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Canadian Research Report for 2000

PART I. Newfoundland Region
PART II. Central and Arctic Region

PART I. Newfoundland Region

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SUBAREAS 0 AND 1

A. Status of the Fisheries

Nominal landings from 1990 to 2000 for fish stocks are listed in Table 1. Additional information on the status of the fisheries is as follows:

a) *Shrimp* - Div. 0AB

Between 1991 and 1996, the *Pandalus borealis* quota in Div. 0A was set at 8,500 t. Since that time, the quota varied between 7,650 and 10,200 t. Annual catches of 4,800-7,500 t were made between 1991 and 1994, but have since fluctuated between 500 and 2,600 t. The *P. borealis* quota in Div. 0B was increased from 5,250 t in 1998 to 8,750 t during 1999. The increase was due to the inclusion of a 3,500 t exploratory quota for areas north of 63°N. In the traditional fishing area south of 63°N, 5,100 t were caught whereas only 100 t were taken in the northern areas. In 2000, the additional 3,500 t was not included in the quota report, and accordingly the catch was not counted against the TAC for the south (5,350 t). The unstandardized and standardized catch per unit effort indices increased between 1993 and 1998, decreased in 1999 to the 1997 level but increased again in 2000. Fluctuations in catches and catch rates are not considered to be valid indicators of overall stock conditions and may reflect oceanographic conditions.

In 2000, about 3,000 t of *Pandalus montagui* were caught from a 3,800 t quota. This quota was taken west of 63°N and includes a part of Div. 2G.

The mixed fishery for *P. borealis*/*montagui* and the absence of a time series of research vessel trawl surveys further confounds the assessment of the distribution and abundance of both stocks.

b) *Greenland Halibut* – 0B+1B-F

The Greenland halibut stock in Subarea 0+1B-F (offshore) is considered to be part of the same stock distributed in Subarea 2 and 3. Canadian catches for 2000 were approximately 5,000 t. The stock is managed jointly by Canada and Denmark (Greenland), with the TAC being split equally. Recent scientific information on this stock is limited, although a new survey was completed in Div. 0A in 1999 and in Div. 0B in 2000. NAFO Scientific Council and the Canadian Fisheries Resource Conservation Council (FRCC) recommended that the TAC in 2001 should not exceed 11,000 t, as in recent years. NAFO SC also advised that an additional catch of 4,000 t could be taken from Div. 0A and 1A combined.

SUBAREA 2

A. Status of the Fisheries

Nominal landings from 1990 to 2000 for fish stocks are listed in Table 1. Additional information on the status of the fisheries is as follows:

a) Atlantic Salmon

The commercial fishery remained closed for 2000. Approximately 9,900 salmon were retained or hooked and released in the recreational fishery.

b) Arctic Char

Commercial landings of Arctic Char in northern Labrador were 47 t, about 16% higher than landings in 1999, and the highest catch recorded since 1992. Catch rates increased in two of the three primary stock complex areas. Increased landings are partly related to the introduction of a community-based licensing system. Over the past 27 years (1974-2000), more than 2,600 t of Char have been harvested from a limited stretch of the north Labrador coast, and attests to the capacity of this area to produce fish. No data are available on the amount of Char harvested for subsistence (food) purposes.

c) Shrimp

The shrimp fishery in Subarea 2 and the northern portion of Subarea 3 is divided into three management areas – 2G, Hopedale and Cartwright Channels (2HJ), and Hawke Channel (2J) + 3K. Between 1998 and 2000, annual catches of approximately 8,000 t were taken in 2G from 8,320 t TACs. The standardized and unstandardized fishing effort and catch per unit effort indices have fluctuated without trend since 1991, reflecting stability in the resource. Historically, the fishery has been concentrated north of 60°N in an area noted for producing high catch rates of large, high-quality shrimp. During 1998, a separate quota was created for the area south of 60°N to reflect the existence of high concentrations of shrimp along the shelf slope. The new quota resulted in a southward shift in fishing effort. Overall, the stock remains healthy as evidenced in continued high catch rates for female shrimp and expansion of the resource.

Catches in Hopedale and Cartwright Channels (2HJ) have increased from 7,500 t during 1994-1996 to 15,000 t during 1997-2000 due to TAC increases. The 1998-2000 standardized effort and catch per unit effort indices remained at 1997 levels. The resource appears healthy, from fishery data, with commercial rates of both male and female components stable throughout the 1980s and increasing during recent years. However, research survey stock size estimates are highly variable making it difficult to interpret trends.

The fishery in Hawke Channel (southern Division 2J) + 3K began in 1987 with landings of approximately 1,800 t. Catches increased to more than 7,800 t in 1988 and ranged between 5,500 and 8,000 t between 1989 and 1993. The first multi-year management plan for 1994-1996 set the annual TAC at 11,050 t for the Hawke Channel, St. Anthony Basin, east St. Anthony, Funk Island Deep, and three exploratory areas on the seaward slope of the shelf. Catches increased to 11,000 t in each of these years. Between 1997 and 2000 catches increased to over 63,000 t reflecting the dramatic TAC increases over that period. The inshore shrimp fishing fleet (<65') has been exploiting this resource since 1997 and took approximately 68% of the 2000 catch. Fall multi-species research vessel surveys throughout 1995-2000 indicate that the shrimp are widely distributed and abundant throughout the area. Survey data indicate that biomass of males could decline in 2000/2001 due to the weak 1996 year-class. Additionally, the 2000 female length frequency distribution is narrow indicating that it is composed of a reduced number of year-classes. Length frequency distributions from the inshore fleet indicated a high number of 3-year-old males relative to the distributions from the offshore fleet. The impact of fishing mortality imposed by the inshore fleet upon the 1997 year-class is unknown. However, it is believed that the 1997 and 1998 year-classes are strong enough to moderate the effect of fishing mortality imposed by the inshore fleet, weak 1996 year-class and the limited residual female biomass. Based upon analyses of the commercial fishery and research survey data, the 1997–2000 assessments concluded that the resource is healthy and exploitation has remained low.

The mandatory use of sorting grates, low groundfish abundance and avoidance of problem locations have minimized by-catch within Subarea 2. Recent studies estimated that low numbers of redfish and Greenland halibut have been caught by the shrimp fishing fleets.

d) *Cod* – 2GH, 2J3KL

The catch from Div. 2GH has been negligible since 1990 and based on the 1996 DFO Stock Status Report the abundance of this stock is assumed to be low. The next regional review of stock status is proposed for 2001. Research vessel surveys have been discontinued in 2G and are carried out only in alternate years in 2H so there are very limited data for future assessments.

The northern cod commercial fishery reopened in 1998 after 6 years of moratorium when income support to Newfoundland fishermen terminated. There is no evidence of any recovery in the stock. Recruitment levels are extremely low. Mortality rates appear to be high given that there is no directed fishery. By-catches in the turbot fishery are increasing, based on Canadian observer records but there is no estimate of unreported fishing mortality. Annual consumption of cod by harp seals is estimated to be about 37,000 t. Hooded seals are estimated to consume a similar amount but the data are more scanty. The biomass of capelin is unknown, and may be insufficient to sustain a cod recovery. Viewed as a single stock, northern cod is well below a spawner biomass reference point of 200,000 t and no directed fishing would be consistent with a precautionary approach. If the inshore is considered to contain a functionally separate subpopulation, then a harvest rate of 10% in this region of the stock area may be compatible with a precautionary approach on this component. However, it is not clear whether the exploitable biomass in the inshore, estimated to be about 40,000 t based on tagging data, has been sustained by recent levels of recruitment at the current levels of natural and fishing mortality. Catch rates from the sentinel survey, commercial logbooks and fall research bottom-trawl surveys in the inshore all show a decreasing trend in exploitable biomass since 1998. However, estimates of exploitable stock size based on tagging studies have been relatively constant and the biomass index in one inlet (Smith Sound, Subdivision 3L) has doubled over the last three years. There is strong evidence that most of the remnant of the northern cod stock is concentrated in Smith Sound in the winter and migrates out in the spring, supporting the limited fishing activity that has existed in inshore regions of southern Subdivision 3K and northern Subdivision 3L over the last three years. This concentration of the remaining stock makes it very vulnerable to fishing and natural mortality.

e) A*merican Plaice* – 2+3K

There was no directed fishery on this stock in 2000. Analysis of data from annual fall multispecies research vessel trawl surveys, indicate that recruitment, abundance, and total and spawning biomass remain low. Low exploitation rate on this stock suggests that fishing mortality cannot be responsible for the observed decline in this species.

f) *Redfish* – 2+3K

There was no directed fishery in 2000 for the Subarea 2+3K stock. Landings have been less than 30 t each year since 1992. Estimates of discarded redfish, taken as by-catch in shrimp fisheries, have declined from 386 t in 1992 to about 180 t in 1998. Preliminary data for 1999 suggest a similar tonnage discarded. Results from fall multispecies research vessel surveys suggested that population biomass indices in both areas are at extremely low levels, between 5% to 15% of the 1978-1990 average of 300,000 t. Recruitment has been poor since the year-classes of the early-1970s. There are no indications that the status of the stock will change in a positive way in the foreseeable future.

g) *Snow crab* – 2J3KLNO

Catches decreased by 23% to 46,100 t in 2000 from 59,600 t in 1999, while fishing effort (number of trap hauls) decreased by 22%. These decreases were associated with a 19% decrease in TAC in 2000. Fishery performance is monitored in through analyses of commercial logbook data, observer program data, and dockside monitoring. CPUE from logbook data generally remained at a high level in 2000. Resource status was determined from fall multispecies bottom trawl surveys and inshore trap/trawl surveys. The residual biomass index of crabs 95 mm and larger, based on fall multispecies bottom trawl surveys, which was stable during 1996-1998, decreased from 85,000 t in 1998 to 47,000 t in 1999 and to 38,000 t in 2000. The fall survey biomass index of 76-94 mm small-clawed males (immediate prerecruits) decreased by 54% from 1998 to 1999 and remained virtually unchanged in 2000. The

exploitable biomass for 2001 is expected to be generally similar to that of 2000, at a lower level than during 1997-1999. Recruitment prospects in the medium and longer terms are uncertain.

h) *Iceland scallop* - 2HJ

Inshore aggregations here were again fished with nominal catches estimated at 105 t, round. The fishery is prosecuted by inshore vessels, typically under 45 ft (14m), L.O.A. Except for exploratory surveys for presence/absence, there have been no directed scientific missions into scallop aggregations along the Labrador coast.

i) *Greenland Halibut* – SA 2 + Div. 3KLMNO

Improved recruitment has lead to an increase in this stock, and catches have increased in recent years. Fisheries Commission set a TAC of 40,000 tons for this stock in 2001, up from 35,000 tons in 2000.

B. Special Research Studies

1. Environmental Studies

a) *Hydrographic Surveys*

Hydrographic multi-beam and single-beam acoustic surveys were conducted to chart, at a better scale, the coastal waters from Ship Harbour Head to Caplin Bay on the south portion of the Labrador Coast. This included alternate routes to reach Charlottetown and passages to go through the Dead Islands, Hawke Bay and Deer Pass. Two New Charts at a scale of 30,000 with numerous insets for the restricted areas will be produced from these surveys during the next year.

b) *Hydrographic Publication*

As the result of the Hydrographic multi-beam and single-beam acoustic surveys that were conducted, New Editions of Charts 5046 and 5048 are to be published to develop a two-mile wide navigation corridor from Turnavik Islands near Makkovik to Cape Harrigan. A similar corridor was also surveyed to provide a safe passage eastward to deeper water, from shallow coastal waters, through the area known as the Farmyards. Hydrographic surveys were also conducted to provide modern hydrographic data to replace outdated and suspect hydrographic data in Shoal Tickle and to fill an uncharted gap in an existing route through Windy Tickle.

2. Biological Studies

a) *Groundfish and Shellfish*

Biological and oceanographic data from fall multi-species research vessel surveys were collected from Div. 2GHJ to conduct distribution and abundance studies and detailed biological sampling. Stomach analysis is conducted from specimens of Greenland halibut caught during the fall surveys.

b) *Arctic Char*

Samples were obtained for food and feeding, age, sex, and length distributions from commercial landings from 11 north Labrador Subareas. Following a long term decline in mean weight of Char harvested in north Labrador, analyses of recent data show that mean weight has increased, or generally stabilized in each of the three primary stock complex areas during the past three years (1998-2000). Besides the long term effects of fishing on stock characteristics, recent analyses have identified a possible environmental component contributing to some of the variation in stock characteristics. Information on ocean migrations of Arctic Char have been updated from analyses of over 3400 tag recaptures through 2000 in the context of consistency with past data used to designate individual stock complexes. In addition, analyses of food and feeding patterns have demonstrated major diet shifts occurring over an 18-year interval.

SUBAREA 3

A. Status of Fisheries

Nominal landings from 1990 to 2000 for fish stocks are listed in Table 1. Additional information on the status of the fisheries is as follows:

a) *Squid* – Subarea 2+3.

Following a peak catch in 1979 of 88,800 t, Subarea 3 catch declined regularly to 5 t in 1983. Catches remained lower than 5,000 t during the thirteen-year period 1983 to 1995. They increased since 1995 to 12,700 t in 1997 before declining sharply to about 800 t in 1998 and 19 t in 1999. They remained low, at about 300 t, in 2000. Increases in catches in 1996 and 1997 were associated with environmental warming and increase in squid abundance at the northern extreme of their range. The recent very low catches during 1998-2000 reflect low squid abundance in Canadian waters, despite persistence of a warm oceanographic regime.

b) *Atlantic Salmon* - Subarea 3+4

A moratorium on the Canadian commercial fishery has been in place since 1992. Landings at St. Pierre (Div. 3PS) totaled 2.3 t in 2000. The 2000 recreational harvest, including both retained and hooked-and-released, was approximately 29,100 fish in insular Newfoundland.

c) *Shrimp* – 3LMNO.

Subarea 3 has been divided into two shrimp management areas - 3L and 3M. The fall survey data indicate that the biomass of 3LNO *P. borealis* increased from 6,000 t to 53,000 t between 1995 and 1999. At least 72% of the biomass was within Canada's 200 Nmi limit, and at least 90% of the total biomass was found within NAFO Division 3L. Divisions 3N and 3O accounted for less than 14% and 1% of the biomass respectively. This is a new fishery with 2000 and 2001 TACs set at 6,000 t and fishing restricted to areas within 3L that have depths greater than 200m. Preliminary estimates indicate that 4,000 t were taken by Canada while approximately 527 t were taken in the NRA. The areal and depth restrictions are to reduce by-catch of economically important groundfish presently under moratoria.

An international shrimp fishery has been conducted in 3M since 1993. The number of Canadian vessels fishing for shrimp in this area has declined steadily from 13 during 1993 to 3 during 2000. Similarly, the catches have decreased from 3,724 t in 1993 to 618 t in 2000. By-catch of groundfish has been quantified, and consists primarily of redfish and Greenland halibut.

d) *Iceland scallop.*

In the Newfoundland area, Iceland scallops are fished in Div. 3LN and Div. 3Ps. and to a lesser extent along inshore waters off Labrador.

The 3LN scallop fishery commenced in 1993. Aggregations over the eastern Grand Bank (3L) were first commercialized. In 1994 the fishery expanded into the Carson and Lilly canyons (LCC) and subsequently (1995) into the northeast of LCC between 45°30' N and 46°30' N. In 1996 a new aggregation was located and rapidly fished down. While some exploratory fishing occurs outside of these "boxed" areas, each with a catch limit, the areas around the LCC continue to attract the most effort. Nominal landings declined throughout, primarily because of effort diversion into shrimp and crab.

There was no directed fishery into aggregations in 3L. Overall catch rates and meat counts here (no. of meats per unit weight) are low and the area is generally considered marginal for the fleet. Catches from the LCC box were 295 t (round) from a TAC of 900 t in 2000. Catch rate (68 kg/tow) is down 31% from 1995, when deposits here were first commercialized. Individual meat-weight frequency distributions show a bias toward slighter larger meats compared to 1998. Meat counts have decreased correspondingly.

Elsewhere, over the Grand Banks (Div. 3LN) little commercial activity was recorded in 2000.

The Iceland scallop fishery on St. Pierre Bank commenced in 1989 and is now separately managed as two zones: (a) the trans-boundary stock, along the northern edge co-managed by France (70% of TAC) and Canada (30% of TAC) and (b) the large area to the south that remains entirely under Canadian jurisdiction. Total removals in 2000 remained the same compared with the previous year (1134 t vs. 1188 t). Near-shore aggregations again accounted for 40% (458 t) of the combined removals from this area. However, catch rates in 2000 remain unchanged (34 vs. 35 kg/tow) from the previous year. There was no directed effort for Iceland scallops in the trans-boundary area, an area within NAFO Subdiv. 3Ps co-managed by Canada and France.

e) C*apelin* – Subarea 2 + Div. 3KL

Inshore capelin catches in Subarea 2 + Div. 3KL are taken during the inshore spawning migration. Female capelin is preferred to satisfy the Japanese roe market. Inshore catches in 1994 and 1995 were less than 1000 t because female capelin was too small to meet the size criterion established in the capelin management plan. A size criterion has not been included in subsequent management plans. Catches decreased from 18,000 t in 1999 to about 16,000 t in 2000. Resource status has been determined by a mathematical model that incorporated several partially overlapping series of indicators.

The model provides estimates of relative year-class strength. This model could not be run for 2001 because there are not enough indices available, consequently there is no stock status update for 2001.

f) S*now crab* – 3Ps.

Catches in 3Ps in 2000 (7,920 t) were similar to those of 1999 (7,900 t). CPUE increased steadily through the 1990s and has remained high since 1996. Bottom trawl surveys are unreliable for indicating resource status because they are carried out in spring when mating and molting occur and the population is incompletely available to the survey trawl. Therefore, resource status and prospects are uncertain.

g) C*od* – 3NO and 3Ps.

The cod stock in NAFO Div. 3NO has been under moratorium to all directed fishing both inside and outside the Regulatory Area since February 1994. During the last assessment of this stock (1999) it was concluded that recruitment and spawning stock are extremely low. In 1999 the total by-catch of cod in Div. 3NO was 909 t. The spring and fall Canadian research vessel surveys conducted in 1999 indicate an increase in catch rates of juvenile fish (ages 1-3) in recent years. This may in part be due to a possible change in catchability resulting from a warming trend in water temperature. The overall biomass estimate for 1999 shows no increase and the spawning stock size is still well below B_{lim}.

The status of the 3Ps cod stock remains extremely difficult to assess because of variability in the research vessel survey index, incomplete reporting of all mortality caused by fishing, low fishing levels during the moratorium, and the mixing of fish between adjacent stocks. The incentive for under-reporting of catches has increased with the implementation of trip limits, IQ's, and quality-based price differentials, however there are not reliable estimates of the magnitude. Increased monitoring of catches and landings would result in better estimates of deaths caused by fishing. Stock status in October 2000 was estimated from commercial landings in conjunction with abundance indices from Canadian (1972-2000) research vessel trawl surveys and sentinel surveys (1995-1999). The spawning stock biomass was estimated at 82,000 t on 1 April 2000 and this was projected to decline to 76,000 t on 1 April 2001 if the 2000 TAC of 20,000 t were taken; this is comparable to the spawning stock biomass in 1992 just before the 1993 moratorium. Spawning stock biomass increased from 1993 to 1998 due to good growth, early maturation and good survival over the moratorium period by the 1989 and 1990 year-classes. This increase in spawner biomass was not sustained by subsequent recruitment, and spawning stock biomass has been declining since 1998. Estimates of year-class strength show a general downward trend over the period 1959 to 1999 with all year-classes from 1991-1996 being particularly low. The TAC for 2001-2002 has been set at 15,000 t, which equates to a 76% probability of the spawning stock biomass declining further, a 23% probability of average F exceeding $F_{0.1}$ and a 95% probability of average exploitation rate exceeding 10%. Precautionary reference points have yet to be agreed on for this stock.

h) *Yellowtail flounder* – 3LNO

There was no directed fishery on this stock between 1994 and 1997 and the fishery was re-opened in 1998 with a TAC of 4,000 t for 1998 as recommended by Scientific Council and the FRCC to permit a limited directed fishery in 3NO. In 1999, because of good results from annual surveys with respect to increases in biomass and recruitment, a TAC of 6,000 t was advised. Stock size has continued to increase and the TACs recommended for 2000 and 2001 were 10,000 t and 13,000 t. In addition to the annual spring stratified-random survey in 3LNO and the fall multispecies bottom trawl survey, joint DFO-Industry surveys have been conducted since July of 1996. Two such surveys were conducted in 2000. The objective of these Fisheries Products International-DFO surveys is to develop a commercial-type index of abundance and to determine distribution of yellowtail flounder within a zone traditionally fished by commercial fleets. Evidence from the commercial fishery and various surveys indicates that the range of this stock has increased along with stock size since the mid-1990s.

i) *American plaice* – 3LNO.

Some indices of stock size have shown slight increases, but overall the stock is at a low level and a moratorium on fishing remained in place during 2000, with a recommendation that it continue for 2001. By catches in other fisheries continue to increase in recent years.

j) *Redfish* – Unit 2 (3Ps4Vs, 3Pn4Vn-June to December, 4Wfgi) and 3O.

Redfish in the Canadian Atlantic have been reviewed on a zonal basis following redefinition of redfish management units in 1993 given substantial linkages between the various management units. Redfish were reviewed at a zonal meeting in November 2000.

Unit 2 Canadian landings in 2000 totaled approximately 11,412 t . Total Canadian catches have declined steadily from 27,000 t in 1993 matching reductions in TACs. The current stock status was determined from annual stratified random industry surveys and sampling of the commercial fishery. Sampling of the fishery in 2000 indicated that the majority of the catch was comprised of fish between 32 cm-35 cm, the bulk of which is predominantly the 1980s year-class. This is very consistent with the 1998 and 1999 fisheries. The 1988 year-class is now fully recruited to the fishery but was minimally represented. Its future contribution will not likely be as great as that of the early-1980s year-class. The 2000 DFO survey confirmed the presence of the 1994 year-class and also detected the 1998 year-class. Biological characteristics suggest both these year-classes and the 1988 year-class are predominantly S. *fasciatus*, a shallower water species. The strength of year-classes of S. *mentella* since 1980 is apparently very weak, yet it continues to be the target of the fishery.

Canadian catches of 3O redfish have increased dramatically from less than 200 t annually from 1983-91 to 7,000 t in 1996 and have fluctuated between 2,000 t and 9,000 t since then due to a varying market for redfish sizes near the small fish protocol limit of 22 cm which predominate in Div. 3O Total catches in 1998 and 1999 have exceeded 12,500 t partly due to increased foreign activity outside the 200 mile limit. About 10,000 t have been taken in 2000. Resource status has been determined from spring and fall stratified random surveys in 3O. The spring index suggests that the stock may have increased since the early-1990s, but has stabilized at around 100,000 t since 1994. The fall survey generally supports this pattern. The additional 2000 survey information for both spring and autumn continues to indicate that stock status has not improved, and may be declining somewhat. Historically, the surveys catch fish in the 10 cm to 25 cm range. Prior to 1998, the surveys were considered to have sampled different size groups than the commercial fishery because the commercial catch was generally comprised of fish greater than 25 cm. Beginning in 1998, there has been greater overlap in the size distributions of the surveys and commercial fishery because the fishery has been targeting size groups that have recently surpassed the small fish protocol (22 cm). There is concern that there has been little sign in the recent surveys of size groups smaller than 17 cm despite using a shrimp trawl, which is very effective at catching small fish.

B. Special Research Studies

1. Environmental Studies

a) *Plankton studies*

Chlorophyll levels in the spring and summer of 1998 appear to be below average while deep nutrient concentrations appeared to increase throughout the year until they leveled off in late summer when they ended being above the 1993-1997 average. In 1999, chlorophyll concentrations on the Northeast Newfoundland shelf were low during the spring and summer relative to the average from previous years whereas summer conditions on the Grand Banks appear to have been above average. There appears to have been substantial depletion of nitrate in deep waters during the spring, which may explain the relatively low concentrations in deep waters observed in the fall of 1999 on the Grand Banks and on the Northeast Newfoundland shelf. In November of 1999, phytoplankton concentrations on the Grand Banks were high (1.5-3 mg m -3), giving an indication of a fall bloom in the area. There was a substantial increase in the abundance of diatoms at that time. The abundance of copepodites in 1998 was higher than in previous years in many areas on the Newfoundland Shelf. The high abundance was due in large part to increases in the abundance of small species, dominated by *Oithona similis* and *Centropages hamatus*, which are generally more abundant on the Grand Banks than in areas further north. Overall zooplankton species diversity was lowest in 1998 relative to the 1993-1999 period. There was a slight decrease in the total abundance of copepodites in 1999 relative to the previous year but the species composition also shifted to larger species, with *Calanus finmarchicus* becoming more dominant.

The enhanced AZMP activities in the Newfoundland region have permitted a number of general observations concerning the chemical and biological conditions in the Newfoundland region. As previous workers have suggested, there is a south-to-north progression in the onset of the spring bloom. The concentration of all nutrients at depths of 100m or more tends to show an increase during the summer and into the fall period, preceding the fall increase in the surface layer that is associated with the breakdown of stratification. Phosphate and silicate concentrations in the surface layer show a seasonal cycle similar to that of nitrate but the former rarely appear to reach depleted levels (near zero concentrations), with the exception of silicate concentrations on the Grand Banks. Finally, the inshore and offshore arms of the Labrador current are generally marked with shallow nutricline and relatively high concentrations of chlorophyll relative to other areas of the shelf, suggesting that variations in current speed and shear may influence the flux of nutrients into surface layers during the summer months.

The contrast in chemical and biological conditions on the Newfoundland Shelf in 2000 relative to observations from 1999 was generally limited in magnitude but there were some notable differences. The significance of those changes to the ecosystem were still difficult to establish given that our understanding of the dynamic interactions must acknowledge some important gaps. Overall, patterns of variations between 1999 and 2000 in the standard variables measured at the fixed station (Station 27) were generally consistent with the regional observations collected during the oceanographic surveys. However, there were some notable discrepancies as well.

Depth of the euphotic layer (1% light level) followed a seasonal cycle that was consistent with expectations based on the seasonal development of the phytoplankton community. Following the spring bloom when high biomass of phytoplankton severely limits light penetration, the euphotic depth at Station 27 fluctuated slightly around a depth of 60m during the course of the summer and into the late fall, consistent with the relatively constant levels of phytoplankton biomass. A similar pattern was also observed over the shelf, where the depth of the euphotic layer fluctuated between 50-100m, depending on local conditions.

The overall levels of inorganic nutrients were generally similar to those observed in 1999. Depletion of nitrate and silicate in the upper water column appears to have been deeper in 1999 than in 2000, suggesting that mixing may have been more limited during the latter year. This was consistent both at Station 27 and during our oceanographic surveys. One notable difference from 1999 was an apparent influx of higher concentrations of nitrate and silicate during late fall. These waters with slightly higher (~2µM) concentrations of inorganic nutrients were only found in the deep near bottom waters associated with the Labrador Current. As such, the increased levels of nutrients were only apparent on the Newfoundland Shelf, the water of the continental slope and the Avalon Channel.

The seasonal phytoplankton production cycle in 2000 differed substantially from the observations from 1999. In contrast to 1999, the spring phytoplankton bloom was restricted to the upper 60m of the water column whereas it was distributed over a greater depth interval in 1999. The chlorophyll maximum in 2000 was also less dynamic than in 1999 when we had observed a number of small subsurface blooms. Overall the subsurface chlorophyll concentration in 2000 was approximately one half to one third of that observed in 1999. Similar differences in the vertical distribution of phytoplankton biomass were also observed during the three oceanographic surveys. In addition, our fall survey found little evidence of a fall bloom on the southern Grand Banks, a feature noted in 1999.

The overall abundance of zooplankton in 2000 was among the higher levels observed since 1996. The increase appears to have been due largely to increases in the overall abundance of *Oithona similis* and *Pseudocalanus* sp. copepodites, the numerically dominant species found on the shelf. This pattern was not evident during our summer survey, when the overall abundance of zooplankton in 2000 was approximately equal to that observed in 1999. The abundance and seasonal progression of copepodites stages of *Calanus finmarchicus* and *C. glacialis* was of the same order as in the previous year, as was the abundance of larvaceans, pelagic gastropods, and the less dominant species of copepods. Species diversity as well as the relative abundance of large and small copepods was similar to that previously observed. The distribution of zooplankton communities during the summer oceanographic survey indicates a slight increase in the spatial extent of the two communities dominated by *O. similis* and *Pseudocalanus* sp., suggesting the possibility of a competitive balance between the two species.

The most notable difference between 1999 and 2000 was in the overall abundance of large calanoid nauplii, likely contributions from both *C. finmarchicus* and *C. glacialis*. Overall abundance levels observed at Station 27 as well as during the summer oceanographic survey were approximately twice that observed in 1999. It was more difficult to contrast the spring surveys as their timing differed between years and the production of nauplii shows a very rapid increase associated with the spring phytoplankton bloom. Since the abundance of adult copepodites (CVI) was not substantially different in 1999 and 2000, our observations suggest there was an increased reproductive rate during the last year, which persisted throughout the productive season (April-November). There is also a suggestion of a more rapid development or better survival from early to late copepodite stages of *C. finmarchicus* during the latter part of the summer but the data are currently insufficient to confirm this pattern. If there was an increase in secondary production during 2000 relative to the previous year, this may partly account for the lower overall levels in subsurface phytoplankton biomass observed across the shelf.

b) *Oceanographic studies Sub-Areas 2 and 3*

Zonal Monitoring Program in the Newfoundland Region.

Physical oceanographic observations are routinely collected during fish assessment and research surveys in the Newfoundland Region. The enhanced Atlantic Zonal monitoring program initiated in 1998 continued during 2000. This program was established to include biological and chemical oceanographic monitoring at a fixed coastal station at biweekly intervals and on offshore transects at seasonal time scales. The Newfoundland Region conducted three annual physical/biological oceanographic surveys during 2000 along several cross-shelf NAFO transects from the Southeast Grand Bank to Nain Bank on the mid-Labrador Shelf. These surveys were conducted during mid-spring, summer and during the fall. The main objectives were to establish the seasonal temporal and spatial distribution and abundance of plant pigments, nutrients, microzooplankton and mesozooplankton in relation to the physical environment. Physical, biological and chemical variables being monitored include temperature, salinity, dissolved oxygen, ocean currents as well as measures of primary and secondary production and biomass, species composition of phytoplankton and zooplankton and nutrients. This monitoring program will allow an understanding of changes in ecosystem productivity and changes in ecosystem structure over time.

Physical oceanographic studies were conducted on the Newfoundland and Labrador Shelves during 2000 in NAFO Div. 2J and 3KLNO. The annual water column integrated temperature at Station 27 for 2000 cooled slightly compared to 1999 but remained above the long-term mean. Surface temperatures were above normal for 9 out of 12 months with anomalies reaching a maximum of near 1.5°C during August. The June, July and December values were about normal. Bottom temperatures at Station 27 were above normal (by >0.5°C) during the first 6 months of the year and about normal during the remainder. Salinities at Station 27 were below normal during the winter months and near normal during the rest of the year. The vertically integrated salinity for the summer months was about normal. Similar trends in temperatures and salinity were observed on the Flemish Cap and on Hamilton Bank

during 2000. Temperatures in the inshore regions along the south and east coast of Newfoundland were above normal by up to 3°C during the summer months. The cross-sectional area of sub-zero °C (CIL) water on the Newfoundland and Labrador Shelves increased over 1999 values, ranging from below normal on the Grand Bank, near normal off the east coast of Newfoundland and slightly above normal on the southern Labrador Shelf. Bottom temperatures on the Grand Bank during the spring of 2000 ranged from 0.5 o C above normal in NAFO Div. 3L and up to 2°C above normal in Div. 3O. During the fall on the Grand Bank they decreased to mostly below normal values in central areas, but remained above normal in northern 3L and along the edge of the bank. Fall bottom temperatures in Divs. 2J and 3K were above normal in most areas, however, the mean bottom temperature in all regions decreased from 1999 values. Correspondingly, the area of the bottom in all areas covered by water in the lower end of the temperature range (-1.7-1°C) increased slightly over 1999 values while the area of warm water (1-4°C) decreased. In summary during 2000, ocean temperatures were cooler than 1999 values but remained above normal over most areas continuing the warm trend established in 1996. Salinities on the Newfoundland and Labrador Shelves were similar to 1999 values, generally fresher than normal.

An oceanographic study was also conducted in NAFO subdivisions 3Pn and 3Ps during 2000. The temperature and salinity data are presented in several ways, as vertical transects across the major banks and channels, horizontal bottom maps, time series of areal extent of bottom water in selected temperature and salinity ranges and as time-series of temperature anomalies at standard depths. Temperature anomalies in the 3Ps St. Pierre Bank area show anomalous cold periods in the mid-1970s and since the mid-1980s, similar to conditions on the continental shelf along the East Coast of Newfoundland. The most recent cold period, which started around 1984, continued to the early-1990s with temperatures up to 1°C below average over all depths and up to 2°C below the warmer temperatures of the late-1970s and early-1980s in the surface layers. Since 1991, temperatures have moderated in some areas from the lows experienced from the mid-1980s and early-1990s but negative temperature anomalies continued over large areas of the banks into the spring of 1995. During 1996 temperatures started to moderate, decreased again during the spring of 1997 and returned to more normal values during 1998. Temperatures during 1999 and 2000 continued to warm and were above normal over most of the water column and near bottom. An analysis of the areal extent of subzero °C bottom water covering the banks shows a dramatic increase since the mid-1980s, very low values in 1998 and a complete disappearance in 1999 and 2000. The areal extent of bottom water with temperatures >1°C on the banks was about 50% of the total area during 1998 the first significant amount since 1984 and it increased further to about 70% during 1999 and to 85% during 2000. An examination of the limited salinity data shows a change in water mass characteristics during 1998 and 1999 to warmer saltier conditions, compared to the cold-fresh conditions that prevailed during the first half of the 1990s. During the spring of 2000 however, the water mass in this region was generally fresher and warmer than normal.

An oceanographic study was conducted during the summer of 2000 on the Flemish Cap in NAFO Division 3M. The cold near-surface temperatures (0.5 to 2°C below normal) experienced over the Cap from 1993-1996 had warmed to 0.5-1.5°C above normal by July of 1997, which increased to 2°C above normal by the summer of 1998 and 1999. Surface temperatures during the summer of 2000 decreased somewhat but remained above normal in some areas over the Cap. Bottom temperatures over the Cap were slightly below normal during 1997, up to 0.5°C-1°C above normal during 1998 to 1999 and near normal during the summer of 2000. Salinities during the summer of 2000 ranged from near normal to slightly below normal over most areas. In general the colder than normal temperatures experienced over the continental shelf and on the Flemish Cap from the late-1980s up to 1995 moderated by the summer of 1996 and continued above normal during 1999. During the summer of 2000 the measurements shows evidence of a reversal in the recent warm trend in some areas of the water column. As in previous years, summer chlorophyll levels in the upper 100-m of the water column over the Cap were higher compared to the adjacent Grand Bank and dissolved oxygen levels were about normal for the region. Both the measured currents and the geostrophic estimates, while showing considerable differences and variability between years, indicate a general anticyclonic circulation around the Flemish Cap.

2. Biological Studies

a) *Flatfish*

A food and feeding study on Greenland halibut is being conducted, based on annual stomach collections from trawl surveys in Subarea 2 and 3.

Analysis of sexual maturity data is conducted annually on A. plaice, yellowtail, G. halibut and other species. In 2000 a study on Greenland halibut (SCR Doc 00/6) was presented to NAFO SC.

Analysis of yellowtail age and growth is ongoing, using a variety of methods. An international workshop on this topic was held at the Northwest Atlantic Fisheries Center in November 2000.

A tagging program was begun on yellowtail flounder in Div. 3LNO in 2000. This is a co-operative project between DFO and FPI Ltd. This program is designed to run in May-June of each year from 2000 to 2004 inclusive. The objectives are to obtain estimates of exploitation and population size to improve the assessment of this stock; and to study movements and migrations, age and growth, mortality, and longevity of this species. These objectives will be accomplished by using two different tagging methods.

Studies are underway on distribution of American plaice in relation to temperature, sex, abundance, and substrate.

b) *Seals*

Multi-disciplinary studies on harp hooded, and grey seal population dynamics and seal–fish interactions continued in 2000. The objectives of these studies were to develop a better understanding of seasonal distributions of seals, determine current population size of harp and grey seals, examine interannual changes in growth and reproductive status, and to estimate consumption of prey species by seals.

The status of Northwest Atlantic harp seals was assessed by the National Marine Mammal Peer Review Committee. After a period of reduced catches from 1983-1995, Canadian reported catches increased significantly to between 240,000 and 280,000 since 1996. Greenland catches have increased steadily since the mid-1970s and are currently estimated to be approximately 100,000. In addition, in recent years (1996-1998) between 16,000 and 23,000 seals were estimated to have been caught incidentally in the Newfoundland lumpfish fishery. Total removals of harp seals including reported catches, estimates of incidental catches in the Newfoundland lumpfish fishery and estimates of seals killed but not recovered during the harp seal hunts in Canada and Greenland, have been relatively stable since 1997, at around 465,000 seals annually.

Aerial surveys were carried out in March 1999 to determine Northwest Atlantic harp seal pup production. Based on these surveys, pup production was estimated to have increased to 997,900 (SE=102,100). The results of a population model, incorporating information on pup production since the late-1970s, reproductive rates since 1960 and catch at age data since 1952, indicated that he harp seal population declined during the 1960s and reached a minimum of less than 2 million in the early-1970s. Since then it increased steadily until the mid-1990s. Due to the large harvests in recent years, the population has been stable since 1996. The estimated population size of Northwest Atlantic harp seals for 2000 was 5.2 million (95% C.I. 4.0-6.4 million).

c) *Capelin*

Studies to determine factors governing capelin survival during egg development and larval emergence from beach sediments continued at one beach site in 2000. An acoustic survey in the spring of 2001 is designed to examine capelin distribution and behavior in Div. 3KL.

SUBAREA 4

A. Status of the Fisheries

Nominal landings from 1990 to 2000 for fish stocks are listed in Table 1. Additional information on the status of the fisheries is as follows:

a) *Snow Crab* – 4R

Catches in 4R in 2000 (1,640 t) remained virtually unchanged from 1999 (1,610 t). The commercial catch rate has remained stable over the past 3 years at a lower level than in other divisions. There are no research data available from this division.

b) Iceland *scallops* – 4R

The nominal catch from the Strait of Belle Isle (4R) in 2000 is estimated at 1,073 t (round) against a TAC of 1100 t. CPUE in 2000 again declined 11% from the previous year. The fishery here continues to be driven by the exploitation of an accumulated biomass consisting largely of cohorts of old, possibly well separated year-classes with little potential for further growth. No significant larval settlement or recruitment has been detected in recent years. Fishing activity in high density scallop aggregations causes high collateral mortality to scallop spat and appears to have had a significant effect on recruitment dynamics in the area.

B. Special Research Studies

1. Biological Studies

a) *Shellfish*

Biological data from a 10- day research mission were collected from Div. 4R to conduct distribution and abundance studies for Iceland scallops.

SUBAREAS 2 + 3 + 4

A. Status of the Fisheries

Nominal landings from 1990 to 2000 for fish stocks are listed in Table 1. Additional information on the status of the fisheries is as follows:

a) *Lobster*

Landings have declined to 1,774 t (preliminary) in 2000 from a long-term high of 3,207 t in 1992. A downward trend is well established and appears to be part of a widespread pattern in Atlantic Canada. The fishery is monitored at localized sites through co-operative arrangements with harvesters to complete logbooks and conduct at-sea sampling of commercial catches. Average seasonal catch rates vary considerably from year to year and are usually highest early in the season and decline rapidly as the season progresses. The fishery is characterized by high exploitation rates and size limits that are small in relation to growth rate and size at maturity. Yield per recruit analyses demonstrate growth overfishing with potential substantial increases in yield through reduction in exploitation rates or an increase in size limit. Egg-per recruit analysis indicates a sufficiently low level of egg production under the current management regime to suggest a high risk of recruitment failure under unfavourable environmental/ecological conditions. Landings can be expected to average lower with a greater degree of inter-annual fluctuation than under a more moderate level of exploitation.

B. Special Research Studies

1. Sentinel Surveys

The Sentinel Surveys, initiated in October 1994, were continued in 2000 and data collected tabled at regional stock assessments in the autumn of 2000 and spring of 2001. Sites in 2J3K3L, 3Ps and 3Pn4Rs were sampled by inshore fish harvesters using traditional fishing gears based on historic fishing patterns. The objectives of the program are: to develop a reliable inshore catch rate, length frequencies, sex, maturity, and otolith series for use in resource assessment; to incorporate the knowledge of inshore fish harvesters in the process of resource assessment, to describe temporal and spatial inshore distributions; to establish a long-term physical oceanographic and

environmental monitoring program of the inshore area; and to provide a source of biological material for other researchers for genetic, physiological, food and feeding, and toxicological analyses.

2. Gear and Selectivity Studies

a) *Comparative trawl studies: Canadian Campelen and the Spanish Pedreira.*

Comparative fishing studies were conducted on the southern Grand Bank with EU-Spain to determine the efficiency of the Canadian Campelen bottom survey trawl and the Spanish Pedreira bottom survey trawl. Fourteen side-by-side parallel hauls were completed. The Pedreira catches of groundfish were approximately 10 times that of the Campelen due to the long 230 m sweeps used on that trawl, compared with the 40 m sweeps on the Campelen, which increases herding efficiency and catch rates.

b) Effect of mesh size on Greenland halibut catches.

Table 1: Summary of preliminary catches for stocks within the DFO, Newfoundland Region, 1990-1998

Subarea	Species	Division	Catch (t)										
			2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990
0+1	Greenland halibut	0B+1B-F	3,442	3,556	3,300	1,700	1,453	5,852	3,723	2,561	8,200	5,945	6,194
	Shrimp	0A	1,588	2,046	933	517	2,823	2,361	4,727	5,501	7,493	6,788	6,177
		0B	5,383	5,132	5,204	5,670	3,220	3,564	476	106	1,291	1,107	1,609
2	Cod	2GH	0	0	0	0	0	0	0	3	0	0	400
	Shrimp	2G (SFA 4)	7,206	7,961	8,051	5,217	5,160	5,104	3,982	2,723	2,706	2,561	2,945
		2HJ (SFA 5)	14,777	15,028	15,170	15,103	7,383	7,616	7,499	5,719	6,315	6,118	5,380
		2HJ3K (SFA 6)	63,074	51,028	46,337	21,246	10,923	10,914	10,978	8,035	6,609	5,500	5,598
	Crab	2J	3,794	5,448	4,061	3,166	3,090	3,178	2,978	2,275	1,529	989	645
2+3	Redfish	2+3K	28	2	3	4	2	1		2	9	161	1,806
	Greenland halibut	2+3KLMNO	10,506	4,124	4,081	5,877	5,891	3,229	2,928	4,899	6,933	6,664	9,129
	American plaice	2+3K	65	6	6	2	16	28	16	77	103	494	1,770
	Witch	2J+3KL	92	2	1	6	4	10	11	343	1,632	2,430	2,825
	Cod	2J3KL	4,660				350	330	1,309	3,938	24,356	120,135	204,900
	Grenadier	2+3	234	145	209	98	225	125	130	614	992	365	152
	Capelin	2J3KL (offshore)	0	0	0	0	0	0	0	0	0	450	57,170
	Squid	2+3	310	19	815	12,748	8,285	48	1,954	276	924	1,719	4,440
3	Redfish	3LN	32		7	19				46	657	362	958
		3M	0									1	
		3O	880	1,990	6,121	1,895	128	24	1,192	677	845	173	5,131
	Yellowtail	3LNO	9,147	5,540	3,536	1				6,265	6,369	6,257	4,754
	American plaice	3LNO	621	269									
		3Ps	593	542									
	Witch flounder	3NO	12	24	4	18			437	3,971	4,090	2,457	2,499
		3Ps	331	461									
	Atlantic halibut	3	128	124	165	152	101	107	36	138	114	231	165
	Cod	3NO	160		306	289	54	31	3	3,719	5,232	5,456	7,222
		3Pn	1,095		559	1,993	70	32	158	2,412	843	1,063	1,216
		3Ps	19,357		15,664	7,518	520	337	574	13,519	21,845	24,693	23,048
	Haddock	3LNO	20		14	190	28	9	0	675	598	708	1,423
		3Ps	110		191	69	118	48	20	86	251	263	232
	Pollock	3Ps	790		428	592	435	248	59	113	437	1,188	1,060
	Capelin	3L	12,140	11,120	20,300	3,560	16,840	100	890	23,480	3,160	22,310	48,000
		3K	4,180	7,460	10,420	9,230	8,920	30	70	13,525	19,350	20,000	35,140
	Shrimp	3M	618	490	469	785	906	970	1,041	3,724			
		3L	4,025										
	Sea scallop	3Ps	unavailable	79	257	9	8	564	1,299	1,438	676	1,279	1,559
	Iceland scallop	3LNO	355	138	1,310	3,986	9,454	6,501	3,941	817	22	-	-
		3Ps	1,134	1,188	2,763	5,245	302	831	440	667	5,967	755	507
	Crab	3K	21,359	21,470	16,788	14,830	14,190	12,245	11,039	9,760	7,295	7,675	4,253
		3LNO	26,857	32,725	23,533	22,185	16,656	13,790	12,237	8,979	6,652	6,394	5,211
		3Ps	7,917	7,909	6,815	4,753	3,047	1,853	1,590	704	121	176	596
	Atlantic salmon	2J3KLPs+4R	30	38	45	82	114	95	133	126	213	353	498
	Arctic Charr	2J3KLPs+4R	47	41	38	38	16	30	31	38	74	70	100
3+4	Redfish	3P+4V	4,458	5,335	4,101	3,825	4,566	3,978	7,594	9,350	4,635	6,628	6,227
4	Iceland scallop	4R	1,073	1,046	1,307	1,205	1,204	1,497	2,294	2,122	1,296	457	88
	Crab	4R	1,640	1,812	1,064	969	833	920	650	-	-	-	-

Note: Newfoundland landings only

PART II – Central and Arctic Region

by

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SUBAREAS 0 and 1

A. Status of the Fisheries

a) Snow Crab

An exploratory fishery was conducted in August and September of 2000 in 0A and 0B. No snow crabs were caught in either area. Brown spiny crabs (150 lbs.) were landed in 0A in August and toad crabs were caught but discarded in 0A in September. No crabs were landed in 0B.

b) Shrimp

See report by Newfoundland.

c) Shellfish

Shellfish in the Qikiqtarjuaq area are fished under an experimental license and sold locally. The quota for 2000 was set at 55,000 kg. Divers collected primarily soft shelled clams (*Mya truncata*) and Greenland cockles (*Serripes groenlandicus*) during a winter fishery conducted in January (807.15 kg) and February (160.00 kg). The catch is not distinguished by species.

d) Arctic Charr

Subsistence and commercial Arctic charr fisheries in the Baffin region are conducted in inshore lakes and rivers not in marine waters. Information on these fisheries can be found in the "Annual Summary of Fish and Marine Mammal Harvest Data for the Northwest Territories" published by Fisheries and Oceans Canada, Central and Arctic Region.

e) Greenland Halibut

Nunavut companies have a 1000 ton inshore allocation for Greenland halibut in Subarea 0. The Cumberland Sound fishery began in 1987 and is the only inshore fishery that has operated on an annual basis. The total allowable catch (TAC) for the Cumberland Sound fishery has been set at 500 tons since 1994. The fishery is exclusively a winter fishery (January to May) and the fishermen use long-lines set through holes cut in the landfast sea ice. In recent years the TAC has not been reached. Fishermen have experienced unstable ice conditions on the landfast ice platform (1996 to the present) and effort has been decreasing since the early 1990's. The fishery produced approximately 45 tons in 2000.

Nunavut companies have a 500 ton quota in the Subarea 0 offshore commercial fishery. In recent years they have also been allowed to transfer any surplus inshore quota to the offshore fishery. The offshore commercial harvest for Nunavut license holders was 975 tons in 2000, harvested by the otter trawl vessel "Acadienne Gale II".

Since 1996 Nunavut companies have had access to an exploratory fishery license to harvest Greenland halibut in NAFO Division 0A. Previous catches have ranged from 329 tons in 1996 to 42 tons in 1998 (data are from observor estimates). There was no exploratory fishing in Division 0A in 1999. In 2000 the "Acadienne Gale II" fished for 6 days under a Nunavut exploratory license and harvested 22 tons.

B. Special Research Studies

1. Environmental Studies

Bottom temperature data were collected during a scientific survey of the groundfish resources in Division 0B (see SCR document Treble et al. 2001 for set by set temperature data). No other environmental studies were conducted.

Table 1. Mean temperature, S.E. and number of observations for NAFO Division 0B by depth stratum.

Depth Stratum (m)	401-500	501-750	751-1000	1001-1250	1251-1500
^{o}C	2.1	2.5	3.5	3.5	3.2
S.E.	0.20	0.15	0.04	0.03	0.02
number obs.	20	22	12	9	5

2. Biological Studies

a) Survey of NAFO Division 0B

A stratified random otter trawl survey covering depths of 400 m to 1500 m and targeting Greenland halibut (*Reinhardtius hippoglossoides)* was conducted in NAFO Division 0B from October 9 to 19, 2000 (See SCR document Treble et al. 2001). This survey was a collaborative effort between Fisheries and Oceans Canada, the Nunavut Wildlife Management Board, and the Greenland Institute of Natural Resources. Survey coverage was 1 set per 1030 km^2 with a minimum of two tows per stratum. This criteria was met in all strata with 64 valid tows of the 69 tows conducted. Greenland halibut were present in all tows with the greatest densities between 501 m and 1250 m. Total estimated biomass and abundance for the survey area were 56,212 tons and 74.6x10^6, respectively. Lengths ranged from 7 cm to 92 cm with 56.5% less than 46 cm. The distribution was bi-modal with peaks at 19 cm and 43-45 cm. Age distribution was estimated using an age-length key from the GINR 2000 survey of NAFO Divisions 1CD. Ages ranged from 0+ to 19 years with a modal age of five years. The majority (90.6%) were less than eight years old. The catch of other commercially important species was minimal.

b) Marine Mammals Studies

Our lab has been studying the beluga and narwhal stocks within Cumberland Sound (NAFO Div. 0B) for a number of years. There is an important subsistence harvest for these whales by hunters in the community of Pangnirtung. Studies have been conducted in 2000 in two main areas, population genetics and movements and migration using satellite telemetry techniques. Results indicate that belugas tagged within Cumberland Sound remain within the Sound all summer and move only as far as the mouth of the Sound during the winter months. Genetic results indicate that Cumberland Sound whales are distinct from belugas landed in other south Baffin Island communities.