., but work on other items of concern, such as the on-board handling of fish, has been virtually suspended due to the increased workload resulting from implementation of the inshore fish handling system.

Seafood Technology

The Seafood Technology Section is a small research group which conducts research into technological problems associated with the handling, preserving, processing, and packaging of fish, shellfish, and other aquatic organisms, from the time they are caught until they are sold to the consumer.

During 1977, the staff of the Seafood Technology Section conducted research regarding: (1) Iced storage of ungutted offshore (non-spawning) capelin; (2) Effect of handling methods on the frozen storage quality of offshore (non-spawning) capelin; (3) Effect of handling methods on the frozen storage quality of roundnose grenadier; (4) Development of rancidity in capelin; (5) Use of the Torry Fish Freshness Meter for fish caught in waters adjacent to Newfoundland; (6) Effect of two packaging methods on the frozen storage quality of Harp Seal meat; (7) Preservation of squid during the period from catching to processing (emphasis was placed on monitoring colour changes during this period); and (8) Salting of comminuted (minced) fish.

During 1978, research regarding: (1) Preservation and processing of underutilized species (capelin, grenadier, and seal); (2) Effect of aquaculture on the composition and sensory characteristics of giant scallops; and (3) Handling and processing of fish parts that are now thrown away, will be continued or initiated.

Fish Inspection Laboratories

In 1977, the Microbiology Section of the branch continued to monitor the production of various filleting, freezing, canning and smoking plants in the province as part of a continuing program of assessing the microbiological quality of all types of fish products. During the year in review, the three Microbiological labs, located in Corner Brook, Grand Bank and St. John's performed 40,100 microbiological analyses on 17,122 samples of domestically produced fish products, including 574 samples of domestic canned fish. The laboratories again remained active in monitoring water quality in the various fish processing establishments.

Water analysis results were again made available to other government departments and agencies, as well as to consulting engineers in instances where new water supply systems were required for various plants and communities.

The year 1977 saw the closing of the Catalina laboratory and the relocation of the Corner Brook laboratory staff from a small portable trailer into newly constructed laboratory facilities. These changes were initiated in order to provide a more efficient and effective support service to both the Inspection field staff and the fishing industry.

During the year, the St. John's laboratory again participated in a collaborative quality assurance program with the United States Food and Drug Administration to evaluate food microbiological methods. A number of investigational studies into the development and performance of miniaturized and quicker methods of analyses was also continued by the Micro Section in 1977.

The Quality Assurance Division of the Fish Inspection Laboratory is responsible for the examination of domestic and imported fish products to ensure satisfactory compliance to established grades and standards, appropriate packaging and labelling regulations, prescribed weight tolerances and the investigation and resolution of consumer complaints. This unit is also responsible for ensuring uniform application of regulations respecting the maintenance and operation of canneries. In this regard, a total of 24 inspections

were conducted of these facilities to ensure adequate compliance and to assist operators in improving quality and/or overcome problems with production. During the year under review, 2011 routine and special samples were examined. These included the inspection and examination of 26 lots of imported canned fish and shellfish representing a total of 45,710 pounds. Of these, two lots were refused entry into Canada pending satisfactory correction of labelling irregularities. Investigations were undertaken to substantiate 20 consumer complaints involving reported instances of food poisoning, poor quality and presence of foreign or other undesireable matter. As a result of the investigations conducted, two lots of fish products were recalled from the market and destroyed under Departmental supervision.

Assistance was also offered other governmental departments or agencies. A study to determine the shelflife of mince salted codfish was undertaken for the Canadian Saltfish Corporation. Assistance was additionally offered the Federal Health Protection Branch in conducting heat penetration tests and assessing the wholesomeness of canned products under their jurisdiction.

The Chemistry Section of the Fish Inspection Laboratory had a substantial increase in the number of chemical analyses performed in 1977. A total of 5,518 analyses was carried out on samples submitted from within the Branch. Included were mercury analyses on canned tuna submitted by Fish Inspection Branch, Black's Harbour, N.B.; elemental analyses on lobster taken from Long Harbour; compositional and mercury analyses on canned, frozen and retail cuts of seal meat and 3,087 mercury analyses on fish taken from Labrador. These latter analyses represents part of an overall program undertaken by the Fisheries and Marine Service to determine the mercury levels in fresh water fish of Labrador.

Chemical analyses performed on samples submitted by the fishing industry in 1977 totalled 3,550. The majority of these analyses were carried out on fish by-products, namely, fishmeal, fish oil and cod-liver solubles.

During the year, the Chemistry Section also carried out 1,085 analyses on samples submitted by other government departments and agencies, as well as private companies. The requests varied from analyses for iron in water samples submitted by a local paint company to compositional analyses on pressed salt cod fish for the Canadian Saltfish Corporation; fat content in herring for the Department's Biological Station; compositional analyses on crab meat for the New Brunswick Provincial Department of Fisheries; elemental analyses of milk samples submitted by a local dairy; zinc analyses of brook trout for Environmental Protection Service and mercury analyses of dogfish for the Newfoundland Provincial Department of Fisheries.

The Fish Inspection Laboratories, while providing consulting and advisory services in Microbiology, Analytical Chemistry and Quality Assurance to the Inspection Branch, other government departments and agencies, the Fishing Industry and private companies, found time in 1977 to put together an extensive six-week laboratory training program for four Cuban students sponsored by the Canadian International Development Agency. The training was in conjunction with CIDA's overall aid development program for foreign students.

CONSERVATION & PROTECTION BRANCH

Offshore Surveillance

From the period January 1, 1977 to December, 1977, there were 685 foreign vessels licenced to fish inside Canada's 200 mile economic zone. Although there are over 600,000 square miles to patrol, for the first year of operation the following statistics will speak for themselves in measuring the degree of success by the Region's surveillance and enforcement staff in achieving the goals of conservation and protection of Canada's fish stocks.

I Total Sea Days on Offshore Surveillance:

MOT - 102 days
DND - 151 days
DFE - 510 days TOTAL Sea Days: 763

II Total Flying Hours on Offshore Surveillance:

Tracker Aircraft - 1,990 hours
Argus Aircraft - 708 hours or 56 flights TOTAL Flying Hours: 2,698

III Breakdown of Boardings:

At sea (inside 200 mile zone) - 330
At sea (outside 200 mile zone) - 58
In port - 180 TOTAL Boardings for 1977: 568

IV

Boardings By Nationality	Inside the 200 mile zone	Outside the 200 mile zone	In Port
Spain	41	4	24
Portugal	19	14	69
Norway	3	-	8
France	23	-	2
W. Germany	7	-	6
E. Germany	6	-	3
Canada	45	6	-
Japan	10	-	1
U.K.	8	2	5
Poland	8	5	18
Cuba	13	6	1
Denmark	-	3	1
Bulgaria	3	-	-
U.S.A.	-	1	1
U.S.S.R.	141	17	38
Romania	3	-	3
TOTALS	330	58	180

V Boardings Outside the 200 Mile Zone under the Joint Scheme of International Enforcement. (ICNAF).

Nationality	Division	No. of Boardings
U.S.S.R.	3M	6
U.S.S.R.	3L	3
U.S.S.R.	3N	8
Portugal	3M	14
Denmark/Faroese	3M	3
U.K.	3M	2
Cuba	3M	1
Cuba	3N	5
Spain	3M	4
Canada	3N	6
U.S.A.	3-O	1
Poland	3M	5
TOTAL		58

VI Violations by Foreign Vessels inside the 200 mile zone:

During 1977, 14 charges were brought against foreign fishing captains under "The Coastal Fisheries Protection Act" (CFPA) and under "The Foreign Vessel Fishing Regulations" (FVFR).

All were found guilty in Magistrates' Court at St. John's with fines totalling $46,500.00 and court costs $2,199.00.

Of the 14 violations:

a. 4 were for undersize mesh in the codend: - (sec. 11(1) FVFR)
b. 8 were for fishing contrary to the provisions of the licence: - (sec. 3(2) (a) CFPA)
c. 1 was for unauthorized entry into the zone: (sec. 3(1) CFPA)
d. 1 was for using illegal chafing gear: - (sec. 12(1) FVFR)

VII Violations by Country:

a. Russia: 6 convictions of fishing contrary to the provisions of licences (sec. 3(2) (a) CFPA). Fines amounted to $32,500.00 and court costs $2,199.00.

b. France: 3 convictions; 2 for the use of undersize mesh in the codend (sec. 11(1) FVFR) and 1 for using illegal chafing gear (sec. 12(1) FVFR). Fines amounted to $2,500.00.

c. Norway: 2 convictions; 1 for unauthorized entry into the zone (sec. 3(1) CFPA), and 1 for fishing contrary to the provisions of licences (sec. 3(2)(a) CFPA). Fines amounted to $5,000.00.

d. Poland: 2 convictions for using undersize mesh in the codend (sec. 11(1) FVFR.) Fines amounted to $6,000.00.

e. Portugal: 1 conviction of fishing contrary to the provisions of a licence (sec. 3(2)(a) CFPA). The fine amounted to $500.00.

VIII Warnings to Foreign Captains inside the 200 mile zone:

17 warnings were given to foreign captains under Canadian fishing legislation.

IX Foreign Captains Charged with a violation outside the 200 mile zone under the Joint Scheme of International Enforcement (ICNAF).

Canadian inspectors, authorized under the Joint Scheme of International Enforcement (ICNAF), issued eight charges of violating ICNAF regulations to foreigners. Four were issued to Russia for using undersize mesh in the codend and one for using illegal chafing gear: one was issued to Cuba for undersize mesh in the codend; one to Portugal for using a double codend and one to Poland for small mesh, another warning was issued outside the 200 miles.

X Six boardings were carried out under sec. 11(r)(i)(ii) of the Coastal Fisheries Protection Regulations, i.e. where the Regional Director has the authority to order a foreign vessel to a specific location for inspection.

XI Licence Cancellation:

One U.K. vessel had its licence cancelled for non-compliance to Canadian Acts and Regulations. One Polish vessel, "Neptun", had its licence cancelled for conviction of using small mesh gear.

Coastal & Inland Fisheries

Monitoring of coastal and inland fishing activities and regulations enforcement in these fisheries is a continuing role of the federal Fisheries and Environment Department's Conservation and Protection Branch in the Newfoundland Region. This activity was continued in 1977 employing approximately 250 men, 12 patrol vessels and a number of helicopters and other aircraft. Mobile enforcement units consisting of officers in plain clothes using unmarked vehicles and boats were also deployed throughout the province to assist in apprehending violators of the lobster and salmon fisheries and the salmon sports fishery in particular.

Completed prosecutions for offences against all fisheries regulations amounted to 323 up to mid-December, up slightly from 319 recorded for the same period in 1976.

To monitor activities at the Canadian large vessel seal hunt on the Front, fishery officers and wardens were stationed on board all vessels for the duration of the hunt. A field operations centre was established at St. Anthony where officers using helicopters and fixed wing aircraft monitored both the

Canadian and Norwegian large vessel operations. Due to delayed opening of the hunt and unfavourable ice conditions, Canadian vessels took only 47,000 of the 62,000 harp seal quota. Norwegian vessels were successful in taking all of their 35,000 quota. Of the total 15,000 hooded seal quota for both countries, Canadian vessels took 2857 and the Norwegians 6049 seals. The increased longliner effort combined with ice breaker assistance during the hunt, resulted in a very successful landsmen hunt along the Northeast Coast in 1977. For the first time the landsmen were placed on a quota system. The quota was reached and the fishery closed May 8. With the aid of helicopters, fishery officers and wardens stationed at various locations along the coast maintained constant surveillance of landsmen activities to monitor the catch and enforce regulations.

In the coastal fisheries, particularly salmon, emphasis was placed on enforcement of licensing and gear marking regulations. Eleven convictions were registered and a number of unmarked commercial salmon nets were seized from persons unknown. Commercial salmon landings totalled approximately 1922 metric tons in 1977, approximately the same as 1976. An increase in landings occurred along the Northeast Coast while the area from Cape St. Francis along the south and west coasts to Cape St. Gregory was down considerably.

There were 62 convictions under the lobster fishery regulations mostly for possession of undersize lobsters. In addition to regular patrols, special patrols by mobile enforcement units were employed frequently to apprehend persons involved in the illegal taking of undersize lobsters and other breaches of the regulations.

The salmon sports fishery yielded approximately 43,000 fish in 1977, compared to 42,073 in 1976. All areas of the province showed an increase in catches except west coast rivers which generally showed decreases. A few scheduled rivers on the southern avalon were closed for a short period in late July due to low water levels and high temperatures. Water levels in all other areas remained high to normal throughout the season and other closures weren't necessary. Although water levels were considerably higher than 1976, poaching continued to be a major problem with extra patrols needed to apprehend violators. Total number of convictions for violations in the salmon sports fishery was 163. In addition, a number of nets were seized from persons unknown.

Increased activity in the small mobile herring fishery along the Northeast Coast kept patrol personnel and equipment busy during the Fall monitoring quotas and ensuring proper fishing methods. Following closure of the ring net quotas, activity in the bar seine fishery increased tremendously with over 2500 tons being taken in Bonavista Bay. It became necessary to enact an emergency amendment to the Atlantic Coast Herring Regulations, and a ban on the use of bar seines on the Northeast Coast was put into effect midnight November 20, 1977 for the remainder of 1977.

Licensing & Registration

The program to register annually all commercial fishermen and fishing vessels on the Atlantic Coast of Canada entered its third year of operation in 1977. The main objective of this program is to identify those fishermen and vessels involved in the commercial fishery and to effectively match the catching capacity to the available resource.

1977 PROSECUTIONS
AS OF DEC. 15, 1977

Type of Violation	No. Persons Prosecuted	No. Prosecutions	No. Convictions	No. Dismissals	Minimum Fine	Maximum Fine	Total Fines
Offshore:							
(1) Foreign	10	12	12	-	$ 500.00	$15,000.00	$41,500.00
(2) Canadian	3	3	3	-	200.00	750.00	1,700.00
Lobster	72	83	62	21	10.00	300.00	4,945.00
Sports Fishery	124	186	163	23	10.00	600.00	13,115.00
Commercial Salmon	12	12	11	1	25.00	75.00	400.00
Mackerel	1	1	1	-	150.00	150.00	150.00
Herring	1	2	2	-	10.00	20.00	30.00
Seals	3	7	7	-	200.00	1,000.00	1,400.00
Registration & Licencing	17	17	15	2	10.00	300.00	625.00
Totals	243	323	276	47			$ 63,865.00

As a result of the above noted prosecutions, the following articles were confiscated by the courts.
3 otter trawl cod-ends, 1 topside chafer, 16 gillnets, 48 fishing rods, 33 salmon, 92 trout.

In addition, 88 nets and a boat and motor were seized from persons unknown and subsequently forfeited to the Crown.

Approximately 20,000 fishermen were licenced and 13,000 vessels registered under the program in 1977. This is a significant increase over 1975 and 1976 figures of 14,000 fishermen and 9,000 vessels and 18,000 fishermen and 12,000 vessels respectively. Other licences issued in 1977 were as follows: Salmon licences - 5,600; Lobster licences - 4,500; Small Mobile Herring licences - 160; Large Mobile Herring licences - 7; Shrimp licences - 42; Tuna Sport Fishery licences - 16; Scallop licences - 59; and Queen Crab licences - 61.

Licensing renewal for 1978 began in November with renewal applications being mailed to all fishermen who were licenced or had vessels registered in 1977. It is anticipated that all licences will be issued well in advance of the opening of the inshore fishing season.

In 1977 many problems were encountered in programming the computer in the case of a vessel transfer if the person who sold a vessel had a Limited Entry Permit. It resulted in long delays in the issuing of these licences. Therefore, in 1978, it is hoped to eliminate this problem by indicating on the Personal Fisherman's Licence the Limited Entry Permits for salmon and lobster.

The Advisory Committee System in 1977 was expanded to include the following: Inshore Groundfish Advisory Committees: Salmon Advisory Committee; Lobster Advisory Committee and Shrimp Advisory Committee. These are in addition to the following previously established committees: Newfoundland Herring Working Group; Newfoundland Snow Crab Advisory Committee, and the Offshore Groundfish Advisory Committee.

The preparation and up-dating of the Fishery Officers' Manual to licensing and registration was started in the Fall. This manual should be completed and ready for distribution early in the new year.

INDUSTRIAL DEVELOPMENT BRANCH

A wide range of development projects were carried out by the federal Fisheries and Environment Department's Industrial Development Branch during 1977 in the areas of resource surveys, fishing demonstrations, fishing gear development and technology transfer.

Offshore Development Projects

Within the offshore sector, the following projects were carried out:

Northern Experimental Shrimp Survey

Results of exploratory and experimental shrimp fishing off Labrador during 1976 indicated a good potential for the development of a commercial shrimp fishery in ICNAF sub-areas 2H and 2J.

The Northern Experimental Shrimp Survey for 1977 was designed as a pilot project with a view to determining the commercial feasibility of developing a shrimp fishery off Labrador, using a freezer trawler to harvest and freeze uncooked shrimp on board for further processing onshore.

For this purpose, a 167' stern trawler of Canadian registry, with a capacity to freeze approximately 30,000 lbs. uncooked shrimp per day, was chartered. This vessel was equipped with Norwegian shrimp (Sputnik) trawls of advance design and carried an all-Canadian crew, including a technical advisor provided by the Branch.

The results of the first three fishing trips were most successful with shrimp landings totalling approximately 700,000 lbs. in 38 fishing days. Good fishing conditions were encountered, with very limited bi-catch and a minimum of gear damage. Areas off Labrador where best catches were made were Hawke Channel, Cartwright Saddle and Hopedale Saddle, in depths of approximately 215 to 240 fathoms.

In addition to the chartered Canadian vessel, a Newfoundland based fishing company was granted permission to engage two shrimp trawlers of Norwegian Registry and later added another freezer trawler of Canadian Registry to take part in this fishery.

Landings by all four vessels during the period, July to November was approximately six million pounds.

Capelin Harvesting Experiment - Offshore

Based on experimental capelin fishing operations undertaken during 1976 on Canada's east coast by Icelandic seiners, encouraging results prompted Canadian interest in 1977 to pursue the possibility of involving Icelandic vessels in the search and harvesting of a portion of the Canadian capelin quota in ICNAF sub-areas 3L and 3N in order to determine the potential resource and the viability of establishing a feasible capelin fishery on Canada's east coast.

Two Icelandic vessels of 135', 600 ton capacity, were granted permission to fish part of Canada's capelin quota in ICNAF areas 3L and 3N. The vessels made a total of 11 trips, averaging 4 days/trip and landed a total of approximately 3,500 metric tons capelin, from which some 215 tons of roe were recovered for human food purposes. The remainder of the fish was used for reduction into meal and oil.

An average fishing trip produced approximately 400 tons of capelin. The greater portion of the total catch was harvested on the southeast shoal of the Grand Banks. Branch personnel participated in this experiment to observe and study the operation aboard the Icelandic vessels.

In conjunction with activities of the Icelandic vessels, a Canadian seiner was engaged to harvest capelin offshore, but due to gear problems and delays, results were disappointing. However, the capelin catching capability by a Canadian purse seiner was effectively demonstrated in the Gulf of St. Lawrence this year and it is felt that with more experience an offshore capelin fishery will be developed by Canadian fishermen.

Special Assistance Program for Trawlers to fish for Traditional Species in Non-Traditional Areas - ICNAF Sub-Divisions 2J and 3K.

This program was designed to encourage and assist trawlers to divert their efforts from traditional fishing areas, where groundfish stocks had been overfished, to areas in the north not being fished by Canadians but where Canadian quotas applied. This action helped to extend limited quotas over a longer season for trawlers not suited to fish in northern areas. Some 68 fishing trips were completed with catches averaging over 200,000 lbs. Some individual trips produced in excess of 400,000 lbs. in 13 days.

The program was considered quite successful, having a twofold effect. It helped reduce fishing pressure in areas where limited quotas applied, thereby extending the fishing season. Also, it opened up new fishing areas to Canadians where they gained valuable experience about new grounds and fishing conditions.

The role of the Branch in this program was to review applications for assistance and coordinate fishing trips. Also, observers were placed on board to monitor fishing conditions and vessel operations with a view to providing firsthand information which was later used in the compilation of a project report which was distributed to the fishing industry.

Inshore Development Projects:

Within the inshore sector, a total of 20 individual charters were completed, utilizing commercial fishing vessels in the size range upto 65 feet in length, for an overall total of 725 fishing days to complete the following projects:

Labrador Scallop Survey

As a follow-up to the scallop explorations which were conducted over the past two years when results indicated that a potential commercial scallop resource was located in this area, a major survey was carried out on the Labrador coast from Nain to Henley Harbour, using four 45'-50' class traditional gill net longliner type vessels which were modified to conduct scallop fishing operations. This survey was carried out over a total 200 fishing day period, broken down into 50 days for each vessel operating in a designated area of the coast. Several good commercial scallop beds were located in the Nain area as well as off Williams Harbour; however, results of the survey along the remainder of the coastline did not indicate a significant commercial potential.

In addition to this survey, considerable progress is being made in the development of a prototype mechanical scallop shucking machine. If successful, this equipment could be a deciding factor in the development of a viable scallop fishery in northern Newfoundland and Labrador.

Crab Survey

An exploratory crab survey was carried out in the Bay of Islands area to determine the commercial distribution of crab. A small 18' vessel was chartered to carry out this experiment. Results were encouraging and possibilities exist for a small boat crab fishery in this area, but only on a minor scale to satisfy local markets.

Scottish Seine Net Development Experiments

This project was designed to inject new life into the Scottish seine net fishery in Newfoundland by conducting fishing trials and demonstrating the most sophisticated and effective equipment and methods on the current international market and also to explore for new fishing grounds.

Seine net experiments were carried out from three locations, using four vessels in the 50' to 65' size range over a total period of 140 fishing days.

Three vessels were used on the south coast, supervised by master fishermen from Europe and excellent results were encountered with landings well in excess of the previous year's production.

To upgrade the present seine nets currently being used in the Newfoundland fishery, the latest European designed nets were imported, tailored to suit the horsepower of the chartered vessels. A new hi-lift box trawl with increased headline height provided a definite advantage for catching groundfish. A new, improved wing trawl which covers a larger bottom area, proved a plus for catching flatfish.

Several new imported items of hydraulic deck equipment were examined and stability tests were carried out on each vessel before and after installation of the new equipment. Two sets of hydraulic Scottish seine-net rope reels were introduced which increased safety when shooting the ropes and eliminated kinks and foul rope. They resulted in less damage to the ropes and splices and less wear to the seine net barrels of the main winch and permitted savings of manpower, time and deck space. Since the skipper has complete control of them during the fishing cycle, there is no need for another crew member to attend to the surging of the rope on the winch barrels. Time saved during the fishing cycle is calculated to be about 8 to 10 minutes and deck space gained about 4 to 5 feet on both port and starboard sides.

Two hydraulic power blocks with lifting and slewing cylinders were demonstrated and proved to be a definite advantage in retrieving the seine. This piece of hydraulic equipment saved about 12 minutes on each set. It is presently being used by all seine net vessels in the United Kingdom.

An echo sounder of advanced design complete with a bottom expansion unit and special transducer for recording soft and hard bottoms was also tested as part of the project and a Decca MK 21 was used to ensure an accurate bearing on set positions and hook-ups.

In Notre Dame Bay, a 65' vessel was chartered and converted to the Scottish Fly Seine Technique. Experiments were carried out during October but owing to the very soft mud-bottom conditions in the inshore area and hard bottom conditions which were encountered offshore, the results of this experiment were not encouraging and indicate very little potential for this technique in Notre Dame Bay.

Purse Seine Experiments

Purse seine experiments were carried out in three locations using three different purse seine vessels, for a total charter period of 110 fishing days.

A. Herring

To introduce and demonstrate the herring purse seine method of fishing and to provide technical assistance and training to Labrador fishermen in the area south of Black Tickle, a longliner from the northeast coast of Newfoundland rigged for purse seining with an experienced crew was chartered for 40 sea days during August and September, 1977. Results were very poor with only one set of 5,000 lbs. of herring being caught. There was little indication of any worthwhile stocks of herring in the area at that time, however, local information indicated that a similar survey immediately after the ice moves out and also during October-November could produce much different results. Further explorations are planned for the area during 1978.

B. Capelin

1. To selectively harvest ripe female capelin in the Conception and Trinity Bay area, a 65' longliner rigged for purse seining was chartered for 40 sea days from mid May to early July, 1977. During this time approximately 600,000 lbs. of capelin were caught - 350,000 lbs. were taken by purse seine with an average of 54% female, and 250,000 lbs. were taken by beach seine with 33% female. This project was carried out in conjunction with the Newfoundland Biological Station through the services of a Biologist who provided scientific direction into the planning and operation of this survey.

2. To introduce and demonstrate the purse seine technique for harvesting capelin, particularly females for which there is a strong market demand, a 52' longliner was rigged for purse seining and chartered for 30 sea days from June 20, 1977 to July 28, 1977, to operate in Notre Dame Bay. During this time approximately 300,000 lbs. of capelin were harvested with over 50% of the total catch being female.

European Pair Bottom Trawl Experiments

To update technology within the small vessel inshore trawl fishery in Newfoundland, the pair bottom trawl technique was introduced and demonstrated in two areas, Fortune Bay and Notre Dame Bay. This method of fishing can be used by two small boats of low horsepower towing a bobbin trawl designed for hard bottom conditions and adding the capability of competing in catching power with much larger vessels operating as single harvesting units.

The projects were supervised by master fishermen from Europe with extensive practical experience in this technique. The vessels were equipped with hydraulic pedestal five sheave power blocks designed for this method of fishing to assist in hauling the gear and electronic ground discrimination/ fish-finding equipment was used throughout the experiment. A selection of pair bobbin trawls from Denmark and the United Kingdom were also used.

Two 52' vessels, 190 H.P. each, were chartered for the Fortune Bay experiment. The boats proved to be quite capable of handling the gear and excellent results were encountered with one hour hauls of up to 12,000 lbs. of

cod and redfish. The two local skippers involved in this project are satisfied with the operation and are fishing better than they would expect to do as single units.

In the Notre Dame Bay area, two 60' vessels with 250 H.P. each were chartered. Results from this project have been minimal mainly due to the lack of any shoal water grounds with a level bottom. The pair trawl, although designed to tow over hard bottom, needs a level bottom to cope with the amount of warp and bridle which is trailing (1000 fathoms from each vessel). Any level bottom found in Notre Dame Bay has been in depths of 150 to 250 fathoms and this does not allow the principle of the pair trawl to come into being, the main reason being that the warp to water ratio for pair bottom trawling is ideally between 7 to 1 and 10 to 1, that is 7 times as much warp as depth of water. Another factor governing the success of the project was the large numbers of gillnets in the areas covered.

Experimental Shrimp Sorting Trawl

In a continuing effort to reduce the bi-catch of immature redfish presently experienced by the northwest coast inshore shrimp fleet, the Branch continued a program designed to develop an effective shrimp sorting trawl acceptable for commercial suitability in the Port au Choix area with the least amount of shrimp loss and a large emphasis on drastically reducing the immature redfish bi-catch through selective sorting. Various sorting panels of 2 1/2"-3" mesh web have been tested, utilizing the standard type shrimp trawls in the Port au Choix area on a 52' L.O.A. shrimp dragger. The sorting panels are in the form of a 3rd belly suspended in the body of the trawl leading to a second cod end. This design allows the shrimp to drop through the large mesh panel into the bottom cod end and the remainder of the catch is led up into the top cod end. Because of the large mesh top cod end, only commercial species of groundfish are retained. Results for single boat fishing show redfish separation averaged 85% and shrimp loss to upper cod end as high as 9.8%. Comparative fishing with the 52' L.O.A. vessels demonstrated that the sorting trawl could compete favourably with similar non-sorting trawls.

Ice Fishing Experiments

The services of a contracted ice fishing expert from Manitoba was utilized by the Branch during February and March, 1977, to introduce and demonstrate ice fishing equipment and to provide technical assistance to commercial fishermen in the Notre Dame Bay area. The following development activities were carried out to upgrade the present gillnet herring fishery in the Lewisporte area by: 1) using a western ice fishing jigger and electronic jigger locater to speed up the net setting process; 2) the utilization of a power ice auger to speed up drilling holes through the ice; 3) to introduce limited mechanical net hauling by utilization of tackle and lines, utilizing a skidoo as a warpinghead power supply; 4) the testing of net placement, which potentially should increase availability in catch per unit of effort; 5) utilization of echo sounding devices in an attempt to locate groundfish and herring under ice cover.

Results were very encouraging and approximately one million pounds of herring were harvested during February and March from Notre Dame Bay.

Mussel Culture - Development Program

A program to develop and increase the productivity of a commercially exploitable mussel resource and to stimulate the production of mussels by use of modern mussel culture practices was continued in cooperation with the Marine Science Research Laboratory of Memorial University of Newfoundland.

Gear has been set at appropriate intervals to ensure a harvest for three consecutive years beginning in 1977. The 1977 harvest, from gear set in 1975 has been processed by a commercial firm. Experience gained from the gear set in 1975 is anticipated to result in greatly increased yields of mussels in 1978 and 1979. The principal factors which must be regulated to attain optimum yields related to, buoyancy of gear as growth proceeds, setting of gear in relation to the current, avoidance of tangling of the gear, and precise regulation of harvest in relation to sexual maturity and spawning.

The amount of gear set for each of the three years was 100 nets, each approximately 10 feet by 10 feet. The estimated production from the 1978 harvest is 400 lbs. per net, or approximately triple the yield achieved in 1977.

Gear has also been set in a reduced salinity situation to determine the depth of penetration which is permissible into a river estuary; an additional site will be selected in 1978 based on the results.

Labrador Saltfish Processing Experiment

In recent years, most of the salt codfish production of Labrador was sold by fishermen in the wet-salted state, thereby terminating a long traditional practice of washing and drying their catch. Some fishermen are now becoming interested in a return to the practice of further processing with a view to adding value to their product.

In an effort to assist and encourage fishermen in this connection, a project was undertaken, in conjunction with the Canadian Saltfish Corporation, to provide drying facilities in three locations in Eastern Labrador as follows: Fox Harbour, Square Islands and Cape Charles.

Federal/Provincial Shared-Cost Program

The Branch was engaged in a shared-cost fishery development program with the provincial Department of Fisheries of Newfoundland. Among projects planned for 1977 include:

1) The provision of improved facilities onshore for fish handling, with a view to upgrading quality;
2) Product development and enhancement;
3) Fishermen's Technical Upgrading.

Technical Assistance

A total of over 20 master fishermen/technical advisors from Canada and overseas were employed under contract to provide technical assistance in the areas of gear development and fishing demonstrations within the above-listed projects.

Reports

Detailed project and technical reports pertaining to the development activities outlined above will be compiled and circulated to the fishing industry.

FISHERMEN'S ASSISTANCE PLANS

Vessel Insurance Coverage

During the past year, 774 new policies were written, with a total insured value of $16,795,500.

In the same period, 632 renewal policies were issued, with a total insured value of $12,730,810, making a grand total of 1,406 policies, with a total insured value of $29,526,310.

Vessel Claims

During the year, 31 total loss claims were paid, with indemnity payments amounting to $412,000.

During the same period, 26 partial loss claims were paid, with indemnity payments amounting to $83,000, making a grand total of 57 claims and total payments of $495,000.

Approximately 10 claims remain to be processed when the necessary repairs have been effected and the invoices received at Regional Office.

Fishing Vessel Construction Subsidy Program

All available funds for the current fiscal year have now been committed.

During the past year, the following list of fishing vessels were completed and launched:

No.	Size	Construction Cost
4	30'	$ 73,000
2	31'	59,500
6	32'	87,800
3	33'	105,800
1	34'	25,000
4	35'	85,000
3	36'	114,000
1	37'	26,000
5	38'	195,000
1	39'	40,000
1	40'	50,000
2	42'	84,000
3	45'	257,500
TOTALS ..36	.....	$ 903,080

For the current fiscal year, a total of 23 applications for new construction of fishing vessels, ranging from 30 feet to 65 feet have been approved. Most of these are now under construction. In addition, several applications for conversion and modification have been approved.

Information relative to the Fishermen's Improvement Loans was also made available to all interested fishermen.

NEWFOUNDLAND BAIT PROGRAM

The Newfoundland Bait Program supplied approximately 4,000,000 pounds of squid, herring, mackerel and caplin, at subsidized selling prices, to fishermen participating in the inshore line fishery, lobster and crab fisheries in 1977.

Squid continues to be the prime bait for the Fall and Winter fishery and the crab fishery. This species, although unpredictable in terms of quantity available from year to year, appeared in abundance again last year.

Stocks on hand for future requirements are considered adequate unless an extraordinary fishery effort is experienced.

Herring, which is used almost exclusively in the lobster fishery, was in short supply for bait purposes during the past year as the bulk of this species went into the food market. Inventories on hand from 1976 made up the short-fall for last year; however, stocks presently in storage for the 1978 lobster fishery are not sufficient and offerings of herring by fishermen to bait depots must increase considerably during the winter and early spring if stocks are to meet the later demand.

Mackerel has not been used to any great extent in recent years as this species is used only as a substitute for squid in years when squid have not appeared in any great quantity. Minimal supplies are in stock for fishermen who prefer this bait at particular seasons.

Caplin has ceased to be a popular bait except in specific areas and more particularly since the turbot fishery is prosecuted in the main with gill-nets.

The refrigerated ship C.G.S."Arctica" continued throughout the year to transfer bait supplies from depots where stocks were frozen and stored to depots and units around the Island and in Southern Labrador where bait was scarce.

Bait Program technicians were also busy attending to emergency repairs, upgrading, and ongoing maintenance to keep facilities operating without interruption for the benefit of the many fishermen depending on these services.

Bait Depot operators and Bait Unit attendants for the most part were also kept busy maintaining a continuity of services.

RESEARCH AND RESOURCE SERVICES

MARINE FISHERIES MANAGEMENT - GROUNDFISH

Eight groundfish cruises were made during 1977: six with the research vessel A.T. CAMERON, one with the new large ice-strengthened research vessel GADUS ATLANTICA, and one with a chartered commercial vessel. Three of these cruises were made to the Grand Bank, one to St. Pierre Bank, one to Flemish Cap, two to the Gulf of St. Lawrence, and one to the southern Labrador-northeast region of Newfoundland. Staff also participated in several cruises on board foreign research vessels: one to the Grand Bank in June on board the USSR research vessel PERSEY III, one to the area north of the Hudson Strait during September-October and another to St. Pierre Bank in October-November, both on board the French research vessel CRYOS and a cruise to the Labrador-northeast Newfoundland area during November on board the Federal Republic of Germany research vessel ANTON DOHRN. From these 12 cruises much useful data on distribution, life history, and abundance changes, etc., for the major commercial species were collected and will be used in the assessment of the annual and long-term potential of the resources in the areas studied. Our participation in the cruises conducted by other countries marked the initiation of a large-scale program of co-operative research with other countries fishing within the Canadian 200-mile fishing zone.

Biological samples were also collected from commercial fish landings at selected Newfoundland ports. During 1977, the addition of another port technician on the Burin Peninsula and another sampling technician in the mobile team, together with the use of a system to monitor the movements of the commercial fleet, resulted in a more complete coverage of catches from the commercial fleet. STudies of fish discards in Canadian fisheries were continued in 1977.

Stock assessments were presented to the ICNAF Annual Meeting in June for those stocks about which Canada had requested advice from ICNAF. These were: three cod stocks, four redfish stocks, and seven flatfish stocks; the remaining stocks in the Newfoundland-Labrador area were assessed by the recently-formed Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC). These assessments formed the basis of catch quota regulations and in turn effort regulations for the different stocks in the Newfoundland-Labrador area.

During the year under review, 20 new man-years were assigned to the Groundfish Program from the Extension of Fisheries Jurisdiction Man-Year Allotment for the Newfoundland Region. Of these, six were designated for scientific staff, one for administrative staff, and thirteen for technical support services. Most of these positions have been filled to date. In addition, one scientist and three sampling technicians were hired to staff a newly created Section which will monitor the sampling of foreign catches. Known as the Foreign Co-operative Research Section, it will eventually co-ordinate Canadian participation in foreign research in the Canadian 200-mile fishing zone.

MARINE FISHERIES MANAGEMENT - PELAGIC FISH

Herring

Extensive tagging studies conducted in 1977 confirmed that herring which appear in abundance in the northern Gulf of St. Lawrence during the fall migrate southwards in early winter to St. George's Bay where they are fished during the spring purse-seine fishery in that area. Similar tagging experiments conducted along eastern Newfoundland in 1977 indicate a general northward movement in summer followed by a return migration in the fall to overwintering areas.

A general assessment of the total productivity of herring stocks in the Newfoundland area indicates a sustainable catch of about 40,000 metric tons, approximately the level of the 1976 and 1977 landings. Projections for 1978 suggest a total allowable catch somewhat below the long-term average catch, due to below-average production of young herring in recent years.

Mackerel

Mackerel abundance in the Newfoundland area remained good in 1977, reflecting in part the reduced catches of mackerel in 1977 during their overwintering period off the New England States. Mackerel catches in the Newfoundland area during 1977 fell well below potential levels due to reduced fishing activity as a result of poor market conditions.

Capelin

A detailed study of the Southeast Shoal spawning population revealed that, although the 1973 year-class was abundant and should have contributed heavily to the 1976 spawning population, growth was slow and relatively few members of this year-class matured in 1976.

A successful survey in February on the northern Grand Bank provided valuable information on larval capelin. The computerized echo integration system used to estimate capelin abundance was successfully used in surveys in June on the Southeast Shoal and in October off Labrador and northeastern Newfoundland. During the latter survey, schools of capelin were photographed with an underwater camera.

Studies on fecundity, stock discrimination, and age and growth continued in 1977.

MARINE FISHERIES MANAGEMENT - SHELLFISH

Lobster

Monitoring of the fishery in selected areas through catch sampling, obtaining records of catch per trap, tagging, etc., continued. The data enabled estimates to be made of the abundance of commercial lobsters, recruitment to commercial stocks, rates of exploitation, growth and natural mortality.

Year to year variations in these are being followed to determine what causes year to year fluctuations in lobster landings. Yield per recruit analyses are also being done in an effort to define optimum minimum legal sizes and rates of exploitation. Plankton sampling of larvae continued in order to broaden our understanding of larval recruitment mechanisms.

Crustacean Population Dynamics

Experimental fishing was again conducted in a relatively confined and closed population of lobsters at Shag Rocks in Placentia Bay to study death rates, growth of individual lobsters and recruitment rates. Surprisingly, catches in 1977 were considerably smaller than those of 1976. These results are contrary to what had been expected since there should have been a full year's unfished recruits available. Several experiments were carried out to explain this phenomenon. Studies on lobster courtship behavior continued in 1977.

Snow Crab

The efficiency of two standard trap designs for catching three species of crabs was investigated both in the laboratory and on the fishing ground. For a trap with a single top entrance, crabs were successful in entering once in every four attempts. For a trap with two opposite side entrances, crabs were successful in entering once in two attempts if entrances were aligned parallel to the current or once in fourteen attempts if entrances were aligned perpendicular to the current. Both ease of finding the entrance and intimidation by crabs inside of crabs outside which would have otherwise entered affected the capture rates of traps.

Scallop

Much of the scallop research effort in 1977 was directed towards resource enhancement of the giant scallop. Spatfall on artificial collectors was considerably higher in 1976 than in previous years and is attributed largely to improvements in gear design. To date spat production has been confined to only one area in Placentia Bay. An attempt is now underway to identify other seed-producing areas in Placentia, St. Mary's and Port au Port bays. Monofilament nylon has been used as a substrate for the first time.

While monitoring of scallop growth in hanging culture continued, aspects of farming these animals on the sea bottom are also being investigated. Three experimental transplant beds have been established at selected locations to study the behaviour of these animals in high-density bottom culture.

Apart from sporadic inshore activity, capture fisheries based on wild stocks remained relatively inactive. A decline in the price paid to fishermen coupled with a relative abundance of other easily-exploited species were largely responsible for this lull in activity.

Squid

Periodic sampling of squid from a number of areas for size, sex, maturity, etc., throughout the period of their occurrence in inshore waters continued in 1977.

FRESHWATER AND ANADROMOUS FISHERIES MANAGEMENT

Atlantic Salmon

Continuation of the Exploits River development project in 1977 resulted in the production of 1.5 million salmon fry at the Noel Paul's Brook incubation facility. Overall egg-to-fry survival was 84.5%. Unfed fry were distributed over five tributaries along the middle section of the Exploits River. Stocking of this section is scheduled for completion in 1980 at which time annual production should reach 30,000-40,000 adults.

Landlocked salmon production and movements were studied in Little Red Indian Brook (Exploits System) while three fishways monitored anadromous salmon spawning escapement on the main river arteries. (Total anadromous adult escapement to the river for 1977 was 7984, up 360% over pre-development levels.) 1150 adult spawners were transferred from the fishway of Great Rattling Brook in Grand Falls to Noel Paul's incubation facility with a subsequent deposition of 1.8 million eggs.

Assessments on the status of Newfoundland salmon stocks continued in 1977. These assessments pointed to significant reductions in salmon stocks in several rivers in the St. George's Bay and Bay of Islands areas indicating overexploitation in these rivers. To optimize future catches, the fishery has been reduced to a level at which a sufficient number of spawning escapements will be maintained.

Analysis of salmon angling data indicated that the total catch for Newfoundland (including Labrador) was 42,987. This represents a slight increase over 1976; the grilse catch was slightly lower, but the catch of large salmon was higher than in 1976.

Research was undertaken on Western Arm Brook (Northern Peninsula) to estimate the effect of parr desnity and type of habitat on salmon production. Downstream smolt migration rates and stamina were investigated by tagging.

Studies on standing-water rearing potential continued. Unfed salmon fry from the Indian River Spawning Channel were distributed to the intake streams of three ponds of the Indian River System. Appraisals of growth and survival in the three areas conformed with initial hypotheses on the suitability of the system for the rearing of salmon.

In association with the standing-water salmon rearing potential studies, investigations were also conducted on salmon fry-brook trout interactions and on brook trout biomass evaluations. Data for a salmon fry (and parr)-brook trout, predator-prey-competitor model were obtained.

Analysis of data on the characteristics of anadromous and landlocked salmon was completed in 1977. Distinguishing characteristics between the two could not be identified because of variations associated with different habitats. Further sampling is proposed for 1978.

The commercial fishery for Atlantic salmon was examined at St. Anthony and St. Barbe, in insular Newfoundland, and at Nain, Labrador. The analyses of these data will continue over the winter. In conjunction with landing reports from Economics and Intelligence Branch, this will provide quantitative descriptions on seasonal size, age, sex ratios, distribution of landings, gear involvement and catch effort from the Newfoundland commercial salmon fishery.

Analysis of the tagging study carried out in St. Barbe Bay will provide us with comparisons of the relative effects of the commercial and angling sports fishery in this area, particularly on the rates of escapement to spawning areas.

Analysis of scale characteristics of Atlantic salmon from river systems in Newfoundland (including Labrador), Maritime Provinces and Maine demonstrated that this technique can be utilized to determine the general geographic origin of Atlantic salmon caught by the commercial fishery.

Analysis of scale characteristics of Atlantic salmon caught in the Labrador Sea just outside the Greenlandic 200-mile zone demonstrated that the proportion of North American fish in this area was about 65%.

Arctic Char

Investigations continued in 1977 on the upstream migration of Arctic char in the Fraser River, northwest of Nain, Labrador. This marked the third season of operation for the portable counting fence facility. By the end of the fourth year of operation, a relatively complete picture should be obtained on the magnitude, timing, age and sex composition of the run. Possible changes occurring as a result of heavy commercial exploitation of this stock may also be clarified.

A report was prepared evaluating the 1976 commercial Arctic char and ATlantic salmon fishery in northern Labrador. Char landings for 1977 at Nain, Labrador, have increased by approximately 40% over the previous year and totaled nearly 186,000 kg. (round). The problem of over-exploitation of char stocks in the vicinity of Nain is still prevalent. Commercial sampling of char landings at Nain was carried out this past season. These data will be analyzed over the winter to provide information on age compositions, mortality and exploitation rates for various stocks along the Labrador coast.

Trout Research

The provision of technical advice to the Hopeall Rainbow Trout Farm pilot projectcontinued in 1977. The service also assisted Memorial University's Marine Sciences Research Laboratory in some experimental feeding studies on "stunted" landlocked salmon to determine if the condition can be overcome through optimum food rations. If these studies prove this to be the case, consideration will be given to an experimental aquaculture project to produce commercial-size "salmon" using the cage-culture technique. Tied in with this experiment was a field research project designed to determine if these "stunted" fish had a potential for use in stocking over-fished lakes. A fish transfer study was undertaken in which "stunted" fish were collected from an unproductive lake (5 Mile Pond East) and stocked into what appears to be a more conducive lake for growth (Briens Pond).

Monitoring the growth of these fish over several years will hopefully provide the data needed to determine the feasibility of the concept.

Eel Research

Investigations on the general biology and population status of eels in the Bottom Brook area of St. George's Bay continued in 1977. Most of the effort was directed to the eel population of St. George's estuary. This consisted of determining age and size composition, growth rate, sex ratio, food habits, population size, and documenting the limnology of the estuary. Initial data analyses indicate that, while eels appear relatively abundant in the area, productivity of stocks is low (i.e. growth is very slow, larger eels are quite old, and annual production is quite low) and, as a consequence, over-harvesting would be likely with any large-scale fishery.

Forest Insecticide Spray Impact Research

During 1977, a detailed research project was initiated to determine the long-term effects of aerial insecticides on aquatic ecology in general and freshwater fish populations in particular. A small section of the Northwest Gander River watershed was chosen for study. Such ecological aspects as water chemistry, plankton populations, stream and lake benthic invertebrates, and fish populations will be assessed in detail over a 2-3 year period prior to any application of spray. These base-line data will form the basis for impact statements to future sprays.

Mercury Contamination of Labrador Fish

Random, spot checks during 1976 revealed abnormally high levels (over 0.5 ppm) of mercury in various fish species in the Smallwood Reservoir, Labrador. In view of the proposed pilot project to determine the feasibility of commercial fishing in the reservoir, the Service undertook a detailed survey of mercury levels in fish during 1977. In addition, this survey was extended to most of Labrador and included sampling of fish in (1) The Churchill Falls area, (2) the Labrador City-Wabush area, (3) the Happy Valley-Goose Bay area, (4) Northwest River area, (5) coastal Labrador, and (6) commercial sport fishing camps. Over 5000 fish samples and lesser numbers of sediment, soil, rock, vegetation, water, rain, and small mammal samples were also collected. Analyses of these samples will enable delineation of the area and extent of contamination as well as identify the probable source.

Habitat Protection

Provision of scientific and technical support for the administration of the Service's regulatory function for fish habitat protection is a continuing responsibility. Continuing liaison and negotiation with industrial developers, development of project referral mechanisms, formal review of plans and specifications, on-site inspections, and surveillance of projects are other functions performed. More long-term habitat protection input is made through representation on varied regulatory groups such as the Regional Ocean Dumping Advisory Committee, Environmental Assessment and Review Process, and the Provincial Government's Assessments Advisory Committee. With respect to the latter, environmental

assessments were initiated on several large proposed projects including: Corner Brook Harbor Development, Hinds Lake Development, Brinex Uranium, and Bell Island Oil Storage. In the area of information/education, work is progressing on preparation of joint Fisheries Service/Environmental Management Service guidelines for construction of resource access roads. A bio-engineering review of the importance and necessity of fishways is being compiled as well.

EXPERIMENTAL ECOLOGY

Through association of a group of specialists, this Program provides: (a) an interdisciplinary venue for studies of the effects of natural or man-made contaminants in the aquatic environment on the genetics, physiology and biology of marine organisms; (b) an approach toward understanding the effects on marine ecosystems of changes in physical, chemical and biological factors, including the interaction among species, predator-prey relationships, competition for food and space, and fisheries exploitation; (c) the use of population genetics, statistics and computer technology in the separation of stocks of marine species employing morphometric and growth variations; (d) studies on the structure of certain antigens produced by the Aeromonas species of bacteria, an important disease-producing species of bacteria which affects salmonids.

Physiological Ecology

A detailed examination of the effects of petroleum on marine life has been resumed. The enzymes responsible for breaking down the most toxic fractions of oil were analyzed by biochemical kinetic methods: these demonstrated that the increase in enzyme levels that occurs when fish are exposed to oil will probably contribute little to the purging of hydrocarbons from the fish. The enzyme system has now been detected in all animal taxa examined except bivalves.

With the gathering of new information on oil spill dispersants, this group is participating in the formulation of new guidelines for their use. Furthermore, we can now identify oil dispersants by manufacturer and type with a simple field-adaptable method.

One of the least-controlled and least-documented routes of entry of oil into the aquatic and terrestrial environments is the elimination of waste crankcase oils, which may amount to 2 million tons annually. Unlike other oils, used crankcase oils were found in this laboratory to be powerfully mutagenic (producing mutants) and probably carcinogenic (cancer producing).

Multispecies Systems

In pursuing a community ecology approach to fisheries, two major projects absorbing most of our efforts. These were the cod-capelin interaction and the Flemish Cap Project. A bioenergetics approach to cod feeding, looking particularly at liver fats as indicators of stored energy, is attempting to answer the question: What will the impact on cod be of a famine of capelin? The Flemish Cap Project is a co-operative international experiment, with the USSR, USA, Poland, and Federal Republic of Germany, to determine factors controlling year-class strength of cod. Particular attention is being devoted to the early larval stages and how they are influenced by the oceanographic regime. Spin-off in equipment techniques and ideas will allow an extension of ichthyoplankton work into the management of all of our fish stocks.

Microbial Chemistry

Detailed analysis of the surface coating of a number of fish disease-causing bacteria has been completed. The results confirm a taxonomic relationship among these bacteria that could not be resolved using conventional techniques. This information will allow prediction and possible treatment of diseases in nature and in aquaculture, and is essential for the development of vaccines for use in aquaculture.

SMALL CRAFT HARBOURS BRANCH

Construction Program

The value of the regular program approved for 1976-77 was $4,800,000. One hundred projects, greater than $5000.00 in value, were carried out and $425,000.00 was spent on 325 emergency and minor projects, each valued at less than $5000.00. The latter group of projects were carried out under the direct supervision of the Small Craft Harbours Branch staff whereas the construction of the larger projects were administered on the branch's behalf by staff of the Department of Public Works of Canada.

Some of the more notable and larger projects carried out during this period were:-

PLACE	PROJECT	VALUE	REMARKS
Fortune	Breakwater Reconstruction	$680,000	Construction commenced in 76-77 & was completed in 77-78.
Burgeo	Longliner Wharf	$430,000	Construction commenced in 76-77 & was completed in 77-78.
Musgrave Harbour	Wharf Extension & Dredging	$260,000	Construction commenced in 76-77 & was completed in 77-78.
Southern Harbour	Fishermen's Wharf	$360,000	Construction commenced in 76-77 & was completed in 77-78.
St. Shott's	Wharf Repairs & Extension	$225,000	Construction commenced in 76-77 & was completed in 77-78.

In addition to the regular program, $1,000,000 was spent during this period under a special Federal Labour Intensive Program (FLIP). Under this program, thirty-four marine projects were constructed. In addition twenty orders were placed for the supply of, labour intensive, locally produced materials to be used in projects planned for the following year.

Again this year, this Branch contributed significantly to the Local Initiatives Program (LIP) by providing technical advice and assistance and by supplying construction materials, which could not be funded under the terms of the LIP Program, on practically all marine projects which were carried out under this program in the Region. In total, this Branch was involved in 125 projects under this program with a financial involvement of $770,000.

Property Management

This year, in the preparation for future projects, requests for the acquisition of property at fifteen different locations were forwarded to the Department of Public Works of Canada. This brings to a total of forty-seven property acquisitions which are currently underway on our behalf by the Department of Public Works of Canada.

During this period, procedure was initiated for the disposal of 20 structures, which are either dilapitated or surplus to the needs of the Branch.

Annual revenue to the Branch, through the collection of ship berthage, wharfage fees and from leases, licences and permits of occupation for this period, was $9,000.00. While this is relatively low it is thirty percent higher than the year's previous revenue. A fifty percent increase over this year's revenue is forecasted for next year.

At present, the Branch is administering a total of fifty leases, licences and permits.

The Branch administers all the Federal Government marine facilities in 537 harbours and certain separate facilities in an additional 36 harbours. The total facilities number 900 and include wharves, breakwaters, coastal sheds, slipways, haulup engines and various miscellaneous structures.