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CANADIAN RESEARCH REPORT, 1983

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SECTION I. NEWFOUNDLAND REGIONS

by

L. W. Coady

SUBAREAS 0 AND 1

A. Status of the Fisheries

1. Shrimp. Canadian landings of shrimp from Subarea 0 in 1983 totalled 4,014 t.

2. Other species. No other species of fish or invertebrates were landed by Canada from these Subareas in 1983.

B. Special Research Studies

1. Environmental Studies

   a) Hydrographic studies. Four current meter moorings were deployed in NE Baffin Bay by the Atlantic Oceanographic Laboratory (Bedford Institute). Four satellite-tracked drifters were released in the same area.

2. Biological Studies

   a) Atlantic salmon. A total of 2,153 salmon was sampled at the fish plant in Holsteinsborg and 1,888 from the fish plant at Godthaab. Scale samples collected from homewater fisheries in Europe and North America to classify salmon caught at West Greenland into European and North American components in 1980 were used to test old discriminant functions. Due to decreased growth in the first sea year, circuli counts for this character of the European group had changed as much as 12% relative to the 1968-70 samples that formed the original database. These new scale samples were then used to identify new variables. The best variables for discriminating between these groups were circuli counts in winter and summer portion of first sea year read at 45° from longitudinal axis. A "test" sample, independent from the database used for developing new discriminant functions, indicated misclassifications of only 2%.

   b) Canadian observers participated in 21 shrimp and 18 Greenland halibut commercial fishing trips (Canada, Faroes, USSR, Denmark) in SA0+1 in 1983. These were domestic and foreign vessels as well as foreign vessels licensed to fish the Canadian allocation of shrimp in Davis Strait. A total of 572 fishing days observed resulted in more than 250,000 length measurements and other biological information.

c) An extensive biological oceanographic survey of pelagic plankton was undertaken (late-July to mid-September) from the Scotian Shelf to Baffin Bay, Lancaster Sound and Jones Sound in the eastern Arctic. The survey was undertaken by the Marine Ecology Laboratory (Bedford Institute).

SUBAREA 2

A. Status of the Fisheries

1. Cod. Canadian landings were about 48,600 t, compared to 76,800 t landed in 1982 and 38,300 t in 1981. Most of the landings were from Div. 2J, with Div. 2H landings amounting to less than 300 t compared to almost 3,300 t landed from this area in 1982. Landings from the inshore sector amounted to 23% of the total landings from this Subarea.

2. Redfish. Canadian landings were 1,200 t, compared to 7,100 t landed in 1982 and 3,600 t landed in 1981. These landings were almost entirely from Div. 2J, with only 50 t being landed from Div. 2H. The decrease in landings from this Subarea reflects a decrease in Canadian fishing effort for redfish in this area during 1983.

3. Other groundfish. Canadian landings of the combined flatfish species were 7,000 t, compared to 11,100 t in 1982 and only 1,000 t in 1981. Greenland halibut comprised about 97% of these landings, with Div. 2H landings amounting to 2,600 t and Div. 2J landings amounting to 4,200 t.

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 1983 were 327 t, a decrease of 35% from 1982. The recreational harvest totalled 5 t.

7. Arctic charr. Landings of Arctic charr in Subarea 2 during 1983 were 179 t, a decrease of 26% from 1982. Factors contributing to the decreased catches were: lower abundance of charr available to inshore fishery, lack of fishery in Hebron-Saglek zone and reduced effort due to ice conditions.

8. Shrimp. The Subarea 2 shrimp fishery was subject to a total quota restriction of 6,150 t in 1983, 4000 t of which were in the Hopedale Channel. Total landings in 1983 were approximately 1,050 t.

B. Special Research Studies

1. Environmental Studies

a) Hydrographic studies. CTD studies of Hopedale Saddle were made in July and October to study the bathymetric steering of the Labrador Current. An array of current meters was maintained by Petrocan Exploration (oil industry) as part of this study.

NAFO standard sections in 2J were occupied in July. Collections of nutrients and temperature profiles were taken at each fishing station occupied.

Three oceanographic moorings were made in the Hamilton Bank vicinity by Atlantic Oceanographic Laboratory (Bedford Institute of Oceanography).

Petrocan Exploration (oil industry) continued ongoing oceanographic observations on the Labrador Shelf in 1982 in support of offshore exploratory drilling operations.

b) Benthic studies. Atlantic Oceanics Company Limited of Dartmouth, N.S., undertook a detailed benthic invertebrate survey of the Labrador Shelf during the fall of 1983 as part of a geological cruise by the CSS Hudson (Bedford Institute).

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 1983 located capelin mainly in Div. 2J.

e) Atlantic salmon. A total of 2,756 Atlantic salmon caught in the commercial fisheries was sampled for size and age distribution.

f) Arctic charr. In excess of 2,500 samples were obtained for age determination of Arctic charr in commercial landings from ten northern Labrador fishing areas. Approximately 19,000 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 six 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 1983. Characteristics of upstream migrating charr and the dynamics of the population are being examined.

g) Shrimp. A research vessel survey which was conducted in July 1983 completed a biomass survey using a Sputnik 1600 shrimp trawl in the major areas where commercial concentrations occur. A total of 170 sets was made with the greatest catch (587 kg) being obtained in the Hopedale Channel. Catches in the Cartwright Channel ranged to 116 kg.

SUBAREAS 2 AND 3

A. Special Research Studies

1. Environmental Studies

The Centre for Cold Ocean Resources Engineering (C-Core) and the Ocean Engineering Institute at Memorial University continued investigations of ice and seafloor dynamics. C-Core has been involved in HF radar remote sensing of ocean surface currents. The OEI is primarily interested in ice/structure and wave dynamics studies.

SUBAREA 3

A. Status of the Fisheries

1. Cod. Canadian landings were 218,000 t, up from 193,000 t in 1982 and 165,000 t in 1981. Offshore landings were 92,000 t, up substantially from 62,000 t in 1982. Inshore landings were 126,000 t, down slightly from 130,000 t in 1982. Div. 3K and 3L landings accounted for about 76% of all landings from this Subarea.

2. Redfish. Canadian landings were 20,500 t, compared to 17,900 t landed in 1982. These landings were almost entirely from Div. 3K (8,100 t), 3L (6,500 t), 3Pn (2,900 t) and 3Ps (3,000 t).

3. Flatfish. Canadian landings of the combined flatfish species were 63,900 t, down significantly from 79,400 t landed in 1982 and 99,600 t landed in 1981. American plaice landings were 38,600 t, compared to 53,200 t in 1982. Yellowtail landings were 9,100 t, down slightly from 11,600 t in 1982. Witch landings remained around the same as in 1982 at about 3,400 t. Greenland halibut landings showed an increase at 12,300 t, compared to 10,500 t landed in 1982. Inshore landings amounted to some 23% of total flatfish landings in this Subarea.

4. Other groundfish. Canadian landings were 5,800 t, comprised primarily of wolffish (3,100 t), hake (1,250 t), pollock (1,000 t) and haddock (450 t).

5. Capelin. Approximately 29,200 t of capelin were landed inshore in Div. 3L in 1983, about the same level as in 1982. 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 600 t and less than 100 t from southern Newfoundland (Div. 3P). Except for bait fisheries, the commercial herring fisheries were closed due to poor recruitment to fishable stocks.

7. Mackerel. Mackerel landings in Subarea 3 were about 7,700 t, well above the 1982 level of 240 t.

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

9. Atlantic salmon. Landings were 525 t in the commercial fishery and 38 t in the recreational fishery. Abundance of large salmon was lower than previous years.

10. Scallops. Landings from the second year of renewed activity have receded somewhat to 594 t from 717 t in 1982, while concomittant effort (days fished) dropped marginally by 4%. Fishery performance here will continue to depend on the relative abundance and availability of sea scallops elsewhere on the Atlantic seaboard particularly Georges Bank.

B. Special Research Studies

1. Environmental Studies

a) Hydrographic studies. Table 1 lists sections occupied by the Northwest Atlantic Fisheries Centre during 1983. 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 1983 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 ancilliary 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. CTD 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.

Three oceanographic moorings were deployed in the eastern Strait of Belle Isle area by AOL (Bedford Institute) during 1983. Six moorings were made in the Labrador Basin (approx. 50°N; 42-43°W) in addition to standard CTD measurements and a number of batfish tows. Ten other oceanographic moorings were made at various locations on and around the Grand Banks. Three meteorological moorings were also deployed on the Tail of the Bank, Whale Bank and St. Pierre Bank.

The International Ice Patrol released ten satellite tracked drifters in the NE Newfoundland Shelf area (March through to July)

Mobil Oil (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 1983.

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 1983, showing distinct bands of chlorophyll, zooplankton, and fish communities.

Plankton samples for squid juveniles were taken south of the Grand Bank as part of a coordinated international survey in February.

c) Other environmental studies. The Northern Institute of Cold Ocean Science (Memorial University) continued comparative physical oceanographic and ecological investigations of Hermitage and Fortune Bays. Analyses of qravity flows in Fortune Bay highlighted these 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).

2. Biological Studies

a) Cod. Sampling of the landings from the commercial fishery both inshore and offshore was continued in 1983. Using research vessels, surveys were carried out in all NAFO Divisions to determine the distribution and abundance of cod. Detailed

biological sampling was extensive during these surveys and several thousand cod were tagged, mainly in Div. 3K.

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.

A three year old study of Flemish Cap larval Sebastes otoliths was completed, assessing within and between year changes, growth rates, extrusion length and growth trajectories.

Autopsy data on swim bladder musculature on Flemish Cap redfish showed Sebastes marinus, S. mentella and S. fasciatus were present. S. mentella apparently spawns later than the beaked forms.

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. The usual spring random stratified survey of 3LNO was not carried out due to mechanical problems with the WILFRED TEMPLEMAN. These surveys are a major source of information for continued biological studies on the various flatfish species.

Research was continued on stock delineation problems in Greenland halibut. Preliminary results of tagging were presented at the NAFO Symposium on Stock Discrimination.

A juvenile flatfish survey was carried out on the southern half of the Grand Bank (Div. 3N and 3O) to study the abundance and distribution of juvenile yellowtail, plaice, and witch flounder.

d) Capelin. 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.

e) Herring. Surveys to determine distribution and abundance of herring larvae were conducted in Trinity Bay in June, August, September, October, November and February. 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.

f) Squid. In February-March a survey was conducted jointly by the Nfld/Scotia-Fundy Regions toward studying the distribution of larval and juvenile squid in the Gulf Stream system between Chespeake Bay and Cape Canaveral, Florida. 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 obsence of squid from fishing areas. Water temperature was monitored at selected inshore sites on the east coast of Newfoundland.

g) Atlantic salmon. Long-term research studies are underway 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 75 commercial salmon fishermen was conducted to assess local sales and by-catch. In June and July 1983, 233 salmon were tagged and released in St. Mary's Bay. Thirteen were recaptured in the commercial fishery and thirty-three in the recreational fishery. A total of 1,488 salmon from the commercial fishery was sampled at Twillingate, Newfoundland.

h) Sampling of foreign and Canadian offshore catches. A total of 2,602 samples representing 635,597 lengths and 6,598 ages* was taken from the catches of foreign and Canadian offshore fisheries (mainly Subareas 0-3) as follows:

Species	Samples	Lengths	Ages
Cod	719	167,173	5,890
Shrimp	749	221,312	-
Plaice	316	72,360	-
Witch	56	14,531	122
Yellowtail	46	12,004	-
Turbot	341	78,109	-
Redfish	163	43,499	290
White hake	21	3,250	296
Haddock	2	676	-
Roundnose grenadier	35	8,918	-
Blue hake	88	453	-
Capelin	66	13,312	-
	2,602	635,597	6,598

About 14,372 sets from a total of 16,630 sets were observed from 4,302** observed days (56,500 hours) fished. Percent coverage on foreign was 60%; Canadian 10%.

*This figure represents the total number of otolith pairs collected, but not necessarily read.

**These figures include Canadian and foreign vessels.

In addition, an extensive product to whole weight conversion factor program was continued from 1982.

i) Scallops. An exploratory survey for scallops was conducted during July-August 1982 in Div. 3LNO. Several areas of Iceland scallop concentration were located. Demonstration fishing was carried out on some of these beds.

j) Multispecies. Investigations of multispecies relationships are progressing using stability studies of computer models of marine trophic 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 landings were around 59,600 t compared to 58,400 t landed in 1982 and 56,900 t in 1981. The inshore sector of the fishery accounted for about 45% of these landings. Div. 4R landings amounted for 93% of the total Newfoundland landings from this Subarea.

2. Haddock. Newfoundland landings were about 400 t, down from about 800 t in 1982 and 5,800 t in 1981.

3. Flatfish. Newfoundland landings were 3,000 t, compared to 2,500 t landed in 1982. These landings were comprised primarily of American plaice (1,900 t) and witch (750 t).

4. Redfish. Newfoundland landings totalled 3,600 t, down from 6,800 t in 1982 and 5,400 t in 1981. Landings from Div. 4R accounted for 58% of the total Newfoundland landings from this Subarea.

5. Other groundfish. Newfoundland landings were about 850 t, comprised mainly of wolffish and pollock.

SUBAREA 5

A. Status of the Fisheries

1. Groundfish. Newfoundland landings amounted to only 50 t in Subarea 5.

SEALS (Subareas 2 and 3)

A. Special Research Studies

1. Biological Studies

The following studies on seals were undertaken in 1983:

Mark-recapture experiment to estimate harp seal pup production.

In March 1983, over 9,000 harp seal pups were tagged in the two major whelping concentrations off northeastern Newfoundland. A sample of over 800 pups was double-tagged to investigate tag loss. Sex and pelage (approximate age) were recorded from each pup and hind flipper length was measured on a sample of over 1,000 pups to investigate size-dependent pup mortality.

Detailed sampling of the age structure of harp seal catches.

The canine teeth of 1,369 harp seals were examined to determine the age composition of the commercial catch. In addition, the ages of 881 harp seals were determined from a sample taken on a research cruise in April 1983 designed to estimate the population age structure and 1+ growth rate.

Analysis of harp seal diets.

Further collections of harp seal stomachs were made in 1983 from both inshore and offshore locations from February to April. All stomachs collected between 1979 and 1982 have been analyzed and the data have been prepared for computer analysis.

Analysis of female condition and pup growth rates in harp seals.

Thirty-six harp seal mother-pup pairs were taken in March 1983 to extend our study of between year variation in female condition and pup growth.

A study of pup growth and female condition in hooded seals was conducted in March 1983. Eleven mother-pup pairs were killed for the study. This and previous data from 1979 have been incorporated into a manuscript.

In support of the March 1983 mark-recapture study, a community survey was conducted to estimate the proportion of recovered tags not returned for the reward. Approximately 1,500 sealers were selected in a stratified cluster survey of approximately 50 communities. The results of this survey are now being analyzed.

A survey to determine pup production of hooded seals at the "Front" using vertical aerial photography with appropriate ground-truthing was carried out during the period 17-27 March 1983. Due to time

constraints and weather problems, only partial non-synoptic photographic coverage of the whelping patch at the Front was achieved. The result will be a minimum estimate of Front pup production for 1983. No ground-truthing was accomplished because of field logistics problems.

Recent pup production of hooded seals at the Front was estimated through detailed analyses of large sealing vessel catch per unit effort data for 1977-82.

Approximately 825 hooded seal pups were tagged at the Front during March 1983. With additional tagging at the Front and in Davis Strait during the next few years, the relationships between the two whelping populations in the northwest Atlantic and their proportional contributions to catches at Greenland should be elucidated within the next several years.

Table 1. Oceanographic sections occupied by NAFC (Nfld.) in 1983.

Section	Dates	Ship	Stns.	Notes
Flemish Cap (47°00'N)	February 2-5	Gadus 74	18	Knudsen Bottle Casts
	March 1-3	Gadus 75	16	CTD Casts
	March 13-15	Gadus 75	12	CTD Casts; Bongos at 4 stns.
	June 23	Lady Hammond 100	1	CTD Cast
	July 1	Lady Hammond 100	1	CTD Cast
	August 6-7	Gadus 82	17	CTD Casts: Nutrients
	August 10	Gauds 82	1	CTD Cast; Nutrients
Flemish Cap (Grid)				
46°00'N	March 3-5	Gadus 75	4	CTD Casts; Bongos
46°30'W	March 5	Gadus 75	7	CTD Casts; Bongos
46°00'W	March 6	Gadus 75	7	CTD Casts; Bongos
45°30'W	March 7	Gadus 75	7	CTD Casts: Bongos
45°00'W	March 7-8	Gadus 75	7	CTD Casts; Bongos
44°30'W	March 8-10	Gadus 75	8	CTD Casts; Bongos
44°00'W	March 10	Gadus 75	7	CTD Casts; Bongos
44°15'W	March 11	Gadus 75	5	Bongos only
Southeast Shoal (Grand Banks)				
43°55'N	June 18-19	Lady Hammond 100	6	CTD Casts; Bongos
44°15'N	June 19	Lady Hammond 100	6	CTD Casts; Bongos
44°35'N	June 19-20	Lady Hammond 100	7	CTD Casts; Bongos
44°55'N	June 20-21	Lady Hammond 100	7	CTD Casts; Bongos

Table 1. (Cont'd.)

Section	Dates	Ship	Stns.	Notes
45°15'N	June 21-22	Lady Hammond 100	8	CTD Casts; Bongos
45°35'N	June 22	Lady Hammond 100	7	CTD Casts; Bongos
45°10'N	June 24-25	Lady Hammond 100	11	CTD Cast; Bongos; Vertical Net; Chlorophyll and Nutrients for 10 stns. CTD Cast only for 1 stn.
44°40'N	June 26	Lady Hammond 100	10	CTD Casts; Bongos, Vertical Net; Chlorophyll and Nutrients.
44°55'N	June 26-27	Lady Hammond 100	10	CTD Casts; Bongos, Vertical Nets; Chlorophyll and Nutrients
44°55'N	June 28	Lady Hammond 100	5	CTD Casts
24-hr. Station 44°55'N 50°01'W	June 28-29	Lady Hammond 100	13	CTD Casts; Bongos; Vertical Net; Chlorophyll and Nutrients
24-hr. Station 44°55'N 49°-34W	June 30-July 1	Lady Hammond 100	12	CTD Casts; Bongos; Vertical Net; Chlorophyll and Nutrients
Lilly Canyon 4 lines	June 27-28	Lady Hammond 100	24	CTD Casts
1 line	August 8	Gadus 82	5	CTD Casts
4 lines	August 8-9	Gadus 82	28	CTD Casts
Seal Island-Cape Farwell	August 1-2	Gadus 82	9	CTD Casts; Nutrients
White Bay	August 2-3	Gadus 82	15	CTD Casts; Nutrients
Bonavista	August 4-5	Gadus 82	12	CTD Casts; Nutrients
Hopedale Saddle Grid (Labrador)	July 29-31	Gadus 82	41	CTD Casts
Hopedale Saddle Grid (Labrador)	October 8-11	Balder Cabot 001	53	CTD Casts
Station 27 Cape Spear 47°32'N 52°35'W	February, through to December	Gadus Atlantica W. Templeman Lady Hammond	25	4 CTD Casts; 21 Knudsen Casts; No data for January or March

SECTION II. SCOTIA-FUNDY REGION

by

J. S. Scott

SUBAREA 4

A. Status of the Fisheries

1. Groundfish General

Total nominal catches (Maritimes and Quebec (M&Q)) increased by 2.4% to about 334,000 metric tons (MT). This was mainly due to improved cod and redfish landings which counteracted decreases in the other major species.

Newfoundland landings from the subarea decreased by 3.4%; improved landings of cod and flatfish did not compensate for a decrease in redfish landings.

2. Cod

Total landings (M&Q) increased by 9.1% to 186,000 MT, 55.7% of the total. This was wholly due to greatly improved catches in the Gulf of St. Lawrence (Divs. 4R-S-T-Vn) which compensated for reduced catches on the Scotian Shelf (Divs. 4Vs-W-X) where an increase in Div. 4W was cancelled out by reduced catches in the other Divisions.

Newfoundland landings totalled over 59,000 MT, a 2.3% increase from 1982, mainly due to increased catches from Div. 4R in the Gulf of St. Lawrence.

3. Haddock

Nominal landings, almost wholly from the Scotian Shelf (Divs. 4Vs-W-X) decreased by 11.9% to about 34,000 MT. Catches from Div. 4X increased slightly but this did not meet a 41% reduction from Div. 4W.

Newfoundland landings were less than half the 1982 level.

4. Flatfish

Total nominal landings (M&Q) of combined flatfish species (except Atlantic halibut) remained at about the same level as in 1982. American plaice constituted about 50% of the total and increased by 6.6% over 1982. This, together with improved catches of witch flounder and unspecified flatfishes, more than counteracted decreases in all other flatfishes.

Newfoundland landings, mainly American plaice from Div. 4R, increased by 18.2% over 1982.

5. Redfish

Redfish landings (M&Q) continued the increase since 1980 with 1983 catches 27.3% above the previous year. The increase was almost wholly due to landings from the Gulf of St. Lawrence; landings from the Scotian Shelf (Divs. 4Vs-W-X) remained at about the same level as in 1982.

Newfoundland catches from Subarea 4 fell by almost 50% to 36,000 MT.

6. Pollock

Nominal landing figures for pollock showed a further decrease, falling by 18.6% from the 1982 level. Almost the whole catch was from the Scotian Shelf, 67% from Div. 4X alone. Catches fell over the whole of the Scotian Shelf except in Div. 4Vs where they were double the 1982 level.

7. Other Groundfish

Landings by M&Q were down by 25% from 1982, white hake remained the major constituent, forming 58% of the total "others" and increased by 10% from 1982 but cusk and unspecified groundfishes fell by 36% and 45%, respectively, to cancel out the increase.

8. Scallop (Placopecten magellanicus)

Landings for Subarea 4 totalled 17,645 MT round weight, a 20% decrease from 1982 landings. Landings from Subarea 5 totalled 22,833 MT round weight, a 36% decrease. This follows a 50% decline in landings between 1981 and 1982.

9. Herring

Total nominal catches (M&Q) were 109,000 MT, down 18.5% from 1982, mainly because of reduced landings from Divs. 4T and 4X although slight increases were shown by Divs. 4Vn and 4W.

Newfoundland landings from Div. 4R, increased by 20% to 11,000 MT.

10. Mackerel

Landings were down 53% at 7,500 MT. Decreases were shown in all Divisions but particularly in the southern Gulf of St. Lawrence where they fell by 74% from the 1982 level.

11. Tuna

No information available.

12. Swordfish

No information available.

13. Atlantic salmon

Nominal landings, including both commercial and sports fisheries, but excluding those from the west coast of Newfoundland (Div. 4R) were about 30% below those of 1982. Commercial catches in Quebec increased by 14% but those in the Maritimes decreased by 45%, and total angling catches were down 38%. A quota system is in effect in New Brunswick.

The Newfoundland set-net fishery in Div. 4R yielded 110 MT, about the same level as in 1982.

14. Squid (Illex illecebrosus)

The Canadian squid fishery on the Scotian Shelf (Div. 4V-W-X) and southern Gulf of St. Lawrence (Div. 4T) yielded 8 MT in 1983 compared with 1,149 MT in 1982. Overall 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 and 422 MT in 1980, 1981, 1982 and 1983 respectively.

B. Special Research Studies

1. Environmental Studies

(a) Hydrography. Investigations into temperature and salinity characteristics of the NAFO area, into climatic conditions during 1981 and 1982 and into year-to-year ocean climate characteristics were initiated.

Results of physical oceanographic measurements from the Magdalen Shallows in July 1981 show that surface nearshore waters off Nova Scotia were warmer and more saline than those in the Magdalen Shallows.

(b) Plankton Studies. Investigations were carried out into the relationships between larval recruitment and physical oceanography, and into local lobster larval production and migration in St. Margaret's Bay (Div. 4X).

Bioness sampling combined with observations by the multiple frequency acoustic system were carried out in the region of the Shelf break to determine biomass and exact vertical position of the various components of the zooplankton and micronekton communities relative to one another and to the other biological and physical features of the water column.

Intensive sampling of ichthyoplankton was conducted in May, July and October in the Browns Bank region (Div. 4X), correlated with CTD casts. Synoptic sampling was carried out in St. Margaret's Bay (Div. 4X) to investigate biological and physical couplings between the inshore and offshore regions.

(c) Benthic Studies. Bottom sampling surveys were carried out on the SW Scotian Shelf (Div. 4X) in order to calculate annual benthic production and to seek relationships between macrobenthic production and haddock production.

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, involving the new research vessel "Alfred Needler". The annual Canada/USSR silver hake survey covering much of Subareas 4 and 5 was run in November. A special series of surveys was completed in relation to the Div. 4X haddock ecology project. Three annual herring larval surveys were completed in the Bay of Fundy (Div. 4X).

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

(b) Cod. Studies of stock structure were continued, including analysis of tagging data and distribution of eggs and larvae from the Scotian Shelf Ichthyoplankton Program (SSIP). A study of microstructure in growth increments in otoliths from larval, juvenile and adult cod was initiated.

(c) Haddock. The Fish Ecology Project (FEP), a 5-year intensive study of Div. 4X life history of haddock, continued into its third year. Special research cruises were completed involving all stages of haddock development, including studies of behaviour feeding and otolith microstructure and the effects of water circulation on larval distribution. The third annual trawling survey of the Sable Island area was completed, and the survey extended to include Browns Bank.

In tagging experiments, 3,547 haddock were tagged and released.

(d) Pollock. A total of 10,055 fish were tagged in relation to work on stock structure.

(e) Herring. Two acoustic-trawling surveys were conducted, one in the Bay of Fundy (Div. 4X) and one in the Chedabucto Bay area (Div. 4W) for development of abundance estimates from acoustic signals. A total of 112 herring were tagged and released.

(f) Silver Hake. A study of silver hake stock structure and biology involving maturation, feeding behaviour and morphometrics was initiated.

(g) Hake. A comparative study of parasites of the hakes of the Scotian Shelf (Divs. 4V-W-X) was continued.

(h) Squid. Investigations into squid biology continued, with emphasis on egg, larval and juvenile stages, and including ecological and behavioural studies. A detailed environmental and biological program aimed at locating and studying all phases of the life history in various areas from the Scotian Shelf to the Sargasso Sea was carried out. Tagging experiments were attempted to study late-sumemr and fall migrations.

3. Gear and Selectivity Studies

Acoustic research centered on discrimination of fish from bottom echoes. Experimental acoustic surveys were carried out in conjunction with the winter herring fishing off Chedabucto Bay (Div. 4W) and the summer fishery in the Bay of Fundy (Div. 4X).

An acoustic fish detection system (ECOLOG) was calibrated against the standard groundfish survey trawl (Western IIA). Field results were interpreted in the light of tank experiments which indicate that target strengths of free-swimming fish provide useful estimates of individual fish size.

SUBAREAS 5 AND 6

A. Status of the Fisheries

1. Groundfish General

Total nominal landings (Maritimes and Quebec (M&Q)) decreased by 20% from the 1981 level to 25,815 MT, about 80% of which was from Georges Bank (Subdiv. 5Ze). Most of the decrease was due to cod landings which fell by 32% and constituted 58% of the total, but landings of pollock, haddock, and cusk, the other major contributors, also decreased while flatfish landings increased.

2. Cod

Landings decreased to 14,883 MT, 63% from Georges Bank (compared with 92% in 1982), the remainder from Div. 5Y.

3. Haddock

Landings were down 15% from 1982 at 5,216 MT.

4. Pollock

Nominal landings of pollock decreased by 18% to 4,376 MT with 75% of the catch from Subdiv. 5Ze.

5. Other Groundfish

Landings of flatfish more than doubled from 1982 to 404 MT, 70% from Georges Bank (Subdiv. 5Ze). Cusk landings fell by 48% to 60 MT.

6. Scallop (Placopecten magellanicus)

Landings totalled 22,833 MT round weight, a 20% decrease from 1982, continuing a steep decline since 1981.

7. Herring

No herring were landed from Subarea 5.

SEALS

A. Status of the Fisheries (Subareas 2-4)

1. Harp Seals

The total catch of harp seals including the Gulf and the Front was 53,225 individuals, 62.5% below the 1982 level, of which 23,407 (44%) were taken by landsmen, the remainder by ships. The "Front" yielded 43,816 seals, 82% of the Northwest Atlantic catch and 11% above the "Front's" share of the 1982 catch.

2. Hooded Seals

The total catch of hooded seals was 128, only 2% of the 1982 catch. All were taken on the "Front" and 65% by landsmen.

B. Special Research Studies (Subarea 4)

1. Harp Seals

From fisheries in the estuary of the St. Lawrence, studies were continued on age composition, reproductive rate and feeding intensity.

In March, from a helicopter, 3,560 young harp seals were tagged in the Gulf of St. Lawrence as part of a repeated capture-recapture experiment also conducted at the "Front."

2. Grey Seals

As in other years, the 1983 pup production on Sable Island was monitored, and the live escapement tagged. A total of 5,516 pups were produced and tagged escapement was 4702; the remainder died in the pre- or post-weaning period on the pupping grounds. During the January-February breeding season, observations were taken on returning branded adults, over 400 individually branded adults returned to Sable to breed. These are the survivors of cohorts marked as pups between 1969 and 1973. Collections of cod-worm were taken from the island's seals population at 6-week intervals throughout the year. A total of 246 seals of all ages were sampled. A study was initiated to examine weaning weight and survivorship during the first year of life. The 1983 work involved weighing 200 newly weaned seal pups with subsequent weighings at 6-week intervals. Preliminary results suggest that 11% of the production was of insufficient weight to survive the first year.

3. Harbour Seals

Total pup production and live escapement marking continued on Harbour seals on Sable Island. Approximately 400 pups were tagged and 36 Harbour seals of all ages were also sampled for cod-worm burden. This study is complimentary to the same study conducted on the resident Grey seals in the area.

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Canadian Research Report, 1983

Section III. Quebec and Gulf Regions

by

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This report describes activities by the Moncton, Quebec City, Rimouski and Arctic Biological Station in Ste-Anne-de-Bellevue Laboratories of the Fisheries Research Branch, as well as those of the Ocean Sciences and Surveys Quebec laboratory of Department of Fisheries and Oceans. Quebec Region is identified as QR and Gulf Region as GR.

A. STATUS OF FISHERIES

(see Section II(A) of SCS Doc. 84/VI/15 by J. S. Scott)

B. SPECIAL RESEARCH STUDIES

1. ENVIRONMENTAL STUDIES

a) Hydrographic studies

Data on physical oceanography were collected during the biology-oriented scientific cruises in the Gulf of St.Lawrence. (GR) Current and salinity - temperature/depth data were collected during joint oceanographic missions related to the study of spatial distribution of euphausiids in the Lower St.Lawrence Estuary. (QR)

b) Plankton studies

Phytoplankton

Data were collected in August for the study of the influence of short-term vertical variations on phytoplankton physiology (20 miles north-west of Iles-de-la-Madeleine). A similar survey was carried out in the Lower St.Lawrence Estuary in October. (QR)

Zooplankton

Zooplankton samples and high frequency acoustic data were collected in the Lower St.Lawrence Estuary in August and October for the study of spatial distribution of euphausiids. (QR)

Studies on feeding of lobster and snow crab larvae around the Magdalen Islands (4T) indicate that their diets overlap considerably, comprising mostly four species of copepods. (QR)

A mackerel egg survey was carried out in June in NAFO Divisions 4T and 4Vn. (QR)

The spatial distribution of fish larvae (principally redfish and cod) was surveyed in NAFO Divisions 4R and 4S in June. (GR)

c) Benthic studies

Continuation of a multi-year project on cycles of density of settlement of benthic organisms larvae on navigation buoys in the St.Lawrence estuary and north shore of Gulf (4ST). (QR)

First year of a long term monitoring of bottom water temperatures in the coastal zone of the St.Lawrence estuary, Gaspé peninsula and north shore of Gulf (4ST). (QR)

Field study of the effects of feeding by littoral fish on benthic communities in the Gaspé (4T). (QR)

2. BIOLOGICAL STUDIES

a) Common whelk

1983 was the second year of a four -year study on the biology of the common whelk, Buccinum undatum, around the Mingan Islands (4S). Emphasis was put on identifying factors determining abundance with depth, and measuring efficiency of commercial gear. (QR)

b) Snow crab

Commercial catch sampling and catch-effort statistics indicated a stability or decrease of snow crab in the southwestern Gulf of St.Lawrence. A new magnetic tagging technique showed that stock size in Area 1 (Cape Breton) was underestimated by the method of Leslie. Knowledge of the larval and juvenile stage of snow crab has increased following analysis (in 1983) of data collected in 1982. A classical method of immunological dosing of ectysterone was developped. It will allow studies of molting mechanisms. (QR)

Research was also directed to estimate the abundance and distribution of crabs in relation to depth and bottom type; to monitor the performance of the fishery in relation to size frequencies of catches, and catch per unit effort; and to understand the moulting cycle in relation to season and stock distribution. (GR)

Commercial port sampling was conducted during the season to monitor the size distribution of catches and log books were collected to obtain information on total catch, fishing effort and areas fished. (GR)

Research on the moulting cycle was initiated to determine molt stages using historical and physiological techniques. (GR)

c) Shrimp

Studies aimed at assessing stock status and providing management advice were carried out on Gulf shrimp. Biomass estimate for 1983 could not be used due to changes in vessel and gear thus causing difficulties in standardizing the 1983 results to those of previous years. Management advice was based on analysis of commercial catch-effort statistics and biological sampling. (QR)

d) Lobster

Following resumption of jurisdiction of fisheries by DFO a monitoring and research program for Quebec lobster fisheries was initiated. (QR)

Southern Gulf of St.Lawrence catches have remained very stable or have slightly increased over the past five years in the various fishing districts. On the basis of yield per recruit and egg per recruit models, assuming no stock density-mortality or stock density-growth dependence, and using low natural mortality rates, it can generally be stated that a slight increase in legal minimal size could generally be beneficial to the fishery on the long term. (GR)

Such assessments are now being conducted on a more detailed geographic scale in order to take in account geographic variations of growth and natural mortality as well as size specific habitat preferences of lobsters. A good knowledge of geographic location of fishing effort has been obtained from aerial surveys of the distributions of lobster trap buoys. Observations on stock density dependence of biological parameters and migrations are made by tagging (with conventional tags and ultrasonic tags), and by underwater monitoring throughout the year on small mapped areas of the fishing grounds (quadrats identified by a grid of ropes). (GR)

The behavior of lobsters entering traps was also monitored by underwater television in order to gain a better understanding of catchability and trap selectivity. (GR)

An attempt is being made to identify substocks of lobsters in the Gulf of St.Lawrence by electrophoretic discrimination of enzymes (population genetics approach). (GR)

e) Sea Scallop

Southern Gulf of St.Lawrence catches have shown drastic fluctuations during recent years. (GR)

Research was directed to mapping the resource using conventional survey methods (chartered commercial vessels), examining length frequency distributions in both commercial and survey catches and estimating biomass or density. (GR)

Growth studies were initiated in several areas of the southern Gulf and results in the Cape Tormentine area are ready for publication. (GR)

Studies on timing of scallop maturation on the major fishing grounds as well as the space time variations of biometrical parameters (eg. meat yield) were initiated. (GR)

Examination of landings and sea sampling data permitted a routine follow-up of the commercial fishery performance. (GR)

Exploratory fishing north of the Magdalen Islands showed that concentrations were not of commercial importance. Sampling of commercial catches was continued. (QR)

f) Cod

Catch sampling and compilation of commercial fishery data were carried out and summarized for an assessment of the status of 3Pn 4RS stock. A biomass survey was conducted in January 1984. Tagging studies to determine relationships between 2J3KL cod and 3Pn 4RS cod were initiated. Stomach samples were collected to study the impact of cod predation on other species. (QR)

In NAFO Divisions 4TVn, an assessment of the cod status was carried out. A four week research survey was conducted in September. In addition to information on abundance and age composition of the stock, cod stomachs were collected for a study of trophic relationships. (GR)

g) Greenland Halibut

Catch sampling and compilation of commercial fishery data were used to make an assessment of stock status. (QR)

h) Redfish

Data from research cruises and commercial fisheries were used in an assessment of the status of the redfish stock in areas 4R, 4S and 4T. (GR)

A recruitment survey was conducted with a research vessel in late June. Data on adult maturity stages and on the larval distribution of redfish were obtained. (GR)

A survey of the abundance and distribution of redfish and shrimp was conducted in September and October. (GR)

Redfish age determination by otoliths was compared with the results of scale reading in collaboration with a Federal Republic of Germany scientist. Various techniques were used to prepare otoliths. (GR)

Meristic data were used to study the discrimination between Sebastes mentella and Sebastes fasciatus. Results were compared with the results of biochemical separation studies conducted by a scientist in the Scotia-Fundy Region. (GR)

i) Herring

In Division 4T the biomass of fall spawners was assessed and catch projections were made. The spring spawners biomass could not be assessed. There are however indications that spring spawners mature biomass is very low. The low level of overall stock abundance was confirmed. Results from a questionnaire sent to inshore fishermen were used to derive abundance indices, fishing effort and partial recruitment. Observations on board commercial purse seiners were used as complementary sources of information. Studies on sexual maturity as a criterion to identify spawning stock were continued. Data collected during the 1981 and 1982 purse seine fishery were used to initiate a study on homogeneity of herring schools. (QR)

An acoustic survey in the overwintering area (subdivision 4Vn) yielded inconclusive results due to ice conditions. (GR)

A diver survey of a spring spawning bed was used to estimate the abundance of progenitors at that site. A comparison with known local catches provided an estimate of the local exploitation rate. (GR)

An aerial protographic survey of area 4T was used to estimate the abundance of anchored gillnets used in the spring fishery. (GR)

Meristic data of herring from several spawning sites were obtained for use in ongoing stock discrimination studies. (GR)

In Division 4R, commercial catch sampling and purchase slips data were used to assess stock status. (QR)

In Division 4S catch rates derived from purchase slips were used to follow abundance trends. (QR)

j) Mackerel

Monitoring of biological characteristics of the catch was continued. An egg survey was carried out in 4T and 4Vn. (QR)

k) Salmon

Sea sampling of post-smolts showed that it was feasible to tag post-smolts in salt water. (QR)

l) Eels

Results of studies on contamination by Mirex and BPC were published. Entry dates of elvers in estuaries of Quebec North Shore rivers was determined. Two hundreds adult eels were tagged to study growth. Adult eels were tracked by telemetry in the estuary of the Grand Calumet river. It indicated movements into the marine environment. (QR)

m) Other fish species

Sampling of commercial fisheries was used to monitor the status of stocks of bluefin tuna, white hake, and American plaice in NAFO Area 4T. For hake and plaice, this information was supplemented by data from a research survey in September. (GR)

n) Harp seals

From fisheries in the estuary of the St.Lawrence, studies were continued on age composition, reproductive rate and feeding intensity. (QR)

In March, from a helicopter, 3 560 young harp seals were tagged in the Gulf of St.Lawrence as part of a repeated capture-recapture experiment, also conducted at the Front ice in subareas 2 and 3. (QR)

o) Other mammals

A new program was initiated to study the causes of death of stranded mammals in the estuary and northern half of Gulf (4ST), and to measure their pollutant load. Emphasis was put on the endangered beluga, with ten carcasses fully autopsied by a pathologist. (QR)

3. GEAR AND SELECTIVITY STUDIES

a) Comparative fishing

During the September shrimp and redfish research survey, in order to permit comparisons with catch rates from previous surveys, parallel tows were made by the research vessel and a commercial vessel similar to the previous survey vessel. (QR and GR)

b) Automated fish measuring boards

Field trials were conducted with two types of measuring boards equipped for automatic data logging. One board has bar codes printed on it. A commercially-available bar code reader is used to read the fish length and record it on magnetic tape. The other type of board is more complex. Magnetically-sensitive sensors are embedded in the fibreglass board. A magnet wand is used to activate the sensor corresponding to the appropriate fish length. Other sensors may be used to record additional data, such as sex and maturity stage. A small computer with a thermal printer is included in the system, permitting the obtention of tabular or graphic data summaries. (GR)

c) Crab traps and photograpic survey

An in depth study allowed to quantify the difference in fishing power between conical crab traps and 1.5 m and 1.8 m rectangular traps. (QR)

Preliminary work indicated that photographic biomass survey will have to take into account the ability of crabs to hide in mud. (QR)

d) Herring gillnet fishing

An experimental gillnet fishing program was carried out in Division 4R. (QR)