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CANADIAN RESEARCH REPORT, 1981

NOTE: This report for 1982 was submitted to the NAFO Secretariat in four separate sections as follows:

SECTION I for the Newfoundland Region was reported by L. W. Coady, Department of Fisheries and Oceans, Research and Resource Services, P. O. Box 5667, St. John's, Newfoundland, A1C 5X1.

SECTION II for the Scotia-Fundy Region was reported by J. S. Scott, Department of Fisheries and Oceans, Marine Fish Division, Biological Station, St. Andrews, New Brunswick, E0G 2X0.

SECTION III for the Gulf Region was reported by H. Powles, Department of Fisheries and Oceans, Fisheries Research Branch, P. O. Box 15500, Quebec City, Quebec, G1K 7Y7; and J. Fréchette, Direction Générale des Pêches Maritimes du Québec, 2700 Rue Einstein, Ste. Foy, Quebec, G1P 3W8.

SECTION IV on Seals was prepared by J. S. Scott and L. W. Coady.

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 1981 totalled 4331 t.

2. Other species. No other species of fish or invertebrates were landed by Canada from these subareas in 1980.

B. SPECIAL RESEARCH STUDIES

1. Biological Studies

   a) Atlantic Salmon. Samples stratified to length were obtained from commercial plants at Godthab and Holsteinsborg, Greenland. Sample sizes were 2649 and 1921 respectively. The estimated proportions from scale character analysis of North American salmon in the samples were 56.2% at Godthab (of these 2.3% were of hatchery origin) and at Holsteinsborg, 63.7% (of these 3.4% were of hatchery origin).

   b) Biological observers were placed aboard twenty-two vessels with fishing activity in Subareas 0 and 1 during 1981. These were domestic and foreign vessels as well as foreign vessels licensed to fish the Canadian allocation of shrimp in Davis Strait.

SUBAREA 2

A. STATUS OF THE FISHERIES

1. Cod

Canadian landings were about 34,100 t, up somewhat from 30,900 t landed in 1980 and only 18,000 t landed in 1979. Inshore landings were down some 5,700 t from 1980, however, this was offset by an 8,900 t increase in offshore landings. Almost all landings occurred in Division 2J, with Division 2G and 2H landings amounting to only 400 t. Landings from the inshore sector amounted to 34% of the total landings from this Subarea.

2. Redfish

Canadian landings were 3,500 t, about the same as in 1980. These landings were almost entirely from Div. 2J. The dramatic decrease in landings in recent years from over 16,000 t landed in 1979 reflects a significant decrease in Canadian fishing effort expended in this fishery.

3. Other Groundfish

Canadian landings of the combined flatfish species were 1,000 t compared to 1,450 t landed in 1980. Greenland halibut landings amounted to 91% of these landings. Landings of other groundfish species were about 70 t in 1981.

4. Capelin

Landings of capelin remained at a low level.

5. Herring

Landings of herring remained at a low level.

6. Atlantic Salmon

Landings of Atlantic salmon in Subarea 2 during 1981 were 813 t; a decrease of 5% from 1980. This, however, represented the second highest reported salmon landings since 1952. The recreational harvest increased by 9% to 12 t.

7. Arctic Charr

Landings of Arctic charr in Subarea 2 during 1981 were 252 t; an increase of 24% from 1980. The increase was largely the result of the expansion of the commercial charr fishery into the Hebron and Saglek regions. These areas have been virtually unexploited since 1969. The expansion was necessitated owing to overfishing of several stocks in the immediate Nain area and the establishment of quotas on four bays.

8. Shrimp

The Subarea 2 shrimp fishery was subject to a total quota restriction of 6150 t in 1981, 4000 t of which were in the Hopedale Channel. Total landings in 1981 were approximately 3540 t.

B. SPECIAL RESEARCH STUDIES

1. Environmental Studies

a) Hydrographic studies. A large amount of data continue to be collected off Labrador as a result of oil-drilling activity. Most of this data will not be available in the public domain for several years, but as it becomes available, it will be archived in MEDS. This level of activity is expected to continue for at least one more year.

The NAFC research vessels occupied the Seal Island (Hamilton Bank) section in early August as a continuation of this time-series. As always, a temperature profile was made for every fishing station occupied for biomass estimates.

b) Other environmental studies. Sediments collected at various stations along the Labrador coast were found to contain low levels of hydrocarbon degrading bacteria. Analyses correlating bacterial numbers with sediment grain size, organic carbon and "total" bacterial populations will continue in 1982.

Codfish, a major commercial species in this area, was shown to have a suitable (mixed function oxidase) enzyme system for biological monitoring. This information will be of use for prospective monitoring at petroleum development sites offshore.

Offshore Labrador Biological Studies (OLABS 1981), an Industry/Community/Government undertaking designed to assist in the environmental assessment of oil and gas development off the coast of Labrador, collected biological and oceanographic data as part of a study to analyse the variability of codfish abundance inshore.

An analysis of the hydro discharge of freshwater from the Churchill River to Lake Melville to Groswater Bay, Labrador was completed. Winter discharge is 1600 m3s-1, which is almost 3 times the rate before the dams were built. Summer discharge is 2390 m3s-1, and was 32% greater than this before damming. Effects an inshore salinity and fisheries were examined.

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, detailed biological sampling was conducted, and several thousand cod tagged.

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 the research and commercial catches in order to monitor the age distribution of commercial catches and the population as a whole. Specimens were collected for parasite analysis.

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 1981 found more capelin than a survey in 1980.

e) Atlantic salmon. Atlantic salmon caught in the commercial fisheries were sampled for size and age distribution. Biological samples were also obtained from the recreational fishery on several rivers.

f) Arctic charr. In excess of 2500 samples were obtained for age determination of Arctic charr in commercial landings from eight northern Labrador fishing areas. Over 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.

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

g) Shrimp. A research vessel survey in July 1981 completed a biomass survey using a Sputnik 1600 shrimp trawl in the major areas where commercial concentrations occur. A total of 207 sets were made with the greatest catch (884 kg) being obtained in the Cartwright Channel. Catches in the Hopedale Channel ranged to 724 kg and were extremely lower in the Hawke Channel.

An intensive observer program on commercial vessels allowed the collection of much useful data from this resource.

h) Whales. An aerial survey of whales in the inshore and nearshore S.E. Labrador coast (to 55°00'N) was completed during August 1981. Assessments of humpback, fin, and pilot whale stocks are forthcoming.

SUBAREA 3

A. STATUS OF THE FISHERIES

1. Cod

Canadian landings were around 158,000 t, down somewhat from 168,000 t in 1980. Offshore landings showed an increase of 10,000 t, however, this difference was more than offset by a 19,500 t decrease in inshore landings. The most dramatic change was a decrease in Div. 3K inshore landings of almost 18,500 t. About 61% of the total landings in this Subarea were from the inshore sector of the fishery.

2. Redfish

There was a significant increase in Canadian landings from 17,200 t in 1980 to almost 29,600 t in 1981. The most dramatic increases occurred in Division 3K and 3L, that of 5,800 and 4,600 t respectively.

3. Flatfish

Total Canadian landings of the combined flatfish species were about 99,500 t, down slightly from 102,000 t in 1980. American plaice landings amounted to 58,300 t, an increase from 56,000 t landed in 1980. A 5,500 t decrease occurred in Div. 3N landings, however, this change was more

than offset by Division 3K and 3L increases of 2,450 and 5,450 t respectively. About 12% of all American plaice landings in this Subarea were from the inshore sector. Yellowtail landings were 14,200 t, up from 12,400 t in 1980. Greenland halibut landings were almost 23,000 t, down substantially from 31,000 t landed in 1980. Although offshore landings were up by about 2,000 t, inshore landings showed an almost 10,000 t decrease. Inshore landings amounted to 75% of the total Greenland halibut landings in this Subarea.

4. Other Groundfish

Canadian landings were around 6,700 t. This comprised mostly catfish (2,450 t), hake (1,500 t) and skate (900 t).

5. Capelin

Approximately 26,000 t of capelin were landed inshore in Div. 3L in 1981, compared to 14,000 t in 1980. Landings in other divisions in Subarea 3 were low. The inshore catches were registered 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 10,300 t and 600 t from southern Newfoundland (Div. 3P). These landings represent a decline of 18% for Div. 3KL and 70% for Div. 3P from the 1980 catch levels. These declines were a result of quota reductions in 1981 which reflected the poor recruitment pattern currently being observed in SA 3 herring stocks.

7. Mackerel

Mackerel landings in SA 3 were 6,600 t in 1981, an increase of 500 t from 1980.

8. Squid

Total catch of squid in 1981 was 14,875 mt (preliminary data) which was a substantial drop from 32,420 mt in 1980. Early season catch rates and fishing success on the southern Grand Bank indicated relatively high abundance but it appears that availability in the inshore area was generally low due possibly to unusual hydrographic conditions.

9. Atlantic salmon

Landings were about 1006 t in the commercial fishery and 65 t in the recreational fishery. There were near record counts of adult salmon on seven fishways which indicated above average spawning escapements throughout insular Newfoundland.

B. SPECIAL RESEARCH STUDIES

1. Environmental Studies

a) Hydrographic studies. Extensive oceanographic work was conducted in SA3 in 1980, including numerous current meter, satellite-tracked drifters, and CTD observations. Most of the standard sections were occupied and some, such as the 47oN line (Flemish Cap) were occupied repeatedly. Table 1 lists the sections occupied by the Northwest Atlantic Fisheries Centre.

As part of the Flemish Cap experiment, oceanographic stations on the grid and associated sections were occupied in February, May, June and July.

Table 1. Oceanographic sections occupied by NAFC (Nfld.) in 1981.

Section	Date	Ship	Stns.	Notes
Flemish Cap (47°00'N)	Jan 05-07/81	GADUS 45	17	17 Knudsen casts 7 stns. with Bongos, nutrients and chlorophyll
	Jan 24-26/81	GADUS 45	17	Knudsen casts
	April 25-May 1/81	GADUS 50	17	CTD
	July 30-Aug 1/81	NFLD. HAWK 002	16	16 CTD casts 5 with Bongos

Table 1 (cont'd)

Section	Date	Ship	Stns.	Notes
Flemish Cap (Grid) (46°40'N)	Aug 2/81	NFLD HAWK 002	4	CTD, Bongos
(47°20'N)	Aug 2-3/81	NFLD HAWK 002	5	CTD, Bongos
(47°40'N)	Aug 3/81	NFLD HAWK 002	3	CTD, Bongos
(48°00'N)	Aug 4/81	NFLD HAWK 002	2	CTD, Bongos
(48°20'N)	Aug 4/81	NFLD HAWK 002	1	CTD, Bongos
Flemish Cap (Grid)				
(44°00'W)	May 8-9/81	GADUS 50	6	CTD, Bongos, Nutrients, Chlorophyll
	May 22-23/81	GADUS 51	7	CTD, Bongos, Nutrients, Chlorophyll
	June 26-27/81	NFLD HAWK 001	7	CTD, Bongos, Nutrients, Chlorophyll
(44°30'W)	May 07-08/81	GADUS 50	7	CTD, Bongos, Nutrients, Chlorophyll
	May 23/81	GADUS 51	7	CTD, Nutrients, Bongos, Chlorophyll
	June 29-30/81	PANDORA 024	3	CTD, Bongos, Nutrients, Chlorophyll
	June 27/81	NFLD HAWK 001	4	CTD, Bongos, Nutrients, Chlorophyll
Flemish Cap (Grid) (45°00'W)	Jan 22-23/81	GADUS 45	9	Knudsen casts
	May 6-7/81	GADUS 50	8	CTD, Bongos, Chlorophyll, Nutrients
	May 9/81	GADUS 50	1	CTD, Bongos, Nutrients, Chlorophyll
	May 24/81	GADUS 51	7	CTD, Bongo, Chlorophyll, Nutrients
	May 20-22/81	GADUS 51	10	CTD, Midwater Trawl Sets
	June 28-29/81	PANDORA 024	9	CTD, Bongos, Nutrients, Chlorophyll
	June 30/81	NFLD HAWK 001	3	CTD, Bongo, Nutrients, Chlorophyll
(45°30'W)	May 4-5/81	GADUS 50	7	CTD, Bongos, Nutrients, Chlorophyll
	May 9/81	GADUS 50	1	CTD, Bongo, Chlorophyll, Nutrients
	May 24-25/81	GADUS 51	7	CTD, Bongos, Nutrients, Chlorophyll
	June 28/81	PANDORA 024	1	CTD
	June 29-30/81	NFLD HAWK 001	6	CTD, Bongos, Nutrients, Chlorophyll

Table 1 (cont'd)

Section	Date	Ship	Stns.	Notes
(46°00W')	May 3-4/81	GADUS 50	7	CTD, Bongos, Nutrients, Chlorophyll
	May 9-10/81	GADUS 50	2	CTD, Bongo, Chlorophyll, Nutrients
	May 25-26/81	GADUS 51	7	CTD, Bongos, Nutrients, Chlorophyll
	June 27/81	PANDORA 024	2	CTD, Bongo, Nutrients, Chlorophyll
	June 28-29/81	NFLD HAWK 001	5	CTD, Bongo, Nutrients, Chlorophyll
Flemish Cap (Grid) (46°30'W)	May 2-3/81	GADUS 50	7	CTD, Bongos, Nutrients, Chlorophyll
	May 26-27/81	GADUS 51	7	CTD, Bongos, Nutrients, Chlorophyll
	June 26-27/81	PANDORA 024	8	CTD Bongos, Nutrients Chlorophyll
Flemish Cap Star Study (47°20'N)	July 1/81	PANDORA 024	9	CTD, Bongos, Nutrients, Chlorophyll
	July 3/81	PANDORA 024	9	CTD, Bongos, Nutrients, Chlorophyll
	July 5/81	PANDORA 024	7	CTD, Bongo, Nutrients, Chlorophyll
(45°30'W)	June 30-July 7/81	NFLD HAWK 001	9	CTD, Bongos, Nutrients, Chlorophyll
	July 2-3/81	NFLD HAWK 001	9	CTD, Bongos, Nutrients, Chlorophyll
	July 4-5/81	NFLD HAWK 001	9	CTD, Bongos, Nutrients, Chlorophyll
Star-Diagonal NE-SW				
47°40'N; 45°00'W	July 1/81	PANDORA 024	9	CTD, Bongos, Nutrients,
47°35'N; 45°07'W	July 3-5/81	PANDORA 024	9	Chlorophyll
47°30'N; 45°15'W	July 6/81	NFLD HAWK 001	9	
47°25'N; 45°23'W				
47°20'N; 45°30.5'W				
47°15'N; 45°37.5'W				
47°10'N; 45°45'W				
47°05'N; 45°52'W				
47°00'N; 46°00'W				
NW-SE				
47°40'N; 46°00'W	July 1-2/81	NFLD HAWK 001	9	CTD, Bongos, Chlorophyll
47°35'N; 45°52.5'W	July 3-4/81	NFLD HAWK 001	9	Chlorophyll
47°30'N; 45°45'W	July 5-6/81	NFLD HAWK 001	9	
47°25'N; 45°37.5'W				
47°20'N; 47°30'W				
47°15'N; 45°22.5W				
47°10'N; 45°15'W				
47°00'N; 45°00'W				

Table 1 (cont'd)

Section	Date	Ship	Stns.	Notes
Flemish Cap 47°20'N; 45°30'W	July 7/81	NFLD HAWK 001	5	XBT, Plankton (i.e. Bongo Vertical Series)
Carson Canyon	May 16-17/81	GADUS 51	14	CTD, Shrimp Trawl Sets
Southeast Shoal				
(45°05'N)	May 17-18/81	GADUS 51	9	CTD, Bongos, Nutrients, Chlorophyll
(44°55'N)	May 18-19	GADUS 51	9	CTD, Bongos, Nutrients, Chlorophyll
(44°45'N)	May 19/81	GADUS 51	10	CTD, Bongos, Nutrients, Chlorophyll
Seal Island Line	March 23/81	GADUS 48	1	Knudsen Cast
Bonavista Line (NE-SW)	August 5/81	NFLD HAWK 002	12	CTD
White Bay Line	Aug 6-8/81	NFLD HAWK 002	17	14 CTD, 3 XBT
Lake Melville (Labrador)	Aug 19-21/81	BURIN BAY 001	9	Knudsen Casts

b) Plankton Studies. On the Grand Bank in July, a study was made of biological and physical oceanographic characteristics of the boundary between Southeast Shoal waters and the Labrador Current. Transects across the front were run for plankton, icthyoplankton chlorophyll, nutrients and with a CTD. Midwater trawlings to characterize the pelagic ichthyofauna communities of the region were made, extending into deep water.

The Flemish Cap grid was occupied to collect plankton and ichthyoplankton on three occasions, May to July.

2. Biological Studies

a) Cod. Sampling of the landings of the commercial fishery both inshore and offshore was continued in 1980. By means of 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. Several thousand cod were tagged.

b) Redfish. Several research cruises throughout Subarea 3 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. Again in 1981 line surveys were conducted in Div. 3LN due to the irregular bottom. Specimens were collected for parasite analysis.

c) Flatfish. Distribution and abundance of flatfish were studied during random stratified surveys of Subarea 3. Information from these surveys additionally provided information on year-class strength of pre-recruited flatfish, especially American plaice and yellowtail on the Grand Bank (NAFO 3LNO). These surveys are also a major source of information for continued biological studies on the various flatfish species.

Research was completed on stock delineation of witch flounder using a new multivariate analysis method. Research was continued on stock delineation problems in Greenland halibut.

A juvenile flatfish survey was carried out on the southern half of the Grand Bank (NAFO Div. 3N and 30) to study the abundance and distribution of juvenile yellowtail, plaice, and witch flounder. Additionally, juvenile flatfish distribution in Hermitage Bay (NAFO Subdivision 3Ps) was surveyed.

d) Capelin. An acoustic survey in Div. 3LNO in June 1981 detected good concentrations of juveniles in Div. 3L and signs of improving stock status in Div. 3NO. A survey for pre-recruit capelin was conducted in October 1981.

e) Herring. Surveys to determine distribution and abundance of herring larvae in Fortune Bay (Subdiv. 3Ps) were carried out in June, August, September, October, November and February. Overall abundance appeared very low. Experiments on diurnal catchability of larvae were carried out and environmental data were collected during each survey. The goal of the project is to determine at which stage in the early life history we can reliably predict recruitment of a particular year-class.

f) Squid. In February-March a survey was conducted toward studying the distribution of larval and juvenile squid in the Gulf Stream. From a pre-recruit survey in June on the Grand Bank a predictive index of inshore abundance was determined. Inshore catch effort and CPUE were collected throughout the season. Samples were taken from the commercial catch at regular intervals to study changes in size, sex composition and maturity. Water temperature was monitored at Holyrood and the tagging program was intensified.

g) Atlantic salmon. Two experimental rivers were initiated in 1981 to uncover stock-recruitment relationships. A weekly survey of 46 commercial fishermen gave accurate estimates of catch, effort and local sales.

In May-June, 1981, 76 adult Atlantic salmon were tagged along the coast of Newfoundland from Bonavista Bay to Notre Dame Bay from the research vessel "Shamook". In total , 14 fish or 18.4% of those tagged were recaptured by anglers in Miramichi River, New Brunswick and the remainder by commercial fishermen from Conception Bay to Cape St. Anthony, Newfoundland.

In June-July, 1981, 158 adult Atlantic salmon were tagged in the Bay of Exploits, Newfoundland. In total, 69 fish or 44% of those tagged were recaptured. Of these recaptures, 28 were caught at the Bishops Falls fishway on the Exploits River, 13 were angled by fishermen on the Exploits River, 21 were recaptured by commercial fishermen in Bay of Exploits and 7 angled on other rivers in Bay of Exploits.

h) Whales. An aerial survey of whales in the inshore and nearshore eastern Newfoundland area (to as far south as 47o48'N) was completed during July and August 1981. Assessments of humpback, fin and pilot whale stocks are forthcoming.

A census of whales on the Grand Bank during June 1981 was accomplished using the research vessel "Gadus Atlantica" (during a research cruise for capelin). Assessments of humpback and fin whales in this area are forthcoming.

i) Sampling of foreign and Canadian offshore catches.

A total of 5409 samples representing 1,321,103 lengths and 15,096 ages were taken from the catches of foreign and Canadian offshore fisheries as follows:

Species	Samples	Lengths	Ages	Meas.
Cod	1,130	244,067	9,270	
Shrimp	2,946	871,754	-	
Plaice	362	77,890	102	
Witch	75	13,261	1,238	
Yellowtail	62	13,387	-	
Turbot	203	37,497	1,598	
Redfish	79	15,607	744	
White hake	1	242	-	
Pollock	6	537	5	
Haddock	12	2,654	-	
Roundnose Grenadier	110	21,505	82	
Porbeagle	33	-	-	1984
Blue Hake	379	20,147	2057	
Blue Shark	1	-	-	6
Spiny Dogfish	1	-	-	8
Yellowfin Tuna	1	-	-	1
Herring	8	556	-	-

About *22,172 sets were observed with about *7312 observed days fished. Percent coverage on foreign was 77%; Canadian 25% (*above figures include Canadian and foreign vessels).

SUBAREA 4

A. STATUS OF THE FISHERIES

1. Cod

Newfoundland landings totalled about 56,000 t, down from 61,700 t landed in 1980. Div. 4R landings amounted to 87% of the total cod landings in this Subarea. Landings from the offshore sector were up by 2,200 t over 1980 landings, however, this increase was offset by a 7,900 t decrease in inshore landings.

2. Haddock

Newfoundland landings were around 5,800 t, up substantially from 1,950 t landed in 1980 and only 500 t in 1979. About 90% of these landings were from Div. 4W.

3. Flatfish

Newfoundland landings were about 4,250 t down from 6,550 t in 1980. Most of this difference was due to decreased turbot and witch landings in this Subarea.

4. Redfish

Newfoundland landings totalled 5,400 t, up from 3,850 t landed in 1980. Landings from Subdiv. 4Vs and 4Vn amounted to 65% of the total landings, with Div. 4R landings amounting to 22%.

5. Other Groundfish

Newfoundland landings were 1,600 t, comprised mainly of pollock, catfish, skate and hake.

6. Herring

Herring landings from Div. 4R were 13,500 t in 1981.

7. Mackerel

Newfoundland mackerel landings in Div. 4R fell to less than 100 t in 1981.

8. Atlantic salmon

Landings were about 76 t in the commercial fishery and 32 t in the recreational fishery.

9. Iceland Scallop

Approximately 60% (1022 mt round) of total Newfoundland landings came from 4Ra. Landings from the northern Gulf fishery was 1022 mt (round).

B. SPECIAL RESEARCH STUDIES

1. Environmental studies

This area should be a major reservoir for pollutants originating in the industrial northeast and entering the region via atmospheric transport and the St. Lawrence River. Sediments have been collected at various offshore stations for mutagenicity-carcinogenicity analysis, and preliminary screening studies are planned for 1982.

2. Biological studies

a) Cod. Studies of the cod population in the eastern Gulf of St. Lawrence were continued in 1980 by means of sampling of the commercial fishery and through a research vessel survey.

b) Redfish. In August a survey was conducted in Div. 4RST to determine the distribution and abundance of small redfish. Otoliths were collected and applied to research length frequencies. Commercial frequencies were collected along with otoliths to gain information on the catch at age. Again in 1981 a hydroacoustic survey was conducted in Div. 4RS.

c) Atlantic salmon. Smolt and adult migrations were monitored in Western Arm Brook and Highlands River. A significant stock-recruitment relationship was developed in Western Arm Brook between egg deposition and recruits measured as smolts. Grilse harvest in Area 4R is predicted to be average in 1982.

Estimates of juvenile salmon production were made in representative types of habitat in the Highlands River. These will be related to production of smolt in 1982. In addition estimates were made of production and biomass of juvenile salmonids in other selected rivers. At the same time a number of physical, chemical and biological parameters were measured. A predictive model is being derived to estimate salmonid production, related to these factors.

d) Whales. An aerial survey of whale abundance was completed along the west coast of Newfoundland during summer 1981.

e) Iceland Scallop. The use of a systematic lattice sampling to obtain estimates of exploitable scallop biomass in the northern Gulf of St. Lawrence (4Ra) was investigated.

SUBAREA 5

A. STATUS OF THE FISHERIES

1. Groundfish

No landings occurred from this Subarea in 1981.

SUBAREAS 2, 3 and 4
A SPECIAL RESEARCH STUDIES

1. Biological studies

a) Stock segregation

Genetic analysis based on electrophoretic properties of phosphoglucomutase (an intermediary metabolic enzyme), indicated that the witch flounder (Glyptocephalus cynoglossus) populations found in the three subareas are heterogeneous while the turbot (Reinharditus hippoglossoides) populations are homogeneous. Studies on the biochemical properties of the enzyme, including pH optima, molecular weight, amino acid analysis and inhibitor effects, supported the hypothesis.

SECTION II. SCOTIA-FUNDY REGION

by

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Subarea 4

A. STATUS OF THE FISHERIES

1. Groundfish General

Total nominal catches (Maritimes and Quebec) increased by 9.5% from the 1980 level to 334,000 metric tons (MT). Increases were shown by all categories except flatfishes. Quotas were in effect for all major stocks, affecting haddock landings in particular.

Newfoundland landings totalled 73,000 MT, the same as for 1980.

2. Cod

Landings (Maritimes and Quebec) continued to increase, by 11.5% over the 1980 level, to 170,000 MT. This constituted 50% of total groundfish, a slight increase from 1980 (49%). Compared to the previous year, landings were up in all areas except 4R, where there was a 13% decrease; this was more than compensated for, in the Gulf of St. Lawrence, by the increases in the other Divisions.

Newfoundland landings totalled 56,000 MT, a 6% decrease from 1980. The decrease was attributable to reduced landings from both the Gulf of St. Lawrence (Divs. 4R-S-T) and the Scotian Shelf (Divs. 4V-W-X).

3. Haddock

Landings, almost wholly from the Scotian Shelf (Divs. 4V-W-X), increased by almost 8% over the 1980 level to about 45,000 MT (13% of total groundfish). The increase was mainly due to improved landings from Divs. 4X and 4W which compensated for slight reductions in the other Divisions.

Newfoundland landings increased approximately three times to about 5700 MT, almost all from Div. 4W.

4. Flatfish

Total nominal landings (Maritimes and Quebec) of combined flatfish species (except Atlantic halibut) decreased by 33% to 28,000 MT, 8% of total groundfish. Reduced landings were shown in all Divisions and all species except yellowtail and winter flounder. Greenland halibut landings decreased by 50% and "mixed flatfish" by 70%.

Newfoundland landings totalled about 6500 MT, the same as for 1980.

5. Redfish

Redfish landings continued to show a good recovery from the recent decline. Landings in 1981 were up 54% from 1980 at over 32,000 MT, most of the increase from the Gulf of St. Lawrence area (Divs. 4V-W-X, Subdiv. 4Vn).

Newfoundland catches also increased, by 41% to 5,400 MT.

6. Pollock

Pollock landings (Maritimes and Quebec) continued to rise, increasing by 18% over the 1980 level, to 35,000 MT, about 10% of total groundfish landings. As usual, almost the whole catch was from the Scotian Shelf (Divs. 4W-X, Subdiv. 4Vs) with 52% coming from the Browns Bank area (Div. 4X). There was a 40% decrease in catches from Subdiv. 4Vs but this was more than compensated for by an increase from Div. 4W where catches more than doubled to 15,000 MT, approaching the 4X figure. Landings from the Gulf of St. Lawrence (Divs. 4R-S-T) were negligible.

Newfoundland landings totalled 814 MT, about double the 1980 figure and almost wholly from Div. 4W.

7. Other Groundfish

Landings by Maritimes and Quebec (27,000 MT) and Newfoundland (500 MT) remained at about the 1980 levels. Catches on the Scotian Shelf (Divs. 4W-X, Subdiv. 4Vs) were up about 7% and from the Gulf of St. Lawrence (Divs. 4R-S-T) down about 10%. Common hake catches remained at 17,000 MT, constituting about 63% of "other groundfish." About 13,000 MT were from the southern Gulf of St. Lawrence (Div. 4T). Landings of cusk remained at about 4000 MT and wolffish at 2500 MT. Silver hake landings were negligible.

8. Sea Scallops (Placopecten magellanicus)

Landings totalled 17,964 MT round weight, a decrease of 25% from the 1980 level. Landings increased slightly in Northumberland Strait (Div. 4T) but decreased by 33% on the Scotian Shelf.

Newfoundland landings of Iceland scallops increased from the previous year by 65% to 1724 MT, all from Div. 4R.

9. Herring

Total nominal catches (Maritimes and Quebec) were 137,000 MT, a decrease of 3% from the 1980 level. Landings from Div. 4X were up about 7% at 89,007 MT, constituting 65% of the total catch. Landings from the central part of the Scotian Shelf (Div. 4W) increased by 76% to 22,000 MT. Landings from the southern Gulf of St. Lawrence (Div. 4T) and Sydney Bight (Subdiv. 4Vn) fell by 44% from the 1980 level, to 26,000 MT.

Newfoundland landings, wholly from the northeast Gulf of St. Lawrence (Div. 4R), were down 37% from 1980 at 13,000 MT.

10. Mackerel

Landings in 1981 (12,000 MT) were down 17% from the 1980 level. The decrease was mainly due to reduced landings from the southern Gulf of St. Lawrence (Div. 4T).

11. Tuna

Total Canadian landings of Atlantic bluefin tuna amounted to 425 MT in 1981, an increase from 324 MT reported in the previous year.

The trap net catch of bluefin in the St. Margaret's Bay area yielded 41 MT, a slight decrease from 47 MT reported in 1980 but still substantially lower than catches reported prior to 1979.

A new handgear was introduced into the rod and reel fishery in the Gulf of St. Lawrence in 1981. This fishery yielded 278 MT, a slight increase from 259 MT reported in the previous year. Catches in the Chaleur Bay area decreased substantially, from 83 MT in 1980 to 11 MT in 1981. Catches off Prince Edward Island increased from 155 to 219 MT and catches in the St. Georges Bay area increased from 21 MT in 1980 to 36 MT. Seasonal mean weights increased throughout the Gulf of St. Lawrence in 1981 and, unlike 1980, was consistent with the trend of annually increasing mean weight observed in the Canadian bluefin catch over the last decade.

12. Swordfish

The total nominal Canadian catch of swordfish in 1981 was estimated to be 561 MT, a substantial decrease from 1885 MT reported in the previous year. Of this total, 542 MT were taken by longline while the remainder was taken by other gear types, principally harpoon. A total of 413 MT was taken in Subarea 4. This decrease in landings was due to a lack of available markets.

13. Atlantic salmon

Total landings, including both commercial and sport fisheries, but excluding those from the Newfoundland fishery in the eastern Gulf of St. Lawrence (Div. 4R), were 403 MT, 10% below the 1980 landings. There was a slight increase in angling landings in Quebec but angling landings in the Maritimes and commercial landings in both areas declined.

The Newfoundland set net fishery in Div. 4R yielded 149 MT, a 15% increase from 1980.

The ban on commercial fishing in New Brunswick and the Gaspé was partially lifted, with imposition of a quota system for 1981.

14. Squid

The squid fishery on the Scotian Shelf and in the Gulf of St. Lawrence (Divs. 4T-V-W-X) yielded slightly reduced catches in 1981 (844 MT), falling to 96% of the 1980 level. The greatest reductions were on the Scotian Shelf in Divs. 4W-X where catches (774 MT) were about 89% of the 1980 level.

B. SPECIAL RESEARCH STUDIES

1. Environmental Studies

(a) Hydrography. Physical (temperature, salinity, density) and chemical (dissolved inorganic nutrients) determinations were made along transects on the Scotian Shelf, in the southern Gulf of St. Lawrence, and in the Bay of Fundy, in relation to investigations into plankton studies and to study water transport in the southern Gulf of St. Lawrence.

Analysis of large-scale physical mechanisms (winds, St. Lawrence River discharge, etc.) was initiated in relation to sea surface temperature. High correlation was found between salinity at a station off St. John's, Newfoundland and sea surface temperature on the eastern Scotian Shelf.

The Bay of Fundy Ecological Study completed its fifth consecutive year, including additional studies of (1) ice dynamics in Chignecto Bay, (2) production and export of Cumberland Basin salt marshes, and (3) physical, chemical and biological properties of intertidal sediments around the perimeter of Minas Basin.

(b) Plankton studies. Studies of zooplankton, phytoplankton, and micronekton were made in several areas, including the Shelf break, transects on the Scotian Shelf, and in the southern Gulf of St. Lawrence. Zooplankton and micronekton diurnal abundance and vertical distribution in association with temperature and salinity were carried out seasonally on the Shelf and off the Shelf break. A pump profiling system was used to profile vertical distribution of chlorophyll, zooplankton, temperature and light.

The Scotian Shelf Ichthyoplankton Program (SSIP) continued. A one-month survey in March-April was followed by field trials for refinement of gear in June and November.

Three larval herring survey cruises were carried out in the Bay of Fundy, including continued development of telemetry eqiupment for STD determination.

(c) Benthic studies. Results from experimental reciprocal transfer of three Mytilus edulis stock sources among three areas indicated that stock source has a highly significant effect on production and that both growth and mortality rates are affected. In order of importance, production is determined by site, stock, year of growth and year-class.

2. Biological Studies

(a) General. The annual groundfish research programme continued with three seasonal surveys (March, July, October) on the Scotian Shelf-Bay of Fundy (Divs. 4V-W-X) and one cruise (September) in the southern Gulf of St. Lawrence (Div. 4T). An annual fall (November) survey of juvenile silver hake on the Scotian Shelf was initiated and a juvenile gadoid exploratory survey carried out on the central Shelf (Div. 4W) in May.

Monitoring and biological sampling of commercial catches both at landing places and at sea (observer programme) continued.

Monitoring of incidence of pseudobranch tumors in cod and of the fungus Ichthyophonus hoferi in yellowtail flounder continued.

(b) Cod. Tagging experiments continued with a total of 10,377 released in the southern Gulf of St. Lawrence and Scotian Shelf (Divs. 4T-V-W-X).

Studies of reproductive physiology were continued. Food habits study utilized collections of 3000 stomachs from research cruises in Div. 4W-Vs. The contents are being analyzed for seasonal and geographic variation in cod diet.

Experiments on digestion rates of various prey species were completed.

(c) Haddock. Plotting of distribution of 0-group haddock on the Scotian Shelf in October was continued in relation to known spawning areas and stock delineation. A special survey of the Sable Island area (Div. 4W) revealed large concentrations of 0- and 1-group haddock in August. A study of the biological and environmental factors influencing haddock stocks was initiated.

(d) Pollock. In tagging experiments, a total of 8,032 young pollock were tagged and released in coastal areas around the Nova Scotia coast (Divs. 4W-X). Recoveries showed dispersion throughout Scotian Shelf and to northeast edge of Georges Bank (Div. 5Z).

(e) Herring. For the second year, distribution, numbers and lengths of herring gill nets in the coastal fishery in the southern Gulf of St. Lawrence were determined by aerial photography. Acoustic survey trials, based on distribution of commercial catches, were made to evaluate the herring stock off Chedabucto Bay (Div. 4W) (January), southwest Nova Scotia and the Bay of Fundy (Div. 4X) (July). A total of 29,103 herring were tagged and released in the Chedabucto Bay, southwest Nova Scotia, and Bay of Fundy areas (Divs. 4W-X).

(f) Redfish. Monitoring of the commercial fishery for redfish in the Gulf of St. Lawrence (Divs. 4R-S-T) continued.

(g) Silver hake. A Canada-U.S.S.R. cooperative survey of juvenile silver hake was completed, covering the whole Scotian Shelf (Divs. 4-Vs-W-X), in October-November. Special studies of juvenile vertical distribution were made in January. Standard gear and methodology have been adopted for the standard juvenile surveys.

(h) Bluefin tuna. A bluefin tuna age and growth study was extended to include juvenile bluefin and resulted in material covering assigned ages 0-31 years old. A tagged bluefin tuna was recaptured after almost 16 years at large. Analysis of the 36th vertebra, the only hard part obtained, is being conducted in conjunction with U.S. scientists in an attempt to validate the results of the ageing study.

Analysis of CPUE and size composition data from the Gulf of St. Lawrence bluefin fishery indicated the trend previously observed suggesting decreasing stock abundance continued in 1981; however, problems associated with coverage of the fishery, data quality, and comparability of the new gear type have precluded any firm conclusions.

(i) Swordfish. Analysis of material collected during the 1980 swordfish research survey continued throughout 1981, concentrating on studies of age determination, internal parasites, and stomach contents.

(j) Squid (Illex illecebrosus). Studies of biology, distribution and abundance continued, with emphasis on egg, larval and juvenile stages, including environmental conditions associated with geographic and diurnal distribution of larval/juvenile and adult squid, spawning behavior, growth, and food and feeding patterns. A detailed cooperative program with the U.S.S.R. was initiated for location of spawning stock, eggs, larvae, and juveniles of Illex as far south as the Sargasso Sea and into the slope water-Gulf stream complex.

3. Gear and Selectivity Studies

Field testing of acoustic survey equipment was carried out in conjunction with herring surveys. Diel vertical and horizontal distributions of juvenile herring were studied using both acoustic and photographic/television techniques with the Bottom Referencing Underwater Towed Instrument Vehicle (BRUTIV).

Subareas 5 and 6

A. STATUS OF THE FISHERIES

1. Groundfish General

Total nominal landings from Divs. 5Y-Z decreased by 14% from 1980 to about 21,672 MT, almost wholly from Georges Bank (Subdiv. 5Ze). Decreases were shown by all major species except cod.

2. Cod

Catches increased by 11% to 9107 MT with over 8500 MT from Georges Bank.

3. Haddock

Following the increase in landings from 1979-80, landings decreased by 40% to 6172 MT in 1981.

4. Pollock

Landings decreased by 28% to 4050 MT. About 85% of the catch was from the Georges Bank area, the remainder from the Gulf of Maine (Div. 5Y).

5. Other Groundfish

Catches of flatfish, mainly yellowtail flounder, American plaice, witch and winter flounder, fell by 63% from 1980, to 88 MT, about the 1979 level, virtually all from Georges Bank.

6. Sea Scallop (Palacopecten magellanicus)

Landings totalled 65,320 MT round weight, an increase of 50% from 1890. This partly reflected the fishing of newly recruited concentrations of small scallops.

7. Herring

No herring landings were reported from Subarea 5.

8. Swordfish

A total of 20 MT of swordfish was taken in Subarea 5 in 1981 by Canadian vessels, primarily by harpoon.

9. Bluefin Tuna

One vessel participated in a Canadian purse seine fishery for tuna in the Atlantic this year and landed 105 MT of small bluefin and 180 MT of skipjack.

SECTION III. GULF REGION

by

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The Department of Fisheries and Oceans reorganised its activities in Eastern Canada in 1981. The new Gulf Region is responsible for research and management in the Gulf of St. Lawrence (NAFO Subdivisions 4RST and 3Pn). This report describes activities of the Québec Laboratory and Arctic Biological Station of the Gulf Region. Other projects in the Gulf were carried out by the Scotia-Fundy and Newfoundland Regions and are described in their sections of this Research Report.

Special Research Studies listed in (B) below were carried out by the Quebec Laboratory and Arctic Biological Station of the Department of Fisheries and Oceans. Special Research Studies listed in (C) below were carried out by the Direction Générale des Pêches Maritimes du Québec.

A. STATUS OF THE FISHERIES

Presented in Section II - Scotia-Fundy Region.

B. SPECIAL RESEARCH STUDIES

1. Environmental Studies

a) Hydrographic studies.

Coastal water temperature monitoring was carried out at three stations at the Magdalen Islands from May to November.

b) Plankton Studies.

The study of interactions between larvae of St. Lawrence estuary pelagic species was completed. An intensive laboratory/field study of distribution, abundance and developmental dynamics of herring eggs and larvae was carried out in the coastal zone near Isle Verte in the St. Lawrence estuary.

Vertical distribution of lobster larvae was examined in relation to physical parameters at the Magdalen Islands.

c) Benthic Studies.

A project on structure and dynamics of coastal benthic communities of the north shore of the Gulf was undertaken in order to provide baseline information prior to hydroelectric development on rivers of this area. Quadrat transects, carried out by divers, were the major methods used; concurrently, responses of potential indicator organism (a sea urchin) to salinity changes were studied.

Benthic studies on the Magdalen Islands lagoons were completed and results are in analysis or submitted for publication.

e) Other.

Field sampling of fish communities of St. Lawrence estuary salt marshes was completed and results were analysed for publication and for assessment of impact of marsh alteration for agricultural purposes.

2. Biological Studies

a) Snow crab.

Analysis of available data showed a statistically significant inverse relationship between snow crab catches in the western Gulf of St. Lawrence and cod biomass 4-6 years previous, suggesting that cod abundance may affect crab recruitment through predation on young crabs. The relationship predicts declining crab catches over the next years due to recent increases in cod abundance.

Two survey cruises (spring and fall) in the western Gulf estimated crab abundance and, along with catch sampling throughout the fishery, provided biological information on the stock. Use of a small submarine for direct abundance assessment was attempted and showed enough promise to justify repeating this experiment. An intensive study of a small population (St. Lawrence estuary) provided data on the moult cycle.

b) Herring.

Research on and surveys of coastal fishery catch per unit effort were continued and, with analysis of other abundance indices and biological data, led to an assessment of stock status considerably more pessimistic than earlier assessments. Given the importance of assessing recruitment to a reduced population, a cruise aimed at developing methodology for assessing abundance of juveniles was carried out for the second year in the western Gulf. In the northern Gulf, three survey cruises covered 2,000 miles of transects but did not locate concentrations of herring. Catch and fishery sampling were intensified to provide information for stock assessments.

c) Capelin.

Two stock definition projects for Gulf of St. Lawrence capelin were carried out, one using multivariate analyses of meristic and morphometric data, the other isoelectric focalisation (a biochemical technique not previously used in this area). Catch sampling and fishery monitoring were carried out on purse seine and coastal fisheries. An acoustic survey of the Chaleur Bay area in spring revealed no capelin schools but a fall trawl survey in the northwestern Gulf yielded significant catches and this technique may be useful for following abundance trends.

d) Salmon.

Smolt surveys in estuaries and coastal waters of the northwestern Gulf were performed with the objective of describing dynamics of seaward movement of smolts.

e) Eel.

The upstream migration of elvers was intensively sampled in a northwestern Gulf river for baseline information on dynamics of this life history stage; however, at-sea sampling for elvers in the same area yielded no specimens. The causes of mass mortalities of adult eels in the fall fishery season in the St. Lawrence estuary were investigated.

f) Marine Mammals.

Cetacean studies were concentrated in the St. Lawrence estuary: periodic overflights were made from May to November for abundance estimation, with particular emphasis on the reduced beluga population. Strandings were sampled wherever possible for biological information and contaminants. Whale observer network supplied information on distribution of cetaceans in the Gulf.

Harp seal pup tagging was carried out out the Magdalen Islands during the winter hunt and intensive sampling of harp seals was conducted in the St. Lawrence estuary.

C. Special Research Studies

1. Environmental studies

Physical oceanographic data was collected during the regular scientific cruises in the Gulf of Saint Lawrence together with a number of tows for fish egg and larvae studies.

2. Biological studies by species

a) Redfish

A scientific survey cruise using a stratified random scheme was carried out in August and September of 1981 in 4 RST. The result show a clear evidence of a large mode of individuals between 9 and 11 cm. Work on age class determinations from otoliths reading is presently being persued.

b) Greenland halibut

Data obtained during the above mentioned cruise indicate a low abundance of year classes which will be recruited to the fishery in next few years. However individuals 2 to 3 years old were relatively abundant.

Results from a research cruise in the outer estuary of the Saint Lawrence in July 1981 showed a fairly good concentration of the species.

c) Herring

A larval sampling program was initiated in the lagoon of the Grande-Entrée in the northern part of the Magdalen Islands (4T). The study revealed that only a small quantity of larvae was present. A study of the herring fall spawn in the laminaria beds of the Chaleurs Bay was carried.

d) Northern prawn

Scientific data was collected from a regular survey cruise in the north-western part of the Gulf of Saint Lawrence and from a cruise in the outer part of the Saint Lawrence estuary. Results from the latter show that P. borealis is distributed at lesser depths (100-200 m) and mixed with another species (P. montagus). The minimum biomass was estimated to be 1 200 t.

e) Snow crab

A survey cruise was undertaken along the North shore (4S). The catch per unit effort was less in 1981 compared to 1980. A large number of pre-recruites was present. To study the snow crabs movements 3600 individuals were tagged. A sampling program on board fishing vessels was initiated using crab pots with small sized mesh.

f) Lobster

5 800 lobster were tagged on the Magdalen Islands (4T) after the end of the regular fishery season. Permanent tags were used in order to study movement, growth and mortality. A special study of the pleopodes of the lobster was carried out in order to study the molting frequency.

The lobster-laminaria relationship was studied in the Chaleurs Bay area (4T).

g) Scallops

A modified scallop drag was used to calculate the recruitment for 1982 on fishery grounds south of the Magdalen Islands.

3. Gear and selectivity studies

A Lofoten type bottom trawl used for rough grounds was tested on board a fishing trawl (18 m) for several weeks and was compared with a Yankee type trawl currently used by the Quebec fishermen. The two trawls were made of polypropylene (130 mm mesh). In comparison the Lofoten trawl gave a far better catch and with for less damage to the net.

In order to improve the selecting of lobster traps several trials were conducted using different escapement systems (for the non-commercial sized lobsters). Trials of steel lobsters traps were also carried out. These studies will continue in 1982.

A comparative study between a modified japonese (larger dimension than normally used) and the rectangular type crab pots were initiated.

The by-catch problem of the Quebec trawlers operating in the southern Gulf of St. Lawrence was looked into with particular emphasis on the small sized cod by-catch.

SECTION IV. SEALS

by

J. S. Scott and L. W. Coady

SUBAREAS 2, 3 AND 4

A. STATUS OF FISHERIES

The TAC for harp seals in 1981 remained at 170,000 animals for the "Front" and "Gulf" areas, plus 15,000 for Greenland, Labrador and the Canadian Arctic. Canada took 175,450, 8% higher than in 1979, of which 55,112 were taken by landsmen and the remainder by ships. The Front yielded 69% of the total Northwest Atlantic catch, about 4% lower than in 1980.

The total Canadian catch of hooded seals was 8,309, an increase of 13% over 1980, of which 90% were taken at the Front.

B. SPECIAL RESEARCH STUDIES

1. Harp Seals

a) Further development and analysis of a harp seal simulation model. In the past year a method was developed to estimate selectivities and correct for biases in hunted age samples used to calculate the 1967 initial age distribution for the model. Also new unbiased estimates of current pup production were calculated using long-term recoveries of the 1978-1980 marked cohorts. These estimates were used to establish current population status. The simulation model was then used to generate a maximum likelihood estimate of natural mortality (M = .098) with confidence limits of 0.08 and 0.12. The results of the analysis are being prepared for publication.

b) Age sampling of commercial harp seal catch. Approximately 1500 harp seal jaws were collected from all components of the hunt 1981 to determine the age composition of the catch. In addition, ages were determined for a sample of about 500 harp seal teeth collected from seals taken along the north shore of Quebec by personnel at the Arctic Biological Station.

c) Feeding habits of harp seals. This is an ongoing 4-year study to determine seasonal and yearly variation in species composition and size of food in the diet. In 1981, we analyzed about one third of approximately 500 harp seal stomachs collected between 1979 and 1981.

d) Changes in female condition during lactation and harp seal pup growth rates. Complete morphometric data were collected from 56 adult females and 68 pups to approximate known-age from birth to weaning. Post weaning growth was determined from collections at sea in April and May of more than 150 beaters.

e) Reproductive rates. Mean age at maturity, age-specific pregnancy rates and fertility rates were estimated from 120 and 232 reproductive samples collected from December to February 1980 and 1981, respectively. There was no significant difference between most recent published data and the 1980-81 estimates.

f) Tag returns from the 1977-80 mark-recapture experiments provided further estimates of pup production in that period.

2. Hooded Seals

a) Age sampling and population analysis of hooded seals. Female hooded seal age samples collected in 1979 (n = 430), 1980 (180) and 1981 (68) were analyzed and added to the catch-at-age data base. These new data were used in a preliminary re-evaluation of the status of the hooded seal population.

b) A total of 183 pups were tagged on 9-16 March 1981, using helicopter support.

3. Grey Seals

a) Total pup production on Sable Island was tagged as in previous years. Early ice formation in the Gulf of St. Lawrence resulted in lower tagged escapement in 1981 (2843) than in 1980 (3250). Mark-recapture data for the period 1977-80 was analyzed and indicated the northwest Atlantic grey seal stock was increasing at an average of 6.5% per annum.

4. Harbour Seals

a) Total live escapement of 366 harbour seal pups were marked on Sable Island. Recoveries show 0-group remains on Sable Island, with recoveries of 1-, 2-, and 3-year-olds in other areas. One 1+ sea seal was recovered from New Jersey, U.S.A.