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ICNAF Subareas 2, 3, 4, and 5

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Section I. Subareas 2 and 3

by

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The following Laboratories of the Fisheries and Marine Service of the Department of Environment conducted research in Subareas 2 and 3 in 1973: Biological Station, St. John's, Newfoundland; Arctic Biological Station, Ste. Anne de Bellevue, Quebec; Marine Ecology Laboratory and Atlantic Oceanographic Laboratory, Dartmouth, Nova Scotia. Harp and Hood seals in Subareas 2 and 3 are dealt with in a later section.

Subarea 2

A. STATUS OF THE FISHERIES

1. Cod

The Labrador coastal fishery improved substantially over 1972 (4591 tons in 1973 versus 1729 tons in 1972) but catches remained much lower than in the 1960's. A small catch of 117 tons was taken offshore.

2. Salmon

The coastal fishery yielded a catch of 579 tons, an increase from 1972, but approximately equal to the catch in 1971.

Other Species

Small catches of herring (441 tons) and mackerel (372 tons) were taken in coastal fisheries.

B. SPECIAL RESEARCH STUDIES

1. Environmental Studies

- a) Hydrography. The section off Seal Islands was occupied in early August. Though temperatures from surface to 10 metres were usually higher than the average of recent years, temperatures in the deeper layers were lower and the volume of water less than 0°C greater than the recent average. In general conditions were similar to the very cold conditions prevailing in 1972.
- b) Other Environmental Studies. Coastal navigational charting was carried out along the Labrador coast between Hopedale and Nain.

2. Biological Studies

- a) Cod. Monitoring of size and age composition in the coastal summer cod fishery was continued. The reduction in catch over the past 10 years is associated with reduction in the numbers of older fish available.
- b) Redfish. Three survey cruises were conducted by the chartered vessel Cape Farewell in Subareas 2 and 3 during the period June 15-August 13. Attempts to locate commercial concentrations of redfish over oceanic depths were unsuccessful.
- c) Atlantic Salmon. A total of 33 tags was returned from a summer tagging experiment on the Labrador coast; 94% of these were from Labrador and 6% from Newfoundland.

Subarea 3

A. STATUS OF THE FISHERIES

1. Cod

Total landings were 72.3 thousand tons, a decline from 1972. This was due largely to a continuing decline in the inshore cod catch.

2. Redfish

The redfish catch totalled 15.5 thousand tons, more than double the 1972 catch. Almost 10 thousand tons were taken in Division 3Ps.

3. Flounders

These remained the principal species taken by the Canadian trawl fishery in Subarea 3, and also form an increasingly important component of small boat coastal catches. Catches of American plaice totalled 51.5 thousand tons in 1973, about 2400 tons more than in 1972. Yellowtail flounder catches totalled 29,000 tons, an increase of about 2000 tons from 1972. The witch flounder catch of 11.7 thousand tons was about equivalent to that in 1972. Catches of Greenland halibut, mainly from coastal fisheries, were 6.9 thousand tons, a decline of 25% from 1972.

4. Herring

Herring catches continued the sharp decline of recent years, and in 1973 were 17.2 thousand tons (51.3 thousand tons in 1972 and 117.8 thousand tons in 1971). This decline is associated with poor recruitment to the SW Newfoundland herring stock.

5. Mackerel

Mackerel catches in coastal fisheries increased from 1554 tons in 1972 to 2335 tons in 1973.

6. Atlantic Salmon

The commercial fishery is almost entirely by set gillnets along the shore. The catch in 1973 was 1276 tons, an increase from 1971 (891 tons) and 1972 (793 tons).

7. Capelin

The capelin catch of 6274 tons included for the first time an amount (2304 tons) from the offshore area.

B. SPECIAL RESEARCH STUDIES

1. Environmental Studies

- a) Hydrography. The usual standard hydrographic sections were occupied in July-August. As in Subarea 2 water temperatures were lower than normal in the deeper layers, and were generally similar to the cold conditions prevailing in 1972. Over the Grand Bank the volume of water with temperatures less than 0°C was the greatest recorded in over 20 years of observations in the July-August period.

In cooperation with the IGOSS BATHY project, temperature data were collected from ships of opportunity and charts of sea surface temperature were prepared on a regular basis.

- b) Other Environmental Studies. Coastal and offshore navigational and resource charting was carried out around coastal Newfoundland, and offshore in Division 3K. Surface oil tows were made during cruises of all ships operated from the Bedford Institute of Oceanography, and analysed for particulate petroleum.

2. Biological Studies

- a) Cod. Biological sampling of coastal and offshore commercial catches was supplemented by research vessel surveys to obtain data for stock inventory and assessment. In research vessel surveys on the Grand Bank in April-May the 1968 year-class made up 24% of the catch in Division 3N and 19% of the catch in Division 3O. The 1970 year-class appears to have experienced poor survival. Overall, a substantial decline in cod abundance is indicated between 1971 and 1973, though this may be partly due to distribution of cod in water deeper than the survey strata because of unusually cold conditions. In Division 3Ps the 1968 and 1969 year-classes were of similar abundance and accounted for 44% of the catch. The numbers of young fish increased relative to the 1972 survey while total estimated weight declined.

Catch per haul in Division 3Ps cod traps increased to 1180 Kg (as compared to 682 Kg in 1972), and was thus closer to the 1970-71 levels.

- b) Haddock. Analysis of catch and effort statistics for the period 1954-72 in Divisions 3NO revealed that peak catches in 1957 and 1961 were associated with high effort. Catch and effort have both been very low since the mid-1960's, and surveys in 1972 in Divisions 3N, 3O and 3Ps indicate that abundance is still very low.
- c) Flatfishes. Commercial sampling and research vessel surveys were continued, with increased emphasis in Division 3K.

Analysis of data collected from 1955 to 1972 in Divisions 3L and 3N revealed an increase in size at age and a decrease in size at maturity of American plaice. Analysis of stomach contents showed that, while capelin and lance contributed the greatest volume, benthic invertebrates occurred most frequently.

Groundfish surveys on the Grand Bank indicated declines in abundance of plaice and yellowtail from 1971 to 1973, though the differences were not statistically significant.

Research on witch flounder was reactivated and analysis of past collections begun. Estimates of total mortality for the period 1949-52 were 0.2 to 0.4. 796 witch flounder were tagged in Division 3K. At the same time 480 Greenland halibut were also tagged.

- d) Redfish. Preliminary stock assessments were conducted for redfish in Subarea 3. A survey, using bottom and off-bottom trawls, was conducted in the period from June 15 to August 13, mainly in Division 3K. Additional bottom fishing surveys were carried out in Divisions 3K, 3L and 3P.
- e) Herring. The age structure of the reduced population of herring fished along the southwest coast of Newfoundland altered in 1972-73, due to recruitment of spring spawners of the 1968 year-class. There was no comparable recruitment from the autumn spawning component.

In Fortune Bay on the Newfoundland south coast the herring are predominantly spring spawners, and since the early 1960's strong year-classes have recruited every 2 to 3 years, though stock sizes appear to have declined over the period 1958-73. The St. Mary's-Placentia Bay herring stock shows similarity to that in Fortune Bay in growth, stock composition and occurrence of strong year-classes. Both stocks support relatively small coastal fisheries.

- f) Mackerel. Increased abundance of mackerel in Subarea 3 is associated with strong year-classes produced in the late 1960's, especially 1967. Limited spawning of mackerel in the area is likely. Age composition and growth rates are similar to those of mackerel supporting the fishery in Subareas 5 and 6. It is likely that the fishery in these southern areas is dependent to some extent on the so-called "northern contingent" of mackerel.
- g) Capelin. Exploratory fishing was conducted in Divisions 3K, 3L and 3N, and biological sampling was carried out. In Division 3N the 1969 year-class was predominant among the males, while among the females this year-class dominated early in the fishery, but was later replaced by the 1970 year-class as the more dominant. Food items of capelin include copepods, amphipods, euphausiids, gastropods, larval fish and mysids.
- h) Atlantic Salmon. Tagging experiments were conducted at several localities along the Newfoundland coast. Analysis of material bearing on stock identification in the West Greenland fishery was continued and largely completed. Serum protein electrophoresis and analysis of scale pattern provide means of identifying European and North American components. Commercial sampling from the coastal fisheries was continued to determine seasonal changes in size and age composition from the various fisheries.
- i) Pink Salmon. Monitoring of runs from the Pacific transplant continued. In 1973 returns were very low (60 fish to the home river and 114 fish from commercial and sports fisheries, and other rivers).
- j) Squid (Illex). Staff of the Newfoundland Biological Station participated in an otter-trawl survey conducted by the French RV Cryos off southern Newfoundland and Nova Scotia.

SECTION II. SUBAREAS 4 and 5

by

J. S. Scott

Canadian researches in Subareas 4 and 5 on oceanography and fish stocks reported here were carried out by the St. Andrews Biological Station, Marine Ecology Laboratory (Dartmouth), St. John's Biological Station and the Arctic Biological Station (Ste. Anne de Bellevue) of the Fisheries and Marine Service, Department of the Environment, and by the Bedford Institute of Oceanography and Quebec Ministry of Industry and Commerce. Nominal landings data for 1973 were obtained from the Fisheries Intelligence Branch of the Fisheries and Marine Service. This report was prepared from submissions by many scientists engaged in research into problems of ICNAF interest. Harp and hood seals for Subareas 2, 3 and 4 combined are dealt with in Section III.

Subarea 4

A. STATUS OF THE FISHERIES

1. Groundfish General

Total landings (Maritimes and Quebec) from Subarea 4 increased by about 10% from 1972, up to about the 1971 level. Landings by Newfoundland from the Subarea increased by about 50%. The increases were due mainly to exceptionally high landings of redfish.

2. Cod

Landings by the Maritimes and Quebec (76,430 metric tons) were down 23% from 1972 and formed only 28% of total groundfish landings as against 39% in 1972. There was a 29% decrease in landings from the Gulf of St. Lawrence and north Cape Breton (Divs. 4R-S-T, Subdiv. 4Vn) from 1972 levels and a smaller decrease (14%) from the southern part of the Subarea (Divs. 4X-W, Subdiv. 4Vs).

Newfoundland landings mainly from the Gulf of St. Lawrence (4R-S-T) increased by 10% to 21,000 metric tons.

3. Haddock

Quota restrictions on the haddock stocks limited the landings but they showed a 3% increase from 1972 at 16,000 metric tons, reflecting improved recruitment to the Div. 4X stock. Landings from the small Cape Breton (Subdiv. 4Vn) fishery fell by 25% to about 265 metric tons.

4. Flatfish

Total landings (Maritimes and Quebec) were about 26,000 tons, a decrease of 6% from the 1972 level. This was due mainly to a 26% decline in American plaice landings (10,840 metric tons, mostly from Div. 4T and Subdiv. 4Vn) but witch and yellowtail landings also decreased, offsetting increases in winter flounder and "mixed flounder" landings. Atlantic halibut landings fell by 9%, continuing the decrease in recent years.

5. Redfish

Landings by Maritimes and Quebec increased by 38% and Newfoundland by 58% over 1972 levels. These increases reflect much greater effort being directed at the stocks consequent on diversion from other fisheries. The major contribution was from the Gulf of St. Lawrence (Divs. 4 R-S-T), from which landings increased by about 56% to almost 99,000 metric tons.

6. Pollock

Landings again increased in 1973, to about 25,000 metric tons, up 51% from 1972 and about twice the 1971 landings. This reflects improved markets and diversion of effort from cod and haddock fisheries. About 88% of landings were from Div. 4X.

7. Other groundfish

Landings increased by about 2% from 1972.

8. Scallops

Landings of sea scallops (Placopecten magellanicus) totalled 4,974 metric tons whole weight, a drop of 36% from 1972. Iceland scallop (Chlamys islandicus) landings from the northeastern part of the Gulf of St. Lawrence were 1,671 metric tons, 22% below 1972 landings.

9. Herring

Herring landings from Subarea 4 (excluding Div. 4 R-S) totalled about 149,000 metric tons, a decrease of 31% (about 70,000 tons) from 1972. The loss was mainly due to a 58% reduction in landings from the southern Gulf of St. Lawrence (Div. 4T), from 53,000 tons in 1972 to 22,000 tons in 1973, a 49% (9,000 tons) decrease from Div. 4W, and a 24% (32,000 tons) decrease from 4X from 1972. In contrast, landings from the northeast Scotian Shelf (4V) increased by about 17% (2,000 tons).

Newfoundland landings from Subarea 4, all from eastern Gulf of St. Lawrence (Div. 4R), were about 9,000 tons, only a slight reduction from the 1972 catch.

10. Swordfish

There were no Canadian landings from Subarea 4.

11. Mackerel

There was a general increase of 35% to about 18,600 metric tons in mackerel landings from Subarea 4 (excluding Div. 4R) from 1972 level. About 50% of the catch was taken in Div. 4T.

12. Tuna

Total landings of tuna in 1973 were approximately 8,000 metric tons. The 60% increase from 1972 was due mainly to diversion of landings by Canadian vessels from foreign to Canadian ports. Commercial bluefin tuna landings amounted to about 800 metric tons, almost four times the 1972 figure. Sports fishing yielded 215 metric tons, 18% below the 1972 level.

13. Atlantic salmon

The total catch for Subarea 4, except 4R which is reported with Subareas 2 and 3, was 324 metric tons, 6% higher than in 1972. A continuing ban on commercial salmon fishing in New Brunswick and the Gaspé peninsula (4T) resulted in only a 5% increase in commercial catches to 143 metric tons and the angling catch increased by about 7% to 177 metric tons.

B. SPECIAL RESEARCH STUDIES

1. Environmental Studies

a) Hydrography. A continuing survey of the St. Lawrence Estuary was started in 1973. Coastal charting was carried out on the eastern shore of Nova Scotia and several local surveys carried out in the Gulf of St. Lawrence.

Studies continued on distribution of trace elements, dissolved and particulate organic carbon and nutrients in the Gulf of St. Lawrence.

Moored current meters and temperature recorders were used in studies of the generation of internal waves on the sloping bottom at the edge of the continental shelf.

Physical oceanographic surveys were carried out in the Gulf of St. Lawrence (T-S) and St. Lawrence Estuary (T-S and current measurements) and monitoring (T-S) of the Halifax Section and Cabot Strait continued.

Coastal inlet studies were conducted in Bras d'Or lakes and Miramichi Bay.

Temperature profiles were recorded in Jacques Cartier Strait (Div. 4S) (June and September-October) and round the Magdalen Islands (4T).

b) Plankton Studies

Horizontal transects to determine chlorophyll concentration and temperature were carried out in an effort to relate spatial heterogeneity of phytoplankton with that in the physical environment (4T, S).

Acoustic surveys were made to determine distribution of concentrations of euphausiids (4T, S).

Preliminary studies were carried out on inshore distribution, growth and succession of fish larvae in relation to prey size, abundance and distribution (4T).

Experiments were made on plankton ecology and physiology and surface film and immediate subsurface water sampled for non-living particulate material and bacterial flora in conjunction with quarterly (April, July, October) Halifax-Bermuda cruises.

c) Other Environmental Studies

Quarterly cruises between Halifax and Bermuda were continued to collect seasonal data of temperature, salinity, petroleum hydrocarbons, dissolved and particulate organic carbon.

Study of correlations between published long term hydrographic data and commercial fish catches in Subareas 4 and 5 continued.

2. Biological Studies

a) General

Annual groundfish surveys were carried out in Divs. 4X to 4T (July-August) and 4T (September) for assessment and monitoring of stocks, and associated biological studies. Herring larval surveys, including Canadian commitments to ICNAF, were carried out in the Bay of Fundy and Gulf of Maine (Divs. 4X, 5Y) (April, October, November, and December), Chedabucto Bay (4W) (June, August, September, October, November), and off Cape Breton (4W-V-T) (June).

Monitoring and biological sampling of commercial fleet landings continued. Special biological studies were continued on species as in previous years and new studies initiated on mackerel, redfish, pollock, silver hake and flatfishes.

Trials of combined acoustic and trawling surveys were carried out on the Scotian Shelf (Divs. 4Vs-W-X) for estimation of groundfish biomass and distribution.

Trawling surveys to investigate the biology, distribution and abundance of groundfish and shrimp were carried out in the Jacques Cartier Strait (Div. 4S). They included comparative fishing experiments with shrimp and Lofoten trawls and studies of effects of mesh selection on shrimp catches. Also in Div. 4S, exploratory fishing was carried out to locate beds of Iceland and Sea scallops.

b) Cod

Landings from the 4T-Vn migrating stock increased from 56,000 tons in 1971 to 66,000 tons in 1972 when the fishery concentrated on the strong 1968 year class as it entered the fishery at age 4. Exploitation rates remain at moderate levels and it is estimated that the stock can sustain landings of about 65,000 tons in the long term. Although mainly within Canadian limits it is subject to international fisheries on overwintering concentrations in Div. 4Vn.

More comprehensive sampling data from the Banquereau-Sable Island (Div. 4Vs-W) stock indicate that previous estimates of maximum yield per recruit and associated fishing mortality may be too high. Research vessel surveys indicate that recent year classes entering the fishery are below average and stock abundance should decline over the next few years.

Research vessel catches in the Jacques Cartier Strait (Div. 4S) in June-July consisted mainly of 5 and 6 year-old fish with best catches at bottom temperatures in the range -0.4 C to 1.0 C.

Tagging experiments on southwest Nova Scotia (Div. 4X) cod in 1969 and 1972 confirmed that there is little mixing between offshore and inshore stocks. A further tagging was carried out in the Bay of Fundy in May-June 1973 to investigate the possibility that cod from this area also belong to a local stock(s).

Virtual population analysis of the 4X offshore stock confirms results of catch-per-unit-effort analysis indicating that the stock is overexploited and has declined seriously in abundance. A fishing mortality rate of $F = 0.35$ (less than half recent rates) should maximize annual yield at 10-15,000 tons and ensure recovery of the stock, but with much reduced catches in the immediate future.

Measurements of gastric depletion in young cod indicated that swimming rate does not interfere with gastric emptying rate at swimming speeds which are likely to be encountered in nature.

Investigations into behaviour of cod in relation to trawling noise show that the mean range at which cod can detect trawling noise is about 3.2 km at 200Hz in summer and about 2.5 km at 125Hz in winter, in southern areas. Study of effects of ocean ambient noise levels on range of detection indicate that cod can detect approach of trawlers under all ocean ambient noise conditions. Use of ultrasonic telemetry techniques is being studied as a means of determining cod responses to trawling.

c) Haddock

Landings, abundance and recruitment indices for both Div. 4V-W and 4X stocks continue to decline. In Div. 4X the 1969 year class, predicted from research surveys to be stronger than those of immediately preceding years, entered the fishery in 1973. This resulted in increased abundance of recruited stock and increased catches up to quota level. Research surveys indicate that the 1971 year class may be comparable to that of 1969. Continued restrictions on fishing could result in a significant increase in adult stock abundance.

d) Flatfishes

A first assessment of the flatfish resources of the Scotian Shelf (Divs. 4V-W-X) was made, relying mainly on research vessel survey data.

For witch flounder (greysole) best estimates of total mortality are $Z = 0.55$ for males and $Z = 0.50$ for females. Assuming natural mortalities of $M = 0.20$ for males and $M = 0.15$ for females, fishing mortalities are close to those giving maximum yield per recruit for both sexes.

For American plaice estimates of total mortality in recent years are $Z = 0.65$ for males and $Z = 0.60$ for females. Assuming natural mortalities similar to those of adjacent plaice stocks, current values of F give 80-90% of maximum yield per recruit and further increases in F would result in decreasing catch rates.

For yellowtail fishing mortality has been high in recent years ($F = 0.95$) and have resulted in severe stock declines and high mortality rates. It appears that the stock cannot sustain yields as high as 6,000 tons.

American plaice samples from each of Divs. 5Y, 4X-W-Vs-Vn-T showed differences in diet and parasites, associated with fish size and locality. Results confirm that the Gulf of St. Lawrence (4T) stock is distinct from that of the Scotian Shelf (4X-W-V) and indicate that the latter includes several different groups.

e) Redfish

The Gulf of St. Lawrence (Divs. 4R-S-T) fishery continues to be heavily dependent on the 1956 and 1958 year classes with poor immediate prospects for recruitment. Modal fish lengths from the commercial fishery were 31 cm for males and 33 cm for females.

f) Herring

A total of 12,147 herring were tagged in the Grand Manan area of the Bay of Fundy (4X) in November-December 1973. Returns to date show movement to the northeast along the New Brunswick coast.

Length of 99,780 herring, and sex, maturity and ageing data and material from about 20,200 herring were taken for assessment purposes. Meristic and parasite numbers were recorded from about 5,000 fish for stock identification.

Various criteria for distinguishing spring and autumn spawning stocks in the Gulf of St. Lawrence (Div. 4T) were examined, including growth, otolith characteristics, fecundity, maturation and meristics.

Investigations continued into the question of larval retention and the ecology and survival of larvae in the Bay of Fundy over winter.

g) Mackerel

In addition to continuing studies of feeding and year-class frequencies, a program was initiated to obtain data on biological parameters such as growth, age at maturity, recruitment to adult stock and mortality rates. Lengths were measured of 20,170 fish and otoliths taken from 4,478 fish from the Gulf of Maine to the Gulf of St. Lawrence (Divs. 5Y to 4T).

Length frequencies of Gulf of St. Lawrence samples indicate that the 1967 year class was dominant, comprising over 40 per cent of the spawning population, but is not yet fully recruited.

A total of 1961 fish were tagged. Returns confirm movement of fish from Canadian waters to the New England coast and intermingling of the "northern" and "southern" contingents.

h) Tuna

The sport fishing catch of bluefin tuna fell to 215 metric tons, 18% below the 1972 catch. Of 742 fish caught only 16 were tagged and released, a result of development of a lucrative export market for large bluefin and consequent landing and sale of nearly all fish caught.

The tagging program for small bluefin continued with 156 fish tagged during a research cruise. Fourteen recoveries have been reported.

i) Atlantic salmon

Comparison of angling and counting fence returns indicate that the residual spawning stock of early run large salmon in the Miramichi River was negligible but there was a satisfactory escapement of grilse. The late run of large salmon and grilse was about the same level as for 1972, an improvement over previous years. Spawning by large salmon was less than 1/6 of the desirable level but grilse spawning has largely recovered from the low levels of the 1950's. Egg deposition levels indicate that abundance of large salmon is unlikely to improve before 1978.

Counts on the northwest Miramichi smolt run indicate that it was one of the smallest on record. Smolt tagging experiments were carried out to improve tagging survival rates and, in conjunction with chemical imprinting, to investigate homing behaviour.

Vertical movements of salmon in nature were investigated with use of depth telemetering transmitters. Preliminary results suggest that water temperature affects the swimming depths of salmon.

Effects of social competition (dominance), environmental temperature and genetics on smolt age, and of predation by brook trout in relation to territorial behaviour of young salmon, are being investigated.

3. Gear and Selectivity Studies

Engineering studies of bottom trawl behaviour continued and studies were initiated to extend the principles to mid-water trawl performance. The methodology is now available to predict the major factors controlling the dynamic forces of water on netting.

A gear selectivity study on Iceland scallop was carried out on the northern Gulf of St. Lawrence (Divs. 4R-S).

Subarea 5

A. STATUS OF THE FISHERIES

1. Cod

Landings increased by 28% from 1972 to almost 3,300 metric tons but were still only about 60% of the 1969 level.

2. Haddock

Landings (1,613 metric tons) showed a recovery to more than twice the 1972 level but were still well below those of 1971.

3. Sea scallop (Placopecten magellanicus)

Landings of sea scallops totalled 35,121 metric tons whole weight, a 1 - 2% increase over 1972. Sixty-six boats fished the northern and eastern edges of the bank and expended a greater effort in the Channel area. Hours fished on the bank increased by 1.5% over 1972.

In June 1973 an internal regulation was introduced prohibiting landing of meats which, on the average, exceed 60 units per pound, as a first step to meeting the 1972 ICNAF regulation of 40 units per pound (95 mm in shell diameter).

4. Herring

Landings from Subarea 5 were 25% lower than in 1972 at little more than 9,000 metric tons.

5. Tuna

The purse seine fishery off the New Jersey coast of the United States yielded 639 metric tons of small (less than 60 kgs) fish, almost 3 times the 1972 catch.

B. SPECIAL RESEARCH STUDIES

1. Biological Studies

a) Sea scallop. Research efforts were largely concentrated on sampling catches for individual meat sizes and attempting to improve methods of log record analysis. A model of the Georges Bank fishery is being developed which takes into account spatial variations in recruitment and fishing effort. Studies on performance of a modified scallop dredge were carried out on Georges Bank, together with comparative fishing of areas on the Northern Edge surveyed in previous years.

b) Tuna. Landings of small bluefin from the purse-seine fishery off the mid-Atlantic coast of the United States were examined for size (length) composition. Data from combined samples show four modes, at about 55, 75, 100 and 125 cms, representing the different year classes.

Seven recoveries were reported from the joint Canada-U.S. tagging program in 1971, bringing the total number of recoveries to 70(26%). Overall recovery rates from the two types of tags used ("H" and FTIA) were very similar (25% and 27.3%).

Analysis of recovery rates from the 1971 tagging indicated that mortality increased rapidly with length of time after tagging.

SECTION III. HARP AND HOOD SEALS

(Subareas 2, 3 and 4)

A. STATUS OF THE FISHERIES

Year	Area	Harp Seals			Hood Seals			All Seals
		Young	Older	Total	Young	Older	Total	
1972	Gulf	3,469	165	3,634	-	-	-	3,634
	Front	61,050	10,182	71,232	267	155	422	71,654
	Total	64,519	10,347	74,866	267	155	422	75,288
1973	Gulf	4,743	1,506	6,249	7	-	7	6,256
	Front	42,980	10,304	53,284	190	115	305	53,589
	Total	47,723	11,810	59,533	197	115	312	59,845

In 1973 the overall quota of harp seals remained at 120,000 for ships and the allowance for Canadian landmen in waters north to Cape Chidley, Labrador, at 30,000. Canadian ships did not reach their quota (60,000), but the landmen exceeded their allowance. The net result was that the overall catch (including Norway) was 125,000 harp seals instead of the allowable 150,000, including some 100,000 young seals.

B. SPECIAL RESEARCH STUDIES

1. Harp Seals. A photographic aerial survey was carried out once in the Gulf (Subarea 4) and twice on the Front (Subarea 2 and 3), the latter before sealing began on March 12. Total adults observed in the Gulf on March 5 were 15,000 and the higher figure obtained on the Front on March 10 was 77,500. Whelping was late and not far advanced at date of survey on the Front, the result of severe ice conditions for a second year in a row. It is clear from results that in such conditions, and with a starting date for sealing of March 12, a photographic aerial survey of whelping adults or young is infeasible on the Front. In the Gulf, on March 8 and 9, a ratio of 2.5 young to 1 adult female was estimated. On this basis, production of young in the Gulf was 37,500. If the same index is used on the Front, a rough estimate of production there is 175,000 for a total of 212,500 young harp seals born.

A capture-recapture experiment on the Front using a helicopter was unsuccessful, owing to the late whelping and distance of whelping groups from shore. A total of 200 adult female harp seals was branded on the Front using explosive branding guns. Future results will hopefully improve knowledge of mixing between subgroups of seals whelping in the two areas of pack ice, Gulf and Front.

Age samples were few, since an early freeze-up restricted shore based catches from which they are purchased. One sample, from the area of St. Anthony, Nfld., showed few young immature harp seals present, for the second season in a row, probably reflecting hard ice conditions which would have displaced these animals southwards.

2. Hood Seals. An aerial reconnaissance over the Front ice north to Frobisher Bay on March 25 was not successful in locating hood seals north of the catching field, but ice conditions at the time were unsuitable for hood seals, and flights could not be extended to the east Baffin area.