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CANADIAN RESEARCH REPORT, 1984

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SECTION I. NEWFOUNDLAND REGION

by

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SUBAREAS 0 AND 1

A. Status of the Fisheries

1. Shrimp. Canadian landings of shrimp from Subarea 0 in 1984 totalled 2,012 t.

2. Other species. No other species of fish or invertebrates were landed by Canada from these Subareas in 1984.

B. Special Research Studies

1. Environmental Studies

a) Hydrographic studies. The Atlantic Oceanographic Laboratory (Bedford Institute) deployed four current meter moorings in the southern portion of Baffin Bay as part of outflow and cross-current investigations. Five tide gauges and two current meters were deployed for one month in Foxe Basin to examine tidal propagation through the Arctic archipelago. Further work was undertaken on the numerical modelling of Hudson Strait and Ungava Bay with specific attention to the provision of tidal current chartlets for marine navigation.

b) Observations on ice conditions. The Centre for Cold Ocean Science (C-CORE; Memorial University) was involved in ice deformation measurement studies in the northern Baffin Island area.

2. Biological Studies

a) Atlantic salmon. A total of 4,151 salmon was sampled at the fish plant in Holsteinsborg; 2,572 from Sukkertoppen and 575 from Frederikshaab. Scale samples collected from homewater fisheries in Europe and North America in 1982 and 1983 were used to test classifications of salmon caught at West Greenland into European and North American components. The misclassification rate was 6.6% and 4.6% respectively for 1982 and 1983 samples.

b) Canadian observers participated in four trips fishing shrimp in Davis Strait during 1984. All trips were on foreign vessels chartered to fish the Canadian allocation. A total of 278 fishing days and 1,113 sets was observed, with a total of some 103,000 shrimp measured.

SUBAREA 2

A. Status of the Fisheries

1. Cod. Canadian landings were 22,800 t, down considerably from 48,800 t in 1983 and 76,800 t landed in 1982. Most of these landings were from Div. 2J, with only 250 t occurring from Div. 2G and 2H. Landings from the inshore sector amounted to 13,300 t or 58% of the total Canadian landings from this Subarea, an increase from 11,300 t landed inshore in 1983. The decrease in offshore landings from this Subarea is explained by a decrease in offshore fishing effort during 1984.

2. Redfish. Canadian landings were only 180 t, down from about 1,200 t in 1983 and 7,100 t landed in 1982. These landings were almost entirely from Div. 2J. The decrease in landings from this Subarea reflects a decrease in Canadian fishing effort during 1984.

3. Other groundfish. Canadian landings of the combined flatfish species were 6,900 t, about the same as in 1983 and down from 11,100 t landed in 1982. Greenland halibut comprised about 98% of these landings, with 1,900 t landed from Div. 2H and just over 4,800 t landed from Div. 2J.

4. Capelin. Landings of capelin remained at a low level.

5. Herring. Landings of herring remained at a low level.

6. Atlantic salmon. Commercial landings of Atlantic salmon in Subarea 2 during 1984 were 330 t, compared to 327 t in 1983. The recreational harvest totalled 5 t.

7. Arctic charr. Landings of Arctic charr in Subarea 2 during 1984 were 148 t, a decrease of 17% from 1983. Factors contributing to the decreased catches included reduced effort (possibly due to ice conditions) and overall decreased abundance of charr in the region.

8. Shrimp. The Subarea 2 shrimp fishery was subject to a total quota restriction of 5,550 t in 1984, 3,500 t of which were in the Hopedale Channel. Total landings in 1984 were approximately 960 t.

B. Special Research Studies

1. Environmental Studies

   a) Hydrographic studies. The Seal Island section in 2J was occupied in July. Temperature profiles were taken at each fishing station occupied during 1984.

      Long-term monitoring of variability in the Labrador Current was continued by the Atlantic Oceanographic Laboratory (Bedford Institute) in 1984 (7th year that current meters were deployed on the Hamilton Bank).

      Bedford-based researchers collected seven months of data (three bottom pressure gauges) during a sea-level experiment on the Labrador Shelf.

   b) Observations on ice conditions. Iceberg tracking studies and current/density profiles around icebergs were carried out by the Bedford Institute.

      C-Core researchers (Memorial University) undertook iceberg detection studies (using ground-wave radar) in the Cape Harrison area.

2. Biological Studies

   a) Cod. Biological sampling of the commercial fishery included observations from both the inshore and offshore sectors. From research vessels, distribution and abundance studies were carried out and detailed biological sampling was conducted.

   b) Redfish. A research cruise to Div. 2J in the fall collected data on the distribution and abundance of redfish. Samples of length frequencies and otoliths were taken both from research and commercial catches in order to monitor the age distribution of commercial catches and the population as a whole.

   c) Flatfish. Data on distribution and abundance of American plaice, Greenland halibut, and witch were collected during a regular fall survey of Div. 2J. Since all flatfish stocks in Subarea 2 overlap Subarea 3, research projects will be covered under the latter Subarea.

   d) Capelin. An acoustic survey in Div. 2J3K in October 1984 located capelin mainly in Div. 2J.

   e) Atlantic salmon. A total of 3,831 Atlantic salmon caught in the commercial fisheries was sampled for size and age distribution.

f) Arctic charr. In excess of 2,800 samples were obtained for age determination of Arctic charr in commercial landings from thirteen northern Labrador fishing areas. Approximately 21,000 fish were sampled for length distribution from the same areas. Tagging studies were continued to clarify the extent of seasonal and annual movements and to determine the degree of annual commercial exploitation. Stomach samples were obtained from four areas for evaluation of food and feeding habits. Information on the sex distribution and maturation of commercially caught charr was obtained from five stock areas.

A counting fence research facility which was established on Ikarut River, Hebron Fiord in 1981 was operated again in 1984. Characteristics of upstream migrating charr and the dynamics of the population are being examined.

A study on the population genetics and ecology of resident and anadromous Arctic charr was carried out from samples obtained from 11 systems in Labrador and 12 in insular Newfoundland.

g) Shrimp. A research vessel survey which was conducted in July 1984 completed a biomass survey using a Sputnik 1600 shrimp trawl in the major areas where commercial concentrations occur. A total of 171 sets was made with the greatest catch (792 kg) being obtained in the Hopedale Channel. Catches in the Cartwright Channel ranged to 576 kg. A detailed analysis of the population dynamics of shrimp in the Cartwright Channel has shown these stocks to be highly unstable due to the interaction of predation, environmental variation, low reproductive capacity and fishery removals.

SUBAREA 3

A. Status of the Fisheries

1. Cod. Canadian landings were 228,000 t, up from 220,000 t in 1983 and around 193,000 t in 1982. Landings from the offshore sector were 112,000 t, up from 92,000 t in 1983. Inshore landings were almost 116,000 t, down from 128,000 t in 1983. Landings from Div. 3K and 3L accounted for almost 80% of all cod landings from this Subarea. Assessment of cod in Subdiv. 3Ps is now being considered in NAFO with full presentation of the extensive French information from St. Pierre.

2. Redfish. Canadian landings were just over 23,100 t, compared to 20,500 t landed in 1983 and 17,900 t in 1982. Div. 3K landings accounted for about 74% of the total landings, with 17,200 t landed compared to only 8,100 t in 1983. This increase in landings in Div. 3K was partially offset by a 5,200 t decrease in landings in Div. 3L to only 1,300 t, compared to almost 6,500 t in 1983. Landings from Subdiv. 3Pn and 3Ps were 2,450 t and 2,000 t respectively.

3. Flatfish. Canadian landings of the combined flatfish species were 67,100 t, up from 63,900 t landed in 1983. American plaice landings were 37,600 t, compared to 38,600 t in 1983. Yellowtail landings were 12,500 t, up from 9,100 t in 1983. Greenland halibut landings remained the same as in 1983, at about 12,300 t. Witch landings were 3,650 t, compared to 3,400 t landed in 1983. Almost 1,000 t of Atlantic halibut were landed from this Subarea in 1984. Landings from the inshore sector amounted to only 21% of total flatfish landings. Almost 81% of all Greenland halibut landings were landed inshore.

4. Other groundfish. Canadian landings were 7,200 t, comprised mainly of haddock (2,500 t), pollock (1,700 t), white hake (1,600 t) and wolffish (1,300 t). Haddock landings increased from only 450 t reported in 1983. This increase occurred primarily in Div. 3O (1,300 t landed) and Subdiv. 3Ps (910 t landed).

5. Capelin. Approximately 33,000 t of capelin were landed inshore in Div. 3L and 7,000 tons in Div. 3K in 1984. Landings in other Divisions in Subarea 3 were low. The inshore catches were taken during the inshore spawning migration. Female capelin are preferred to satisfy the Japanese roe market.

6. Herring. Herring landings from eastern Newfoundland (Div. 3KL) were less than 1,300 t and slightly greater than 100 t from southern Newfoundland (Div. 3P). The commercial herring fisheries (closed in 1983 due to poor recruitment) were opened in Div. 3KL during the fall of 1984 but landings were well below the quota.

7. Mackerel. Mackerel landings in Subarea 3 were about 5,200 t, compared to 7,700 t landed in 1983.

8. Squid. Total catch of squid in 1984 was 532 t (preliminary data), up from 5 t in 1983 but substantially less than 11,160 t taken in 1982. Early season catch rates on the southern Grand Bank indicated a very low inshore resource level for the summer/autumn fishery. The low catch was due to a natural absence of squid from commercial fishing areas.

9. Atlantic salmon. Landings were 588 t in the commercial fishery and 38 t in the recreational fishery. Abundance of large salmon was lower than previous years.

10. Scallops. Further reductions in sea scallop aggregations in 3Ps in the face of continued demand and attractive prices encouraged many vessels to shift effort to the smaller Iceland scallop. It is estimated that about 80% (by numbers) of the 413 t meats (provisional) landed in 1984 was made up of Iceland scallops.

11. Shrimp. A biomass survey was conducted in Div. 3K during a July 1984 research cruise. Highest catches (up to 398 kg) were obtained in depths of 400-450 m. Catches throughout the area were quite variable and particularly low at night.

B. Special Research Studies

1. Environmental Studies

a) Hydrographic studies. Table 1 lists sections occupied by the Northwest Atlantic Fisheries Centre during 1984. Most of the standard sections in Subarea 3 were occupied and some, such as the 47°N line (Flemish Cap), were occupied repeatedly. In addition, data were collected south of the Grand Banks during squid surveys. As always, a temperature profile was made for every fishing station occupied for biomass estimates.

Oceanographic work in 1984 focussed on two special projects described in part b). In Trinity Bay, three CTD transects were occupied six times, covering all seasons. Detailed CTD sections, with much ancillary data, were collected in the central eastern Grand Bank as part of the Southeast Shoal Project. The annual oceanographic cruise occupied all the NAFO standard sections north of 46°N. The Flemish Cap project special sections were not occupied in 1983. XBT data were collected south of the Grand Bank as part of the annual squid survey.

The inshore thermograph network was maintained, with about 40 instruments in the field. The time series of Station 27 (4 km east of Cape Spear) was continued, although hampered by vessel problems and pack ice for the first four months of the year.

The Atlantic Oceanographic Laboratory (Bedford Institute) undertook drift buoy studies in November, 1984 to look at dispersion characteristics and scales of motion on the Grand Banks. They further initiated heat/salt studies of the Grand Banks based on hydrographic data models. From January to end of May a pressure gauge survey was made in the area to examine outer boundary conditions aimed at modelling tides on the Newfoundland Shelf to verify models of wind-driven circulation.

The oil industry continued ongoing oceanographic observations on the Grand Banks in support of offshore exploratory drilling operations.

b) Plankton studies. No plankton data were collected on the Flemish Cap in 1984.

Trinity Bay was sampled six times, with both fine and coarse mesh nets, in a survey to study recruitment in herring and capelin.

An intensive study of ichthyoplankton distribution in relation to the Labrador Current front on the Southeast Shoal was completed in 1984. This was a continuation of work carried out in 1983.

Plankton samples for squid larvae were taken south of the Grand Bank in February-March.

c) Other environmental studies. Tissue samples were taken at various locations within Subarea 3 for use in multi-variate monitoring of the biological effects of offshore hydrocarbon exploration and development. Field studies were conducted at the site of an 1982 spill of No. 2 fuel oil (inshore site).

The Northern Institute of Cold Ocean Science (Memorial University) continued comparative physical oceanographic and ecological investigations of Hermitage and Fortune Bays. Analyses of gravity flows in Fortune Bay highlighted these studies. The Institute has also been involved in investigations of canyon processes on the eastern Grand Banks and ecological studies of seabird/capelin interactions at Witless Bay on the Avalon Peninsula.

The Grand Bank Modelling Exercise (organized by the Marine Ecology Laboratory, Halifax) continued in 1984. General aims are to produce a process-based dynamic ecological model of the Grand Bank to aid in assessing the environmental effects of proposed hydrocarbon development.

2. Biological Studies

a) Cod. Sampling of the landings from the commercial fishery both inshore and offshore was continued in 1984. Using research vessels, surveys were carried out in all NAFO Divisions to determine the distribution and abundance of cod. Biological sampling was extensive during these surveys and several thousand cod were tagged, mainly in Div. 3K.

Growth rates of cod from the commercial fishery in 2J3KL have declined in recent year-classes resulting in cod being less heavy at a particular age. This is a major factor in recent projected TACs for the late 1980's being less than earlier projections.

Acoustic tracking of cod on their inshore migration provided observations on their diurnal behaviour in relation to feeding and temperature.

Food and feeding studies on specimens collected during the autumns of 1977-82, revealed that the rate of predation by cod on capelin varied with capelin abundance and that cod only partially compensated for reduced predation on capelin by preying more intensively on other species.

b) Redfish. Several research cruises throughout Subarea 3 (except Div. 3LNO) were conducted yielding information on abundance and distribution. The collection and subsequent ageing of otoliths from both research and commercial catches, and the application of these to respective length frequencies yielded information about commercial catch at age as well as population structure.

c) Flatfish. Distribution and abundance of flatfish were studied during fall random stratified surveys of Div. 3K and 3L. Information from these surveys additionally provided information on year-class strength of pre-recruited flatfish. A spring random stratified survey of 3NO was carried out. The usual spring survey of 3L was not undertaken due to vessel problems. These surveys are a major source of information for continued biological studies on the various flatfish species.

A seasonal survey in Div. 3L was carried out in July-August, but on a reduced scale from that planned. The fall survey was cancelled due to vessel problems.

d) Capelin. There was a delay in the inshore migration of capelin in 1984 due to unusually low temperatures which retarded maturation rates as well as delayed the time when beach spawning normally occurs. Acoustic surveys in April and June detected juvenile capelin in Div. 3L. The June survey also detected a good spawning biomass in Div. 3NO. The inshore capelin fishery was monitored by a comprehensive logbook survey. An aerial survey was conducted during the inshore spawning migration. Capelin were tagged during the inshore phase of their life cycle to describe migration patterns. Analyses of yearclass variations in capelin abundance have shown meteorological and hydrographic factors to be the main regulators of year class strength.

e) Herring. Surveys to determine distribution and abundance of herring larvae were conducted in Trinity Bay in June, August, September and October. The goal of the project is to determine at which stage in the early life history recruitment of a particular year-class can be reliably predicted. Sonar surveys for herring were conducted in bays of eastern Newfoundland during October.

f) Scallops. A comprehensive assessment of the abundance of Giant and Iceland scallops on St. Pierre Bank was completed and the feasibility of a sustained fishery evaluated.

g) Squid. In February-March a survey was conducted by the Nfld. Region to study the distribution of larval and juvenile squid in the Gulf Stream system between 55°W and 60°W longitude. A predictive index of squid abundance during the commercial fishery was also developed. From a pre-recruit survey in June on the Grand Bank a predictive index of inshore abundance was determined. There was no commercial sampling, tagging program or collection of catch and effort data due to the virtual absence of squid from fishing areas. Water temperature was monitored at selected inshore sites on the east coast of Newfoundland.

h) Crabs. Biological aspects of a shallow-water spring breeding migration of snow crabs was documented for the first time and many of the accepted characteristics of snow crab biology (such as terminal molt, only soft-shelled mating) were shown to be invalid.

i) Atlantic salmon. Long-term research studies have been initiated to develop a model which could be used to estimate salmon production capacities of streams, optimal egg deposition and stock and recruitment relationships. A survey of about 63 commercial salmon fishermen was conducted to assess local sales and by-catch. A total of 1,552 salmon from the commercial fishery was sampled at Twillingate, Newfoundland. Studies on marine migration patterns and feeding areas confirmed the presence of salmon migrating routes to the south of Newfoundland while trans-Atlantic migrations of a limited number of salmon were recognized.

j) Multispecies. Investigations of multispecies relationships are progressing using stability studies of computer models of marine tropic webs.

k) Comparative fishing trials between the WILFRED TEMPLEMAN and A. T. CAMERON were carried out in NAFO Div. 3L.

SUBAREA 4

A. Status of the Fisheries

1. Cod. Newfoundland Region landings totalled 29,300 t with Div. 4R landings accounting for almost 84% of this amount. The offshore fishing sector landed about 73% of all cod landed in this Subarea during 1984.

2. Haddock. Newfoundland Region landings remained low at around 380 t.

3. Flatfish. Newfoundland Region landings of the combined flatfish species were 900 t. These landings were comprised primarily of 590 t of American plaice, 175 t of witch and 110 t of yellowtail flounder.

4. Redfish. Newfoundland Region landings were about 2,700 t. Landings from Div. 4R accounted for 85% of this amount.

5. Other groundfish. Newfoundland Region landings were about 750 t, comprised mainly of pollock (470 t) and wolffish (230 t).

B. Special Research Studies

1. Biological Studies

a) Redfish. An acoustic cruise for redfish was conducted in Div. 4Rs during August. The data collected will yield information concerning stock biomass as well as diel movements and spatial distribution of redfish.

SUBAREA 5

A. Status of the Fisheries

1. Groundfish. No Newfoundland Region landings occurred from this Subarea in 1984.

SUBAREAS 2 AND 3

A. Special Research Studies

1. Environmental Studies

a) Hydrographic and related studies. The Bedford Institute (AOL) commenced production of monthly State-of-the Oceans reports (from July, 1984) on research activities throughout the NAFO Area. Ships of opportunity XBT programs have also been expanded.

2. Biological Studies

a) Assessments. Assessments of some 25 groundfish stocks presently under catch quota regulations were conducted and in some cases refined and advice on TACs for the 1985 fishing season was provided either through CAFSAC on NAFO. Further assessments were conducted of 17 pelagic-shellfish-marine mammal stocks, the marine phase of mixed Atlantic salmon stocks originating from Nfld., Labrador, Quebec and Maritime rivers, six Arctic charr stocks and other commercial and potentially commercial species.

b) Research vessel cruises. Sixty-four research vessel cruises were undertaken in 1984 utilizing DFO-owned vessels (WILFRED TEMPLEMAN, MARINUS, SHAMOOK), the GADUS ATLANTICA (on long-term charter) and ten other vessels on short-term charters.

c) Commercial sampling. Sampling of foreign and Canadian offshore catches by the Canadian Observer Program continued in 1984. A total of 1,161 samples representing some 280,600 length measurements and approximately 6,650 otolith pairs were collected from the catches of foreign and Canadian offshore fisheries in Subareas 2 and 3. A total of 3,197 days and 9,918 sets was observed. Approximate coverage in 1984 was 19% of Canadian and 64% of foreign fishing activity. In addition, the product to whole weight conversion factor program was continued in 1984.

d) Seals. Marked structural changes were observed in the harp seal hunt in 1984. Hunting generally occurred later in the year and longliner catches of 1+ seals were reduced to less than 10% from previous levels of about 40% to 60%. Due to reduced markets and prices, many of our landsmen and longliner collectors did not hunt, resulting in rather poor sampling compared to previous years. Only 66 samples were obtained from the Newfoundland net fishery and 227 samples were available from the landsmen component, mostly from small boats (93%). The April moulting charter was successful again in 1984, with age and morphometrics collected from 541 animals age one and older.

Analyses of returns from the 1983 mark-recapture experiment have confirmed our evaluation of the recent and current status of the harp seal population (i.e. it is currently large and increasing).

Further investigations were made of the energetics of harp seal lactation and of lactation length and the length of time pups remain in each pelagic stage.

Approximately 70 harp seal pups of known-age were weighed at regular intervals to determine daily weight gain. Results indicate that both male and female pups gain at a rate of 2.3 kg/day. Further, that only about 30% of animals were weaned at 10 days of age, suggesting that lactation lasts for at least 11 to 12 days. The rate of milk consumption by pups was examined for 10 experimental animals given duetrium oxide shortly after birth. An extensive series of milk samples was obtained from harp seal mothers to estimate changes in energy content of milk. About 24 mother-pup pairs were taken over the entire period of lactation to examine the components of pup growth and changes in female energy stores.

On March 18 and 19, 62 newborn hooded seal pups were tagged. Four types of evidence were used to determine age at which weaning occurred: 1) presence of mother near the pup, 2) daily weight gain, 3) milk in pup's stomach, and 4) opacity of pup's blood serum. Results indicate that weaning occurs at 3 to 5 days post partum, making this the shortest lactation period for any mammal. Further, daily weight gain was about 7 kg/day, approximately 3 times that observed in harp seals. Milk consumption rates and composition of mother's milk were determined as for harp seals. Twenty-one mother-pup pairs were taken for morphometric analysis.

Estimates were made of the pup production of hooded seals at the Front during March 1984 by means of vertical aerial photography and visual survey sampling with appropriate provision for "ground-truthing". Patch-specific data on the whelping ogive, lactation period and pup emigration rates were essential components of ground-truthing and therefore of the aerial survey itself. Due to weather problems and camera malfunction, complete photographic coverage was not obtained. However, two estimates of pup abundance were made by means of visual strip survey sampling conducted from a helicopter. Analysis and a preliminary report will be completed by the end of 1984. Detailed ground-truthing was achieved using a helicopter and ship base.

To further our knowledge of migrations and stock inter-relationships of hooded seals in the northwest Atlantic, 450 hooded seal pups were tagged at the front during March 1984.

An intensive research study of hooded seals in Davis Strait was completed during March 1984, to complement a similar program at the Front off Newfoundland. A fixed-wing aerial photographic survey of pup production was carried out. Using a helicopter and large ice-strengthened sealing-type vessel, about 1,500 pups were tagged, a research sample of adult females and their pups was accomplished owing to extra funding provided by DFO/OERD and with the collaboration and participation of Danish colleagues. The research took place in Greenlandic waters and had the approval of the Greenland Home Rule Authorities. To improve knowledge of migrations and stock inter-relationships of hooded seals in the Northwest Atlantic, 1,500 hooded seal pups were tagged in Davis Strait during March. To determine the reproductive rates and other vital parameters of hooded seals whelping in the Davis Strait, samples of about 135 adult females and their pups were obtained in March. Analyses of age composition, growth and reproductive parameters are in progress.

e) Atlantic salmon. Quantitative estimates of mortality associated with precocious maturation of Atlantic salmon parr revealed the potential for related significant decreases in yields of Atlantic salmon, possibly in the order of 60-70%.

Oceanographic Sections Occupied by NAFC (Nfld.) in 1984

Section	Dates	Ship	Stations	Notes
45°10'N	July 16-17	W. TEMPLEMAN 015	5	CTD Casts; Bongos; Chlorophyll and Nutrients
Squid Survey 55°00'W	Feb. 24-26	GADUS 091	5	CTD Casts
55°10'W	Feb. 26-28	GADUS 091	9	6 CTD Casts; 3 Knudsen Casts
55°29'W	Feb. 28-29	GADUS 091	7	2 CTD Casts; 5 Knudsen Casts

Oceanographic Sections Occupied by NAFC (Nfld.) in 1984 (continued)

Section	Dates	Ship	Stations	Notes
55°57'W	Mar. 1-2	GADUS 091	6	2 CTD Casts; 4 Knudsen Casts
56°34'W	Mar. 2-3	GADUS 091	5	4 CTD Casts; 1 Knudsen Cast
56°56'W	Mar. 3	GADUS 091	5	5 CTD Casts
57°30'W	Mar. 4	GADUS 091	7	7 CTD Casts
57°04'W	Mar. 5	GADUS 091	4	3 CTD Casts 1 Knudsen Casts
56°39'W	Mar. 5-6	GADUS 091	5	5 CTD Casts
56°10'W	Mar. 6-8	GADUS 091	5	5 CTD Casts
55°45'W	Mar. 8-9	GADUS 091	6	6 CTD Casts
Flemish Cap (47°00'N)	Feb. 17-20	GADUS 90	19	Knudsen Bottle Casts
	Aug. 4-6	LADY HAMMOND 122	25	CTD Casts
Bonavista Triangle (SW)	July 27	LADY HAMMOND 122	9	CTD Casts
Bonavista Triangle (SE)	July 27-28	LADY HAMMOND 122	9	CTD Casts
Bonavista Line	July 28-29	LADY HAMMOND 122	13	CTD Casts
White Bay	July 30-31	LADY HAMMOND 122	17	CTD Casts
Seal Island	Aug. 1-2	LADY HAMMOND 122	9	CTD Casts
Southeast Shoal (Grand Banks)				
Transect Start Position 47°32.8'N 52°35.2'W End Position 46°36.0'N 51°07.0'W (Stations ≈ 10 nautical miles apart)	July 12-13	W. TEMPLEMAN 015	9	CTD Casts; Chlorophyll and Nutrients
44°40'N	July 15-16	W. TEMPLEMAN 015	10	CTD Casts; Bongos; Chlorophyll and Nutrients
44°55'N	July 14-15	W. TEMPLEMAN 015	10	CTD Casts; Bongos; Chlorophyll and Nutrients
45°10'N	July 13-14	W. TEMPLEMAN 015	10	CTD Casts; Bongos; Chlorophyll and Nutrients

SECTION II. SCOTIA-FUNDY REGION

by

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Subarea 4

A. Status of the Fisheries

1. Groundfish General

Catch statistics from Divisions 4R-S-T are not complete and are omitted from this report. Total nominal catches decreased by 6.2% to about 155,561 metric tons (MT). This was mainly due to a fall in catches of the major species cod, haddock and redfish.

2. Cod

Total landings decreased by 5.0% to 71,982 MT, 46.3% of the total. This was principally due to reduced catches in Divs. 4W-X which cancelled out a 30% increase in Div. 4Vs.

3. Haddock

Nominal landings decreased by 20% to about 27,000 MT. Catches from Div. 4Vs increased slightly but this did not meet a 46% reduction from Div. 4W and 20% from Div. 4X.

4. Flatfish

Total nominal landings of combined flatfish species (except Atlantic halibut) were about the same as in 1983. American plaice constituted about 47% of the total.

5. Redfish

Redfish landings decreased with 1984 catches 16.4% below the previous year. The decrease was almost wholly due to a fall in landings from the northeast Scotian Shelf (Divs. 4Vs).

6. Pollock

Nominal landing figures for pollock reversed the recent trend, increasing by 13.4% from the 1983 level. Catches rose over the whole of the Scotian Shelf except in Div. 4Vs where they were 10% below the 1983 level. About 63% of the catch was from Div. 4X alone.

7. Other Groundfish

Landings were down by 10% from 1983. White hake remained the major constituent, forming 44% of the total "others", but cusk catches fell by 25%. About 78% of "others" were taken in Div. 4X.

8. Scallop (*Placopecten magellanicus*)

Landings for Subarea 4 totalled 10,750 MT round weight, a 40% decrease from 1983 landings. Landings from Subarea 5 totalled 16,957 MT round weight, a 26% decrease. Landings have been declining since 1982.

9. Herring

Total nominal catches were 90,000 MT, down 10.9% from 1983, with reduced landings in both Divs. 4W and 4X.

10. Mackerel

Landings were down 20% at 3,300 MT, with reductions in both Divs. 4W and 4X.

11. Tuna

No information available.

12. Swordfish

No information available.

13. *Atlantic salmon*

Nominal landings in the whole of Subarea 4 except the west coast of Newfoundland (Div. 4R), including both commercial and sports fisheries, were about 29% below those of 1983. Commercial catches in Quebec decreased by 32% and those in the Maritimes decreased by 37%. Total angling catches were down 25%. A quota system is in effect in New Brunswick and larger fish are required to be returned to the water.

The Newfoundland salmon fisheries in Div. 4R yielded 97.6 MT, about 11% below the 1983 level.

14. Squid (*Illex illecebrosus*)

The squid fisheries on the Scotian Shelf (Divs. 4V-W-X) and southern Gulf of St. Lawrence (Div. 4T) yielded 410 MT in 1984 compared with 1,430 MT in 1983. Nominal catches for Subareas 2 to 4 have declined consistently from a peak in 1979 (162,092 MT) to 69,606, 29,666, 12,768, 422 and 721 MT in 1980, 1981, 1982, and 1983, respectively.

B. Special Research Studies

1. Environmental Studies

(a) Hydrography. Analysis was made of historical temperature and salinity data for the Scotian Shelf (Divs. 4V-W-X). Monthly mean T,S characteristics for 35 subareas were compiled and plotted. A study was made of relationship of nesoscale circulation patterns on Browns Bank (Div. 4X) to distribution of gadoid eggs and larvae. Results suggest limited retention over the Bank comparable to hatching time, and inshore transport of larval stages to possible survey areas off S.W. Nova Scotia.

Hydrographic conditions in the southern Gulf of St. Lawrence (Div. 4T), and in St. Margaret's Bay (Div. 4X) in relation to larval lobster distribution and ecology, were carried out.

Studies were initiated into (i) relationships between hydrographic data and groundfish distributions and long-term abundance changes; (ii) relationships of surface and bottom circulation off S.W. Nova Scotia and Bay of Fundy (Div. 4X) to larval herring distribution.

(b) Plankton Studies. Sampling studies were made using BIONESS to determine biomass and exact vertical position of components of zooplankton and micronekton communities relative to one another and to biological and physical features of the water column (Divs. 4-V-W-X).

Diurnal migration of lobster larvae was studied in the Browns and Georges Bank areas (Divs. 4X, 5Ze). Studies of distribution of eggs and larvae of haddock were carried out to determine larval drift or migration. Studies of temporal and spatial variability of distribution of larvae of silver hake, redfish, haddock and cod were started.

2. Biological Studies

(a) General. The annual groundfish research survey program continued with three seasonal surveys (March, July, October) on the Scotian Shelf and in the Bay of Fundy (Divs. 4V-W-X). The annual Canada/USSR silver hake survey (Subareas 4 and 5) was completed in November. The special series of ichthyoplankton surveys in relation to the 4X haddock ecology project was continued. Two annual herring larval surveys (March, October) were completed in the Bay of Fundy (Div. 4X). Two squid cruises, one in conjunction with France, were carried out on the Scotian Shelf (Divs. 4-V-W-X).

Monitoring and biological sampling of commercial catches, both at-sea (International Observer Program) and landing places continued.

General studies were initiated or continued on the Scotian Shelf on (i) predator-prey relationships of groundfish; (ii) biology and ecology of fishes of the continental slope margin; (iii) relationships of distributions of various groundfish (species interactions).

(b) Cod. Tagging studies were continued to examine movements in the Div. 4T, 4Va and 4VsW stocks and to elucidate relationships between Browns Bank (Div. 4X), Georges Bank (Div 4Ze) and inshore areas. A total of 6,848 cod were tagged on the Scotian Shelf (Divs. 4V-W-X).

Studies were made of otolith microstructure in adults for comparison of growth processes in different year classes. A study of condition factor in relation to feeding in larvae was initiated. Experiments were continued in estimation of digestion rates and digestibility of major cod items.

(c) Haddock. The fourth (penultimate) year of the Fish Ecology Project (FEP) was completed. Special research studies included all phases of haddock life history, behaviour, growth, feeding and relationship of water circulation to egg and larval retention and distribution. The fourth annual inshore survey of Sable Island was completed.

In tagging experiments, 14,146 haddock were tagged and released.

Validation of visual assessment of maturity stages of histological examination was started. Definition of stock structure using meristic, morphological and biochemical procedures is being investigated. A study of fecundity and seasonal patterns of growth continued. The relationship between benthos characteristics and haddock concentrations were studied using an epibenthic sled.

(d) Pollock. Validation of visual assessment of maturity stages by histological examination was started. A total of 3,999 fish were tagged and released on the Scotian Shelf (Div. 4W-X).

(e) Herring. Tagging results of the *past* several years were used for examination of stock boundaries and migration. The general life-history and spawning stock characteristics of the Minas Basis (Div. 4X) spring spawning stcok were evaluated.

Two acoustic-trawling surveys were conducted, one off S.W. Nova Scotia (Div. 4X) and one in the Chedabucto Bay area (Div. 4W) for development of abundance estimates from acoustic signals.

(f) Redfish. Investigation of age validation by estimation of ratios of Rn^{222} to Pb^{210} levels. Distribution abundance and stock structure on the Scotian Shelf slope.

(g) Silver Hake. The study of demographics and trophic interactions continued.

(h) Hake. A comparative study of helminth parasites of the Scotian Shelf hakes continued.

(i) Squid (Illex illecebrosus). Studies of distribution, abundance and biology, and related oceanographic features continued.

(j) Miscellaneous tagging. The following were tagged and released: 4 American plaice; 1 witch flounder; 42 yellowtail flounder; 427 winter flounder; 28 windowpane flounder; 949 American shad; 3,999 sea scallop; 2,677 American lobster; 514 snow crab.

3. Gear and Selectivity Studies

Development of acoustic methodology for estimation of herring abundance. Development of ECOLOG dual beam acoustic system for fish counting in relation to fish distribution and abundance surveys.

Subareas 5 and 6

A. Status of the Fisheries

1. Groundfish General

Total nominal landings (Maritimes and Quebec (M&Q)) decreased by 40% from the 1983 level to 15,602 MT, about 60% of which was from Georges Bank (Subdiv. 5Ze). Most of the decrease was due to cod landings which fell by 40% and constituted 57% of the total, but landings of all other species fell except for white hake which showed a small increase.

2. Cod

Landings decreased to 8,849 MT, 66% from Georges Bank (about the same as in 1983 compared with 92% in 1982), the remainder from Div. 5Y.

3. Haddock

Landings were down 49% from 1983 at 2,708 MT.

4. Pollock

Nominal landings of pollock decreased by 27% to 3,200 MT with 66% of the catch from Subdiv. 5Ze.

5. Other Groundfish

Landings of flatfish were about the same as in 1983 at 456 MT. Cusk landings fell by 48% to 60 MT. White hake landings increased by 26% to 1,013 MT.

6. Scallop (Placopecten magellanicus)

Landings totalled 16,957 MT round weight, a 26% decrease from 1983, continuing a steep decline since 1981.

7. Herring

No herring were landed from Subarea 5.

SEALS

Subareas 0-4

A. Status of the Fisheries

Harp Seals

The total catch of harp seals, including the Gulf and the Front was 30,900 MT, 42% below the 1983 level, of which 26,413 MT (85%) were taken by landsmen, the remainder by ships, reflecting the marked decrease in ships' operations in 1984. The "Front" yielded 19,872 MT, 64% of the Northwest Atlantic catch, a decrease of about 18% from the 1983 share.

Hooded seals

The total catch of hooded seals was 444, only 3½ times the 1983 figure. About 68% were taken from Subareas 0 & 1 by ship, and 12% by landsmen on the Front.

B. Special Research Studies

Harp Seals

From fisheries in the estuary of the St. Lawrence River, studies were continued on age composition and reproductive rate of the Gulf population.

Hooded Seals

Aerial survey detected a large patch of hooded seals off Cape Breton Island (Div. 4T) but bad weather prevented estimation of size and drift. A total of 450 pups were tagged, using a helicopter from the Magdalen Islands (Div. 4T) and the stages of some pups recorded at different dates for comparison with the whelping season in other areas. It was estimated that 500-1,000 hooded seals whelped in the Gulf of St. Lawrence.

Grey Seals

The program of monitoring pup production and tagging live escapement on Sable Island was continued. Total pup production was 5,826, a 5.6% increase over 1983, and tagged escapement was 5,169. Analysis of 1983 seal-worm collections is almost complete. The study of weaning weight and survivorship continued with capture of 800 "0-group" seals between March and July, 1984.

Harbour Seals

All 489 newborn harbour seals on Sable Island were tagged. Pre-weaning mortality was 20, and live marked escapement 467. All stomachs collected for seal-worm studies in 1983 have been analysed.

SECTION III. GULF REGION

by

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Subarea 4

A. Status of the Fisheries

1. Southern Gulf Cod (4TVn): The Total Allowable Catch was 67,000 tonnes, including 7,000 tonnes for France. Slightly less than 80% of the domestic allowance was landed, with the 4Vn winter fisheries (occurring when stocks are concentrated) performing best. In Division 4T, catch rates were unusually high in the spring but unusually low in late summer. The latter phenomenon, combined with apparently reduced effort, resulted in low catches for those months. Catch rates improved as usual in the fall. In 1983 and 1984, there may have been some deviance from the usual seasonal distribution of cod. Although late summer catches were low in most traditional areas, Prince Edward Island had unusually high catches. Reduced catches are attributed to changes in distribution catches than abundance.

2. Gulf Redfish (4RST): The Total Allowable Catch was 50,000 tonnes, but the reported catch was only about 70% of this. Overall catch rates were compatible with the results that would be predicted on the basis of the existing stock assessment. However, rates were quite low in late summer. They improved in the fall. Most representatives of the

Gulf-based industry have stated that their catch rates are unacceptably low. Other fleet representatives claim satisfactory rates. A preliminary examination of the logbooks from both these groups shows similar catch rates. It thus appears that statements about catch rates are influenced by each participant's individual economic constraints.

3. Southern Gulf American Plaice (4T): The Total Allowable Catch is 10,000 tonnes, whereas landings were about 90% of this amount. These are the highest landings in several years. In addition to reflecting the health of the plaice stock, this probably also indicates its relatively increased attractiveness during the period when cod catch rates were poor.

4. Southern Gulf White Hake (4T): The Total Allowable Catch for 1984 was 12,000 tonnes. The reported landings were slightly more than 50% of this. Low landings appear to be due to poor availability inshore and unstable fishing effort. The existing TAC has virtually no analytical basis. Using data from new surveys and intensified catch sampling, an analytical assessment will be prepared in 1985.

5. Southern Gulf Herring (4T): The Total Allowable Catch was 19,250 tonnes in 1984. The reported landings were 22,904 tonnes. True total catches may have been in excess of 25,000 tonnes. This is a common problem in this fishery. Recent assessments have been more pessimistic about stock status than the fishermen have been. Catch rates have improved considerably in recent years. In fact, the stock assessment has a rather weak analytical basis since data from pelagic fisheries is difficult to interpret, and since very little fishery-independent data is available. Our spawning bed survey is an example of the latter. We are also accumulating acoustic data on distribution and abundance, which may start to be useful in 1986.

6. Gulf Lobster (4RT): Lobster landings from the Gulf of St. Lawrence fishery have remained stable or increased over the last five years. The fishing effort in this area does not appear to have increased over the same period. These two factors indicate that the near future of the lobster fishery should be good. Questions have been raised in some areas of the Gulf about the effects of a minimum size increase in the lobster fishery. Researchers have presented to industry and management scenarios of the possible short and long term effects of a size change. Further investigation on the lobster stocks shall be required before they can properly access the long term impact of a minimum size increase.

7. Southern Gulf Snow Crab (4T): The total allowable catch was 26,000 tonnes for the southwestern Gulf fishery. Total landings were estimated at 26,062 tonnes. Catch per unit effort estimates in 1984 were comparable to 1983 (65.5 kg/trap in 1983 and 66.7 kg/trap haul in 1984). Boat quotas were in effect for the Cape Breton (Area 1 and 7) fishery with an estimated 1360 tonnes landed in 1984. The catch per unit effort estimates for this fishery were lower in 1984 than 1983 (85 kg/trap in 1983 and 50 kg/trap haul in 1984). Researchers are concerned about the status of Gulf crab stocks - maintenance of catch per unit effort in 1984 was probably attributable to the increased distribution of the fleets. The phenomenon of a terminal moult in snow crab is hypothesized - this has potential fishery management implications for reduced catches.

8. Southern Gulf Scallop (4T): Estimated total landings for 1984 were 219 tonnes of meats as compared to estimated landings of 334 tonnes in 1983. A decrease in landings occurred in District 7b1 (Nova-Scotia/ Cape Breton/eastern Prince Edward Island) from 154 tonnes in 1983 to 57 tonnes in 1984 and in District 8 (southeastern New Brunswick and western Prince Edward Island) from 151 tonnes in 1983 to 126 tonnes in 1984, whereas an increase of landings occurred in District 7c (northeastern New Brunswick and Baie des Chaleurs) from 30 tonnes in 1983 to 36 tonnes in 1984. A decrease in scallop landings in 1984 is attributed to a decrease in fishing effort rather than a recruitment problem.

B. Special Research Studies

1. Environmental studies

a) Hydrographic studies - Data on physical oceanography were collected during research surveys in the Gulf of St. Lawrence.

2. Biological studies

a) Cod - Catch sampling and compilation of commercial fishery data were conducted for an assessment of the 4TVn cod stock. A six week research survey was conducted during August - October. In addition to information on abundance and age composition of the stock, cod stomachs were collected and examined for future multi-species work.

b) Redfish - Data from research vessel surveys and commercial fisheries were used in an assessment of the status of the redfish stock in areas 4RST. In addition, biochemical analyses and swimbladder dissections were made for stock identification purposes; age validation studies were made in cooperation with Canadian and Federal Republic of Germany scientists; an electronic fish measuring board was successfully tested; and log book catch rates were critically examined to detect changes due to the use of improved gear in the fishery.

c) American Plaice - A stock update on plaice and other flounder was made using research vessel and commercial fisheries data. A plaice discard study was conducted to differentiate between landings and catches.

d) White Hake - A stock update using limited data was prepared. Extensive ageing of current and historic samples, biological sampling, contacts with various fishermen and processors, and two inshore cruises were made in order to collect data for an analytical assessment.

e) Herring - An analytical assessment, including virtual population analysis of both spring and fall spawning groups, was made utilizing commercial fisheries data. A diver survey of herring spawning beds in Miramichi Bay, New Brunswick, was made to estimate population size and exploitation rate, to map the size of spawning beds, to estimate the intensity of predation by winter flounder, and to observe time of hatching. Herring gillnet selectivity of four mesh sizes was determined with the selectivity curves corresponding to a slightly skewed normal ogive, and with selectivity at length being a linear function of stretched mesh diameter. Acoustic surveys for juvenile herring did not result in absolute estimates because fish were concentrated in shallow water and were easily confused with other small fish. Acoustic data from an adult herring survey, conducted during autumn, will be analyzed to initiate an annual abundance index. The IYGP (International Young Gadoids & Pelagic) trawl was found to be an efficient means of sampling adult herring. Two acoustic systems (echolog and CSD system) were successfully used to identify the distribution and abundance of adult herring. A parasitological study of herring was initiated to determine the usefulness of parasites for differentiating spring and fall spawners, and for identifying stock components of the 4Vn fishery. Otolith characteristics were used to identify herring spawning groups in the Pictou/Souris fishery and to show potential relationships with fish in the 4Vn winter fishery. Meristic studies were continued in an effort to differentiate spawning groups. Preliminary investigation of the relationship between fecundity and other population parameters suggest that fecundity of herring in 4T may be density dependent.

f) Lobster - Research was directed to providing scientific advice to fisheries managers on the impact of potential changes in legal size, fishing seasons and geographic limits of fishing districts. Projects included an aerial survey of buoys in the southern Gulf of St. Lawrence to determine fishing effort; lobster tagging off northern Prince Edward Island and in Northumberland Strait; sampling cruises in western Northumberland Strait and sea sampling throughout the southern Gulf; an underwater television survey off Miminegash, Prince Edward Island; pilot quadrat work in northern New Brunswick; an exploratory sea sampling cruise off western Newfoundland; and a preliminary population genetics study to identify stocks in the southern Gulf of St. Lawrence.

g) Snow Crab - Research was directed to providing a stock assessment of the snow crab resource in the southern Gulf of St. Lawrence. Projects included commercial catch sampling in northeastern New Brunswick and Cape Breton for size and sexual maturity of males; log book collection and analysis from commercial vessels; moulting cycle studies and staging using pleopods; a research vessel survey off Cape Breton; and a biomass survey, using a commercial vessel, in the southern Gulf of St. Lawrence.

h) Scallop - Research was directed to monitoring and providing a stock assessment of the sea scallop resource in the southern Gulf of

St. Lawrence. Projects included research vessel surveys using sampling drags and underwater television to estimate densities, and to determine catch rates and size frequencies; age and growth studies; maturation studies; tagging studies in Chaleur Bay; and an assessment of recruitment patterns using population genetics.

SECTION IV. QUEBEC REGION

by

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This report summarizes the research of several laboratories in Quebec, they are identified as follows:

ABS - Arctic Biological Station in Ste-Anne de Bellevue (DFO)
CREP - Fisheries Research Branch, Rimouski laboratory (DFO)
QUE - Fisheries Research Branch, Quebec laboratory (DFO)
MAPAQ - Direction de la Recherche Scientifique et Technique, Quebec Provincial Government.

BIOLOGICAL STUDIES:

1. Cod

QUE- Catch sampling and compilation of commercial fishery data were carried out and summarized for an assessment of the status of the 3Pn-4RS stock. A biomass survey was conducted in January 1985. Tagging studies to determine relationships between 2J3KL cod and 3Pn-4RS cod were continued. A research project on inshore migrations was started. Stomach samples were collected to study the impact of cod predation on other species.

ABS- A biological analysis of Atlantic cod taken in the inshore developmental fishery being carried out at Killineq by the Makivik Corporation was begun under contract.

MAPAQ- Migratory studies on the cod populations of the Lower North Shore of the Gulf of St.Lawrence (4Sv. 4Sw) have been conducted since 1983. The research was initiated to better understand migratory patterns and estimate the proportion of cod from 4S stock and from 2J3KL. From historic tagging-recapture data, it is hypothesized that a part of the 2K3KL cod stocks move into the Gulf of St.Lawrence along the Quebec Lower North Shore. The studies were done using tagging-recapture method as well as analysis of a blood parasite (Trypanosoma murmanensis) which appears to be specific to certain stocks. Preliminary results indicate (from tagging) that most of the cod belongs to the Northern Gulf stock.

2. Herring

QUE- Catch sampling and compilation of commercial fishery data were carried out and summarized for an assessment of the status of 4R herring. A comparative study of microscopic and macroscopic determination of maturity stages was continued and should be completed in 1985. Commercial fishemen on the West Coast of Newfoundland were contracted to maintain logbooks to obtain an index of stock size. Data were also collected for 4S herring.

CREP- Historical data on herring catches in the Northern part of the Gulf of St.Lawrence (4S) have been collected and analysed. Marked cyclical cpue fluctuations (11 yrs) were observed. A joint analysis (with Scotia Fundy personnel) of herring migration was completed. Eggs fertilized in vitro hatched successfully. Otoliths of the larvae were collected for a study of daily growth.

3. **Mackerel**

QUE- Catch sampling and compilation of commercial fishery data were carried out and summarized for an assessment of the status of Northwest Atlantic mackerel. Commercial catch rates for the Canadian inshore fishery were compiled and standardized. A mackerel egg survey was conducted in June and the results will be used in the 1985 assessment to estimate spawning stock size. A biochemical analysis of mackerel sampled in the Gulf of St.Lawrence and off New England was conducted. A review of the natural mortality rate used for mackerel was made. The fecundity of mackerel was studied.

CREP- Based on the hypothesis that seasonal temperature plays a key role in determining yearclass strenght a study of energetic balance was undertaken. Mackerel larvae were successfully kept in the laboratory and their instantaneous rates of digestion were measured. Work on the development of an apparatus that will allow a precise measure of the effect of temperature on metabolic rates is underway.

4. **Anadromous and catadromous fish**

QUE- Post-smolts having spent 8 to 16 weeks at sea were sampled and tagged. Salmon scales collection collected from 1982 to 1984 have been examined to establish their river of origin. Work on elvers and young eel on the North Shore has continued and for the fourth consecutive year the arrival date of elvers has been determined. Work on telemetry to study eel behavior towards changes in temperature and salinity was continued. The research program on eel mass mortalities in the Estuary was also continued.

ABS- An arctic charr range expansion study was carried out under contract. A biological analysis of a large sample of two species of whitefish was also begun under contract.

MAPAQ- Research was pursued in 1984 on the sturgeon along the south shore of the upper St.Lawrence Estuary. A wide spectrum of biological parameters was collected with a particular emphasis on the stock recruitment relationship. For a number of years no spawners have been caught in the commercial fishery and apparently few sturgeon are being recruited to the fishery each year.

Research on the American eel was initiated in 1984 (July-October) at 5 locations on the north shore of the Lower St.Lawrence Estuary. The objective was to determine the potential of developping a commercial eel fishery. Data was collected on the biological parameters of the populations, their relative abundance and the relative efficiency of various gear types.

5. **Greenland halibut**

QUE- Catch sampling and compilation of commercial fishery data were used to make an assessment of stock status of 4RST Greenland halibut.

6. **Snow crab**

QUE- A magnetic tagging program was carried out in the Estuary. The results will be used to assess stock size. Catch sampling and compilation of commercial fishery data were used to make an assessment of stock status. An histological study was made to locate and identify the gland responsible for molting. A spatio-temporal study of larvae in Chaleur Bay and a study of the ecology of juvenile snow crab off Cape Breton were completed.

MAPAQ- In 4RS, research on the evaluation of the abundance of pre-recruits was continued. The evolution of molting cycle has been studied twice a month using the proportion of crabs that have already molted at the same sampling station. A research program on growth of crab in its natural habitat was also carried out.

In 4T, pre-recruits analysis has been done from research data to try to predict stock abundance from relative abundance of recruits. Results from trap experiments could not be used for this purpose, consequently a gear was developped specifically to catch small crabs on any soft or rocky bottom. Work was also done to improve the selectivity of traps and to evaluate mortality of crabs discarded on board fishing vessels.

7. **Shrimp**

QUE- Catch sampling, compilation of commercial fishery data and the results of a stratified survey were used to make an assessment of stock status. Cod stomachs were collected on shrimp vessels to study the influence of that predator on shrimp. The study of inter-molt growth was undertaken to complete data collected in 1982.

ABS- A study of inshore epibenthic decapod crustaceans ("shrimp") was carried out at Killineq in collaboration with the Makivik Corporation.

MAPAQ- A catch at age matrix for the Sept-Iles stock was calculated. This was used, among other things, to investigate the applicability of Sequential Population Analysis to shrimp. Study of diurnal migrations continued. Great variability in density was observed at every 1 meter level off the bottom as well as a sharp decrease in density during night time. A catchability coefficient was derived from these results to adjust the annual biomass estimate.

8. **Lobster**

QUE- This is a new research program and the work carried out in 1984 consisted mainly in organising the projects and doing some preliminary work on juvenile lobster in the Magdalen Island as well as defining the research priorities.

CREP- Data analysis to study factors effecting the survival of lobster larvae was continued. The focus is mainly on the factors influencing vertical and horizontal distribution as well as feeding.

MAPAQ- Effort was concentrated on the Magdalen Island stocks but field data on lobster density were also obtained from the southern side of Anticosti Island. Data on sexual maturity, growth, spawning and moulting as well as from tagging experiments were used to differentiate two apparent population units on the two sides of the Magdalen Islands. Yield models were also used to evaluate the combined effect of recruitment and exploitation on the stocks. Preliminary results confirm that differences exist between the north and the south side of the archipelago.

9. **Scallop**

QUE- This is also a new program and a good part of the year was devoted at establishing the section and defining the research projects. A stratified biomass survey was conducted to assess the biomass of the Magdalen Island stock.

10. **Marine mammals**

CREP- A program with the aim of identifying the cause of death of stranded marine mammals was undertaken by the Centre de Recherche en Ecologie des Pêches. A total of 42 strandings was recorded and of these, 15 carcasses were authopsied. The most interesting results were obtained for belugas (white whales). The observed pathologies were related to intoxication by organochlorides.

ABS- A three-year study on the population of ringed seals inhabiting the fast ice of Barrow Strait was initiated. It will attempt to relate numbers, reproductive status and condition of ringed seals to the quality and extent of sea ice.

Studies continued on the summering concentration of belugas at Cunningham Inlet, Somerset Island, N.W.T. Aerial observations were made of belugas congregating at the edge of the fast ice in Lancaster Sound to provide further information on age composition and production of young. In Northern Quebec, belugas killed during the Inuit hunt were sampled and information on the hunt was gathered. A three year comparative study on the population parameters, morphometrics and ecology of belugas in Hudson Strait and eastern Hudson Bay was undertaken. A photographic aerial count of the population of belugas in the estuary of the St.Lawrence was carried out. Also, the movements of the animals at the mouth of the Saguenay River were monitored in an attempt to assess the effect of tourist (whale watching) traffic.

The distribution and behavior of bowhead whales in northeastern Baffin Island were studied from an aircraft and 39 ft, vessel.

A report evaluating the nature and extend of shore based whaling for bowheads in the eastern Beaufort Sea and Amundsen Gulf, and another report on the current status of the Bering Sea stock of bowheads were prepared for the "Whales Beneath the Ice" Program of WWF.

Studies of the deposition of hard tissues in arctic cetaceans, as a means of verifying present methods of age determination or establishing new techniques, were also carried out as part of the "Whales Beneath the Ice".

Analysis of returns from a large-scale tagging of harp seals in the Gulf of St.Lawrence allowed an up-to-date estimate of production.

Tagging of 450 hooded seal pups and estimation of the duration of the whelping season were achieved in the Gulf of St.Lawrence. This was part of a major joint Canadian-Danish effort to assess numbers and inter-relationships of geographically separate herds of this species in the northwest Atlantic.

A major tagging program on the grey seal in the Gulf of St.Lawrence was successfully carried out in Jan.-Feb. 1984. Returns of tagged pups from the bounty kill in the Gulf and neighbouring regions have provided an estimate of production.

Marine Plants

MAPAQ- Various harvesting regimes are being applied on the intertidal brown algae Ascophyllum nodosum in order to determine management regulations permitting an optimum yield for this resource. The effects of harvesting frequency (1 to 5 years) and degree of cutting (manual harvest method) on instantaneous and long-term biomass recovery are investigated. The MAPAQ, in collaboration with the University of Sherbrooke (Quebec), was also involved in the assessment of remote sensing techniques to monitor the distribution and abundance of subtidal marine algae (Laminaria) in Chaleurs Bay.