Fisheries Resource Conservation Council | Conseil pour la conservation des ressources halieutiques

Ottawa, Canada
K1A 0E6

1994 CONSERVATION REQUIREMENTS FOR ATLANTIC GROUNDFISH

REPORT TO THE MINISTER OF FISHERIES AND OCEANS

NOVEMBER 1993

Canada

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November 29, 1993

Honourable Brian Tobin, P.C., MP
Minister of Fisheries and Oceans
House of Commons
Ottawa, Ontario
K1A 0A6

Dear Minister:

As required by the mandate of the Council to provide public recommendations to you on TACs and other conservation measures, I am pleased to provide you with the Fisheries Resource Conservation Council's report on 1994 Conservation Requirements for Atlantic Groundfish.

This report follows the Council's extensive consultations with the fishing industry, other persons interested in the Atlantic fishery, and the Department of Fisheries and Oceans.

Yours truly,

Herbert M. Clarke
Chairman

Attachment

PARTNERS IN REBUILDING FISH STOCKS FOR OUR FUTURE

ABSTRACT

This report to the Minister of Fisheries and Oceans details the conservation recommendations of the Fisheries Resource Conservation Council for Canadian-managed Atlantic groundfish stocks for the 1994 fishing season. These recommendations are based upon the Council's assessment of available scientific information together with information and advice presented by fishermen, industry and the general public at a series of public hearings and industry meetings held since July and through written briefs. In addition, it discusses the Council's approach to other aspects of its mandate and outlines the Council's plans for 1994.

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CHAPTER 1. INTRODUCTION

1.1 FRCC Mandate

The Fisheries Resource Conservation Council (FRCC) is a partnership of government, the scientific community and industry, bringing together fisheries and scientific expertise to make formal public recommendations to the Minister of Fisheries and Oceans on Total Allowable Catches (TACs) and other conservation measures for the Atlantic fishery. The Council also advises the Minister on scientific research and assessment priorities and methodologies.

The main activities of the Council are:

1) advising the Minister on research and assessment priorities;
2) reviewing DFO data and advising on methodologies;
3) considering conservation measures that may be required to protect fish stocks;
4) reviewing stock assessment information and conservation proposals, including through public hearings, where appropriate; and,
5) making written public recommendations to the Minister on TACs and other conservation measures.

These recommendations will include "any measures considered necessary and appropriate for conservation purposes such as TACs, closure of areas to fishing during specific periods, approaches to avoid catching sub-optimal sized fish or unwanted species, and restrictions on the characteristics or use of fishing gears."

The mandate of the Council is "Conservation" and two primary conservation objectives have been adopted:

> ***Rebuilding stocks to their 'optimum' levels and thereafter maintaining them at or near these levels, subject to natural fluctuations, and with 'sufficient' spawning biomass to allow a continuing strong production of young fish;***
>
> *and,*
>
> ***Managing the pattern of fishing over the sizes and ages present in fish stocks and catching fish of optimal size.***

The membership of the Council includes, in addition to the Chairman, 12 external members drawn from the fishing industry and the scientific community, 3 ex officio members from the Department of Fisheries and Oceans, and provincial delegates, one each appointed by the 6 concerned provincial and territorial governments. Members come from each of the Atlantic provinces and Québec, and all sectors of the fishing industry (inshore, offshore, processing, fishermen, owners, management) as well as various scientific disciplines (biology, oceanography, economics). A list of the Members is included as Appendix 5.

1.2 FRCC Process

On July 6, 1993, scientists from the Department of Fisheries and Oceans publicly presented the 1993 Atlantic Groundfish Stock Status Report to the Fisheries Resource Conservation Council. Normally, the process begun by this presentation would have resulted in the Council making its conservation recommendations for the 1994 groundfish fishing season to the Minister of Fisheries and Oceans in October. However, upon review of the drastic declines in many of the groundfish stocks, on July 7 the Minister asked the Council to advise him on those stocks thought to be in a critical situation.

Through the end of July, 1993, the Council held 7 public hearings in Rimouski, Moncton, Port Hawkesbury, Yarmouth, St. John's, Corner Brook and L'Anse au Clair, in order that stakeholders might receive the scientific information and provide their views on what they considered should be done immediately. On August 23, 1993, the Council presented its first report to the Minister of Fisheries and Oceans. At that time, the Council also provided the Minister its advice on Canada's position prior to the meeting of the Northwest Atlantic Fisheries Organization (NAFO), as well as its review of the issues concerning the silver hake fishery.

Starting in September, the Council held thirteen public hearings in Atlantic Canada on the subject of 1994 conservation requirements for Atlantic groundfish. These meetings were held in Gaspé, Shippagan, Charlottetown, Gander, Marystown, Saint John, Digby, Shelburne, Sydney, Dartmouth, Port aux Basques, Plum Point, and Cartwright. These meetings are briefly summarized in Appendix 2 to this report. Most of the meetings were well attended by fishermen, processors, and others interested in the fishing industry. The Council was impressed with the quality of the presentations, from comprehensive oral briefs to thoughtful written presentations. The effort that many people and organizations put into the elaboration of their presentations is recognized and appreciated by the Council.

In addition to the public hearings, the Council held four industry meetings in Québec, Moncton, Halifax and St. John's, to which were invited representatives of all industry and fishermen's organizations. These meetings are also summarized in Appendix 2.

The Council asked for and received from the Department of Fisheries and Oceans an update to the 1993 Stock Status Report, containing preliminary information from some of the summer scientific surveys. This update is Appendix 3.

The Council also asked the Department of Fisheries and Oceans to undertake a special review of the redfish stocks and fisheries in Units 1 (Gulf of St. Lawrence), 2 (Laurentian Channel), and 3 (Scotian Shelf), and held a special stakeholder consultation on November 15, 1993 in Halifax to review the situation and seek conservation advice on these stocks. This review is attached as Appendix 4.

The Council assessed the information from all sources in arriving at its conclusions.

1.3 1993 Report

The FRCC's August 1993 report, entitled "WE MUST STOP CHASING QUOTAS DOWN TO THE LAST FISH" outlined some very serious resource situations (much worse than had been thought when the original decisions for 1993 were first made) and recommended immediate conservation actions for critical stocks.

That report further documented the fact that a significant number of stocks in a 'critical' or precarious position had key biological indicators showing a continuing and rapid decline. Further, the report pointed out the "uncertainties" in the stock assessment process which appear to be particularly prevalent when stocks are at low levels as at present; the past occurrences of underestimating mortality and overestimating biomass and allowable catch levels; and the problems experienced in recent years when setting Total Allowable Catches at the $F_{0.1}$ reference level of mortality.

Given this situation, and the Council's clear mandate to make conservation recommendations aimed at **"stock rebuilding"**, the philosophy behind the 1993 Report was to attempt to halt and reverse these disastrous trends for certain stocks. But to quote from the report **"...there is no guarantee that it can be done nor precedent as to how to do it. ... We cannot be completely certain. We cannot in the current situation take the risk of stock collapse. We must 'err on the side of caution'!"**

The recommendations in the 1993 report were accepted by the Minister of Fisheries and Oceans and implemented in September, 1993.

1.4 1994 Report

This report continues the Council's conservation philosophy, and discusses both the appropriateness of certain conservation measures and constraints to stock rebuilding. It details the Council's conservation recommendations for Canadian-managed Atlantic groundfish stocks for the 1994 fishing season. In addition, it discusses the Council's approach to other aspects of its mandate and outlines the Council's work activity plan for 1994.

Chapter 2 provides further detail on the Council's conservation philosophy and approach. To assist in applying this philosophy, the Council is seeking to increase its own knowledge base on appropriate conservation measures. Further, in conserving and rebuilding the fisheries resource, many challenges present themselves: overcapacity, foreign overfishing, predation by seals, and adverse environmental conditions are the most prominent.

Chapter 3 presents the Council's 1994 recommendations to the Minister of Fisheries and Oceans. First, some general recommendations applying to all groundfish stocks are offered. These deal with protecting small fish, minimizing bycatches to permit other fisheries to continue, and avoiding effort redirection to stocks which are either already fully utilized or vulnerable to increased effort. Next, for each of three discrete ecological areas, a general overview of the environmental conditions is provided and stock-by-stock recommendations are made. It is not the Council's intent here to suggest a direct cause and effect relationship between environmental conditions and each stock situation, but to describe both as we start to move toward an ecosystem approach. The Council feels, however, that those environmental conditions may be an important factor in the rebuilding of groundfish stocks, as well as a clue to the cause of their decline, particularly for some areas of the Canadian Atlantic coast, e.g. the Northeast Newfoundland - Labrador shelf.

The final chapter of the report discusses some of the other aspects of the Council's mandate, such as the formation of Subcommittees to address priority areas, the Council's 1994 workplan, and the annual workshop which the Council will hold with internationally-known scientists and key stakeholder representatives in May.

CHAPTER 2. PHILOSOPHY AND ISSUES

2.1 A Focus on Conservation

The mandate of the Fisheries Resource Conservation Council is "conservation". Throughout the FRCC's 24 public hearings and industry meetings held from July to October 1993, this mandate for conservation received support and reinforcement from many participants who see the FRCC as a key vehicle for ensuring a sustainable fishery. The Council is pleased to see the extent to which stakeholders have expressed their strong commitment to conservation in the fishery, and the commitment which has been demonstrated in the quality of the presentations, both written and oral, which have been made to the Council.

The Council's report in August 1993 recommended a number of strong conservation measures in response to a request from the Minister of Fisheries and Oceans for advice on immediate action that might be appropriate given the depressed state, near record low levels of abundance, of many groundfish stocks. The acceptance of these recommendations by the Minister resulted in a number of mid-season changes to fishing plans. These changes represented an important step toward arresting the decline and beginning the process of rebuilding stocks, but caused disruption in the 1993 fishing plan. It is the hope of the Council that, through conservation measures which "err on the side of caution", such mid-season changes can be avoided in the future wherever possible.

In considering the two conservation objectives provided in the Council's Terms of Reference, there are a number of key questions which can be asked for each stock. What is an "optimum" stock size? How does this depend on environmental conditions and on inter-species effects? What is a "sufficient" spawning stock? What is the "optimal size" of a fish? What is a desirable age composition of the harvest?

Further, a mandate for conservation requires treatment of the fishery in its full context, as a component of the broad ecosystem. In this report, efforts have been made to move in this direction, with recommendations based in part on a recognition of interactions amongst stocks in the same geographical area (for example, on the Scotian Shelf or in the Gulf of St. Lawrence). These are clearly only initial moves toward an "ecosystem approach", since at present, information is largely available only on a stock-by-stock basis. There is limited knowledge of inter-species effects, and individual attention is needed for the many stocks which are in a critical condition. **Nevertheless, the Council believes progress can be made in developing more complete ecosystem-based approaches, and is pursuing this further.**

2.2 Approaches to Conservation

2.2.1 Conservation Criteria

In recent years, conservation plans for Atlantic Canadian groundfish stocks have focused on the $F_{0.1}$ "reference level" as the principal criterion for setting allowable harvests (in cases where analytical assessments are possible). This approach implies that Total Allowable Catches are set so as to correspond with a certain level of fishing mortality.

However, there is a growing recognition that use of the $F_{0.1}$ reference level must be modified or extended depending on circumstances. First, there are a number of groundfish stocks for which no $F_{0.1}$ calculation is possible, due to a lack of certain necessary data. In such cases there is no alternative but to use other indicators of stock health.

Second, where it is possible to make $F_{0.1}$ calculations, there remain high levels of uncertainty in the results, reflecting the inherent uncertainties in the fishery data.

Third, there is growing evidence that fishing mortality levels have been underestimated and biomass levels overestimated for reasons that are not yet understood. In the past, this has resulted in serious over-estimates of reasonable harvest levels. This problem is the subject of research by scientists, and attention by the FRCC. Pending its resolution, however, the Council feels that calculated $F_{0.1}$ reference levels should be viewed as merely "nominal", with better estimates of the actual $F_{0.1}$ level being perhaps 30-40% lower (although the exact extent of this adjustment can only be determined after the fact).

Fourth, even if $F_{0.1}$ catch levels could be determined precisely, the methodology involved does not recognize the dependence of future stock health on the maintenance of a reasonable spawning stock. For example, participants in the Council's public hearings have pointed out that it would be foolhardy to apply the 16-17% harvest rate typically implied in $F_{0.1}$ strategies to stocks at critically-low abundances. As an extreme example, catching 2 of the last 10 fish in a stock would hardly be a conservationist strategy! Hence, the spawning stock biomass must surely be relevant as an indicator of stock health.

Accordingly, while recognizing the usefulness of $F_{0.1}$ as a reference level, the Council rejects a pure reliance on $F_{0.1}$ in providing its conservation advice. It is recognized that under some circumstances, catch levels should be set below the "true" $F_{0.1}$ level, while in other cases, given different stock conditions, a higher level may be sustainable. In any case, the determination of appropriate conservation plans may involve examining a number of "indicators". These include:

- $F_{0.1}$ reference level
- Total biomass
- Spawning biomass
- Biomass trends
- Recruitment
- Recruitment trend
- Historic catch level
- Catch rate
- Age structure
- Fish size
- Fish growth rate
- Fishing mortality trends
- Natural mortality
- Environmental conditions

There is no magic formula for determining exactly which of these indicators are most important in reaching "correct" conservation plans, nor for blending them together. To complicate matters, there are often a number of different ways by which each of the indicators can be measured. For example, indications of the biomass level can be obtained from research vessel surveys, from analytical models, from commercial catch rate data, and from fishermen directly.

In seeking to provide a more comprehensive framework for the provision of conservation advice, the Council will develop conservation criteria for classifying stocks as being in a "healthy", "dangerous" or "critical" condition, in terms of commercial exploitation.

This approach reflects a number of presentations made at the Council's 1993 hearings. It should be noted, however, that just as any single indicator, such as the $F_{0.1}$ level, is not applicable under all stock circumstances, similarly any package of indicators cannot be expected to apply over all stocks. The FRCC has established a Stock Assessment Subcommittee (discussed below) to explore this matter further.

In the meantime, however, it is imperative that such criteria be incorporated, at least to some extent, in providing conservation advice for groundfish stocks. Accordingly, the Council examined a variety of available indicators for each stock -- including the $F_{0.1}$ reference level, total biomass, spawning biomass, recruitment prospects, and fish size measurements -- and developed recommendations based on a conservation-oriented balancing of this information.

2.2.2 Conservation Options

In the context of the groundfish fishery, it is useful to examine the applicability of conservation principles such as protecting fish while in the juvenile and/or spawning stages, and allowing all fish to reproduce at least once before entering the fishery. These principles suggest a wide range of possible conservation measures in addition to Total Allowable Catches (TACs), such as: (1) using selective gears which allow for the escapement of fish below spawning age, (2) closing areas where spawning takes place for the period during which fish aggregate to spawn, and (3) restricting the areas available to different gear types based on their respective impacts on the resource.

At present, the TAC approach combined with the limitation of entry is well-established within the Atlantic groundfish fishery. However, the FRCC recognizes that stock conservation involves more than just catch quotas. Other measures may complement the setting of TACs, in providing protection for fish resources.

Accordingly, the FRCC has recommended, in this report, the implementation of such approaches for certain stocks and geographical areas.

As with other fishery management measures this would be best accomplished if the details are worked out by Departmental managers with the cooperation of industry, and with strict enforcement. Over the coming year and beyond, the FRCC will be examining further the applicability of a full range of conservation options.

2.2.3 Building the Knowledge Base

The FRCC has highlighted previously its commitment to utilize all sources of fishery information, and to balance these appropriately, in developing its advice on suitable conservation measures. These sources of information include:

1. Scientific research surveys provide data on fish population abundance and distribution, etc., under controlled circumstances.

2. Commercial fisheries provide data on stock abundance, spatial and temporal distribution of the stocks, and trends in size and age structure. However, it is important to note that, because the commercial fishery focuses on fish aggregations, misleading assessments of stock abundance can result from commercial catch rate information.

3. Fishermen and other stakeholders provide direct information about the fishery. This is of great importance in providing both timely data and useful comparisons with historical fishing performance, especially so when fishermen keep records of their observations, so that information is built up systematically year after year.

When a fishery is closed, however, information is no longer obtained from the commercial fishery, nor from fishermen directly. Knowledge is obtained solely from research-oriented surveys or test fishing. The Council recognizes the importance of mechanisms for monitoring fish stocks both when the fishery is open and when it is closed. To provide continuity in stock assessments, attention must be paid to the possibility of using commercial vessels to maintain or implement some form of fishing activity, on a wider temporal or geographical scale than scientific surveys alone, but with strong controls to minimize possible adverse impacts on conservation actions. Such fishing could take the form of "experimental" or "sentinel" (test) fisheries.

The Council, through its Subcommittee on Stock Assessment, will explore with DFO on a priority basis the applicability and utility of experimental and/or test/sentinel fisheries.

2.3 Constraints to Rebuilding

2.3.1 Overcapacity

Given the precipitous and continuing declines in the Atlantic groundfish stocks, the FRCC is compelled to state that overcapacity in the Atlantic fishing industry must be dramatically reduced if we are to have any realistic hope of arresting declines and reversing trends.

Most participants in the fishery, as well as the fishery managers, concur that harvesting overcapacity (including both fleet and the number of fishermen), as well as overcapacity in the processing sector, have overwhelmed efforts to manage groundfish stocks on a sustainable basis. This occurs for a wide variety of understandable reasons. For example, concern amongst those in the fishing industry about meeting boat payments, keeping processing plants open, or obtaining social benefits creates pressure to keep fisheries open or increase quotas.

The domestic overcapacity problem dates back more than a decade, but measures such as limited entry and vessel replacement guidelines generally have not been effective in curtailing or reducing capacity. In some instances, technology improvements alone have resulted in dramatic and potential increases in catching capacity, e.g. significant increase in the number and use of gillnets, expansion of the use of mid-water trawls in the redfish fishery, and new high-powered vessels in the "inshore" otter trawl fleet.

The unabated expansion in the past decade has left us with an industry capacity that threatens the survival of many stocks. The imperative to catch and process fish is pervasive. The Council believes a dramatic reduction in capacity is an urgent priority if there is to be any reasonable prospect of restoring Atlantic groundfish stocks.

2.3.2 Foreign Overfishing

In a letter dated August 20, 1993, the FRCC provided the Minister with its advice on the position Canada should take at the September NAFO meeting on NAFO-managed straddling and transboundary stocks, and other matters of interest to Canada. In particular, attention was drawn to the precarious state of 2J3KL cod, 2+3KLMN Greenland halibut, and the four key Grand Bank flatfish and cod stocks. The Council's recommendations in summary were as follows:

- a continuing moratorium on fishing 2J3KL cod outside 200 miles;

- a moratorium on fishing 3LNO American plaice, 3NO witch flounder, 3LNO yellowtail flounder, and 3NO cod both inside and outside 200 miles until the current declines are arrested and sufficient rebuilding occurs to allow a fishery to take place; and,

- significant reductions in the catches of 2+3KLMN Greenland halibut in the regulatory area and a joint commitment to appropriately address the scientific questions in a timely fashion. The Council further suggested that total catches for this stock should be in the order of 25,000t annually until analytical assessments are available.

While these positions were accepted by Canada and promoted within NAFO, the resultant NAFO decisions fell far short with respect to 3NO cod and the Greenland halibut situation was not seriously considered by the Fisheries Commission of NAFO.

Generally, NAFO has not been able to control the activities of its own members (and certainly not those of non-members) with respect to overall fishing levels or fishing practices, particularly the targeting of juveniles. This makes any fish on the "Nose" and "Tail" of the Grand Bank particularly vulnerable to the large number of vessels which continue to fish in the regulatory area.

Overfishing by foreign fleets generally, and their indiscriminate taking of small fish in particular, are believed by the FRCC, and by many who made representations to us, to be a serious constraint to the rebuilding prospects for Grand Bank stocks. The Council therefore recommends that the Government of Canada take appropriate action to correct this situation.

2.3.3 Predation by Seals

Many participants in the FRCC public hearings expressed concern that the consumption of fish by predators such as seals is one of the causes for the decline of fish populations, and a threat to their recovery. Fishermen claim in particular that harp and grey seals are damaging nets, cleaning out their lobster pots, and eating their fish.

Despite years of studies of seals and indeed a past Royal Commission on Seals and the Sealing Industry, there appears to be little agreement between scientists and the fishing industry regarding the impact of seals. The issue is an emotional one, and may have conservation implications. Some emphasize a need for more knowledge about seals, including better estimates of the population of each species, their location, diet, and effects on groundfish. Others focus on encouraging the development of markets for seal products so as to permit a harvest.

As a priority, the Council, through its Subcommittee on Environment and Ecology, will review all current information on seal impacts, and will discuss its findings in public consultations, prior to making recommendations.

2.3.4 Environmental Conditions

Common sense tells us that fish stocks are affected by the environment in which they live. Nevertheless, relationships between environmental factors and long-term trends in fish stocks are not well understood. Some areas of study are as follows:

- Poor environmental conditions may have a direct effect on adult fish stocks. For example, the fact that many stocks in the area of the Labrador Sea and the Newfoundland Shelf have moved to greater depths could be a reaction to environmental changes, including colder water.

- Cold water could also affect the physiology of the fish, resulting in changed behaviour (in feeding, for example) and slower growth rates. The latter could also be related to food availability, as a result of large-scale changes in production within the marine system.

- Adverse environmental factors may also explain the decline of average weights (mean weight-at-age) observed in the cod stocks around Newfoundland, in the Gulf of St. Lawrence, and on the eastern Scotian Shelf.

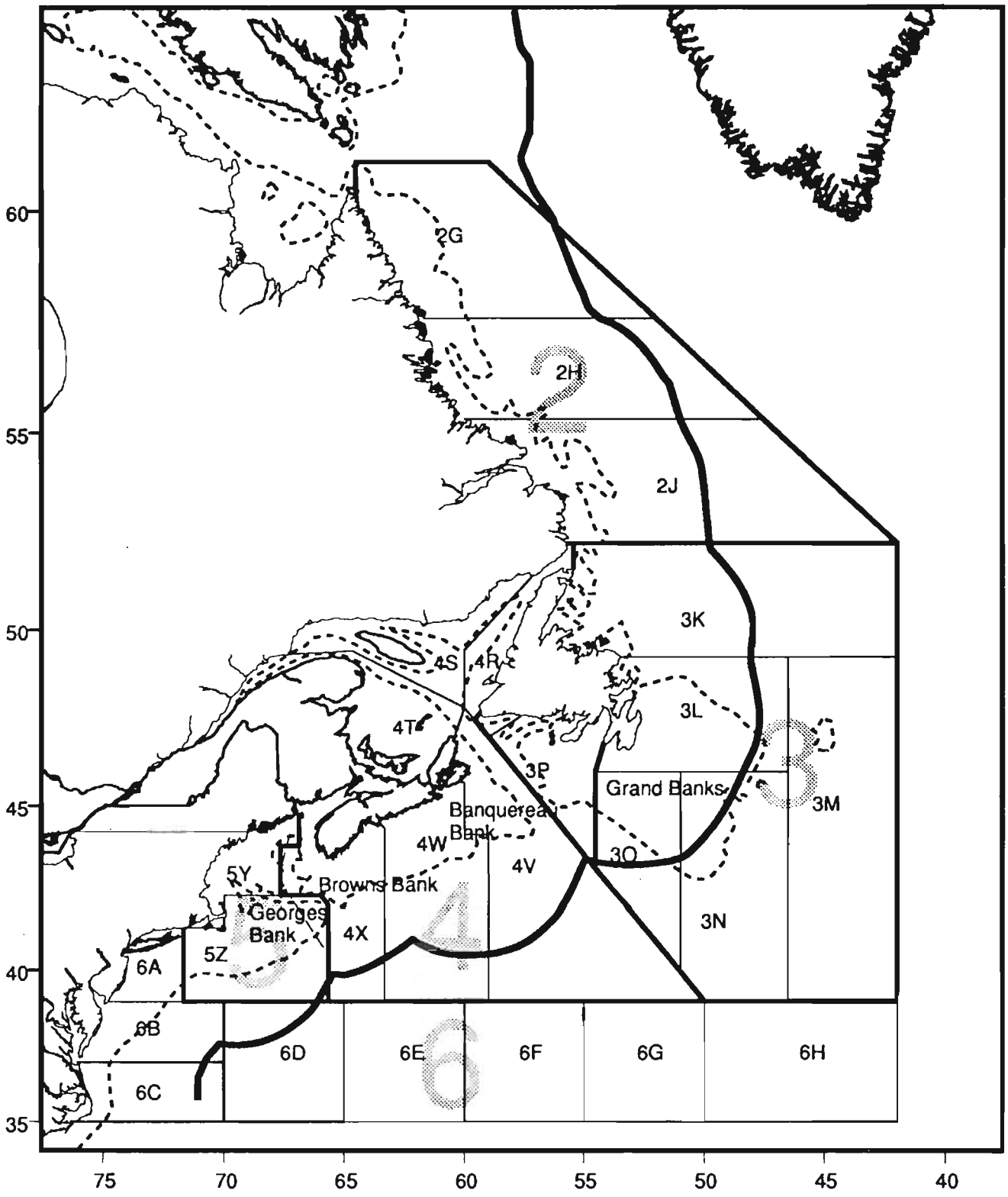
- It is well established for marine fish species that environmental factors can affect recruitment -- this is a major cause of the great variations in year-class strength, from one year to the next. For the northwest Atlantic, cold water and low salinity may have played a key role in reducing stock productivity, and thus the fishable biomass. Very recently, a positive correlation has been found in eastern Newfoundland between cod recruitment and the ocean's surface salinity.

It seems evident now that unfavourable ocean conditions, present over the past decade in the waters off Labrador, eastern Newfoundland and in the Gulf of St. Lawrence, have had detrimental impacts on fish stocks, although the extent of this has not been quantified. It is clear that while humans cannot control these environmental factors, a

better understanding of links between oceanographic conditions, global oceanic production and fish stock trends could result in better forecasting of the future fishery.

Unfavourable ocean conditions may be the biggest constraint to stock rebuilding in the near future. The Council will, through its Subcommittee on Environment and Ecology, seek to better understand the interactions between fish stocks and environmental factors, and to examine the conservation implications of such interactions.

NAFO Fishing Areas



CHAPTER 3. CONSERVATION RECOMMENDATIONS FOR 1994

3.1 General

3.1.1 Protecting Small Fish

Weak recruitment in the form of a series of year classes below average strength is a common phenomenon in many Atlantic Coast groundfish stocks. In a number of others, year classes previously thought to be strong have subsequently been found to be less so. In many instances, the protection of fish through their juvenile life stages is considered key to the achievement of more rapid rebuilding of stocks to more productive levels.

The Council views in a very positive light recent measures introduced by DFO to protect juvenile fish in some stocks. These measures have included increased mesh and hook sizes, small fish testing protocols, and the no-discard rule. The Council recognizes, however, that these measures have a powerful influence upon the day to day operation of these fisheries and, as such, care must be taken to ensure that such measures are applied fairly and uniformly and that they are effective without being unduly restrictive.

The Council also notes that the industry has been supportive of the intent of small fish protective measures but urges DFO to discuss and develop specific applications of those provisions in party with the industry.

The Council, as a general rule, supports the maintenance of existing initiatives to protect juvenile fish and encourages the development and introduction of similar measures for other fisheries. The Council recommends that the design and implementation of measures to protect small fish be cognizant of the need to:

- **investigate the impacts of instituting minimum fish sizes which would allow the majority of individuals to spawn at least once;**
- **determine the feasibility of matching mesh and hook/bait sizes to the minimum fish size;**
- **seek gear technology solutions/improvements, especially where mixed species fisheries occur; and,**
- **balance the benefits of landing all catch against the benefits of releasing certain species and/or sizes under clearly defined circumstances.**

3.1.2 Minimizing Bycatches

In its August 1993 report to the Minister, the FRCC noted that "tolerance levels (e.g. 10%) which have been set for catches of incidental species have subsequently become targets, when in fact, the bycatch target should be zero". Consequently the Council recommended that management measures "be taken to ensure bycatches are truly incidental and kept to an absolute minimum".

After some initial adjustment, the Department did in fact implement new, more stringent 1993 bycatch measures. The reduction in percentages of bycatch permitted and the capping of absolute amounts are important steps. Nevertheless, there are situations where total bycatch captures may still constitute a significant threat to the species in stress and further measures may have to be considered.

The Council wishes to reiterate for the 1994 fishing season that "management measures must be taken to ensure that bycatches are truly incidental and kept to an absolute minimum", and that conservation must take top priority in setting allowable bycatch levels.

3.1.3 Avoiding Effort Re-direction

In its August 1993 report, the Council expressed concern about the possibility that increased conservation measures for critical stocks could result in the redirection of harvesting effort onto other less prominent but already fully-exploited stocks. This possibility of effort re-direction is compounded by the serious industry over-capacity.

The Council reiterates its recommendation to the Minister that in implementing conservation measures on specified stocks, actions also be taken to avoid the re-direction of fishing effort onto other stocks that are in a fragile state and/or fully exploited.

3.2 Stocks of Labrador, Northeast Newfoundland Shelf, Grand Banks and Southern Newfoundland

3.2.1 Environmental Characteristics

a) General features

The continental shelf is characterized by strong geographic differences, with depth variations of hundreds of meters and a width varying from 30 to 300 km. Generally, water masses in this area move southward as the Labrador Current, one of the largest movements of cold water in the North Atlantic. One branch of this current hugs the coastline, while another moves along the edge of the continental shelf. Freshwater runoff originating from Hudson Bay and the rivers of Labrador greatly influences the general characteristics of the water in the Labrador Current.

The Labrador Current consists of three layers. A surface layer, to a depth of 40m, varies greatly in temperature and salinity with the seasons. The extent and the duration of ice coverage in winter may change both the salinity and the temperature of this layer from year to year. The Cold Intermediate Layer (CIL) ranges to a depth of 150 - 200 m. Its temperature may vary several degrees, due to movement of the water masses and mixing with the surface layer in winter. This means that a cold winter may reduce the temperature of the CIL. The bottom layer corresponds to deeper waters that may occasionaly invade the deepest part of the shelf. As this water is warmer and more saline than the upper layers, these irregular invasions may create contrasting environments on a short vertical distance. The deep layer is preferred by the cod.

It has been suggested that the water in the CIL of the Labrador Current may create a thermal barrier, especially to cod, when its temperature is too low. The position and the extent of the CIL may fluctuate quite extensively from year to year.

The southern area of the Grand Banks is also influenced by the relatively warm offshore slope waters to the south and occasionally by the Gulf Stream, which brings warmer waters from the south. Cod in this area grows faster than cod from northern areas.

The St. Pierre Bank area is influenced by incursions of cold water from the Labrador Current, water coming out of the Gulf of St. Lawrence, and by warmer water from the offshore slope waters.

b) Recent trends

Near record cold air temperatures persisted throughout 1992 in the coastal region of the Labrador Sea. Temperatures below the 60 year average have been observed for the past ten years. Cold air and strong northwesterly winds resulted in early ice formation, covering a larger area than normal, and late retreat of ice off northern Newfoundland and

southern Labrador. New records for duration of ice coverage were established in some areas of the outer northern Newfoundland shelf. A general trend shows an increase of the winter ice coverage (January-March) since 1980.

Off St. John's (station 27), the ocean temperatures observed in 1992 were generally below normal throughout the water column. The near-bottom waters warmed slightly compared to 1991 but were still colder than normal, continuing a trend that began in 1991. Salinities were also below normal during most of the year. The extent of the CIL in summer off northern Newfoundland and southern Labrador continues the trend of decreases started in 1991, but overall is still above normal.

For 1993, the cold air temperatures in the Labrador Sea appear to be continuing. The combination of cold air and heavy northwesterly winds has produced a larger surface coverage of ice than normal. On the basis of cold winter conditions during the last several years, it is expected that lower-layer temperatures in the Newfoundland area will again be colder than normal and the areal extent of the CIL greater. With heavy concentrations of ice off Newfoundland, salinities should be fresher than the long-term average in spring and summer.

c) General stock trends

The groundfish fisheries along the Labrador and east coasts of Newfoundland exploit three main species groups: the gadoids (essentially cod in this area), the flatfishes (American plaice, yellowtail flounder, witch flounder, Greenland and Atlantic halibuts) and the others consisting of species such as grenadier and redfish.

In this area, most of the groundfish stocks appear to be in a very critical situation, perhaps even collapse. Most public of these has been the decline of the Northern Cod stock. It seems, however, that the whole ecosystem is following the same trends, as massive downturns have been noted for both fished and non fished populations. The remaining fish are located in narrower areas and at greater depths than observed in the past. Stocks of American plaice, witch flounder and cod present the lowest abundance ever recorded, too low to allow directed fisheries to occur. Redfish stocks remain in a precarious situation. As recruitment does not show any sign of improvement, a strong recovery of the fishery cannot be anticipated in the foreseeable future.

3.2.2 Stock-by-Stock Recommendations

Cod - 2GH

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	1,000
Catch	2,400	1,500	500	500	100	500	400	400	0	0	0*

*As of November 3, 1993

The TAC for this stock was reduced in 1993 to 1,000t from 20,000t in 1992. Canadian catches on this stock have been less than 500t per year since 1985.

A survey was conducted in the autumn of 1991 and the resulting biomass estimate was very low. All indications, including advice from fishermen, suggest that there have been very few cod in 2GH in recent years. In 1992, scientists suggested that if cod do appear in 2GH, the possible linkages with 2J3KL cod should be investigated before the current TAC of 1,000t is increased.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for 2GH cod be set at 1,000t.

Cod - 2J3KL

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	260,000	266,000	266,000	266,000	256,000	266,000	235,000	199,262	190,000	Mora-torium	Mora-torium
Catch	232,200	232,500	231,300	251,500	235,000	268,700	253,400	218,700	170,900	43,700	*

*no estimate yet available

The June 1993 assessment shows that this stock continues to decline and is at a very low level, probably the lowest level of abundance experienced during the 20th century. Total biomass is estimated to be as low as 100,000-150,000t and the spawning biomass as low as 20,000t. These numbers are less than 10% of comparable numbers just a few years ago. This drastic decline is probably due to a variety of factors (high fishing mortality, poor environmental conditions, low recruitment, poor availability of food and possibly increased predation by seals). Environmental conditions are having an adverse impact on recruitment and the growth of young fish. After the 1986-1987 year-classes, there have been five consecutive years of observed or predicted poor recruitment. Stock recovery in the near future is unlikely and substantial recovery of the spawning biomass is unlikely before the year 2000 at the earliest. At this stage, there are no reasons to be optimistic about recovery even then. From a conservation perspective, it is clear that given the continuing decline and continuing poor recruitment, it is prudent not to fish.

RECOMMENDATION: The Council recommends that the moratorium on fishing for 2J3KL cod be continued in 1994.

Industry has raised a number of concerns with respect to the so-called "recreational" fishery because of the abuse in terms of quantity and the destruction of large numbers of small fish. The general view is that this fishery should be stopped completely. If a "food" fishery for personal consumption is necessary, then appropriate measures should be utilized. Suggestions included limiting the fishery to certain week(s) of the year or certain day(s) of the week with a strict permit system for the few registered commercial tour boat operators. It is generally felt by industry that a "bag limit" would lead to highgrading and would be difficult to enforce.

RECOMMENDATION: If a "food fishery" is to be permitted, the Council recommends that strict limits be placed on it, to ensure that it is truly a fishery for personal consumption.

Cod - 3Ps

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	33,000	33,000	41,000	41,000	41,000	41,000	35,400	35,400	35,400	35,400	20,000 Closed[1]
Catch	38,500	37,000	51,400	57,300	57,300	43,400	39,500	41,300	43,100	31,500	13,600[2]

1. Closed in September 1993
2. As of November 3, 1993

The 1993 Stock Status Report indicated that the stock abundance is at its lowest since 1978. Although the 1987 and 1989 year-classes may be relatively strong, the 1988 year-class is the weakest observed. Research surveys have shown a marked decline in stock size since 1988, with low estimates in 1992, and even lower in 1993, approaching the lowest level seen.

In August 1993, the Council expressed its concern with the alarmingly low estimates of biomass for this stock. The Council recommended that fishing for this cod stock be discontinued at least until April 30, 1994. The fishery was closed in September 1993.

The 1993 fishery was very variable, being very good in some areas and very poor in others. Fishermen reported that it had been necessary to significantly increase their effort in recent years to catch the same amount of fish as in the past, although there was some difference of opinion as to whether or not the fishery should be closed. Some fishermen also feel that fish overwintering in Placentia Bay are actually from another cod stock, possibly that of 2J3KL.

A survey of this stock will be conducted in April 1994. The 1994 survey plan will include, to the extent possible, parts of Placentia Bay, because of concerns expressed by fishermen that the inshore portion of the stock may not have been appropriately covered. **Following the analysis of results of the April survey, the Council will make recommendations for this stock prior to the end of April.**

Haddock - 3LNO

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	---	---	---	---	4,100	8,100	8,100	10,000	4,100	4,100	500
Catch	N/A	2,800	4,000	7,800	5,700	8,100	6,400	3,100	1,200	800	600*

*As of November 3, 1993

The TAC was reduced to 500t for 1993 following recommendations from the scientists that the fishery should be limited to a bycatch fishery with a precautionary ceiling of no more than 500t. Scientists indicated that an increase in biomass in the mid-1980s was due to relatively strong 1980 and 1981 year-classes. However, these year-classes have been subjected to high exploitation rates and have been fished out. If the 3LNO haddock stock is to be rebuilt, future recruitment will need to be protected to prevent the heavy exploitation exerted on the 1980 and 1981 year-classes.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 3LNO haddock stock in 1994 and that bycatches be limited to 500t.

Haddock - 3Ps

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	---	---	---	---	150	2,200	3,200	3,200	3,200	3,200	500
Catch	100	2,800	7,500	5,300	2,700	2,400	2,900	1,500	600	400	100*

* As of November 3, 1993

While there is no new information provided in the 1993 Stock Status Report, the Council notes that the TAC was reduced to 500t for 1993 following recommendations from the scientists that the TAC of 3,200t was too high. Scientists indicated in 1992 that the fishery should be limited to a bycatch fishery with a precautionary ceiling of no more than 500t. They indicated that the 1981 year-class was above average but had been rapidly reduced because of high fishing mortality. If this stock is to be rebuilt, future recruitment will need to be protected to prevent the heavy exploitation exerted on the 1981 year-class.

With the closure of the 3Ps American plaice fishery and the 3Ps cod fishery until at least the end of April, the bycatch of haddock in these fisheries will be substantially reduced.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 3Ps haddock stock in 1994 and that bycatches be limited to 500t.

Pollock - 3Ps

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	----	----	----	----	1,500	5,400	5,400	5,400	5,400	5,400	600
Catch	900	1,800	2,300	7,100	5,000	3,900	3,400	1,800	1,100	500	40*

* As of November 3, 1993

The fishery in the mid-eighties was from a single year-class and scientists indicated in 1992 that the biomass has been declining since 1986 as this year-class was fished out. The fishery was reduced from a precautionary quota of 5,400t in 1992 to a bycatch fishery in 1993. There are very few pollock left in 3Ps.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 3Ps pollock stock in 1994 and that bycatches be limited to 500t.

Redfish - 2+3K

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	20,000	20,000	20,000
Catch	15,300	23,700	29,200	27,100	18,500	6,900	3,200	2,400	239	9	5*

*As of November 3, 1993

The 1993 Stock Status Report indicated that this stock is at a low level due to poor recruitment. The 1992 survey index is an historically low level. There has been no substantial recruitment since the year-classes of the early 1970s. The stock is expected to continue to decline until good recruitment takes place and prospects for the fishery will not improve until 8-10 years after that time.

Given the current very low level of this stock, the current level of TAC is clearly too high.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for the 2+3K redfish stock be set at 1,000t.

Redfish - 3O

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	20,000	20,000	20,000	20,000	20,000	14,000	14,000	14,000	14,000	14,000	14,000
Catch**	7,100	10,000	8,200	10,500	24,000	24,800	11,100	10,900	8,000	11,100	8,000*

*As of November 3, 1993 **Includes surveillance estimates outside the Canadian zone

The 1993 Stock Status Report indicated that research surveys identified a pulse of recruitment which corresponds to the 1988 and 1989 year-classes. The strength of these year-classes is not known precisely but, in any event, they will not recruit to the fisheries before 1996. There has been a general decline in the commercial catch rates since 1982.

Catch levels of the last four years averaged 10,000t. Given the current status of the stock, the existing TAC of 14,000t is probably too high and should be reduced.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for the 3O redfish stock be set at 10,000t.

Redfish - 3Ps4Vs4Wfgj+3Pn (Jun.-Dec.)4Vn(Jun.-Dec.) - Unit 2

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC											28,000
Catch	13,500	8,100	11,500	10,800	14,000	10,700	15,400	14,800	20,100	17,000	19,600*

*As of November 3, 1993

In 1992, scientists indicated that the stock could be of average abundance, maybe slightly lower. A new management unit was adopted for 1993, based on an evaluation of available data from the fisheries and research in the area.

Recent surveys have detected a recruitment pulse corresponding to the 1981, 1985 and 1988 year-classes. There does not appear to be reason to expect a significant change in abundance until the 1985 and 1988 year-classes appear in the fishery.

Consultations with the industry indicated that catch rates appear to be stable.

RECOMMENDATION: The Council recommends that the 1994 TAC for the Unit 2 redfish stock be set at 25,000t.

American Plaice - 2+3K

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	5,000
Catch	1,600	1,200	800	3,000	1,100	1,000	4,200	1,800	500	100	10*

*As of November 3, 1993

The 1993 Stock Status Report indicated that this stock is at a very low level. Both the total and the spawning stock biomasses are far below any previous estimate in the 15-year time series. Total mortality is likely very high. However, reported catches could not have caused such a rapid decrease. Extreme oceanographic conditions may have increased natural mortality.

There is no sign of good recruitment and, as plaice aged 9-12 comprise the majority of the commercial catches, a recovery of the fishery is unlikely before at least 10 years.

Public consultations confirmed that the stock is in decline and that catches of plaice are practically non-existent.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 2 + 3K American plaice stock in 1994 and that bycatches be limited to 500t.

American Plaice - 3Ps

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	5,000	5,000	5,000	5,000	5,000	5,000	5,000	4,000	4,000	4,000	3,000
Catch	1,700	3,000	4,200	5,100	5,300	4,400	4,000	4,800	4,400	2,300	300*

*As of November 3, 1993

This stock has declined markedly since the mid- to late-1980s and is now below any previously observed value. Total mortality is likely very high. It is unlikely that reported catches are solely responsible for the observed decline in abundance. There is no sign of good recruitment and, consequently, no immediate prospects for stock rebuilding. In particular, research vessel surveys since 1980 showed an overall rapid decline in abundance to less than 5% of the 1980-1982 levels.

In August 1993, the Council recommended that the 3Ps American plaice fishery be halted immediately. This fishery was halted in September 1993.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 3Ps American plaice stock in 1994 and that bycatches be limited to 500t.

Witch Flounder - 2J3KL

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	8,000	8,000	8,000	8,000	6,000	5,000	5,000	4,000	4,000	4,000	4,000
Catch	3,100	4,800	3,000	3,900	4,500	4,200	4,900	3,600	4,000	2,300	300*

*As of November 3, 1993

The 1993 Stock Status Report indicated that both the total and the spawning biomasses are far below any previous estimate in the 15-year time series. The stock level is presently the lowest recorded. Recruitment has been very poor to non existent from the mid-1980s. Adverse oceanographic conditions may have played a role in the decreased abundance of witch.

During the recent public consultations, the industry confirmed that the availability of witch in 2J3KL is very low.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for 2J3KL witch flounder be reduced to 1,000t.

Witch Flounder - 3Ps

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	3,000	3,000	3,000	3,000	3,000	1,000	1,000	1,000	1,000	1,000	1,000
Catch	400	500	600	1,300	1,300	600	900	1,000	1,100	1,100	800*

*As of November 3, 1993

Research surveys indicate that the biomass has been relatively stable since the early 1980s.

Industry representatives have also indicated that this stock appears to be relatively stable, that catch rates in 1993 remained consistent with those of previous years, and that there appears to be little change in the stock abundance.

RECOMMENDATION: The Council recommends that the 1994 TAC for 3Ps witch flounder be set at 1,000t.

Greenland Halibut - O+1

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Catch	8,700	7,000	10,200	9,000	10,000	9,600	10,100	19,600	21,700	28,500	*

*no estimate yet available

Greenland halibut in the northwest Atlantic (with the exception of those in the Gulf of St. Lawrence) are considered to be one stock extending from Davis Strait, south to the Grand Banks. However, separate TACs have been set for 0+1, 2GH and 2J3KL for many years. In Area 0+1, catches were around 8,000-10,000t from 1983 to 1988 and subsequently increased to 29,000t in 1992. The TACs have been set at 25,000t for this period. The survey biomass indices have declined since 1989. However, catch per unit of effort and size compositions have remained unchanged. The offshore fisheries in this region are now concentrated in small areas. The NAFO Scientific Council has recommended that the TAC be maintained at 25,000t but warned that intensive fishing effort in localized areas of abundance is imprudent given the lack of scientific information on stock structure and stock size.

RECOMMENDATION: The Council recommends that the 1994 TAC for Subarea 0+1 Greenland halibut be set at 25,000t (i.e. 12,500t for Subarea 0).

Greenland Halibut - 2+3KLMN

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	55,000	55,000	75,000	100,000	100,000	100,000	100,000	50,000	50,000	50,000	50,000
Catch	27,800	26,700	20,300	18,000	32,400	18,400	18,900	47,400	55,000 to 75,000	63,000	*

*no estimate yet available

The catches from SA2 and Divisions 3KL peaked at 39,000t in 1978 and subsequently declined to an average of 20,000t from 1985 to 1989. Catches increased sharply to 55,000-75,000t in 1991, mainly due to a developing fishery in the Regulatory Area in Divisions 3L, 3N and 3M.

Until the 1991 research survey, the year-classes of 1984-1986 appeared to be relatively strong. Survey results in 1991 and 1992 suggest that they had declined rapidly. Most of the indices of abundance for 1992 indicate a decline from 1991. The number of older fish in the survey area has continued to decline. The decline in some indices may be due, in part, to a redistribution of the stock from northern areas to the Regulatory Area of 3L, 3M and 3N. The effect on the stock of continued catches in the Regulatory Area at the 1990-1992 levels is unclear but catches in 1992 were of smaller fish than in 1990 and 1991. Past advice for this stock has been to distribute fishing effort over as wide an area as possible.

Results of surveys in the late 1980s indicated that the biomass had decreased by about 50% between the 1978 - 1987 level and 1990. The TAC was therefore lowered to 50,000t in 1990. The observed declines in Greenland halibut in the northern areas cannot be explained by the fisheries. The NAFO Scientific Council has indicated that it is possible that the fish have redistributed to deeper water and may have moved further south and outside 200 miles where they have become available to the foreign fleets. At present, there are no data to suggest that this foreign fishery is being prosecuted on a separate stock, and the high catches of recent years from this fishery are cause for concern.

In August 1993, the Fisheries Resource Conservation Council called for significant reductions in catches in the Regulatory Area and for a joint commitment to appropriately address the scientific questions related to stock structure in a timely fashion. The Council noted, in the absence of scientific advice on catch levels, that the historical catch for the 2+3KLMN area had been of the order of 25,000t annually and suggested that this be considered a maximum catch level until available information suggests otherwise.

The FRCC is concerned that despite dramatic declines in stock size in traditional areas and major shifts in distribution, the fishing effort towards this stock has expanded

at an alarming rate in three areas: a) outside the 200-mile limit in the Flemish Pass by foreign trawlers since 1990, b) Davis Strait largely as a result of the "development pool" in recent years and c) along the deep continental slope by gillnets from Division 3K northward to Division 0B. The latter fishery began in earnest in 1991 in Division 3K and, by 1993, catch rates here already appear to have declined substantially. In 1993, gillnet effort moved northward to Divisions 2GH and 0B, where catches were higher. However, it is not clear how sustainable these fisheries may be or what effects they may have on the stock. It is also of concern that nearly the entire catch is of large females.

Public consultations reveal that catch rates have declined. Fishermen were concerned that artificially high TACs result in increased fishing pressure and suggested that the TAC for this stock be reduced. They were particularly concerned that this stock is still considered as part of the "underutilized pool", and suggested that all stocks of Greenland halibut be withdrawn from the developmental quota since this species is fully utilized in the northwest Atlantic.

Fishermen also noted the large number of gillnets per vessel used in this fishery, and the soak times which may exceed ten days in some cases.

The Council views the above issues, as well as the lack of adequate scientific knowledge on stock structure and abundance for this stock, with concern. The Council feels that additional research effort should be directed towards obtaining more scientific information on stock delineation and improving our overall estimates of abundance over the entire stock area (0+1 as well as 2+3).

RECOMMENDATION: From a conservation perspective, the Council feels that the 1994 TAC for 2+3KLMN Greenland halibut should be reduced substantially. In the absence of controls on foreign fishing outside 200 miles, the Council considers that catches in the order of the historical catch level of 25,000t should be a maximum level. The Council notes the absence of controls on the foreign fishery for this stock outside 200 miles, and recommends that all means be taken by Canada to limit the effort on this stock.

Roundnose Grenadier - O+1

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Catch		100	100	100	400	500	80	160	160	190	8*

*As of November 3, 1993

Catches have been very low on this stock. The Scientific Council of NAFO reviewed the information on this stock in June 1993 and advised that the 1994 TAC remain at the 1992 level of 8,000t for roundnose grenadier in Subareas 0+1 (4,000t for Subarea 0).

RECOMMENDATION: The Council recommends that the 1994 TAC for roundnose grenadier in Subarea 0 be set at 4,000t.

Roundnose Grenadier - 2+3

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000
Catch	4,000	4,000	5,000	7,000	8,000	6,000	5,000	4,000	9,000-14,000	5,000	200*

*As of November 3, 1993

The TAC for this stock has been 11,000t since the 1983. Prior to 1979 catches averaged about 26,000t. They have declined to an average of about 6,000t since 1988. Since about 1989, catches from the traditional fishery have steadily declined, while catches from the Regulatory Area have increased due to bycatch in the Greenland halibut fishery.

A Russian survey in 1992 yielded catches below those of 1991 in all areas. No concentrations of roundnose grenadier were found at traditional fishing depths. Catches have decreased by a factor of 10 since 1970s.

In its June 1993 report, the NAFO Scientific Council recommended that the TAC for 1994 be set at a new precautionary level of 3,000t, which is half the catch level of the period of recent catch stability.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for SA 2+3 roundnose grenadier be set at 3,000t.

3.2.3 Summary Table

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Cod 2GH	20,000t	0t	1,000t		0t	Precautionary TAC at 1,000t
Cod 2J3KL	Morato-rium	43,700t	Morato-rium		No estimate yet available	Continue moratorium; strict limits on food fishery
Cod 3Ps	35,400t	31,500t	20,000t	Closure	13,600t	Recommendation to follow April survey
Haddock 3LNO	4,100t	800t	Bycatch (500t)		600t	No directed fishery; limit bycatch to 500t
Haddock 3Ps	3,200t	400t	Bycatch (500t)		100t	No directed fishery; limit bycatch to 500t
Pollock 3Ps	5,400t	500t	Bycatch (600t)		40t	No directed fishery; limit bycatch to 500t
Redfish 2+3K	20,000t	9t	20,000t		5t	Precautionary TAC at 1,000t
Redfish 3O	14,000t	11,100t	14,000t		8,000t	Precautionary TAC at 10,000t

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Redfish - 3Ps4Vs4Wfgj+3Pn (Jun.-Dec.)4Vn(Jun.-Dec.) - Unit 2	----	17,000t	28,000t		19,600t	TAC at 25,000t
American plaice 2+3K	10,000t	100t	5,000t		10t	No directed fishery; limit bycatch to 500t
American plaice 3Ps	4,000t	2,300t	3,000t		300t	No directed fishery; limit bycatch to 500t
Witch flounder 2J3KL	4,000t	2,300t	4,000t		300t	Precautionary TAC at 1,000t
Witch flounder 3Ps	1,000t	1,100t	1,000t		800t	TAC at 1,000t
Greenland halibut 0+1	25,000t (12,500t for 0)	28,500t	25,000t (12,500t for 0)			TAC at 12,500t (For Subarea 0)
Greenland halibut 2+3KL	50,000t	63,000t	50,000t			TAC at 25,000t; limit fishing effort
Roundnose grenadier 0+1	4,000t	190t	4,000t		8t	TAC at 4,000t
Roundnose grenadier 2+3	11,000t	5,000t	11,000t		200t	Precautionary TAC at 3,000t

3.3 Stocks of the Scotian Shelf and Georges Bank

3.3.1 Environmental Characteristics

a) General features

The continental shelf off Nova Scotia is separated from the Newfoundland area by the Cabot Strait and Laurentian Channel. The shelf is marked by depressions, depths greater than 200 m, and several shallow banks. Georges Bank is located in the most southern part of the region.

The inner part of the shelf, between the banks and the shore line is influenced by waters originating from the Gulf of St. Lawrence and flowing south. These waters are characterized by low salinity and seasonal temperature variations. The seasonal variations create a warm surface layer in summer that overlays a water body that remains cold (less than 4 - 6°C) all year round (the Cold Intermediate Layer, CIL). Slope water invades the deep basin observed on the Scotian Shelf, below the CIL. The slope water is formed at the surface from a mixing of shelf and Gulf Stream waters and at depths below 100 m by water masses from the Labrador Current.

b) Recent trends

Winter air temperature was below normal in 1992 and resulted in a longer duration and wider extent of ice coverage. Air temperatures in the first two months of 1993 were below normal and some of the coldest for these months in recent years, producing heavy ice accumulation as far as Halifax, much further south than normal. In addition, greater amounts of local ice have formed along the bays and inlets of the coast of Nova Scotia.

Both at St. Andrews and Halifax, sea surface temperature remained below the 30 year average during 1992, continuing a decreasing trend started in the early eighties. In contrast, deep waters in the basins and in the Cabot Strait exhibited temperatures above normal showing a rapid rise from the very low values observed in 1991. These conditions are believed to have resulted from intrusions of warm offshore slope waters into the deep basins and channels of the shelf.

c) General stock trends

The Scotian Shelf and Georges Bank groundfish fisheries are dominated by cod, haddock and pollock. Important fisheries for flatfish (plaice, yellowtail, witch and winter flounder), Atlantic halibut, redfish and silver hake are also conducted.

For most of the stocks, the declines observed since the mid-1980s are continuing. All the cod stocks are in a precarious situation, with no indication of strong incoming recruitment. Haddock stocks remain at very low levels. However, the relatively rapid

growth of cod and haddock in the southern part of the ecosystem could lead to a reversal of the situation if fishing pressure is reduced. The pollock stock shows some signs of incoming good year classes. The silver hake stock is declining while redfish stocks appear relatively stable albeit not abundant. Flatfish are under increasing fishing pressure and there is growing concern about redirection of effort onto these stocks.

3.3.2 Stock-by-Stock Recommendations

Cod - 4Vn (M - D)

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	14,000	14,000	12,000	12,000	9,000	7,500	7,500	7,500	10,000	10,000	1,800 Closed[1]
Catch	9,500	10,400	12,500	11,800	10,600	9,000	7,600	5,200	4,600	4,300	530[2]

1. Closed in September 1993
2. As of November 3, 1993

The 1993 Stock Status Report indicated that catches have decreased rapidly in the last five years. The fixed gear sector has been particularly affected by the decline and has been unable to catch its allocations in the past three years. This stock is in a very depressed state and recent year-classes do not appear strong.

In August 1993, the Council recommended that fishing on this stock be halted immediately. The recommendation was accepted and the fishery was closed in September.

Up to September, mobile gear had taken less than 100t and had been closed on several occasions due to the presence of high proportions of small fish in the catch. In late August and early September, some fixed-gear fishermen reported good catch rates. At present, a small (six boat) longline fishery is engaged in collecting samples of cod from designated areas in 4Vn. The information from these samples may help in ongoing studies on stock differentiation.

This stock was surveyed in July 1993 as part of the regular groundfish survey series conducted on the Scotian Shelf since 1971. The 1993 catch per tow is very low compared with the early 1980s. There are no indications of improved recruitment. These results are consistent with the information provided in the Stock Status Report.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 4Vn (M - D) cod stock in 1994 and that bycatches be kept to the lowest possible level.

Cod - 4VsW

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	64,000	55,000	55,000	48,000	44,000	38,000	35,200	35,200	35,200	35,200	11,000 Closed[1]
Catch	52,400	52,500	57,500	48,100	43,500	35,900	34,200	29,700	24,200	25,400	3,200[2]

1. Closed in September 1993
2. As of November 3, 1993

Catches for this stock were, in 1991 and 1992, the lowest on record since 1978. Poor recruitment and high fishing mortality have characterized this stock through the 1980's and early 1990's. Fishing mortality has been very high since 1978, and more than 1.0 in the early 1990s. Recruitment has been very poor since the early 1980s. The spawning stock biomass and the total biomass are currently at the lowest levels ever recorded. Even if the 1992 or the 1993 year-classes were to be strong, they would not result in a spawning stock increase until 1998-1999 in 4VsW. Therefore stock rebuilding will be slow.

In August 1993, based on the drastic stock decline, the Council recommended that the 4VsW cod fishery be halted immediately. The fishery was closed in September. The Council noted the potential impact of the grey seal herd of Sable Island, which has been increasing at a rate of 12% per year. Indications are that the effect of this may be magnified by the small size of the cod population.

The July survey for this stock indicated that the abundance of large cod remains very low. In addition, there was no indication that incoming recruitment is strong. These results are consistent with the information presented in the Stock Status Report.

When directed fishing was permitted in this stock in 1993, fishermen reported that they were catching small fish and that even those were difficult to find. This observation is consistent with the numerous closures implemented in 1993 because of the presence of small fish in the catch. During public consultations, some fishermen were very concerned about the future of this stock and suggested that it not be fished in 1994.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 4VsW cod stock in 1994 and that bycatches be kept to the lowest possible level.

Cod - 4X

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	30,000	30,000	30,000	20,000	17,500	14,000	12,500	12,000	26,000	26,000	26,000 15,000[1]
Catch	29,300	25,300	21,400	19,900	18,700	19,800	19,600	23,600	27,500	26,000	14,500[2]

1. Closed in September 1993
2. As of November 3, 1993

The 1993 Stock Status Report indicated that recruitment has generally been steadier for this stock than for most cod stocks. The strong 1985 and 1987 year-classes have already made most of their contribution to catches. The 1988 year-class is as weak as the weakest recorded, and the 1989 year-class is below average. A general downward trend in biomass has been observed since 1990.

In August 1993, the Council recommended, as a precautionary conservation measure, that the 1993 TAC be reduced from 26,000t to 15,000t, a level still about twice the $F_{0.1}$ level.

Results from the July 1993 survey show a continuing decline. While these results are generally consistent with the information contained in the Stock Status Report, ages 6, 7 and 8 are less abundant in the survey than expected.

Fishermen have indicated that the stock is in poor shape, "perhaps as poor as ever", and that large fish seem to be scarce. They also suggested an increase in hook and mesh size to achieve a minimum 19-inch fish size, as well as closures to protect spawning and juvenile fish.

Taking into account the reduced TAC of 15,000t for 1993, the revised $F_{0.1}$ catch for 1994 would be of the order of 9,000t. Given this and the low July survey results, the Council concludes that some reduction in the TAC is warranted for 1994.

RECOMMENDATION: The Council recommends that the 1994 TAC for 4X cod be set at 13,000t. In addition, other conservation measures, such as (a) improved selectivity of fishing gears (increased hook and mesh sizes), (b) limitations on the quantity and dimensions of fishing gear used, and (c) expanded use of area closures to protect spawning and/or juvenile aggregations, should be considered for this fishery.

Cod - 5Zj,m

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC									15,000	15,000	15,000
Catch	20,700	16,300	17,100	14,100	16,600	20,600	14,200	20,700	20,000	16,800	8,100*

*As of November 3, 1993 (Canadian catches only; no estimate available for catches by U.S.A. in 1993)

This is a transboundary stock, the majority of which appears to be in Canadian waters. The 1993 Stock Status Report indicated that the total and spawning biomasses are at the lowest level observed since 1978 when observations began. Fishing mortalities have been very high and have increased to about 0.8 in 1991 and 1992 as the stock declined. Further reductions in the stock are expected if fishing continues at the present level. With the exception of the 1990 year-class, recent year-classes have been below average. The 1990 year-class accounted for over 65% of the 1993 landings.

In August 1993, the Council concluded that, from a conservation perspective, the fishery for this stock should be closed. The Council noted, however, that a closure by Canada alone would not be sufficient to protect the stock without corresponding action by the United States. The Council also notes that discussions are proceeding between Canada and the United States on this stock.

During recent consultations, some management options were put forward for 1994 by industry participants, such as improved gear selectivity and/or seasonal closures of the area.

The Council continues to feel that a closure of the fishery for this stock is necessary.

RECOMMENDATION: From a conservation perspective, the Council concludes that the 5Zj,m cod fishery should be closed; however, a closure by Canada would not be sufficient to protect the stock without corresponding action by the United States. The Council urges that consultations continue with the United States with the objective of undertaking urgent and immediate management action to rebuild this stock.

RECOMMENDATION: The Council also recommends that, if fishing is to continue on this stock, a conservation harvesting package be considered containing such measures as (a) improved selectivity of fishing gears (increased hook and mesh sizes), (b) limitations on the quantity and dimensions of fishing gear used, and (c) expanded use of area closures to protect spawning and/or juvenile aggregations.

Haddock - 4TVW

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	19,000	15,000	15,000	17,000	Bycatch	Bycatch	6,700	6,000	Bycatch	Bycatch	Bycatch
Catch	9,400	8,000	11,700	16,900	3,900	4,500	9,100	7,000	5,400	6,000	1,100*

* As of November 3, 1993

The 1993 Stock Status Report indicated that this stock has essentially disappeared from 4Vn and 4Vs and abundance in 4W is low. There are no indications of strong year-classes after that of 1988. The bulk of the stock is concentrated in Division 4W and is mainly of the 1988 year-class. Fishing mortality is believed to be high, probably in the order of 1.0.

In August 1993, the Council expressed concern about the low level of this stock.

The summer 1993 survey indicates that the stock is still at a very low level and is dependent upon a single year-class, that of 1988.

Fishermen indicate that there is good agreement between the Stock Status Report and their overall view of the resource.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 4TVW haddock stock in 1994 and that the closure of the haddock box to all gears be continued.

Haddock - 4X

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	32,000	32,000	15,000	15,000	15,000	12,400	4,600	4,600	Bycatch	Bycatch	Bycatch 6,000 [1]
Catch	25,000	19,600	14,900	15,000	13,600	11,000	6,700	7,300	9,700	10,300	6,300[2]

1. Closed in September 1993
2. As of November 3, 1993

Catches declined from 31,000t in 1981 to 7,000t in 1989. In an effort to further decrease exploitation rates, the 1991 and 1992 fisheries were reduced to bycatch only. However, the catches in both years reached 10,000t. For 1993, a TAC of 6,000t (bycatch only) was set. Stock abundance was higher in 1991 than the low values of the late-1980s but was still below the productive levels of the 1960s and late-1970s. Recruitment has been weak since 1983, except for the 1987 and 1988 year-classes which were relatively strong. The 1989 year-class is very weak and those of both 1990 and 1991 appear below average. Fishing mortalities were high thoughout the eighties, from 0.5 to 1.0.

In its August 1993 report, the Council recommended that every action be taken to ensure that there are no overruns of the 1993 quota. The stock was closed to fishing in September because the quotas had been taken.

The July 1993 survey results are the lowest since at least 1970. They indicate a considerable decrease in abundance of the 1987 and 1988 year-classes, which suggests that these year-classes have been subjected to high levels of fishing. There are indications that the 1992 year-class may be of average strength.

Some fishermen suggested that haddock are more abundant than indicated in the 1993 survey. Public consultations with the industry provided a number of options for conservation measures in 1994, including "no change in the TAC", "a higher TAC", "expanding the spawning closure by one month or more", measures to "prevent the capture of small fish including increased hook and mesh size", and "an adequate fishing plan for all fleet sectors involved in the fishery".

The most recent survey results indicate a continuing decline in the stock from 1991 to 1993. Given that this stock appears to be at a very low level compared to the levels of the late 1970s and early 1980s, the Council feels that some reduction in the TAC is warranted for 1994.

RECOMMENDATION: The Council recommends that the 1994 TAC for 4X haddock be set at 4,500t (bycatch only) and that every action be taken to ensure that there are no overruns of this quota. The Council believes there could be additional benefits to implementing other conservation measures, such as (a) improved selectivity of fishing gears (increased hook and mesh sizes), (b) limitations on the quantity and dimensions of fishing gear used, and (c) expanded use of area closures to protect spawning and/or juvenile aggregations, in this fishery.

Haddock - 5Zj,m

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC									5,000	5,000	5,000
Catch	7,500	6,600	5,200	5,600	6,100	5,700	3,800	4,500	6,400	6,000	3,400*

*As of November 3, 1993 (Canadian catches only, no estimate available for U.S.A.)

This is also a transboundary stock, the majority of which appears to be in Canadian waters. The 1993 Stock Status Report points out that this stock is near its historically low level which occurred in the mid-1970s. Recent recruitment has been poor, with occasional moderate size year-classes being produced. Fishing mortality has been very high, having increased from 0.5-0.6, to more than 1.0 in 1992, the highest level observed. Scientists are concerned that mis-reporting of 4X haddock to 5Z has increased in 1993.

In August 1993, the Council recommended that the 5Zjm haddock fishery be closed.

Recent public consultations indicated that the industry would be supportive of conservation actions if similar measures are taken by USA. The Council notes that the U.S.A. New England Regional Council has recently recommended a cessation of winter haddock fishery on Georges Bank.

The Council continues to feel that a closure of the fishery for this stock is necessary.

RECOMMENDATION: From a conservation perspective, the Council concludes that the 5Zj,m haddock fishery should be closed. The Council urges the continuation of the consultations with the United States with the objective of undertaking urgent and immediate management action to rebuild this stock.

RECOMMENDATION: The Council also recommends that, if fishing is to continue on this stock, a conservation harvesting package be considered containing such measures as (a) improved selectivity of fishing gears (increased hook and mesh sizes), (b) limitations on the quantity and dimensions of fishing gear used, and (c) expanded use of area closures to protect spawning and/or juvenile aggregations.

Pollock - 4VWX5Zc

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	45,000	53,000	42,400	40,000	43,000	43,000	43,000	38,000	43,000	43,000	35,000 21,000[1]
Catch	34,600	35,400	43,800	44,300	46,100	43,100	43,000	37,500	39,500	34,300	17,500[2]

1. Reduced in September 1993.
2. As of November 3, 1993

The pollock biomass peaked in the mid-1980s and declined subsequently to levels approaching the long-term average.

In August 1993, the Council recommended, as a precautionary conservation measure, that the 1993 TAC be reduced from 35,000t to 21,000t. The Council also noted that the closure of the 4VsW cod fishery could cause some redirection of effort to the pollock fishery.

The summer survey for this stock suggests that the 1989 year-class could be stronger than was assumed in the July Stock Status Report. If this is the case, the 1989 year-class could contribute substantially to catches in upcoming years.

Fishermen state that small pollock are being caught while large pollock are rare. Industry has also suggested that strict enforcement be applied to ensure that small fish catches are kept to within the 15% small fish rule.

Taking into account the reduced 1993 TAC of 21,000t, the revised $F_{0.1}$ reference level for 1994 would be 24,000t.

RECOMMENDATION: The Council recommends that the 1994 TAC for 4VWX5Zc pollock be set at 24,000t.

Redfish - 4WdehklX - Unit 3

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC											10,000
Catch	4,900	5,500	6,000	6,900	6,500	4,000	3,300	2,400	2,000	2,400	4,500*

*As of November 3, 1993

Landings were 6,000-7,000t in 1985-1987 but decreased to about 2,000t in 1990-1992. Landings to date in 1993 are about 4,200t from a TAC of 10,000t. Survey estimates of stock abundance are variable and no clear trends are discernable in the 1980s and early 1990s. There is no indication of significant recruitment in recent years. Recent information gives no reason to expect significant changes in this stock in 1994.

There is no indication from either research surveys or commercial catch rate data to suggest that there has been a significant change in stock status recently.

Industry representatives suggest that there may be increased effort on this stock due to decreased availability of other groundfish and this should be monitored closely.

RECOMMENDATION: The Council recommends that the 1994 TAC for Unit 3 redfish be set at 10,000t.

Flatfishes - 4VWX

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000
Catch (total)	12,300	12,500	9,900	10,800	11,700	9,800	8,700	10,300	9,700	10,000	7,200*
Plaice - 4VW	5,500	5,800	4,100	3,100	4,600	3,100	3,400	1,900	400	500	
-4X	580	340	320	590	260	370	480	470	990	410	
Witch -4Vw	1,000	1,300	1,700	2,400	2,700	2,400	1,800	1,300	1,300	1,000	
-4X	660	600	530	630	490	540	530	640	600	820	
Y-tail - 4VW	2,100	2,300	900	700	1,000	1,000	1,500	2,900	1,300	1,400	
- 4X	320	170	70	110	110	80	50	80	140	120	
Winter fl. 4VW	80	10	30	10	10	110	190	80	40	5	
-4X	920	880	800	1,000	1,000	1,500	1,300	1,900	600	560	
Unsp. - 4VW	50	10	10	70	40	90	90	30	1,500	1,900	
- 4X	2,000	2,000	2,200	3,200	2,400	2,200	1,000	2,700	2,400	3,800	

*As of November 3, 1993

The absence of reliable catch information makes it difficult to estimate the exploitation of American plaice, yellowtail, witch flounder and winter flounder (blackback) on the Scotian Shelf. The 1992 landings of unspecified flounder were the highest in the time series. Industry reports suggested that these resources are under increasing fishing pressure due to the decline in other groundfish resources. In the 4X area, survey estimates indicate that abundance is low but stable or slightly increasing for American plaice and yellowtail, but declining for witch flounder. Summer survey estimates in 4VW indicate that American plaice, yellowtail and witch flounder abundance is relatively stable or increasing slightly, while spring survey estimates give a more pessimistic view of the resource. Winter flounder (blackback), while not currently under quota regulation, is increasing in abundance in the surveys. Because it is a more coastal species, a portion of the fishery is outside the survey area. However, information from the industry suggests that catch rates are declining in inshore areas.

In 1992, scientists recommended that, in order to better protect flatfish resources on the Scotian Shelf, it would be more appropriate to assess the species separately and that the stocks be separated into 4X and 4VW management units. It was also noted that accurate landings data by species, including the partitioning of unspecified flounder to species, were required in order to assess these individual stocks.

There is support from some of the industry representatives for a division of the Scotian Shelf into two management units for flatfish. However, there is little support for separation by species. Aside from the logistics in assigning species to catch, flatfish quotas by area were favored over separate quotas because of potential discard problems. Furthermore, the fact that blackbacks are not under quota management raised some concerns, especially in 4X. Fishermen indicated that catch rates for blackback in 4X are decreasing and suggested that this species be brought under quota management to avoid shifts in effort or misreporting by species as a result of changes in management or decreases in other groundfish. Consultations with industry are ongoing in an effort to resolve some of these problems, as well as to establish appropriate precautionary TACs for the new management units and for winter flounder.

RECOMMENDATION: The Council recommends that efforts now underway to obtain better information on the landings by species and area be encouraged in order to provide a more rational basis for conservation measures for this resource complex in future years.

RECOMMENDATION: The Council also recommends that, pending the provision of more reliable catch data on flatfish on the Scotian Shelf, the 1994 TAC for 4VWX flatfish be set at 14,000t.

Silver Hake - 4VWX

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	80,000	100,000	100,000	100,000	100,000	120,000	135,000	135,000	100,000	105,000	75,000
Catch	36,000	74,000	75,000	83,000	62,000	74,000	91,000	69,000	68,000	32,000	29,000*

*As per the NAFO Scientific Council report.

Catches from this stock peaked in 1973 at 300,000t. In recent years catches have dropped from 91,000t in 1989 to about 30,000t in 1992 and 1993.

In August 1993, the Council provided information and advice on issues pertaining to silver hake but deferred recommending any conservation measures for 1994 pending completion of the assessment by the NAFO Scientific Council in September 1993.

The September 1993 NAFO Scientific Council report indicated that the survey estimates of stock abundance and biomass declined progressively between 1986 and 1992. The 1993 survey estimate showed a moderate increase in numbers and biomass. Fishing mortalities for this stock have been in excess of the reference $F_{0.1}$ level of 0.72 from 1989 to 1991. For 1994, it estimated that a catch of 51,000t would correspond to $F_{0.1}$. However, the Scientific Council has identified a pattern of consistent underestimation of fishing mortality by 40%-60%. Although the underlying cause for this is unclear, the Council suggested that the 1992 fishing mortality was probably also underestimated.

Fishermen are concerned with the bycatch of other groundfish in the silver hake fishery. They also requested information on the nature of ecological relationships between silver hake and other fish species of commercial importance. These issues were addressed in the August 1993 report of the FRCC on silver hake.

Given the consistent underestimation of fishing mortality for this stock, the Council concludes that it would be unwise to set the 1994 TAC at the calculated $F_{0.1}$ level of 51,000t and that a more cautious approach (i.e. approximately 60% of 51,000t) is warranted.

RECOMMENDATION: The Council recommends that the 1994 TAC for 4VWX silver hake be set at 30,000t.

Argentine - 4VWX

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	---	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Catch	863	360	292	203	83	351	107	217	143	---	---

Catches from this stock, which are taken as bycatch in the silver hake fishery, have not exceeded 360t since 1983. The existing TAC of 10,000t was established some years ago based on an estimated $F_{0.1}$ from survey biomass extimates. Research vessel surveys in the late 1980s and early 1990s suggest the biomass may be lower than in the early 1980s. Exploitation has been by foreign vessels only and directed fishing for argentine was opportunistic and ancillary to the silver hake and squid fishery. The Fundian Channel area, which accounted for much of the directed catch, has been closed to small mesh fishing since 1977.

No interest has been expressed by Canadian fishermen in this fishery.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for argentine in 4VWX be set at 1,000t.

Atlantic Halibut - 3NOPs4VWX5Zc

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	---	---	---	---	---	3,200	3,200	3,200	3,200	3,200	3,200
Catch	2,300	3,000	4,000	3,300	2,600	2,300	1,900	2,100	2,200	1,300	1,100*

*As of November 3, 1993

Based on declining commercial catch rates and landings, this stock is decreasing. The stock is now less abundant than when the 3,200t TAC was established.

Fishermen indicated that there was a higher incidence of small fish being landed and suggested that the minimum size for halibut be at least 32 inches. They recommended that the current mandatory landing provisions implemented in 1993 be modified so as to exclude Atlantic halibut. In 1993, catches came principally from 4X, 4W, 4Vs and, to a lesser extent, from 3NO.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for 3NOPs4VWX5Zc Atlantic halibut be set at 1,500t. The Council also recommends that the mandatory landing provisions be reviewed with the aim of allowing halibut smaller than 32 inches to be released, if feasible.

3.3.3 Summary Table

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Cod 4Vn (M - D)	10,000t	4,300t	1,800t	Closed until Dec. 31, 1993	530t	No directed fishery; minimize bycatch
Cod 4VsW	35,200t	26,000t	11,000t	Closed until Dec. 31, 1993	3,200t	No directed fishery; minimize bycatch
Cod 4X	26,000t	25,400t	26,000t	15,000t	14,500t	TAC at 13,000t; other conservation measures
Cod 5Zj,m	15,000t	16,800t	15,000t		8,100t	Closure of fishery desirable; continue consultations with U.S.; other conservation measures
Haddock 4TVW	Bycatch	6,000t	Bycatch		1,100t	No directed fishery; continue closure of "haddock box"

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Haddock 4X	Bycatch	10,300t	Bycatch	6,000t cap	6,300t	TAC at 4,500t (bycatch only); other conservation measures
Haddock 5Zj,m	5,000t	6,000t	5,000t		3,400t	Closure of fishery desirable; continue consultations with U.S.; other conservation measures
Pollock 4VWX5Zc	43,000t	34,300t	35,000t	Reduce TAC to 21,000t	17,500t	TAC at 24,000t
Redfish 4WdehklX - Unit 3	----	2,400t	10,000t		4,500t	TAC at 10,000t
Flatfishes - 4VWX	14,000t	10,000t	14,000t		7,200t	TAC at 14,000t; better information on species and areas
Silver hake 4VWX	105,000t	32,000t	75,000t		29,000t	TAC at 30,000t
Argentine 4VWX	10,000t	----	10,000t		----	Precautionary TAC at 1,000t

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Atlantic halibut 3NOPs4VWX5Zc	3,200t	1,300t	3,200t		1,100t	Precautionary TAC at 1,500t; release small halibut (if feasible)

3.4 Stocks of the Gulf of St. Lawrence

3.4.1 Environmental Characteristics

a) General features

The Gulf of St. Lawrence opens to the Atlantic Ocean through two narrow straits, Cabot Strait, in the southeast, and the Strait of Belle-Isle, in the northeast. The region is marked by a wide deep trench, the Laurentian Channel.

The hydrography is driven by three major sources: the outflow of the St. Lawrence River, showing high seasonal variations; the Labrador Current that enters the Gulf through the Strait of Belle-Isle and along the north side of the Cabot Strait; and, the deep slope waters that also enter via Cabot Strait. Along the north shore, the outflow of important rivers induces local oceanographic systems that are important for the general biological production of the region.

Water masses are in three layers: a surface layer, mainly created by the St. Lawrence outflow, with high seasonal variations; an intermediate cold layer, that mixes with the surface layer in winter; and a deep, warmer and more saline water, originating from the offshore slope water, and moving west in the deepest part of the Laurentian Channel.

b) Recent trends

Air temperature remained low in 1992, but close to the 60 year average, with no indication of a downward trend since the extreme minimum observed in the mid-1970s. Cold winter temperatures and strong northwesterly winds caused early ice formation and above normal ice coverage by the end of December 1991. The Gulf remained ice-covered until April 1992, almost reaching the maximum recorded ice extent. Air temperatures in the first two months of 1993 were below normal and some of the coldest for these months in recent years, producing heavy ice in the Gulf.

c) General stock trends

The Gulf of St. Lawrence groundfish fishery is dominated by three species: cod north and south of the Laurentian Channel, redfish in deep waters, and to a lesser extent, American plaice in the southern Gulf. There are smaller localized directed fisheries for Greenland halibut in the St. Lawrence estuary and western Gulf, witch along the southwest coast of Newfoundland, white hake in Northumberland Strait, and winter flounder in inshore areas.

Both cod stocks remain at the lowest level ever recorded, with no foreseeable strong recruitment, justifying fisheries closures. The redfish stock, which formerly provided high catch levels, is declining and the situation is likely to continue until potential recruitment reaches commercial size. There are some concerns regarding high fishing pressure. The stock of American plaice has been plagued by high levels of discarding which raises concerns about the future of this stock. The abundance of witch flounder appears to be

low. Considering stock size and recruitment, rebuilding of this stock is expected to be slow. The Greenland halibut stock is at a low level but may be increasing if expected recruitment actually occurs and if exploitation rates are decreased. The white hake fishery is poor with a decline in abundance in recent years and no foreseeable improvement in recruitment.

3.4.2 Stock-by-Stock Recommendations

Cod - 4RS3Pn

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	100,000	100,000	100,000	92,100	80,300	73,900	76,540	58,000	35,000	35,000	31,000 18,000[1]
Catch	106,100	103,600	88,300	82,800	66,500	48,000	46,900	39,600	31,800	28,900	15,700[2]

1. Reduced in September 1993.
2. As of November 3, 1993.

The 1993 Stock Status Report showed that catches have declined steadily, from 106,000t in 1983, to 29,000t in 1992, the lowest on record. Only the 1987 year class has been significantly above the average level of recruitment in the last 10 years; other year classes present in the population are very weak. The stock is at a very low level and stock rebuilding is likely to be slow. Inshore fixed gear catches have been declining for some years while the mobile gear allocations have been taken. Furthermore, mean weights at age of fish have been declining slowly since the mid-1970s.

In August 1993, the Council recommended as a precautionary conservation measure that the 1993 TAC for this stock be reduced from 31,000t to 18,000t, the revised $F_{0.1}$ level for 1993. The TAC was reduced by the Minister of Fisheries and Oceans in September 1993.

Since the Council made its August recommendation, new information has become available which indicates that this stock may be continuing to decline. The biomass index from the research survey in August-September 1993 was only about 30% of the 1992 value, suggesting a substantial decrease between the two years. Summer surveys on this stock only commenced in 1990, and hence this survey series is not yet used as part of the regular assessment of this stock. Nonetheless, the decrease observed in the summer series between 1992 and 1993 was similar to the decrease between the 1992 and 1993 winter surveys. Although the summer series is short, and its usefulness as an index of cod abundance is not yet clear, these results suggest that the anticipated increase in the stock due to the recruitment of the 1986 and 1987 year classes may not be occurring. The 1986 and 1987 year classes may now be less abundant than previously estimated.

Processors report that production yields are down by at least 4 percentage points (a 10% decrease) due to the condition of the fish. Fishermen generally concur that fish are small and skinny, are not feeding even though capelin appear abundant, and are increasingly difficult to find. Industry recommended a range of options, from closure to a minimum fishery, together with additional conservation measures regarding small fish and closed seasons.

As a result of this new information, the Council has become increasingly concerned about the state of this stock and considers that more drastic action is required to attempt to arrest the apparent continuing decline.

RECOMMENDATION: The Council recommends that there be no directed fishing for the 4RS3Pn cod stock in 1994 and that bycatches be kept to the lowest possible level.

Cod - 4T+4Vn (J - A)

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	62,000	67,000	67,000	60,000	45,200	54,000	54,000	53,000	48,000	43,000	13,000 Closed[1]
Catch	61,300	55,400	52,100	67,200	53,200	54,500	55,400	54,500	47,400	38,700	4,400[2]

1. Closed in September 1993.
2. As of November 3, 1993.

The 1993 Stock Status Report indicated that, while long term average catches have been around 56,000t, the 1992 catch was 39,000t. Scientists noted that some catches in recent years came from unit area 4Vsb, which is outside the stock area. These fish were accounted for in their analyses. The stock was estimated to be at the lowest level since 1950 and recruitment prospects were qualified as being poor, as the 1988-1990 year-classes appear to be particularly weak.

In August 1993, the Council noted the dramatic decline in all of the indicators for this stock and the poor recruitment prospects. It recommended that the 4T+4Vn(J - A) fishery be discontinued at least until June 1, 1994, at which time the Council will have assessed the most recent assessment on the stock. The fishery was subsequently closed by Fisheries and Oceans.

The late summer survey for this stock is consistent with the July Stock Status Report. These results suggest that the stock continues to be in a depressed state. There was no sign of improved recruitment in the survey. The Department will undertake another survey on this stock in January 1994, to assess its winter distribution.

The 1993 mobile fishery was characterized by repeated fishery closures due to the presence of small fish. While there was no agreement for conservation measures for 1994, suggestions varied from continuation of the closure to much reduced TACs to allow the stock to recover.

Another assessment will be carried out before the Council makes its recommendation for the period following June 1, 1994. Based on the information currently available to the Council, the prospects for reopening in 1994 are slim.

Redfish - 4RST+3Pn (Jan.-May)+4Vn (Jan.-May) - Unit 1

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC											60,000
Catch	25,000	25,500	35,100	36,400	43,400	51,900	52,500	59,900	59,500	77,400	47,300*

*As of November 3, 1993

The 1993 Stock Status Report indicated that landings increased progressively from 15,000t in 1978 to 77,400t in 1992. The fishery in recent years has been supported mainly by the 1981 year-class. Scientists indicated that, if the TACs remain at the 60,000t level in upcoming years, the exploitation rate will increase as the biomass decreases and that catch rates will also drop as they did when earlier strong year-classes were fished down in the 1980s.

Estimates of stock biomass from the 1993 summer survey are 40% lower than those in 1992 and 70% lower than in 1990. The decline was observed for all sizes, but most markedly in the 1988 year-class. This year-class is now estimated to be one third of what it was in 1992, which itself was only one third of the 1991 estimate. It now appears that recruitment to the fishery in the late 1990s of a strong 1988 year-class can no longer be anticipated.

Commercial catch rates showed less reduction over the years because of the introduction of more efficient fishing gears. However, despite this, the fishing industry reports that catch rates have declined dramatically in 1993, that there is a higher incidence of small fish, and that pockets of fish are fewer. During the public consultations, a variety of options were put forward for reducing the TACs over the upcoming years while providing stability to the industry.

The Council is very concerned about this stock, and in the absence of precise reference levels, it has no choice but to recommend a nominal reduction in the TAC. The Council will address research requirements for redfish in its December review of DFO research programs and priorities.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for Unit 1 redfish be set at 30,000t with the view to keeping it at this level for the following two years if at all possible.

American Plaice - 4T

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	5,000
Catch	6,100	9,600	9,500	7,200	8,100	7,000	5,700	5,600	5,200	5,100	1,400*

*As of November 3, 1993

The 1993 Stock Status Report indicated that the abundance of American plaice in the last ten years has appeared to be relatively stable, but at a low level. Because of high levels of discards (maybe as high as 30 - 40%) in this fishery, actual catch levels are uncertain. Scientists report that yield from this resource could be increased substantially if small plaice were not caught and discarded, but were allowed to grow until they reach commercial size.

The abundance of plaice in the 25-35cm size category has declined markedly since 1991. This range of sizes correspond to the sizes exploited in the fishery using mesh sizes in effect at the time.

Fishermen report significant catches of small fish. Catches were good and the stock appeared healthy until 1992 but catches in 1993 dropped sharply as a result of management measures directed at cod. Through 1993, a series of mobile gear mesh size increases was introduced and a small fish protocol was established. Fishermen also report concern over possible redirection of effort to this fishery due to the closure, at least until June 1, 1994, of the 4T+4Vn (J - A) cod fishery.

RECOMMENDATION: The Council recommends that the 1994 TAC for the 4T American plaice stock be set at 5,000t.

RECOMMENDATION: The Council also notes the apparent high incidence of small plaice and recommends that conservation measures such as those instituted in 1993 to protect small fish be continued.

Witch Flounder - 4RS

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	3,500	3,500	3,500	---	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Catch	800	200	700	700	900	1,100	1,200	600	500	400	400*

*As of November 3, 1993

The 1993 Stock Status Report indicated that the abundance of this stock is low and that, given the current stock size and age of recruitment, stock rebuilding is expected to be slow.

Fishermen report concern over possible redirection of effort to this fishery should the 4RS3Pn cod fishery be closed. Fishermen also noted that catches of 4T witch flounder are not counted against a stock, and may indeed be part of the 4RS stock. Other fishermen suggested that a separate TAC be established for 4T witch flounder.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for 4RS witch flounder be set at 1,000t, and that pending clarification of stock boundaries, catches of witch flounder in 4T be monitored.

Greenland Halibut - 4RST

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	5,000	5,000	5,000	5,000	8,700	10,500	10,500	10,500	10,500	10,500	4,000
Catch	1,100	2,100	2,300	6,500	11,100	8,000	5,000	2,400	2,300	3,400	2,300*

*As of November 3, 1993

The 1993 Stock Status Report indicated that the stock was quite low but may be increasing. Based on the research surveys and the incidental catch of small Greenland halibut in the shrimp fishery, recruitment may be increasing. Future prospects will depend upon recruitment. However, sustained rebuilding is unlikely unless exploitation rates are decreased substantially.

Fishermen report that fish are smaller and have requested more scientific information on stock structure. They also requested that effort be controlled so as to avoid a redirection of effort due to the decreases in other groundfish stocks in the area.

RECOMMENDATION: The Council recommends that the 1994 TAC for 4RST Greenland halibut be set at 4,000t.

White Hake - 4T

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	12,000	12,000	12,000	12,000	9,400	5,500	5,500	5,500	5,500	5,500	3,600
Catch	7,300	6,600	6,000	5,000	6,400	3,900	5,100	4,900	4,100	3,500	1,050*

*As of November 3, 1993

The 1993 Stock Status Report indicated that recruitment has been below average since 1990, and that fishing mortality has been high. Recovery of this resource will depend on the occurrence of favourable recruitment.

The 1993 abundance index from the September survey has declined by about 50% in comparison to 1992, and is the lowest since 1983. An examination of the length composition of white hake caught in the 1993 survey did not indicate significant improvement in recruitment. The survey also reveals that the number of large fish are down and that the distribution of this stock appears to be shrinking. However, catch rates in areas of concentration may still be high.

Fishermen say that abundance of white hake has declined in recent years and that fish are "small and scarce". A series of increases in the minimum mesh size for mobile gears was introduced through the 1993 season. However, a small fish protocol has not been established for this stock. Some fishermen suggest that this fishery is in as a bad state as that of the 4T-Vn cod fishery.

Some key areas and times of spawning activity, in particular along the Northumberland Strait, are known and fishermen report that some effort is directed at those concentrations of larger fish.

RECOMMENDATION: The Council recommends that, as a precautionary measure, the 1994 TAC for the 4T white hake stock be set at 2,000t. The Council also notes the historically high incidence of small fish in the catch, and recommends that measures such as those instituted in 1993 to protect small fish be continued.

RECOMMENDATION: The Council also recommends that key areas and times of spawning activity for this stock be delineated and that, if feasible, measures be taken to establish closures during spawning areas/periods.

Atlantic Halibut - 4RST

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC	----	----	----	----	----	300	300	300	300	300	300
Catch	175	180	150	315	260	240	290	410	340	160	75*

*As of November 3, 1993

The 1993 Stock Status Report indicated that lower landings in recent years may indicate low stock abundance or may be the result of lower fishing effort or lower availability of Atlantic halibut.

Fishermen reported that the size of Atlantic halibut is decreasing. They also requested that effort be controlled so as to avoid a redirection of effort due to the decreases in other groundfish stocks in the area.

RECOMMENDATION: The Council recommends that the 1994 TAC for the 4RST Atlantic halibut stock be set at 300t.

Winter Flounder - 4T Not in the Groundfish Management Plan

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
TAC											
Catch	1,800	100	1,200	2,000	1,800	1,400	2,000	1,900	2,500	1,900	

This stock is not under the Groundfish Management Plan. The history of reported landings does not accurately reflect actual catches.

Fishermen believe that this stock is declining and have expressed their concern both for the historically high incidence of small fish in the catch, and the possibility of redirection of effort because of declining TACs on other groundfish stocks. Some fishermen have suggested that this stock be put under the Groundfish Management Plan.

A small fish protocol for flatfish species, including winter flounder, was introduced late in 1993. However, fishermen feel that it may be difficult to apply a minimum size appropriate for larger flatfish to this inherently smaller species.

RECOMMENDATION: The Council recommends that landings of 4T winter flounder be monitored more closely and that the measures introduced to protect against high mortality of juveniles be continued.

3.4.3 Summary Table

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Cod 4RS3Pn	35,000t	28,900t	31,000t	18,000t	15,700t	No directed fishery; minimize bycatch
Cod 4T+4Vn(J - A)	43,000t	38,700t	13,000t	Closed	4,400t	Recommendation prior to June 1, 1994
Redfish 4RST+3Pn (Jan.-May)+4Vn (Jan.-May) - Unit 1	----	77,400t	60,000t		47,300t	Precautionary TAC at 30,000t
American plaice 4T	10,000t	5,100t	5,000t		1,400t	TAC at 5,000t; reduce catch of small fish
Witch flounder 4RS	3,500t	400t	3,500t		400t	Precautionary TAC at 1,000t; monitor catches of 4T witch flounder
Greenland halibut 4RST	10,500t	3,400t	4,000t		2,300t	TAC at 4,000t

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
White hake 4T	5,500t	3,500t	3,600t		1,050t	Precautionary TAC at 2,000t; conservation measures to protect small fish
Atlantic halibut 4RST	300t	160t	300t		75t	TAC at 300t
Winter flounder 4T	None	1,900t	None			Monitor landings; protect small fish

3.6 Summary Table as per the Groundfish Management Plan

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Cod 2GH	20,000t	0t	1,000t		0t	Precautionary TAC at 1,000t
Cod 2J3KL	Morato-rium	43,700t	Morato-rium		No estimate yet available	Continue moratorium; strict limits on food fishery
Cod 3Ps	35,400t	31,500t	20,000t	Closure	13,600t	Recommendation to follow April survey
Cod 4RS3Pn	35,000t	28,900t	31,000t	18,000t	15,700t	No directed fishery; minimize bycatch
Cod 4T+4Vn(J - A)	43,000t	38,700t	13,000t	Closed	4,400t	Recommendation prior to June 1, 1994
Cod 4Vn (M - D)	10,000t	4,300t	1,800t	Closed until Dec. 31, 1993	530t	No directed fishery; minimize bycatch

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Cod 4VsW	35,200t	25,400t	11,000t	Closed until Dec. 31, 1993	3,200t	No directed fishery; minimize bycatch
Cod 4X	26,000t	26,000t	26,000t	15,000t	14,500t	TAC at 13,000t; other conservation measures
Cod 5Zj,m	15,000t	16,800t	15,000t		8,100t	Closure of fishery desirable; continue consultations with U.S.; other conservation measures
Haddock 3LNO	4,100t	800t	Bycatch (500t)		600t	No directed fishery; limit bycatch to 500t
Haddock 3Ps	3,200t	400t	Bycatch (500t)		100t	No directed fishery; limit bycatch to 500t
Haddock 4TVW	Bycatch	6,000t	Bycatch		1,100t	No directed fishery; continue closure of "haddock box"

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Haddock 4X	Bycatch	10,300t	Bycatch	6,000t cap	6,300t	TAC at 4,500t (bycatch only); other conservation measures
Haddock 5Zj,m	5,000t	6,000t	5,000t		3,400t	Closure of fishery desirable; continue consultations with U.S.; other conservation measures
Pollock 3Ps	5,400t	500t	Bycatch (600t)		40t	No directed fishery; limit bycatch to 500t
Pollock 4VWX5Zc	43,000t	34,300t	35,000t	Reduce TAC to 21,000t	17,500t	TAC at 24,000t
Redfish 2+3K	20,000t	9t	20,000t		5t	Precautionary TAC at 1,000t
Redfish 3O	14,000t	11,100t	14,000t		8,000t	Precautionary TAC at 10,000t

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Redfish 4RST+3Pn (Jan.-May)+4Vn (Jan.-May) - Unit 1	----	77,400t	60,000t		47,300t	Precautionary TAC at 30,000t
Redfish - 3Ps4Vs4Wfgj+3Pn (Jun.-Dec.)4Vn(Jun.-Dec.) - Unit 2	----	17,000t	28,000t		19,600t	TAC at 25,000t
Redfish 4WdehklX - Unit 3	----	2,400t	10,000t		4,500t	TAC at 10,000t
American plaice 2+3K	10,000t	100t	5,000t		10t	No directed fishery; limit bycatch to 500t
American plaice 3Ps	4,000t	2,300t	3,000t		300t	No directed fishery; limit bycatch to 500t
American plaice 4T	10,000t	5,100t	5,000t		1,400t	TAC at 5,000t; reduce catch of small fish
Witch flounder 2J3KL	4,000t	2,300t	4,000t		300t	Precautionary TAC at 1,000t
Witch flounder 3Ps	1,000t	1,100t	1,000t		800t	TAC at 1,000t

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
Witch flounder 4RS	3,500t	400t	3,500t		400t	Precautionary TAC at 1,000t; monitor catches of 4T witch flounder
Flatfishes - 4VWX	14,000t	10,000t	14,000t		7,200t	TAC at 14,000t; better information on species and areas
Greenland halibut 0+1	25,000t (12,500t for 0)	28,500t	25,000t (12,500t for 0)			TAC at 12,500t (For Subarea 0)
Greenland halibut 2+3KL	50,000t	63,000t	50,000t			TAC at 25,000t; limit fishing effort
Greenland halibut 4RST	10,500t	3,400t	4,000t		2,300t	TAC at 4,000t
Roundnose grenadier 0+1	4,000t	190t	4,000t		8t	TAC at 4,000t
Roundnose grenadier 2+3	11,000t	5,000t	11,000t		200t	Precautionary TAC at 3,000t
Silver hake 4VWX	105,000t	32,000t	75,000t		29,000t	TAC at 30,000t

Stock	1992 TAC	1992 Catch	1993 TAC	1993 Revision (if any)	1993 Catch (to Nov. 3, 1993)	FRCC 1994 Recommendation
White hake 4T	5,500t	3,500t	3,600t		1,050t	Precautionary TAC at 2,000t; conservation measures to protect small fish
Argentine 4VWX	10,000t	6t	10,000t		0t	Precautionary TAC at 1,000t
Atlantic halibut 3NOPs4VWX5Zc	3,200t	1,300t	3,200t		1,100t	Precautionary TAC at 1,500t; release small halibut (if feasible)
Atlantic halibut 4RST	300t	160t	300t		75t	TAC at 300t
Winter flounder 4T (Not in the Groundfish Management Plan)	None	1,900t	None			Monitor landings; protect small fish

CHAPTER 4. FRCC 1994 PRIORITIES

4.1 Other Aspects of the Council's Mandate

Much of the 1993 work of the newly-formed FRCC was focused on organizing itself, addressing the emergency in Atlantic Canada groundfish stocks which required mid-year conservation recommendations, and developing the stock-by-stock conservation recommendations which are given in the present report.

However, as mentioned earlier, in keeping with its mandate of developing a framework for ecological management of the fishery, the Council is striving to progress beyond the existing stock-by-stock management regime towards a new one which will take explicit account of inter-species interactions and environmental effects, and recognize fishing as an integral component of the ecosystem. The path towards this new regime will have to be clarified by significant advances in the scientific understanding of the ecosystem and its sensitivity to climatic conditions.

The Council has recognized a number of major issues which are pertinent to its goal and which touch on various aspects of science and management. Among these issues are: the influence of climate on stocks; conservation problems associated with over-capacity or gear types; the management of trans-boundary stocks; the role of fishermen in experimental fisheries and stock assessment; the influence of bycatch or effort re-direction on conservation measures; inter-species interactions, such as the influence of seal predation on cod and bait stocks; conservation attitudes toward fisheries, etc.

Finally, as part of the process of reflection and consultation which will guide the FRCC in its deliberations leading to "advising the Minister on scientific research priorities and methodologies", the Council has requested a thorough overview of DFO's scientific programs relevant to Atlantic Canada's fishery. A presentation from DFO is scheduled for December 1993.

4.2 Subcommittees

Six Subcommittees have been created to address in a focussed way the issues discussed earlier in our report and recognized as being particularly urgent and important to the Council's work. These Subcommittees present a further opportunity for industry to make studied and focussed input to the conservation/rebuilding process of the FRCC, and for the Council to probe more deeply into the issues it faces. The Terms of Reference and membership of each one of these Subcommittees are presented in Appendix 1. The Subcommittees will reflect the priorities of the whole Council and will facilitate the efficient accomplishment of its objective to provide the Minister with judicious advice by regular reports and briefings to the Council. Each Subcommittee will be assigned a FRCC Secretariat and DFO support staff to facilitate liaison and

consultation with DFO, and consultations with industry stakeholders and the general public.

The first Subcommittee created, on Stock Assessment, arose out of the early recognition of a number of crucial questions concerning the methodology of stock assessment, the presentation of information to the FRCC and to the public, and the incorporation of fishermen's information in the assessment process.

The Subcommittee on Historical Perspectives will examine the circumstances of stock collapses and recoveries, in Canadian waters and elsewhere, in an effort to seek lessons which would assist in rebuilding Atlantic groundfish stocks.

Harsh environmental conditions are often put forward as a cause of the current low recruitment levels of groundfish. The Subcommittee on Ecology and Environment will examine inter-species interactions and stock sensitivity to changes in the ocean environment.

The Communications Subcommittee will be concerned with information exchange between the FRCC, DFO, stakeholders and the public. It will examine means by which increased commitment to fisheries conservation and greater cooperation with conservation initiatives may be achieved through communications and other programs.

Finally, while it is recognized that direct management issues, including the selection of fishing gear, are beyond the FRCC's mandate, it is also clear that there are conservation consequences associated with both management and gear selection. Two working groups will address these conservation consequences: the Management and Regulations Subcommittee, and the Gear Technology Subcommittee.

The Subcommittees reflect the objectives of the FRCC and will gather information and prepare position papers for deliberation by Council as a whole. They will draw primarily upon DFO expertise supplemented by other sources of expertise as necessary.

4.3 1994 Activities of the FRCC

Planning FRCC activities for 1994 is continuing and, at present, incomplete. However, the following is a tentative workplan which includes significant activities currently scheduled.

January - Recommendations to DFO with respect to science programs and priorities.

February - Preparation begins for Annual FRCC Workshop/Review

April
- Review assessment, consult with industry and make recommendations regarding 4T+4Vn(J - A) cod.
- Review assessment, consult with industry and make recommendations regarding 3Ps cod.

May - Annual FRCC Workshop

June - Joint meeting FRCC/DFO scientists to release l994 Stock Status Report.

July - FRCC/DFO develop 1994 stock conservation options with input from science, economics, management, enforcement and industry.

July/August - FRCC conducts public consultations on stock conservation options and Stock Status Report.

September - FRCC prepares recommendations for advice on conservation measures.

October - FRCC provides 1995 groundfish advice to Minister.

November - Full Council meeting to review status and begin planning for the next year

Activities and meetings of the Subcommittees will take place throughout the year.

4.4 Annual FRCC Workshop

The annual Workshop, to be held in May, is designed to review and evaluate the activities of the FRCC during its first year with reference to its mandate, and to develop recommendations for future plans and work. The review will include the work of the Council on such matters as the nature of the scientific advice, state of the stocks, conservation initiatives, and the public consultation process. Priorities for the Council and its Subcommittees will be reviewed. Plans for the FRCC to take on the additional responsibilities of its mandate including other species groups (i.e. pelagics and shellfish) will be examined. Stakeholders and scientists, external to the FRCC, will be invited to participate in the Workshop.

APPENDICES

APPENDIX 1	SUBCOMMITTEES OF THE FRCC
APPENDIX 2	GENERAL SUMMARY OF PUBLIC CONSULTATIONS AND INDUSTRY MEETINGS
APPENDIX 3	UPDATE OF THE 1993 STOCK STATUS REPORT FROM THE SCIENCE SECTOR OF THE DEPARTMENT OF FISHERIES AND OCEANS
APPENDIX 4	UPDATE ON REDFISH FROM THE SCIENCE SECTOR OF THE DEPARTMENT OF FISHERIES AND OCEANS
APPENDIX 5	LIST OF MEMBERS OF THE FISHERIES RESOURCE CONSERVATION COUNCIL

APPENDIX 1

SUBCOMMITTEES OF THE FRCC

SUBCOMMITTEES OF THE FRCC

In line with priorities established by the Council and the need to provide the Minister with advice, six Subcommittees have been established: (1) stock assessment; (2) historical perspectives; (3) environment and ecology; (4) communications; (5) management and regulations; (6) gear technology. These Subcommittees present a further opportunity for industry to make studied and focussed input to the stock conservation and rebuilding process, and for the FRCC to probe deeper into the issues it faces. Terms of Reference for these Subcommittees are presented below.

1) STOCK ASSESSMENT SUBCOMMITTEE

Committee Membership: Paul LeBlond (Chair), Maureen Yeadon, Michael Belliveau, Tony Charles, Jean-Claude Brêthes, Jean-Paul Lussiaà-Berdou

Support Staff: Denis Rivard, Bruce Atkinson

Purpose: In the light of recent Canadian and international experience with stock collapses, a review of the assessment principles and methodology for determining the abundance and quality of groundfish stocks, with particular emphasis on improvements in reliability and timeliness, is necessary. Furthermore, to implement the FRCC's mandate of ecological management for conservation, a review of principles and criteria used in setting harvest levels and determining other conservation methods is also required. Based on these reviews, recommendations will be developed for changes in data collection and interpretation, as well as in the development of principles and criteria to assist in implementing ecological management.

Operation:

1) Principles and methodology of assessment will be reviewed (with DFO assistance) particularly with respect to (a) data collection and (b) data interpretation.

   a) Data collection issues include: the sufficiency and adequacy of surveys; the advisability of including catch/effort information; methods of including non-quantitative (anecdotal) information in the assessment process; influence of discarding and misreporting; influence of technological improvements.

   (b) Data interpretation issues include: methods of population estimation; choice of natural mortality level; origin of apparently consistent over-estimation in retrospective analysis; sources of uncertainty, their presentation and interpretation; improvements in the temporal and spatial resolution of assessments.

2) The practical implementation of ecological management principles and criteria will be reviewed. In particular, (a) the choice of reference levels: $F_{0.1}$, historic harvest levels and critical spawning stock level; (b) the formulation of broader management options, with explicit presentation of uncertainty and risk associated with each option; (c) the influence of multi-species interactions in setting harvest levels; (d) defining characteristics of long-term, sustainable fisheries; (e) conservation measures based on alternative fishing strategies, conservation areas, catch monitoring, size limits, etc.

3) To explore and foster measures which will increase the participation of fishers in the stock assessment process, consultative mechanisms and programs such as "index fishermen", participation of fishers in surveys and the introduction of measures which will build confidence and enhance compliance with regulations. On these points, this working group will liaise closely with the Communications Subcommittee.

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2) HISTORICAL PERSPECTIVES SUBCOMMITTEE

Committee Membership: Scott Parsons (Chair), Michael Belliveau, Glen Blackwood, Victorin Mallet, Fred Woodman, Jean-Paul Lussiaà-Berdou

Support Staff: Jean-Jacques Maguire

Purpose: Many fish stocks throughout the world have exhibited dramatic collapses and recoveries. Investigating these variations may reveal patterns and indicate strategies which could be helpful in understanding how the present state of groundfish stocks in Atlantic Canada developed and, more importantly, identify science and management priorities to assist recovery.

Operation:

1) Stocks of interest, from Canada and internationally, will be selected for study.

2) The factors which may have lead to these stock collapses, and factors which contributed to, or inhibited, stock recovery will be examined.

3) A summary of findings will be produced and recommendations made to Council.

3) ENVIRONMENT AND ECOLOGY SUBCOMMITTEE

Committee Membership: Herb Clarke (Chair), Jean-Claude Brêthes, Dave Gillis, Paul LeBlond, Scott Parsons, Jones Sheehan

Support Staff: Ken Frank, Don Bowen

Purpose: While the need to manage fishery resources on an ecological basis is widely recognized and recommended, there has been limited implementation of this approach. There are formidable problems including lack of knowledge of linkages between physical and biological factors and managed stocks which have inhibited the development of appropriate models. If the FRCC is to successfully fulfil its mandate to implement a more "ecological" approach to the management of Atlantic fish stocks, we must achieve a better understanding of the environment in which the fish live.

The objective of this Subcommittee will be to develop an understanding of the links between physical oceanographic conditions and biological indicators and predator-prey relationships and recommend appropriate steps toward the FRCC goal of a more "ecological" approach to conservation and management of the fisheries resource.

Operation:

1) To better understand the ocean itself:
   a) to describe and better explain the circulation and variability of water properties in the Labrador-Newfoundland shelf, the Gulf of St. Lawrence and the Scotia-Fundy-George's Bank areas;
   b) to better understand the effect of changes in climate and run-off variations on ocean properties;
   c) to examine the relationship of changes in the productivity of the above ocean areas in response to changing oceanographic conditions.

2) To better understand the living creatures within the oceans:
   a) develop a map or diagram of the ocean ecosystem food chain - what predator/prey relationships do we understand;
   b) learn the relationships among exploited stocks? Can we understand, for instance, the relationships between capelin, groundfish and seals?
   c) Is there agreement on the impact of seals on specific groundfish stocks? How can we practically address this question?

3) To define and better understand the links between physical and oceanographic conditions and biological indicators of fish stocks.

4) To better understand trends:
a) Are the current environmental conditions the result of a cycle or a long-term trend?;
b) Can we effectively model global climatic/oceanographic change?;
c) Can we model Atlantic marine ecosystems?;
d) If so, can we use these models to help us with important projections, such as when the fish stocks will recover?

5) To recommend:

a) new approaches to management of fish stocks in line with our goal of a more "ecological" approach;
b) required additional research.

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4) COMMUNICATIONS SUBCOMMITTEE

Committee Membership: Jon Lien (Chair), Linda Haché, Max Short, Sam Elsworth, Catrina Tapley

Support Staff: Sharon Ashley

Purpose: Fisheries management requires the involvement and cooperation of all participants to effectively implement conservation measures. Innovative programs are needed to educate, develop and foster full participation in fishery conservation. The initial purpose of this committee is to develop a communication plan for the FRCC itself. An on-going objective is to examine means by which increased commitment to fisheries conservation and greater cooperation with conservation initiatives may be achieved through communications and other programs.

Operation:

1) Plan communication strategies for the FRCC and its Subcommittees which effectively inform stakeholders and the public of the work of the Council and its role in fisheries conservation.

2) Plan communications for stakeholders and the public which will provide them with information required to evaluate conservation options on stocks, and special issues of conservation concern, and ensure effective consultation.

3) Plan and recommend communication and other programs which effectively foster conservation attitudes, stakeholder involvement in fisheries science and management, and produce responsible fishing practices.

5) MANAGEMENT AND REGULATIONS SUBCOMMITTEE

Committee Membership: Tony Charles (Chair), Jean-Eudes Haché, Max Short, Frank Hennessey, Art Longard, Catrina Tapley

Support Staff: Bob Huson, Alan Sinclair

Purpose: Regulations and management measures sometimes provoke unpredicted changes in fisheries. Their effectiveness is often different from that intended and the impact on the practical realization of conservation goals uncertain. The purpose of this Subcommittee will be to review and evaluate the conservation impacts of management measures and regulations and to make appropriate recommendations to the FRCC.

Operation:

1) Examine the conservation consequences of "at-sea practices" resulting from specific management measures such as trip limits, fish and mesh size limits, small fish protocols, amounts of gear, landing of all catches, by-catch limits and closed spawning areas.

2) Link with relevant DFO activities, including reviews of the regulatory process and of the individual (transferable) quota system.

3) Link with the FRCC Subcommittees on Stock Assessment, Gear Technology and Communications.

4) Review the issue of over-capacity and its consequences for conservation of stocks.

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6) GEAR TECHNOLOGY SUBCOMMITTEE

Committee Membership: Victorin Mallet (Chair), Max Short, Fred Woodman, Sam Elsworth, Frank Hennessey, Maureen Yeadon

Support Staff: Andrew Duthie, Steve Walsh

Purpose: Opinions regarding the appropriateness of fishing technology often reflect sector interests. There is less frequently a clear understanding of the conservation aspects of gear use. The purpose of this Subcommittee is to determine, for each harvesting technology, the conservation implications, optimum manner of usage and relative desirability from a resource conservation perspective. This will be based on an

objective analysis of historical experience and current evidence concerning habitat impact, gear selectivity, inherent manageability, the potential for improvement or abuse of the technology, and any other relevant considerations.

Operation:

1) The Fishing Gear Technology Subcommittee will work closely with other experts, within and external to the Department of Fisheries and Oceans, involved in research and study of gear technology.

2) A Fishing Technology Advisory Board will be established to provide advice to the Subcommittee and to facilitate an exchange of information; the chairperson of the Advisory Board shall be an ex-officio member of the Subcommittee.

3) In the first phase of its work, the Fishing Gear Technology Subcommittee will:

   a) commission an independent and objective study, to be completed by March l994, of the state of knowledge on conservation implications of fishing gears, based on existing international literature and on relevant experience

   b) use the results of this study to prepare for the FRCC a public discussion paper outlining the current state of knowledge on questions of gear technology. This report will describe conservation advantages and disadvantages of each gear technology, including the selectivity of each gear, the effect of stock abundance on the impacts of each fishing gear, the environmental and/or habitat impacts of each gear technology, manageability implications, and the potential for abuse.

4) In its second phase, the Subcommittee will continue to analyze results from the above-noted discussion paper, and may organize and conduct "Gear Technology and Fishery Conservation" workshops. The goal will be to bring to the FRCC appropriate proposals concerning gear technology or gear-oriented regulatory measures required for conservation of the resource.

APPENDIX 2

A. GENERAL SUMMARY OF PUBLIC CONSULTATIONS AND INDUSTRY MEETINGS

During 1993 the FRCC held public meetings throughout Atlantic Canada. In addition, written briefs were received from public and industry stakeholders.

The release of the FRCC's mid-year report in 1993 prompted many groups to focus on the disruptive nature of mid-season reviews. There was an overwhelming consensus that mid-season changes caused both an economic and social disruption to the industry and that mid-season changes must be avoided in the future unless there is firm evidence that stocks will be jeopardized. The FRCC agrees with this and feels that the 1993 decisions were unavoidable, given the desperate conditions of most stocks. Nevertheless, the 1994 recommendations are for the 1994 fishing season and it is not the intent to undertake mid-season reviews.

While it is not possible to provide the position of each individual, group, or organization, following are the key conservation themes of the public and industry stakeholders which were presented to the FRCC:

1. Conservation
   - All fish should be allowed to spawn at least once.
   - Strong measures must be implemented to prevent the destruction of juvenile fish.
   - Spawning areas need to be defined and protected through seasonal closures/area closures.
   - The age structure of groundfish stocks needs to be addressed.
   - Groundfish should not be managed on the basis of incoming year classes.
   - Nursery areas for juveniles need to be identified and protected.
   - The condition of the fish was a big concern since the catch consists of large numbers of small fish and fish are smaller at age with lower yields due to its decreased body weight.

2. TAC management has not worked
   - $F_{0.1}$ works in theory, but has never been achieved in practice. TACs should be set at more conservative levels, given the tendency to over-estimate the biomass in the past.
   - The industry is somewhat sceptical of TACs based upon limited surveys or mathematical models. Concern was expressed that surveys are restricted to specific zones, while fish migrate between zones.
   - Fishermen want to have their views and knowledge of the stocks incorporated into the science and the decision-making process in the future.

3. Natural Mortality
   - Natural mortality estimates need to be adjusted to reflect increases in the numbers of predators, decreases in prey species and adverse environmental conditions.

4. Fisheries Management
   - Managers must be more aware of by-catch, discards and misreporting.
   - Dockside monitoring should be expanded to all gear sectors to prevent further abuse of the resource and ensure adherence to future management measures.
   - Redirection of effort into stocks which were previously not exploited or lightly exploited, without any scientific knowledge of the impacts, is of concern.
   - Mesh size should be increased and mesh sizes should be standardized in mixed stock fisheries.
   - Management plans should not jeopardize conservation plans, i.e.. trip limits, size of fish, by-catch. Management plans should not increase motivation for dumping, discarding, etc.

5. Capacity
   - Both the industry and the public stressed the need to address harvesting and processing over-capacity on an Atlantic-wide basis.

6. Closures
   - Fishermen support closures in many areas but stressed the need to address support and compensation if fisheries are to be closed.
   - The industry stressed the need to establish criteria for reopening i.e. target spawning biomass levels, size of biomass, age structure, size of fish, etc.

7. Technology
   - Despite the finger pointing and accusations between gear types, there was often consensus that all gear types have impacts on stocks and the environment. The abuse of technology was also stressed as being a major contributor to the problem.

8. Straddling Stocks
   - There was concern and frustration expressed throughout Atlantic Canada that the conservation measures put in place are compromised by the fact that many major stocks straddle international boundaries and there is no effective management control over these resources. The most common view was that Canada must take the lead role in conserving, protecting and managing the marine resources on its Continental Shelf.

B. SUMMARIES OF SPECIFIC PUBLIC AND INDUSTRY MEETINGS (SEPTEMBER-OCTOBER)

There were 13 public hearings and 4 industry meetings conducted between the issuance of the FRCC mid-1993 report and the preparation of the present report. For the public hearings, general invitations to stakeholders, media and the general public were issued. FRCC members and DFO staff from science and fisheries management attended. Anyone was permitted to submit a brief and/or make an oral presentation. Generally these meetings did not allow for much informal discussion of stock status or issues. Meetings were opened by a presentation on the work of the FRCC and the goals of the meeting. An agenda was introduced to facilitate and guide discussion.

Industry meetings were by invitation and attended by representatives of all industry organizations. These meetings had the same agenda as the public hearings, but permitted more informal dialogue between the Council and industry representatives. These meetings were opened by a brief introduction to the activities of the FRCC and indications of the stocks and issues on which discussion was needed.

In this section, brief summaries of public and industry meetings which were held are presented by location.

Public Hearings:

Gaspé, Québec - 27 September

About 35 stakeholders and 6 reporters attended the Gaspé meeting. There were also 2 representatives of DFO and 5 members of the FRCC. Three written briefs were received from *L'Association Québecoise de l'industrie de la pêche (August 2, 1993 letter); Regroupement des pêcheurs professionnels de Gaspé sud - La pêche au poisson de fond dans le Golfe (État de la situation et recommendations);* and *Regroupement des pêcheurs professionnels de Gaspé nord - Recommandations au CCRH.*

Stocks of major interest were 4T+4Vn (J - A) cod, 4T hake, 4T Witch flounder, 4RST turbot, dogfish, American plaice, and redfish.

Issues of concern which were discussed included: (1) the difficulties which mid-year changes impose on industry, (2) impact of seals on stocks, (3) conditions of 4T stocks, (4) impact of the recreational fishery, (5) conservation measures for turbot, (6) compensation programs for those effected by closures, (7) involvement of fishermen in management and science, and (8) the importance of having a minimal fishery to monitor stocks during closures.

Shippagan, New Brunswick - 28 September

The meeting was attended by about 50 fishermen and industry representatives. There were also 6 reporters, 4 representatives from DFO and 7 members of the FRCC. One written brief was received from *l'Association des pêcheurs professionnels acadiens - Effet de l'utilisation de ralingues sur la capture de morues de moins de 41 cm par les engins mobiles dans le sud du Golfe Saint-Laurent.*

Interest was focused on the following stocks: 4T+4Vn(J - A) cod, 4T American plaice, 4T Winter flounder and Unit 1 redfish.

Issues under discussion during the meeting were: (1) an experimental fishery using Lastridge ropes, (2) the TAC for Unit 1 redfish, (3) the need for fishermen on the FRCC, (4) by-catch of juvenile blackbacks and plaice, (5) gear selectivity studies, (6) the seal problem, and (7) status of 4Vn(M - D) cod.

Marystown, Newfoundland - 29 September

There were approximately 30 people that attended this meeting. In addition there were 5 reporters, 3 DFO representatives and 5 FRCC members. Three written briefs were received: Alliance of Deep Sea Communities: Position Paper Presented to the Fisheries Resource Conservation Council; Fishery Products International: A Presentation to the Fisheries Resource Conservation Council; and a written brief from Joe Edwards..

The stock of primary interest was 3Ps cod. Unit 1-3 redfish, 2J3KL turbot, 3Ps witch and 4RS3Pn cod were also discussed.

Major points raised in this meeting included: (1) the role of draggers and seals in stock declines; (2) stock differences in the Placentia Bay winter and summer cod fisheries; (3) impacts of gillnets and other technology on stocks; (4) the need of fish plant workers for a sustainable fishery; (5) the dependence of Newfoundland towns on deep sea fisheries; (6) failure of NAFO to close all fisheries; (7) the need to assess the real conservation impact of fishing technology; (8) management of redfish stocks for industry stability; (9) social consequences of fishery closures; and (10) the role of mismanagement, increase in effort and over-capacity in producing the present state of groundfish stocks.

Charlottetown, Prince Edward Island - 29 September

Fewer people attended this meeting. There were 15-20 participants including media, 4 DFO staff and 7 members of the FRCC. No written briefs were received.

Stocks of interest were those in 4T, cod, redfish, American plaice and flounder, hake, winter flounder, herring, and scallop.

Issues discussed included: (1) democratization of fishery management, (2) environmental impact assessments of fishery management plans, (3) environmental impact and conservation considerations of gear technologies, (4) conservation measures for hake, (5) fish quality, (6) by-catch of redfish, (7) the need for a forum to discuss allocation issues, (8) harvesting of mature fish which have spawned, (9) predator impact by cormorants, seals and dogfish, (10) concern for state of the redfish stock, (11) availability of new scientific information, and (12) by-catch levels for cod in flounder, plaice, hake and blackback fisheries.

Saint John, New Brunswick - 30 September

There were 14 participants at this meeting from industry and the public. In addition there were 4 from media, 1 from DFO and 6 from the FRCC. One written brief was submitted: a Presentation to the FRCC by Floyd Hawkins.

Stocks of primary interest were 4X cod and flounder.

Discussion at this meeting included: (1) the short meeting notice given, (2) management practices which lead to discards, (3) conservation measures to avoid small fish, (4) specific methods to encourage responsible fishing practices by responsible management, (5) protection for spawning areas and management measures to save spawning fish, (6) mesh sizes and selectivity, (7) concern over mid-year corrections in management plans, (8) concern regarding lack of information on flounder, (9) representation on FRCC, (10) impacts of government support of the fishing industry, (11) DFO science, (12) community roles in fishery decisions, and (13) the need for conservation measures in addition to TACs.

Gander, Newfoundland - 30 September

This meeting was not well attended. Only 18 individuals from the industry and public attended. In addition there were 3 from media, 5 from DFO and 6 from FRCC. Four written briefs were received from: Beothic Fish Processors Limited: Deep Water Turbot Stocks in NAFO Area 2J3KL; Newfoundland and Labrador Offshore Sealers' Association; Lower Trinity South Development Association: Where Have All the Codfish Gone?; and, Mark and Fraser Carpenter, Doryman Marine (Letter, October 1, 1993).

The groundfish stock of interest was 2J3KL cod and turbot.

Presentations made at this meeting focused on: (1) foreign fishing on the Nose and Tail of the Grand Banks; (2) declines in turbot and dependence on turbot stocks; (3) monitoring of the turbot fishery; (4) expansion of the harp seal hunt to minimize seal impact on fish stocks; (5) effects of fishery closures on communities; (6) causes of the demise of northern cod; (7) impacts of different fishing methods on stocks; (8) the extent and impact of the 2J3KL "recreational" fishery, and the need to close it; (9) the

importance of developing conservation attitudes in the fishery; (10) the role of large scale fisheries vs the inshore; and (11) the possibility of fish hatcheries improving stocks.

Digby (Smiths Cove), Nova Scotia - 4 October

About 50 fishermen, processors and members of the public were present at this meeting. There were also 6 media representatives. Two DFO staff attended as did 7 FRCC members. One written brief was received: A Proposal to Improve Conservation Measures in the 4X 1994 Groundfish Fishery - Maritime Fishermen's Union, Local 9.

Stocks of primary interest were 4X cod and haddock, 5Z trans-boundary stocks, 4TVW haddock, silver hake and pollock.

Issues discussed were: (1) problems imposed by mid-year corrections in fishery management plans, particularly for ITQ fishermen, (2) restrictions on diamond mesh in the mobile gear fishery, (3) minimum fish sizes - "let each one spawn once", (4) TACS for 4X, 5Z and 4TVW stocks, (5) protection for spawning fish, (6) minimum fish sizes, (7) fishermen participation in scientific cruises, (8) mackerel predation on gadoid eggs and larvae, (9) ocean ranching and (10) trans-boundary stocks and American conservation initiatives.

Shelburne, Nova Scotia - 5 October

This meeting was very well attended. There were about 100 stakeholders and 6 media representatives. In addition, DFO had 2 representatives present and there were 5 members of the FRCC that attended. Five written briefs were submitted from: Letter from Captain Basil Acker; 1994 Management Plan from Evan Walters, Scotia-Fundy Inshore Fishermen's Association; A Proposal for Tuna Quota from Sterling Belliveau; Proposed Management Plan for 4X and 5 - South West Nova Fixed Gear Association; and, A Submission to the Fisheries Resource Conservation Council by William A. Williams.

Stocks of interest which were discussed include groundfish of 4X, 4Vn, 4W and 4VsW.

Issues and problems which were discussed include: (1) the silver hake fishery, (2) effectiveness of fishery closures, (3) management options for 4X, 5Z, (4) extension of the haddock box, (5) closure of spawning area off Cape Smokey, (6) 4Vn winter fishery opening, (7) diversification of the fishery, (8) conservation measures in 4X, (9) the silver hake box, (10) foreign fishing, (11) minimum sizes for halibut, (12) tuna management, and (13) impacts of various management activities on fishermen and stocks.

Sydney, Nova Scotia - 7 October

About 80 fishermen, processors and community representatives attended the Sydney meeting. There were also 6 reporters present. DFO had 5 representatives at the meeting; 6 FRCC members were present. Six written briefs were submitted from: Mark Biagi a) Island-Wide Fishery Symposium, b) Coastal Habitat Enhancement Support Systems; Union of Nova Scotia Municipalities Submission to the Fisheries Resource Conservation Council Public Hearings; Glace Bay Inshore Fishermen's Association - Proposals for the 1993 and 1994 Atlantic Groundfish Management Plan; MFU Local 6 Presentation to the FRCC, October 7, 1993; Groundfish Conservation Management Plan for an Area in Western NAFO Sub-division 4Vn - North of Smokey Fishermens Association; and, Letter from William Schrader, October 7, 1993.

Stocks of interest at this meeting were primarily 4Vn(M - D) cod, but other stocks were discussed including 4Vsb cod, redfish, 3Pn cod, 4RS3Pn cod, and 4T+4Vn(J - A) cod.

Issues discussed were: (1) habitat destruction by trawling, (2) diversification and value-added fisheries, (3) information needs of communities and their role in decisions in fishery management, (4) UNCLOS and extension of jurisdiction, (5) ecologically sound fishing practices, (6) fixed gear fisheries, (7) the need for fishery observers, (8) the need for fishermen and scientists to work together, (9) movements of stocks between 3Pn and 4Vn, (10) steps in re-opening 4T+4Vn(J - A) fishery, (11) discards, (12) jargon in scientific documents, (13) the need for review of gear technologies, (14) condition of seals because of food depletion, (15) ecosystem management and environmental assessment of fisheries, (16) Senate's recommendation for a Royal Commission on fishing and gear technology, (17) impact of mid-year corrections and (18) reference levels for TACs.

Dartmouth, Nova Scotia - 8 September

This meeting was attended by 15 fishermen processors, and representatives. There were also 3 reporters presents, 5 representatives from DFO attended and 6 from the FRCC. One written brief was received: a Presentation to the Fisheries Resource Conservation Council - Prepared by National Sea Products.

Issues discussed at this meeting were: (1) minimum fish sizes for groundfish, (2) protection for large fish, (3) recalculated $F_{0.1}$ values for 1994, (4) requests for review of redfish information and Scotian Shelf flatfish, (5) problems with natural mortality estimates, (6) problems with mid-year corrections, (7) relation of Units 1 and 2 redfish, (8) an experimental stocking program, (9) sanctuaries and closed nursery areas as conservation measures, (10) lack of effectiveness of spawning closures, (11) expansion of gillnet fishery and (12) use of fishing data in assessments.

Port aux Basques, Newfoundland - 12 October

This meeting was attended by just over 20 stakeholders; there were also 6 DFO staff and 5 FRCC members in attendance. No written briefs were received.

Stocks of interest in this meeting were 4RS3Pn cod and redfish

There were a number of issues raised: (1) recalculation of $F_{0.1}$ level for 1994 because of reduced fishing in 1993; (2) concern over survey schedules; (3) size of fish; (4) consistency in methods of measuring mesh sizes; (5) success of methods used to reduce take of small fish; (6) redirected effort on redfish as a result of closures; (7) economic TACs for redfish stocks with single cohort recruited to the fishery, (8) effects of mid-season changes in management plans on EA and ITQ holders; (9) impact of different fishing sectors on stocks; (10) encouragement for index fishermens' programs; and (11) transferability of redfish unit quotas to other areas.

Plum Point, Newfoundland - 13 October

This meeting was attended by about 50 people representing fishermen and processors. Some representatives of media and the general public attended. There were 6 from DFO and 6 from FRCC in attendance. There were three written submissions: Fishery Products International Limited - Presentation by Jack Rowe; Presentation to the Fisheries Resource Conservation Council at Plum Point Newfoundland by Mr. Chesley Genge; and, a letter from Roland Hedderson, Straitsview, Newfoundland.

The stock of overwhelming concern was 4RS3Pn cod.

Problems and issues discussed included: (1) the state of 4RS3Pn cod; (2) catch rates by mobile and fixed gear; (3) the size of fish at length and age; (4) locations of research vessel surveys in relation to fishing effort; (5) difficulties imposed by mid-season modifications of management plans on ITQ holders; (6) conservation measures to increase fish size; (7) factors producing small fish and poor yields; (8) factors influencing fish movements and the pattern of fish movements in the area; (9) social-economic consequences of FRCC recommendations; and (10) closure of the 4RS3Pn cod fishery.

Cartwright, Labrador - 14 October

This meeting was well attended; 36 stakeholders attended; there were 5 FRCC members and 1 DFO scientist also present. No written briefs were presented at this meeting. The major stock discussed was Northern cod and turbot.

Issues presented during this consultation included: (1) the decline of the Groswater Bay cod stock in the late 1960's, which was similar to the present decline in Atlantic groundfish; (2) the lack of assistance and compensation given to Labrador fishermen,

in contrast to present programs; (3) consideration of different factors which may have contributed to the decline of local stocks, including over-fishing, promotion of Labrador fishing for "outsiders" and environmental changes; (4) the "situational moratorium" on cod fishing off Groswater Bay and the failure of stock recovery after 20 years.

Industry Meetings:

Quebec City, Quebec - 26 October

A total of 28 people attended this meeting. Eight were from industry, 13 from the FRCC, 6 from DFO and 1 from the provincial government.

The major stocks discussed were 4T+4Vn(J - A) cod, 4RS3Pn cod, 4RST turbot, and Unit 1 redfish.

Major issues of importance were: (1) the problem that mid-year changes in management presents to the industry; (2) the use of mesh size and spawning area closures as conservation measures; (3) small fish closures have not allowed fishermen to adequately monitor the condition of the stocks; (4) dependence of assessments on research vessel surveys; problems with catch data; (5) need to decrease the error margins on assessments; (6) maintain some minimal fishing activity for economic reasons: maintain processing plants and markets; (7) new management measures introduced in 1993 will have significant effects on the condition of the stocks; (8) modest, incremental changes to achieve conservation objectives are more desirable than quick and deep changes; and, (9) fixed gear catches must be used in the assessments.

Moncton, New Brunswick - 27 October

A total of 20 industry members attended this meeting. Thirteen members of the FRCC, 6 from DFO and 2 from the provincial governments.

The major stocks discussed were 4T+4Vn(J - A) cod, 4Vn(M - D) cod, 4T American plaice, 4T white hake, and Unit 1 redfish.

Major issues of importance were: (1) the problem that mid-year changes in management presents to the industry; (2) the use of mesh size and spawning area closures as conservation measures; (3) problems with catch data; (4) maintain some minimal fishing activity for economic reasons: maintain processing plants and markets; (5) new management measures introduced in 1993 will have significant effects on the condition of the stocks; (6) the most recent survey results; (7) need for information from the fishery versus closing the fishery and not getting this information - need to continue this source of information during a closure.

Halifax, Nova Scotia - 28 October

A total of 28 industry and fishermen 's representatives attended this meeting. There were 6 DFO staff in attendance. The meeting was attended by most FRCC members.

Groundfish stocks discussed were 4TVn cod, 4Vn(M-D) cod, 5Z cod, 4Rs3Pn cod, 4X haddock, 4TVW haddock, pollock, silver hake and redfish in Unit 1, 2, and 3.

Some representatives that attended were under the impression that FRCC had received much additional information following the 1993 Stock Status Report which was not available to industry. The chair of the meeting corrected this impression and mentioned that, with the exception of redfish and a general update on some surveys, all scientific information which provided the basis for 1994 conservation recommendations was public already. The chair informed that group that the new review of redfish status prepared by DFO at the FRCC's request would be released and be the basis for further consultation with industry, prior to the FRCC finalizing the 1994 Conservation Requirements for Atlantic Groundfish report.

Major issues of importance were: (1) the problem that mid-year changes in management presents to the industry; (2) that the FRCC mid-year reviews for 4T+4Vn(J - A) are interpreted by industry as allocation decisions; (3) the need for an allocation council so FRCC can function adequately; (4) the notion that total fish destroyed is more important in setting quotas than TAC; (5) the use of mesh size and spawning area closures as conservation measures; (6) small fish catches as by-catch in bait fisheries; (7) dependence of assessments on research vessel surveys; problems with catch data; (8) discussion of trans-boundary stocks with Americans; (9) extension of the haddock box and (10) allowance fisheries.

St. John's, Newfoundland - 29 October

A total of 18 industry and fishermen's representatives attended, 14 FRCC members were present, and 6 DFO science and management officials were in attendance.

Major groundfish stocks discussed were 3Ps cod, 4RS3Pn cod, Unit 1, 2, and 3 redfish and Greenland halibut. The recreational fishery in 2J3KL and the continuing fishing activity in 3NO were also discussed.

Primary issues of importance were: (1) the problem of mid-year changes in stock management plans for the industry; (2) the social impact of fishery closures and the importance of adequate planning in dealing with consequences; (3) an emphasis on the importance of the FRCC to stick to science and "look after the fish"; (4) the state of 4RS3Pn cod; (5) the inadequacy of the $F_{0.1}$ reference level, especially for depleted stocks; (6) the importance of using conservation measures other than TACs and closures; (7) economic considerations in setting of redfish TACs; (8) conservation

problems with developmental fisheries; (9) the problem of the 2J3KL recreational fishery; and (10) problems with the NAFO decisions in 3NO.

Other briefs received by the FRCC are listed below:

Eastern Fishermen's Federation - 1994 Conservation Requirements for Atlantic Groundfish, October 7, 1993

Mr. J. Woodworth, Fishermen's Resource Centre, Grand Falls, Newfoundland, Oct. 14 letter

Lower North Shore Fishermen's Association - Economic Situation, tabled october 26 in Quebec

Mr. Bruce Chapman, Fisheries Association of Newfoundland and Labrador, Oct. 26 brief

Présentation faite par Pierre Haché, Pêcheries Mylène H. Ltée, tabled Oct. 27 in Moncton

Mr. Clifford Aucoin, Northern Cape Breton Fishing Vessels Association, Oct. 27 letter

Mr. Glen Wadman, Independent Seafood Processors' Association of Nova Scotia - Proposals for 1994 Fishery in areas 4X and 5Z, Oct. 27 letter

Mr. Fred Greens, Independent Seafood Producers' Association of Nova Scotia - Proposals for 1994 Fishery in areas 4VsW and 4Vn, Oct. 27 letter

Mr. Sylvain D'Eon, D'Eon Fisheries Ltd., Oct. 27 letter

Southwest Nova Dragger Fishermen's Association - 1994 Recommendations, tabled on Oct. 28 in Halifax

Mr. Chris Finlayson, Rutgers University, Oct. 28 letter

Mr. Paul Siegel, IFAW, Oct. 29 letter

Mr. Karl Sullivan, Seafreez Foods Inc., Nov. 1 letter

Mr. Thomas Woodley, International Marine Mammal Association Inc., Nov. 2 letter

Mr. Eric Roe, Clearwater, Nov. 3 letter

Mr. Francois Poulin, APCQ Inc., Nov. 4 letter

Plan de Gestion du Poisson du fond - l'association des pêcheurs professionnels acadiens

Ms. Tina Pelley, President of CAW Local 1972, Canso, Nov. 12 letter

APPENDIX 3

UPDATE OF THE 1993 STOCK STATUS REPORT FROM THE SCIENCE SECTOR OF THE DEPARTMENT OF FISHERIES AND OCEANS

UPDATE ON GROUNDFISH STOCK STATUS REPORT

INTRODUCTION

This report presents information from groundfish abundance surveys conducted since the publication of the "Report on the status of groundfish stocks in the Canadian Northwest Atlantic" in July 1993 (Stock Status Report). Some anecdotal information on the 1993 fisheries to date are also provided. The stocks for which updated information is presented are those identified by the Fisheries Resource Conservation Council, in their August 23, 1993 report, as being in a critical situation:

COD:	3Ps, 3Pn4RS, 4T-4Vn(Jan.-Apr.), 4Vn(May-Dec.), 4VsW, 4X, 5Zj,m
HADDOCK:	4TVW, 4X, 5Zj,m
POLLOCK:	4VWX+5Zc
A. PLAICE:	3Ps

Information is also provided for 4T American Plaice and 4T White Hake.

The new information from the surveys and the commercial fisheries have been compared to the results of the most recent assessments with respect to overall stock abundance, the size and age compositions, as well as recruitment prospects.

The interpretation of the information from the fisheries is complicated by the changes in fishing patterns and management measures during 1993. The regulation to close the fisheries when the proportion of small fish in the catch exceeded 15% in numbers, combined with the stocks being comprised mostly of small fish, resulted in mobile gear fisheries being open for a much shorter duration than in previous years. Therefore the fish that were not caught by mobile gear fisheries in 1993 became available to other gear sectors, which, in some cases, resulted in better performance for those other gear sectors. The better performances, where they occurred, are good signs, but they cannot be interpreted directly as increases in stock sizes.

For several stocks (cod in 3Ps, 4T-4Vn(Jan.-Apr.), 4Vn(May-Dec.), 4VsW, 4X, 5Zj,m; haddock in 4TVW, 5Zj,m, and A. Plaice in 3Ps) the new information is consistent with the most recent assessments. A further decline in abundance is suggested for 3Pn4RS cod and 4X haddock. The 1993 abundance survey suggests that the 1989 year-class of 4VWX+5Zc pollock may be above average in size.

3Ps COD

Research Surveys

There is no new survey information for this stock. The February and April 1993 survey results were used in the assessment presented in the July 1993 Stock Status Report.

Winter surveys in this area have been conducted mainly during the months of February and March. The 1994 survey is planned for April to reduce the influence of recent changes in depth distribution and stock overlap (3Pn-3Ps) on biomass and abundance estimates. This should also be at a time before any major shoreward migration.

The 1994 survey plan includes, to the extent possible, parts of Placentia Bay because of concerns expressed by inshore fishers that the inshore portion of the stock was not being adequately covered. The results of this additional coverage will be of limited value in the short term, other than to see if large amounts of cod may be found in these previously unsurveyed areas. As with all new survey observations, it will take several years to evaluate the impact of this new coverage on the stock assessment.

Information from the Fishery

The 1993 fishery was very variable, from very good in some areas to very poor in others. Overall, the fixed gear catch was about equal to 1992 (10,400t in 1993 compared with 11,000t in 1992) but less than the 15,000t average for the most recent five years. Factors that may have contributed to this include the participation in NCARP by some fishers from 3Ps, the number of small fish closures in the area in 1993, and a good lumpfish fishery may have diverted some traditional effort away from cod.

The fishery was closed in September, 1993 following the FRCC recommendation.

3Pn4RS COD

Research Surveys

This stock has been surveyed during August-September 1993 as part of a new bottom trawl survey started in 1990 to estimate cod, redfish and shrimp abundance in the northern Gulf of St. Lawrence. The first year of this new survey series is not considered representative of cod abundance because shallow depths (less than 50 fathoms) were not surveyed. In addition, 3Pn was surveyed for the first time in 1993. The preliminary biomass estimate from the 1993 survey is about 30% of the 1992 value, suggesting a substantial decrease between the two years (Figure 1). The decrease in estimated biomass between 1991 and 1992 was of a similar magnitude.

The summer survey was considered too short to be used in the assessment presented in the July

Stock Status Report. The assessment is based on a January survey series, including the January 1993 biomass estimate. The decrease in survey estimated biomass between January 1992 and January 1993 was of the same magnitude as the decreases observed in the summer series.

The assessment presented in the Stock Status Report estimated that the adult (7+) biomass of 3Pn4RS cod would increase in 1993. Although the summer series is short and its usefulness as an index of cod abundance has not been established, it suggests that the increase forecast in the July assessment has not occurred and that the decline may in fact have continued.

It is difficult to estimate relative year-class strengths from the summer surveys due to the short time series. However, the decline in the 1993 survey estimate occurred across all ages. The 1993 survey estimates of the 1986 and 1987 year-classes, which appeared to have been strong in previous assessments, were about 40% of the three year average.

The distribution of cod during the 1993 survey is similar to that of previous years and the highest catches were made well within the survey area; away from the boundaries. There are no reports from industry about increased fishing activity or about unusual abundance of cod in the unsurveyed shallow waters (<20 fm).

Information from the Fishery

Reports from index fishers, from fisheries unions, from fisheries association and from DFO personnel generally concur that fish are small, skinny and scarce. Mobile gear fisheries have taken 8844 t out of their 10985 t quota. The fixed gear catches to date are 6222 t of a 6619 t quota compared to 7500 t to this date last year.

Detailed examination of the commercial length frequencies and aging will be undertaken in early 1994. Given that the fleet sectors are highly selective, it is essential that detailed landings statistics from western Newfoundland be made available.

4T-4Vn(Jan.-Apr.) COD

Research Surveys

This stock was surveyed in September 1993 as part of the regular groundfish survey series conducted in the southern Gulf of St. Lawrence since 1971. The average catch per tow for all ages was 53.7 cod/tow in 1993 compared with 45.3 cod/tow in 1992, an increase of about 20% (Figure 2). However, this difference is within the normal variability of survey estimates and may not be significant. An approximate age composition of the 1993 survey population abundance was derived from age-length information from 1992. This suggest that the 1993 survey estimate for ages 3 and older of 47.4 cod/tow is very close to the 44.2 cod/tow expected based on the July 1993 assessment (Figure 3). Abundance in the survey therefore is still very low compared with the early 1980s and the stock continues to be in a depressed state. These results are consistent with the assessment presented in the Stock Status Report.

There is no sign of improved recruitment in the survey.

Information from the Fishery

The total 1993 catch is expected to be less than 4,000t.The mobile gear fishery was considerably restricted by fishery closures because the percentage of small fish in the catch exceeded 15% in number. Fishers reported that the 1993 fixed gear fisheries were better in some areas (e.g. Baie des Chaleurs).

The fishery was closed in September, 1993 following the FRCC recommendation.

4Vn(May-Dec.) COD

Research Surveys

This stock was surveyed in July 1993 as part of the regular groundfish survey series conducted on the Scotian Shelf since 1971. Survey results for cod are quite variable in this area because there are few fishing sets and to a lesser extent because of the sporadic and variable presence of cod from neighboring management units. The 1993 catch per tow is very low compared to the early 1980s (Figure 4). These results are consistent with the assessment presented in the Stock Status Report.

There are no indications of improved recruitment.

Information from the Fishery

Fixed gear catches have generally been poor during 1993, although the fishery appeared to improve somewhat towards the end of August. The mobile gear fishery has yielded less than 100 t to date and has been closed on several occasions because of the presence of small fish.

The fishery was closed in September, 1993 following the FRCC recommendation. A fixed gear test fishery was approved after demands by local fishers.

4VsW COD

Research Surveys

The March 1993 survey results for this stock were reviewed during the latest assessment but were not used to calibrate the VPA. This stock was surveyed in July 1993 as part of the regular groundfish survey series conducted on the Scotian Shelf since 1970. The July 1993 survey results are higher than the 1992 results both in terms of numbers per tow (23.7 vs 13.9 for 3+) and biomass (90.9 vs 46.2 for 3+), but remain considerably lower than values from the late 1970's through the mid 1980's (Figure 5). There is no indication of incoming strong recruitment and the abundance of large cod remains very low. These results are consistent with the assessment presented in the Stock Status Report.

Information from the Fishery

The mobile gear fisheries in 1993 were severely restricted by fishery closures because the percentage of small fish in the catches exceeded 15% in number. To date the mobile gear has landed about 1400 t from an allocation of about 8000 t. By comparison, the fixed gear have done somewhat better landing over 1700 t which is over half of their allocation.

Most of the fishery was closed in September, 1993, following the FRCC recommendation. The landings to date (Oct. 6) total 2627 for all gear sectors which may be compared to about 23000 t to the same date last year.

4X COD

Research Surveys

This stock was surveyed in July 1993 as part of the regular groundfish survey series conducted on the Scotian Shelf since 1970. Overall, the results are consistent with those presented in the Stock Status Report (Figure 6). However, the 1990 year-class, which was assumed to be average in the assessment, now appears marginally better than average while ages 6,7 and 8 are less abundant in the 1993 survey than would have been expected from the assessment.

Information from the Fishery

Landings to date (13,720t) in the 1993 commercial fishery are lower than at the same time last year (19,248t), however it is not possible to interpret this pattern meaningfully due to changes in the management plan and to changes in fishing strategy by the fleets under ITQs. Anecdotal information though, supports the perception that fishable sized cod are scarce. Some fishermen noted that the fish they did catch were small.

5Zj,m COD

Research Surveys

There is no new survey information on this stock. The results of the March 1993 survey were used in the assessment presented in the July Stock Status Report.

Information from the Fishery

Reported 1993 landings to the end of September were about 7,500 t, a decline from 10,500 t for the same period in 1992. The 1993 mobile <65' otter trawl fishery opened in January rather than June and about 2,000 t, compared to a recent average of less than 500 t, were taken by the otter trawl fleet in the first quarter of 1993. Opening of the otter trawl fishery in January 1993 rather than June probably resulted in high catch rates on densely aggregated and actively spawning fish. Preliminary analysis of 1993 commercial landings samples indicates that the 1990 year-class at age three accounted for over 65 percent of the total landings (Figure 7).

4TVW HADDOCK

Research Surveys

This stock was surveyed in July 1993 as part of the regular groundfish survey series conducted on the Scotian Shelf since 1970. The average catch per tow for all ages was about 27 haddock/tow in 1993 almost equal the 1992 value of about 28 haddock/tow (Figure 8). Most of the haddock were in Division 4W, very few were in 4V (Figure 9). Therefore, there appears to be very little change in stock status and the stock continues to be dominated by a single year-class, that of 1988. These results are consistent with the assessment presented in the Stock Status Report.

Recruitment since the 1988 year-class appears to be below average.

Information from the Fishery

Total catches to date are approximately 1000 t compared to a catch of 4067 t in 1992. As opposed to previous years, the Emerald/Western Bank closure applied to all gear types including fixed gear in 1993. Rumours of impending closure and the restrictive by-catch measures imposed have also contributed to these reduced catches.

4X HADDOCK

Research Surveys

This stock was surveyed in July 1993 as part of the regular groundfish survey series conducted on the Scotian Shelf since 1970. The average catch per tow for all ages in 1993 was 9 kg/tow, the lowest observed in the survey series and about half the 1992 value (Figure 10). Previous survey results had indicated that the 1987 and 1988 year-classes were of average abundance. The 1993 results indicate a considerable decrease in abundance of these year-classes and would suggest extremely high exploitation rates.

There are indications that the 1992 year-class could be of average strength (Figure 11).

Information from the Fishery

Total catches to date are 5920 t. The fixed gear fleet has exceeded its haddock quota and is restricted to 10% haddock bycatch levels.

Anecdotal information from the industry suggests that haddock are more abundant than indicated by the 1993 survey. Consultations are ongoing to explain this discrepancy.

5Zj,m HADDOCK

Research Surveys

There is no new survey information on this stock. The most recent survey was conducted in March 1993 and the results were used in the assessment presented in the July Stock Status Report.

Information from the Fishery

For the first time in recent years, the mobile gear fishery was opened in January. There was an active fishery on the spawning aggregations and landings in the first half of the year were 1,381t, more than double those for the first half of 1992. Subsequent landings have been considerably lower with the result that landings to date (3,181t) are lower than those for the same period in 1992 (3,319t). Information suggests that mis-reporting of 4X haddock to 5Z, though not quantified, has increased in 1993, further complicating interpretation of trends and compromising the ability to accurately assess the status of the resources.

4VWX+5Zc POLLOCK

Research Surveys

This stock was surveyed in July 1993 as part of the regular groundfish survey series conducted on the Scotian Shelf since 1971. The results suggest that the 1989 year-class, age 4 in 1993, which was assumed to be of average strength in the July Stock Status Report, could be considerably stronger (Figure 12). If this year-class proves to be as strong as the 1993 survey indicates, it would contribute substantially to catches in the coming years.

Information from the Fishery

Total catches to date are 16791 t compared to 25215 t last year. Reports from industry indicate large numbers of small pollock are being caught though large pollock are rate.

3Ps AMERICAN PLAICE

Research Surveys

There is no new survey information on this stock. The most recent surveys were conducted in February and April 1993 and the results were used in the assessment presented in the July Stock Status Report.

Information from the Fishery

The catch to date is less than 300 t, compared to 1300 t last year, and will likely be near the total catch for the year. The catch may have been slightly higher except for the new by-catch regulations at the beginning of the year as the first quarter is generally the best. However, the fishery didn't really get under way until late February. Nevertheless, the catch rates were so poor that it is unlikely things would have been much different regardless of either the by-catch regulations or the fishery closure.

4T AMERICAN PLAICE

Research Surveys

Mean numbers per tow (1+) for American plaice declined from 259 fish/tow in 1992 to 210 fish/tow in 1993, near the lowest observed (Figure 13). As indicated in the last review of this stock, the abundance of American plaice in the last ten years appears to be relatively stable at a low level.

Length-frequency distributions for the last five surveys suggest that the 1989 year-class and the 1991 year-class may be more abundant than adjacent year-classes. However, abundance at this size is not considered to be a reliable index because plaice are only partially recruited to the survey gear. The abundance of plaice in the 25-35 cm size category has declined markedly since 1991. This size-class is exploited by the fishery.

The largest catches in the 1993 survey were obtained in waters off northeastern New Brunswick, similar to previous years. Catches were low south of the Magdalen Islands compared to the three previous years.

Information from the Fishery

The landings of plaice to date are currently less than half of corresponding 1992 landings; however, numerous factors other than stock abundance may account for reduced catches: late start of the fishery, numerous cod closures, and reduced effort. The American plaice fishery will continue in November in a restricted zone off northern Cape Breton.

4T WHITE HAKE

Research Surveys

Mean numbers per tow have declined by about 50% from 1992 and are the lowest since 1983-84 (Figure 14). A cursory examination of the length frequency of white hake caught during the 1993 survey did not indicate significant improvement in recruitment. The abundance of larger fish has continued to decline.

The distribution pattern of catches during the survey was similar to that observed in previous years. White hake were caught either in the shallow, inshore waters of the southern Gulf or in the deeper waters of the Laurentian Channel. The area of distribution, however, appears to be shrinking.

Information from the Fishery

These results are consistent with fishermen's views expressed during the recent round of public hearings of the Fisheries Resource Conservation Council. They indicated that the abundance of white hake has declined markedly over the last few years. The fishery is still continuing in some areas (as of 20/10/93 864 t had been caught from the 3,600 t TAC). Aside from a few index fishermen that reported better than average catch rates of large hake, many of the fixed gear index fishermen that targeted hake this year again reported that the fish were "small and scarce".

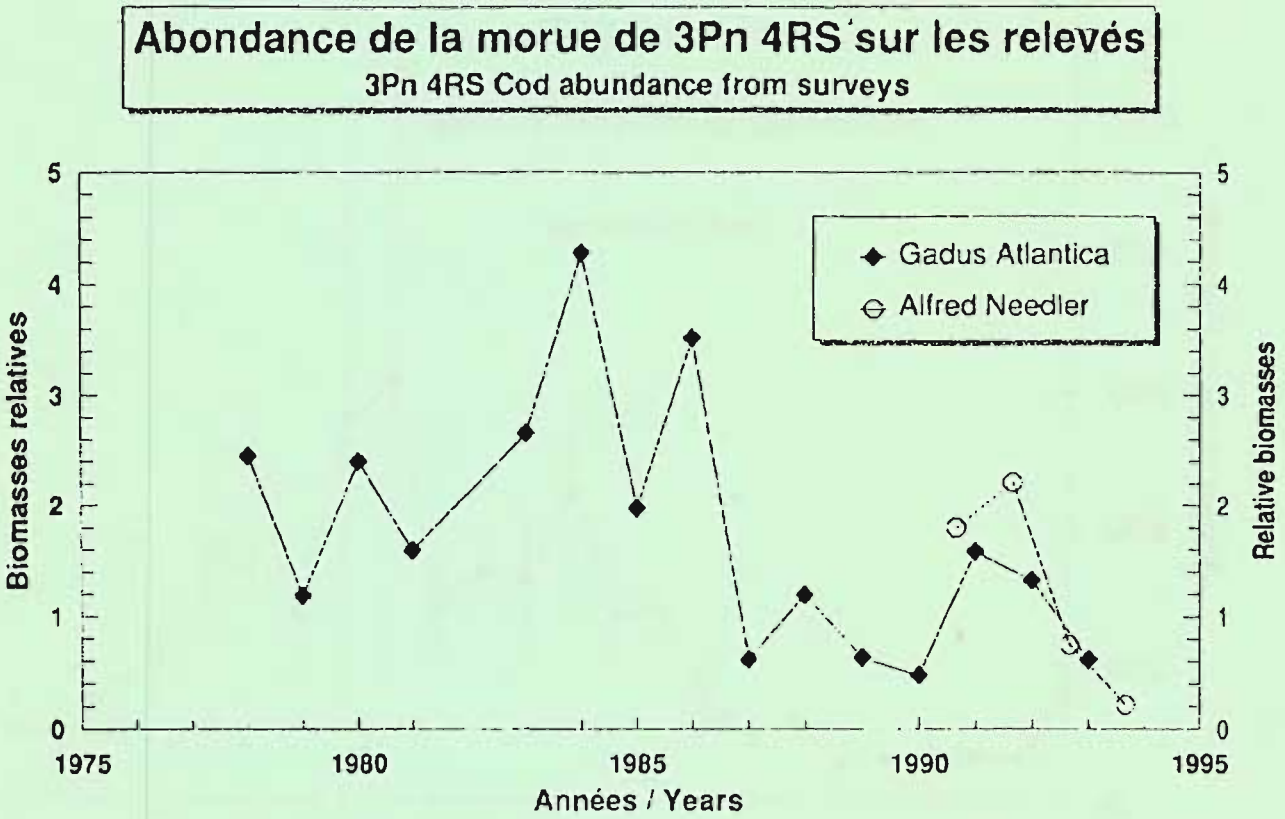
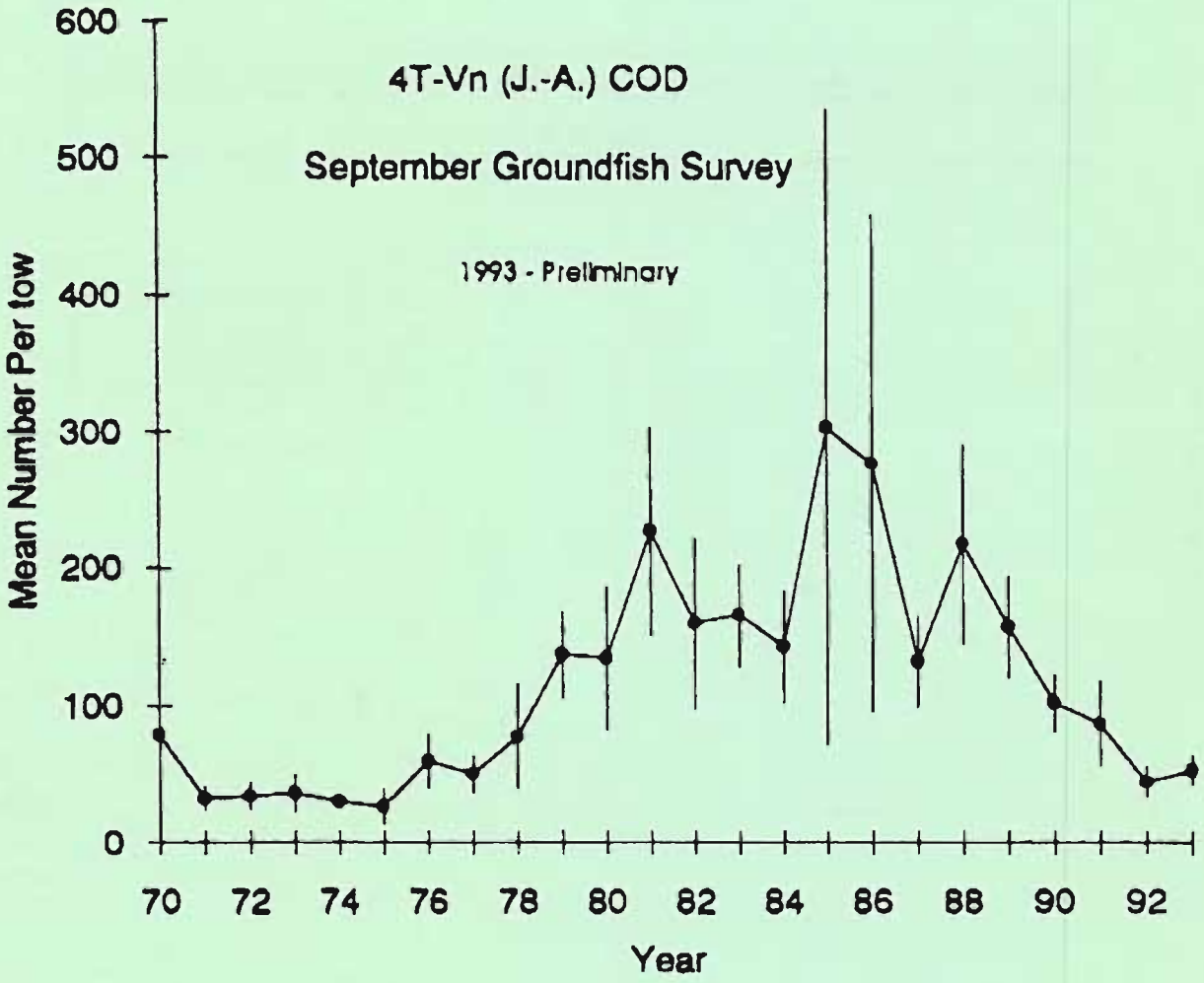
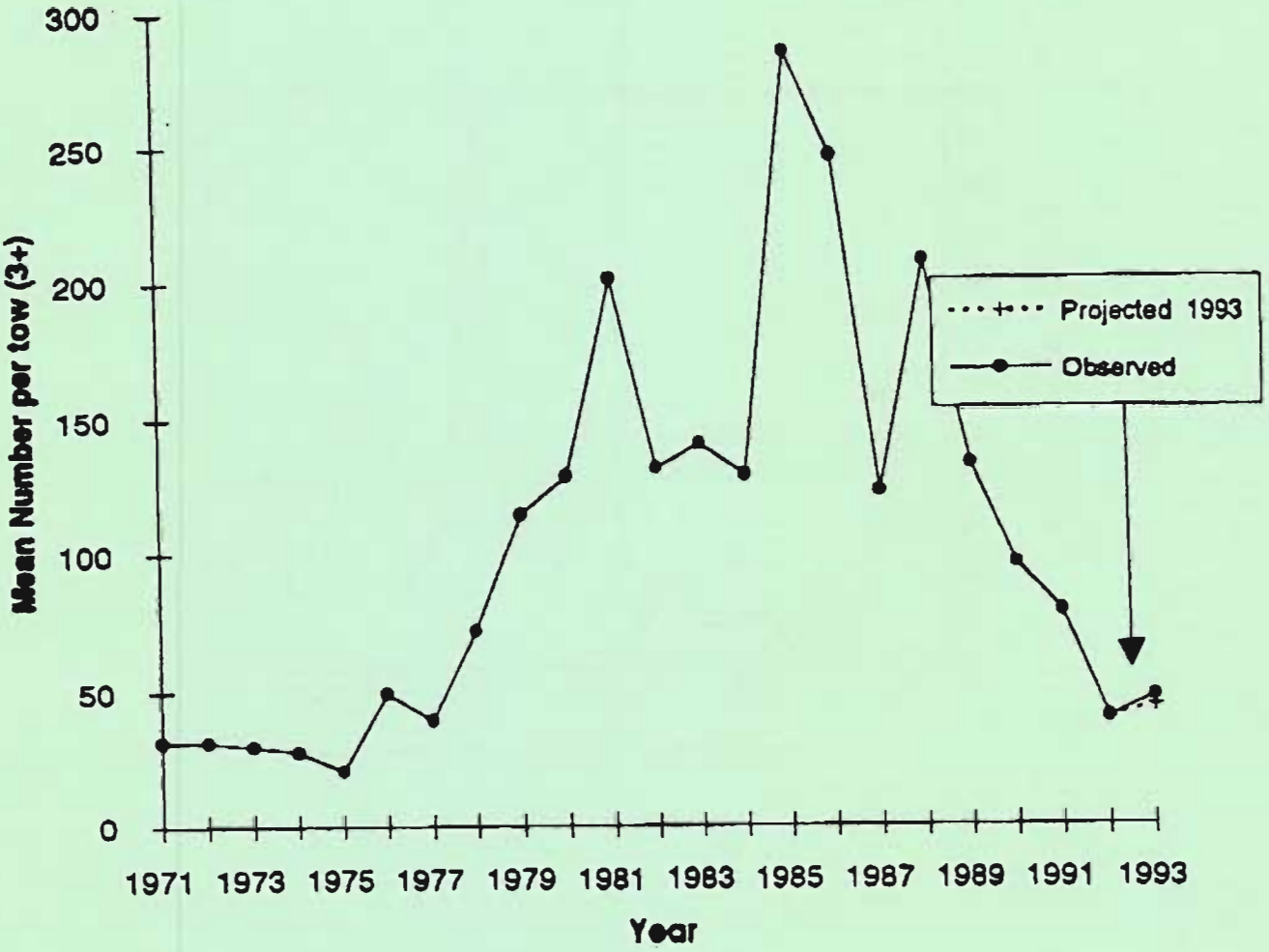

Abondance de la morue de 3Pn 4RS sur les relevés
3Pn 4RS Cod abundance from surveys
Gadus Atlantica
Alfred Needler
Biomasses relatives
Relative biomasses
Années / Years
0
1
2
3
4
5
1975
1980
1985
1990
1995

Figure 1



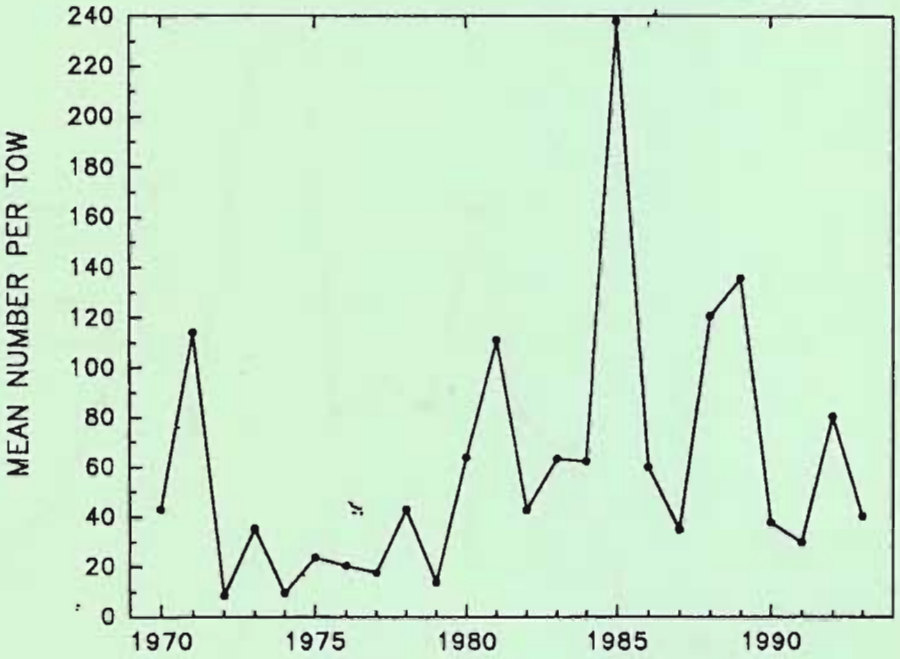
Mean number per tow (ages 0+) for cod in the southern Gulf of St. Lawrence September groundfish survey. Note: 1992 and 1993 adjusted for the *Lady Hammond / Alfred Needler* comparative experiment.

Figure 2



Mean number per tow (ages 3+) for cod in the southern Gulf of St. Lawrence from the September research surveys. The dotted line connects the 1992 point with the predicted estimate for 1993 using the results from the last assessment and estimated catches for 1993.

Figure 3



Abundance of 4Vn cod – July research cruises.

Figure 4

4VsW Cod 3+ biomass from July survey and VPA

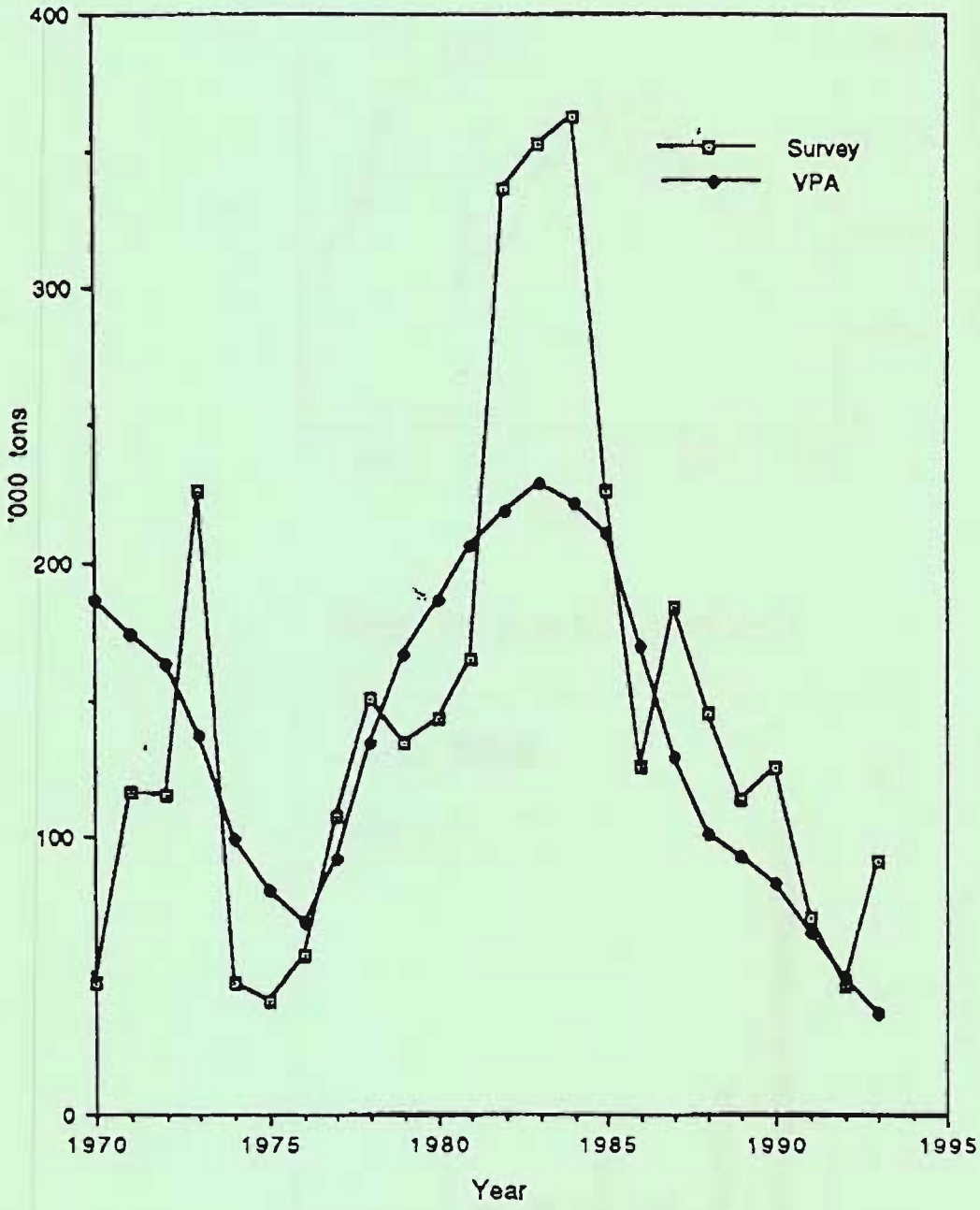
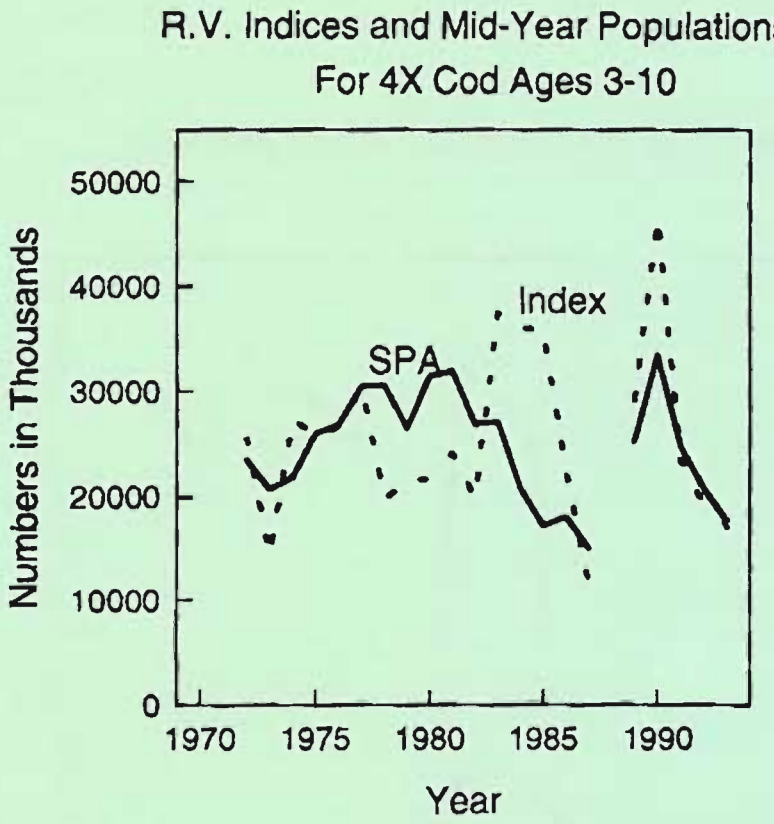


Figure 5


R.V. Indices and Mid-Year Populations
For 4X Cod Ages 3-10
Numbers in Thousands
50000
40000
30000
20000
10000
0
SPA
Index
1970
1975
1980
1985
1990
Year

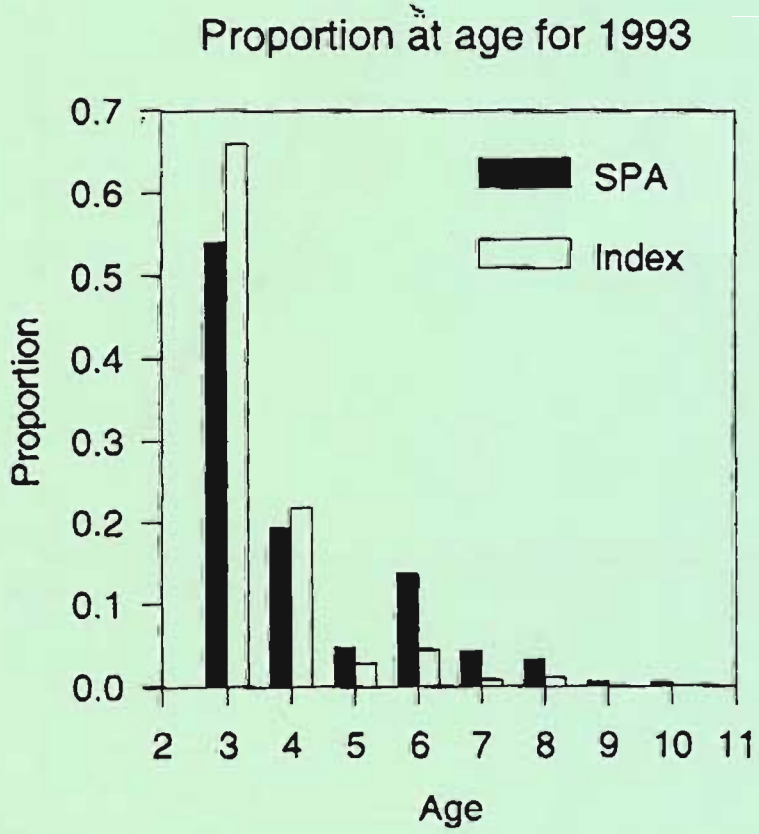

Proportion at age for 1993
Proportion
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
SPA
Index
2
3
4
5
6
7
8
9
10
11
Age

Figure 6

Figure. Catch at length for 1993 Canadian landings of 5Zj,m cod to the end of September 1993

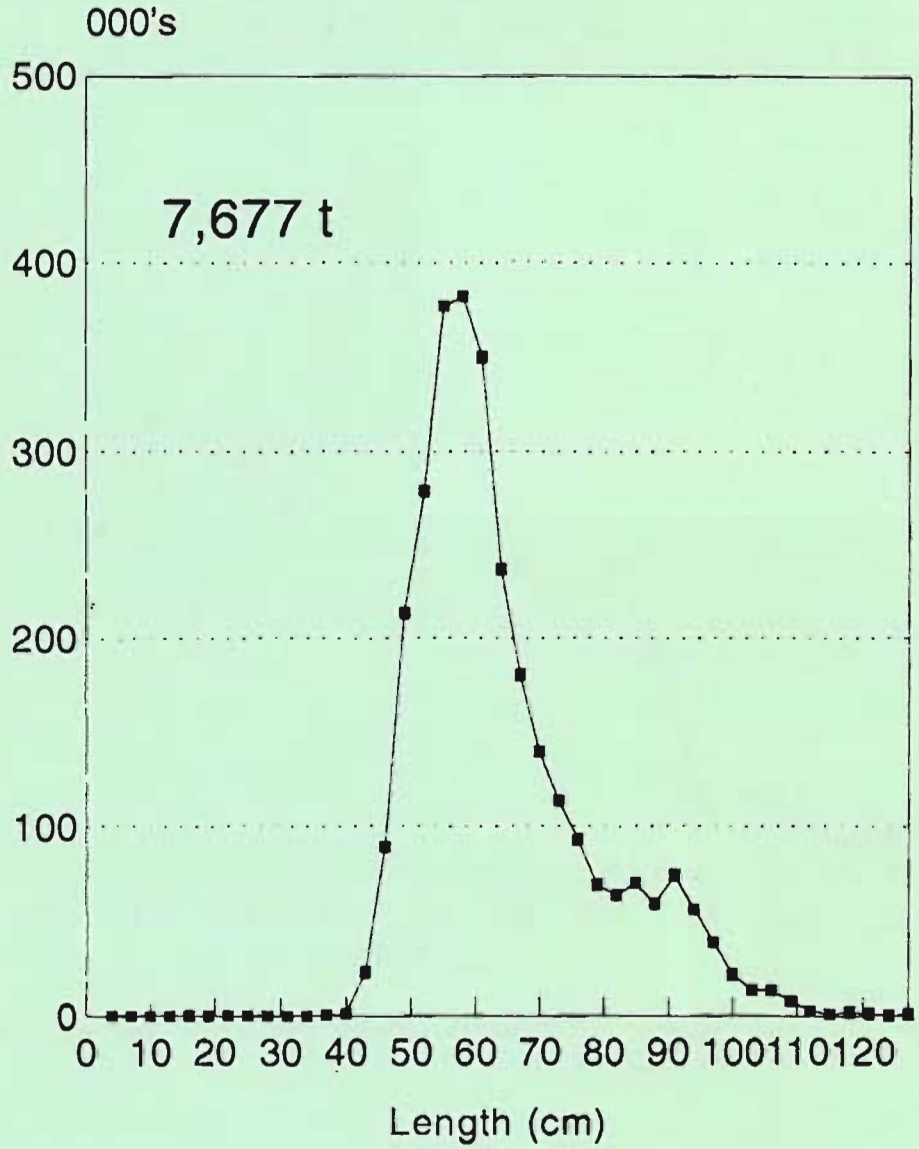
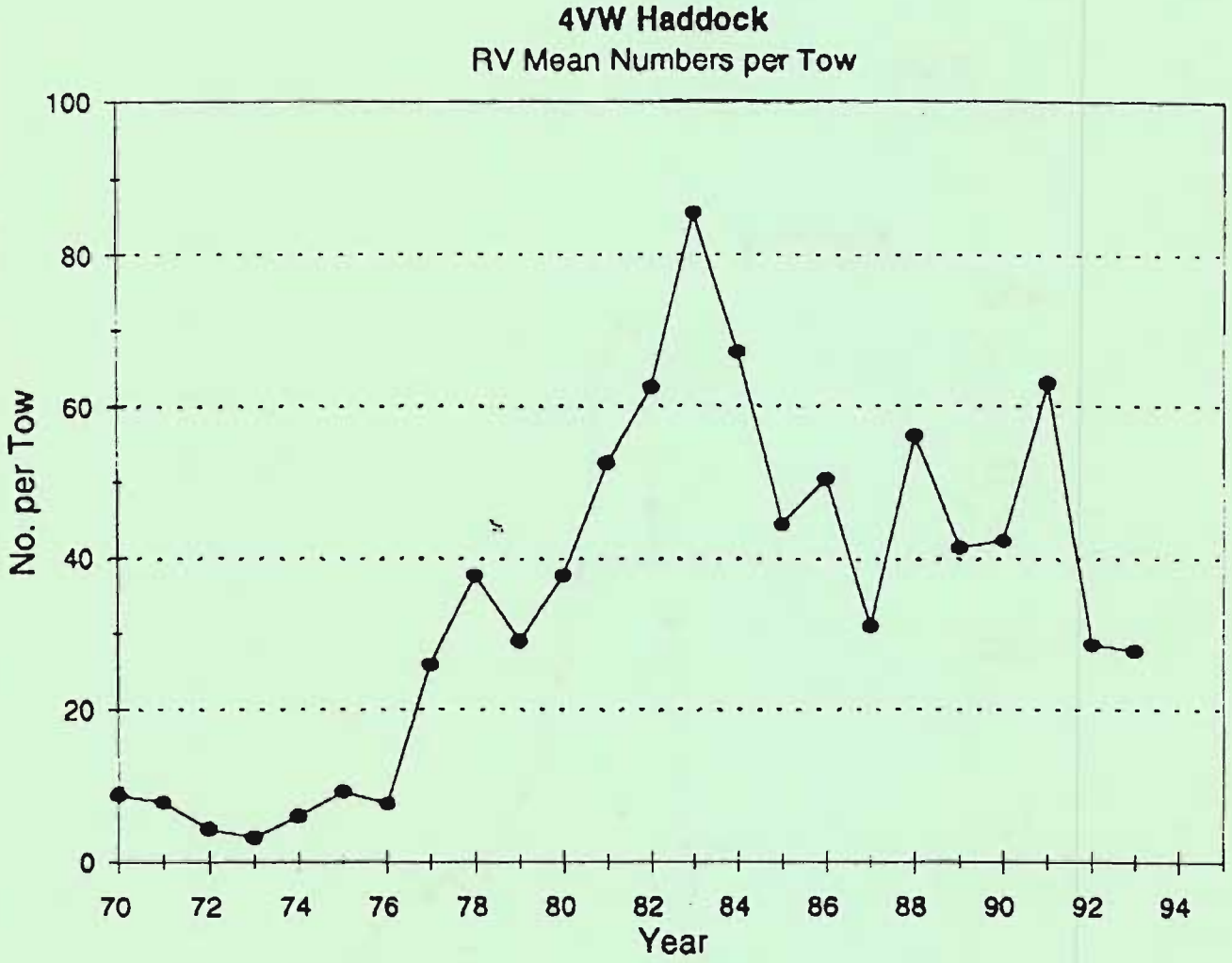
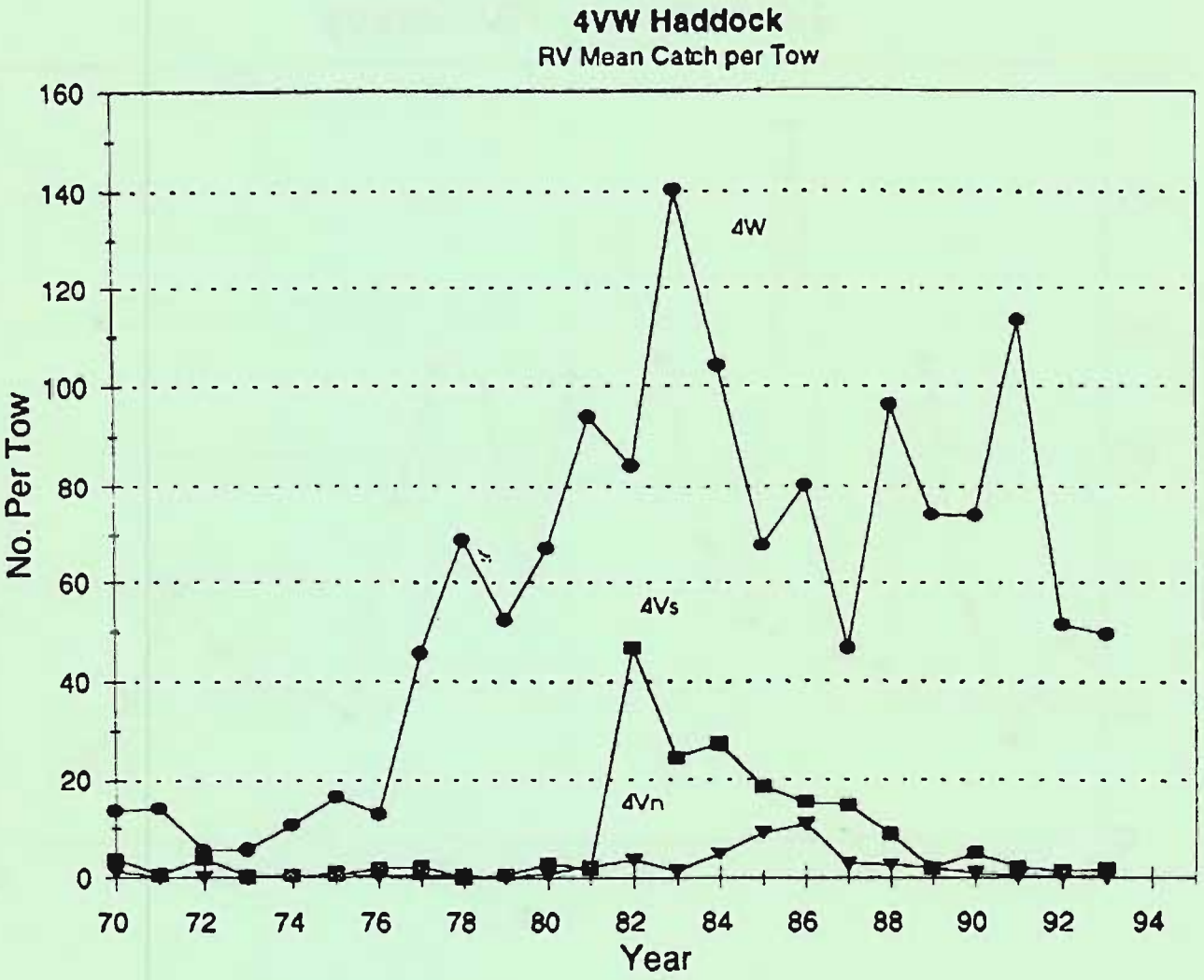


Figure 7



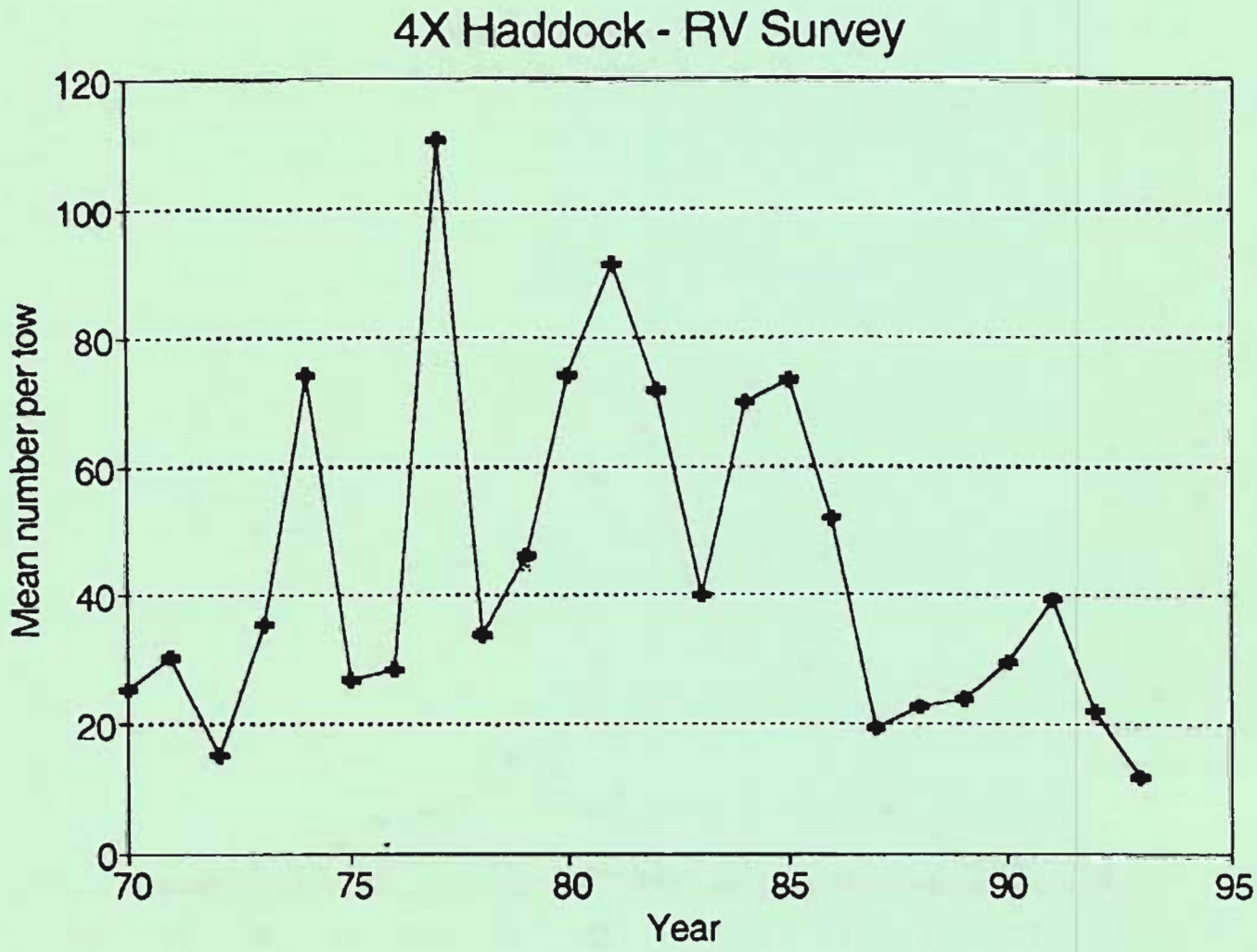
Mean number of haddock caught each year during the July survey of 4VW haddock.

Figure 8



Mean number of haddock caught each year in each of the three NAFO areas comprising the 4VW haddock stock.

Figure 9



Research vessel survey 4X haddock stratified mean number per tow 1970-1993.

Figure 10

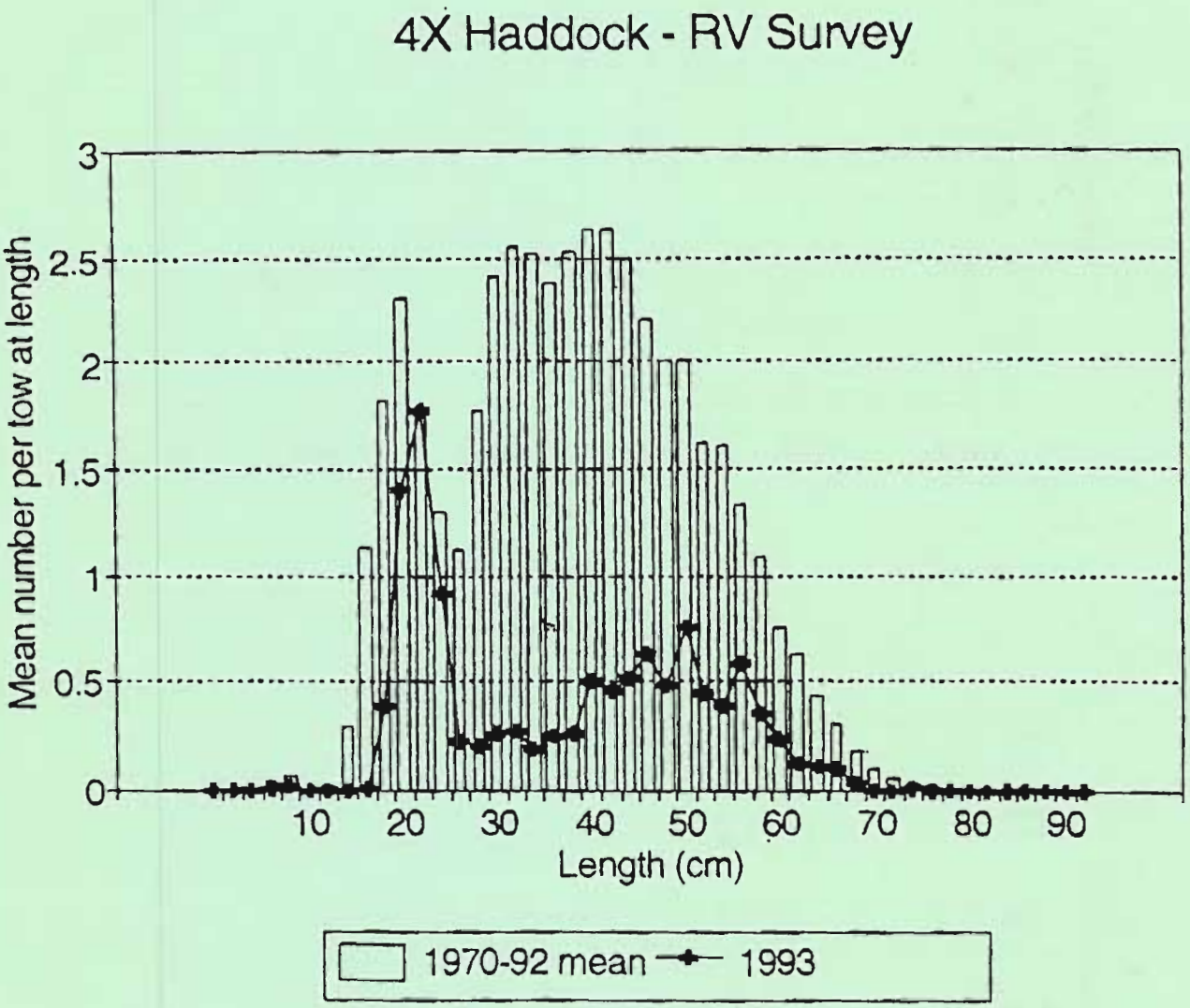
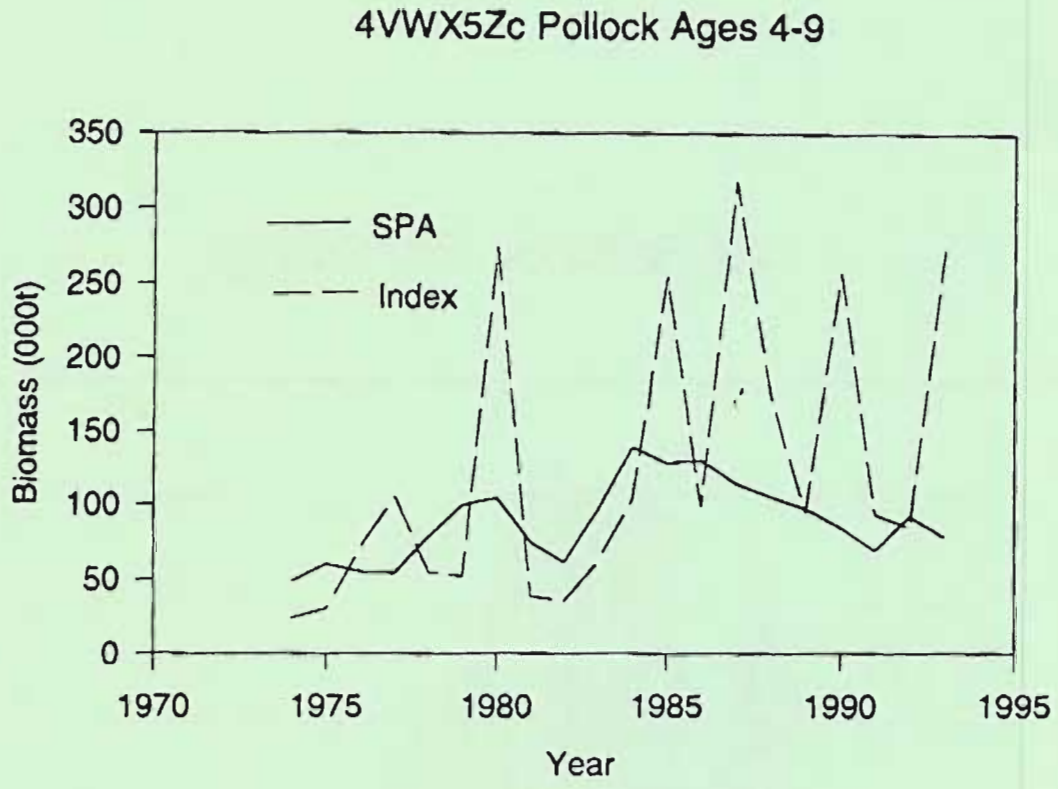


Figure 5.2. Research vessel survey 4X haddock length composition (bars are 1970-92 mean and points are 1993 values).

Figure 11


4VWX5Zc Pollock Ages 4-9
350
300
250
200
150
100
50
0
Biomass (000t)
SPA
Index
1970
1975
1980
1985
1990
1995
Year

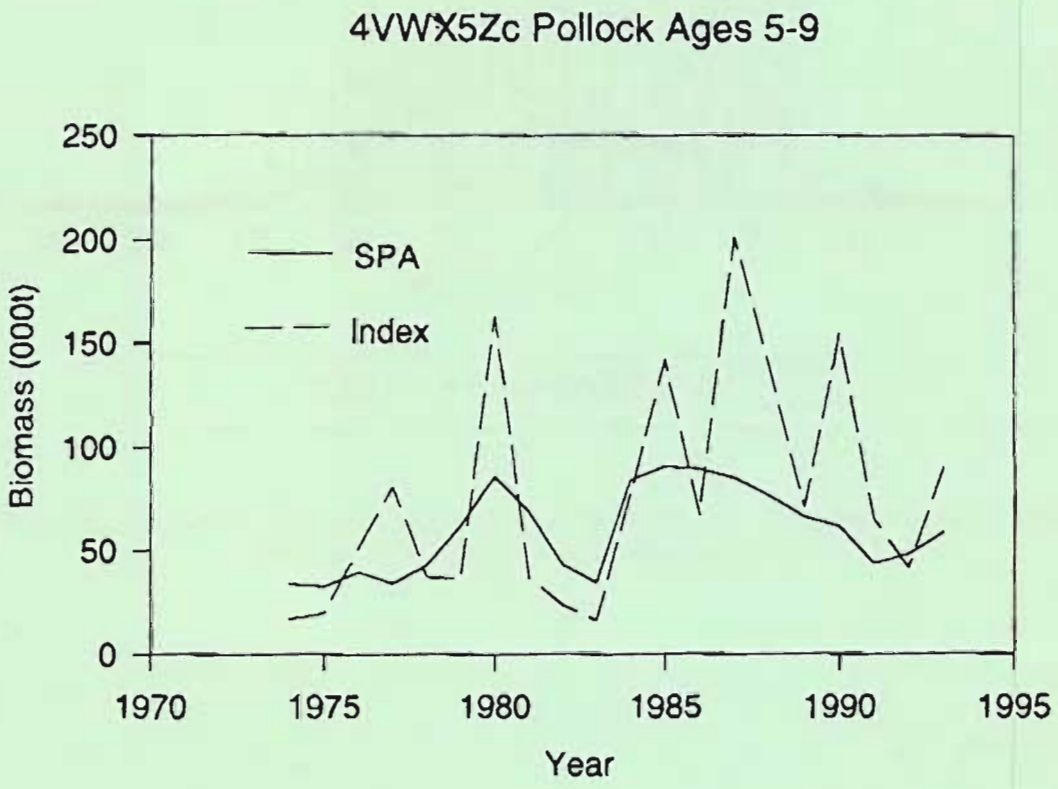
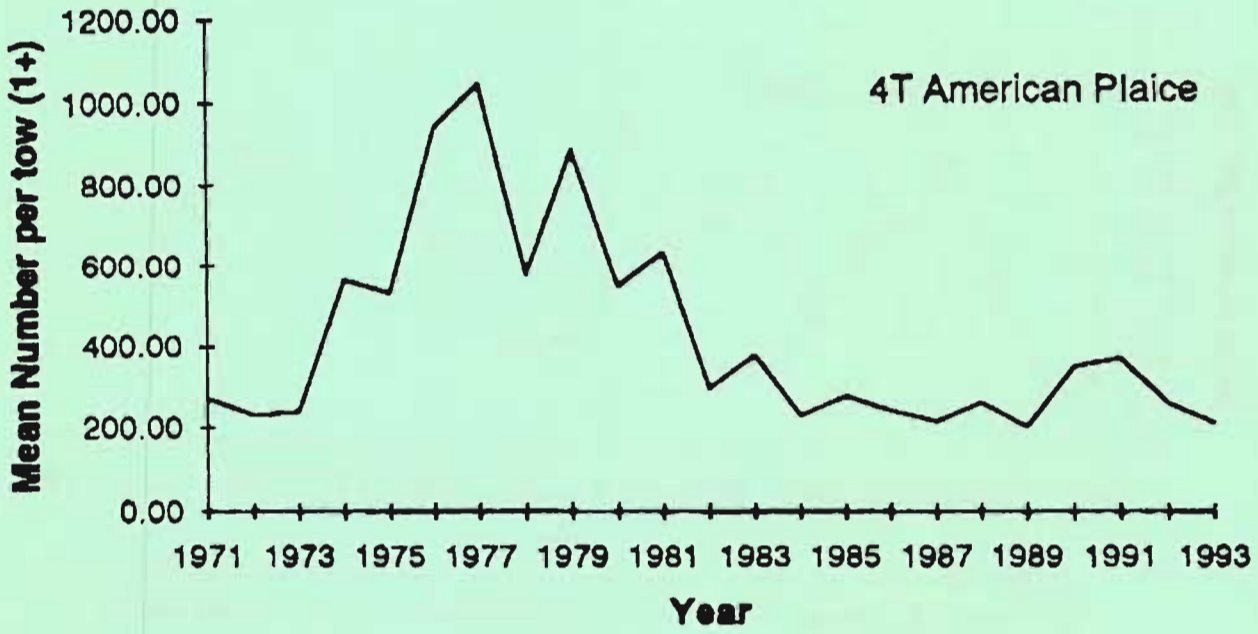
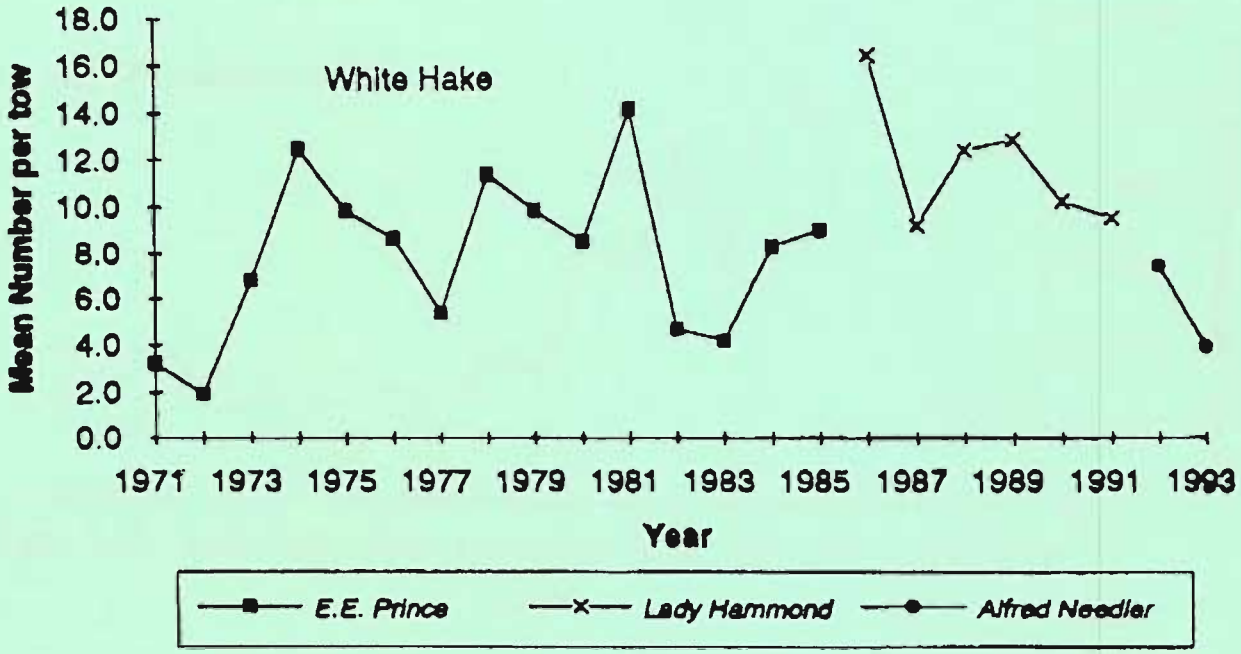

4VWX5Zc Pollock Ages 5-9
250
200
150
100
50
0
Biomass (000t)
SPA
Index
1970
1975
1980
1985
1990
1995
Year

Figure 12



Mean number per tow (Ages 1+) for American plaice from the southern Gulf of St. Lawrence September groundfish surveys (1993 - preliminary)

Figure 13



Mean numbers per tow (Ages 0+) for white hake from the southern Gulf of St. Lawrence September groundfish surveys (1993 -preliminary). Note: *E.E. Prince* numbers multiplied by 1.2 to account for difference in fishing power

Figure 14

APPENDIX 4

UPDATE ON REDFISH
FROM THE SCIENCE SECTOR OF THE
DEPARTMENT OF FISHERIES AND OCEANS

Redfish in the Gulf of St. Lawrence, on St. Pierre Bank, and on the Scotian Shelf (Units 1,2,3) - Review of Stock Status and Stock Structure.

Executive Summary

Reports from the fishing industry that indicated increasing difficulty in catching redfish in the Gulf of St. Lawrence, and catches close to the boundaries of management units, together with a further marked decline in the estimate of biomass from the 1993 summer research surveys in the Gulf of St. Lawrence led to a request by the Fisheries Resource Conservation Council for a review of stock status and stock structure.

It was not possible to provide quantitative estimates of stock abundance in any of the three management units. Information was most complete for Unit 1 (4RST and 3Pn-4Vn [Jan.-May]). The estimates of biomass from research surveys declined in 1993 for the third year in a row by 40% between 1992 and 1993, and by 70% overall since 1990, although there are wide confidence limits about the annual estimates. A decline was expected, but the observed decline is greater than would be expected on the basis of catches alone and is particularly marked in 1993 for the 1988 year-class which had earlier appeared to be strong and was expected to recruit to the fishery in the late 1990s. This information suggests that the conclusions in the 1993 Stock Status Report (SSR) are too optimistic and that maintaining catches at current levels will result in a rapid increase in the exploitation rate.

Little information is available on trends in abundance in Units 2 and 3, but there does not appear to be reason to expect major changes in stock status in the near future.

With respect to stock structure, the distribution of catches over time in the area of Cabot Strait suggests that redfish of the Unit 1 stock (Gulf of St. Lawrence) may migrate as far as Subdivision 3Pn (and perhaps 4Vn) earlier than the end of the year, may extend as far south as northern Subdivision 3Ps in March and may linger in Subdivisions 3Pn and 4Vn through the early summer. The southward movement in the late fall appears to have been earlier in 1992 and 1993 than usual. In 1993 fishing was located close to the 4R/3P border by October.

Further study of stock structure will require more detailed information on the location of the fleets over time, and in particular, for the Newfoundland vessels fishing Unit l and Unit 2 redfish. It will also be necessary to examine fleet distribution and catch rates by vessel size. Most of the groundfish research surveys with bottom trawls are not fully satisfactory for redfish, but plans for 1994 include more investigation of areas adjacent to those traditionally surveyed, and in particular a trawl survey of Divisions 3P and 4VW in August.

A meeting of a Fisheries Oceanography Working Group next spring will address the interrelationship between cod and redfish migration and oceanographic conditions in the area of Cabot Strait.

Introduction

The Fisheries Resource Conservation Council held a number of consultations with the Fishing Industry and with DFO scientific staff during the summer and autumn. Many industry representatives expressed concern about the status of the redfish stocks, particularly that in Unit 1 (Gulf of St. Lawrence), and about the appropriateness of the time/area separation between the Units. DFO science staff reported declines in the estimates of abundance particularly for Unit 1 that appeared to be greater than expected. The Council requested on September 24 that DFO undertake a review of stock status and stock structure for Units 1, 2, and 3. This rapid review was undertaken by staff from the four DFO Atlantic Regions and from the National Capital Region (see Appendix)

Background

Until 1993, redfish were managed on the basis of the Gulf of St. Lawrence (4RST), St. Pierre and Burgeo Banks (3P) and the Scotian Shelf (4VWX). During the late 1980's however, evidence accumulated that suggested these management units did not represent the actual stock structure. In particular, redfish distribution between the eastern Scotian Shelf and St. Pierre Bank appeared to be continuous in the summer and redfish from the Gulf of St. Lawrence appeared, in some years, to occur in 4Vn and 3Pn during the early months. CAFSAC, in 1991, undertook a review of redfish distribution and recommended that the management units be the western Scotian Shelf (4VsW d e h l ; X), the eastern Scotian Shelf (4W f g j) and St. Pierre Bank combined, and the Gulf of St. Lawrence. Subdivisions 4Vn and 3Pn were considered "swing" areas, with catches in January to May likely to be from the Gulf of St. Lawrence stock, but in other months to be from the eastern Scotian Shelf stock St. Pierre Bank (Figures 1-3).

CAFSAC was unable to assess the population status of the units but recommended that the sum of the existing TACs be redistributed among the new units on the basis of the average proportion of the catches during 1981-90. This proportion was:

- 66% in Unit 1 (3Pn [Jan-May] 4Vn [Jan-May] 4RST)
- 24% in Unit 2 (3Pn [June-Dec] 4Vn [June-dec] 3Ps 4W f g j)
- 10% in Unit 3 (4VsW d e h k l X)

These units were not fully introduced as management measures until 1993.

Analytical assessments are still not possible, but information from the commercial fisheries and from research surveys has provided indications of trends in stock status, particularly for Unit 1, (Gulf of St. Lawrence stock) which has yielded most of the catches. The most important information has been data on catch rates and size distribution.

Review of Stock Status

Unit 1-(3Pn [Jan-May]+4Vn [Jan-May}+4RST)

Catches from this Unit (Figure 4) increased fairly steadily from 36,000t in 1986 to 77,000t in 1992. The 1992 TAC was 57,000t for Divisions 4RST alone with some flexibility to fish in Subdivisions 3Pn. The 1993 TAC for Unit 1 is 60,000t and catches to October 6 are reported to be 44,223t. Gulf-based vessels apparently started the summer fishery later than in earlier years, whereas non-Gulf-based vessels took their allocation in the winter fishery. The rate at which total catches have accumulated is slower than in 1992 but the catch-per-hour for Gulf-based vessels appears only slightly lower than in 1992. There are reports, however, that vessels are requiring more days to catch a "full trip" which may indicate that catch-per-day is less.

The commentary on stock status provided in the Stock Status Report (SSR) of this summer indicated that the population was dominated by the 1981 and 1988 year-classes, with the fishery being supported mainly by the 1981 year-class. Prior to these year-classes, those of the 1970-72 period had been the main support to the fishery. These early 1970s year-classes and that of 1981 supported substantial increases in catch rates (Figure 5).

Results of research surveys (Figure 6) in 1990-92 suggest that the total population had been declining. In terms of biomass, the reduction between 1990 and 1991 was 40%, and between 1991 and 1992 was 20%. On the basis of this information, it was concluded that "if TACs remain at the 60,000t level, the exploitation rate will increase as the remaining biomass decreases. Catch rates will also drop as they did earlier when strong year-classes were taken up in the 1980s. However, current landings are roughly double the catches in that period; if the year-class supporting this fishery is roughly equal to the last big year-class, the biomass will decline faster this time around, because the catches are higher".

Since the 1993 Stock Status Report was prepared, the annual survey was undertaken in late August, early September. The results are preliminary, but it appears that biomass declined by a further 40% between 1992 and 1993. The overall decline between 1990 and 1993 was 70% but there are wide confidence limits about the annual estimates. The decline was seen in all sizes, but most markedly in the 1988 year-class for which the 1993 estimate of total numbers is less than one-third of what it was in 1992, which itself was only one-third of the 1991 estimate. The trends in the separate biomass estimates for the three divisions 4R, 4S and 4T have varied, but some of the areas of aggregation that have been detected have been close to the dividing lines, so small changes in location from year-to-year might account for this. The survey extended into Subdivision 3Pn in 1993 but very little redfish biomass was detected.

Other groundfish research surveys in the Gulf indicate declines in redfish abundance but they generally are not conducted at depths below 400 metres and would not be expected to consistently sample redfish.

The research survey data indicate declines in abundance that are faster than were expected, yet

commercial catch rates when measured in terms of fishing time, show much less reduction. This contradiction would be explained if redfish schools retain the same density of fish, even when total abundance declines. It might be expected that, if this occurs, the schools would be smaller and/or more scattered, thus requiring more searching time and hence catch-per-day fishing would be lower. Trip length might therefore be longer in order to catch the target amount in weight. This appears to be the situation for Gulf-based vessels in 1993, but requires further analysis.

The declines in the estimates of abundance from research surveys, and particularly the relative disappearance of the 1988 year-class (which is reported also by industry) are cause for concern and would strengthen the conclusions in the 1993 SSR. Thus, not only will exploitation rates increase more rapidly, and biomass decline more rapidly than after the peak in abundance in the early 1980s, for any given harvest level, but the declines appear to be faster than would be expected on the basis of the fishery alone. Furthermore, recruitment to the fishery in the late 1990s of a strong 1988 year-class can no longer be anticipated. The cause(s) of the decline are not known and further investigation is warranted.

Unit 2-3Pn (June-Dec)+4Vn (June Dec)+3Ps+4W f g j (Figure 2)

Landings increased slowly between 1984-1991, from about 10,000t to 20,000t and were about 18,000t in 1992 (Figure 7). The TAC for 1993 is 28,000t and catches as of October 6 are close to 15,000t. Fishing captains report no apparent decline in abundance and commercial catch rates appear similar, for Newfoundland vessels to those in 1992, although somewhat below 1990-91 levels (Figure 8).

Research surveys have either not extended deep enough (4V) or the results have been too variable from year-to-year (3Ps) to permit conclusions about abundance trends. The survey results (Figure 9) do however give qualitative information about relative year-class strength. Stronger year-classes were produced in 1981, 1985, and 1988 compared to other years.

Based on the commercial catch rates, the abundance of larger fish increased with the recruitment of the 1980-81 year-classes at the beginning of the 1990s. There does not, however, appear to be reason for expecting a significant change in abundance in the near future under current catch levels.

Unit 3 - 4VsW d e h k l X (Figure 3)

Landings were 6,000-7,000t in 1985-87 but decreased to about 2,000t in 1990-92 (Figure 10). In 1993, landings to the end of September were about 4,000t from a TAC of 10,000t.

The increase in landings in 1993 is almost entirely a result of increase in fishing effort. Catch rates increased only slightly between 1992 and 1993.

Research vessel survey abundance estimates vary greatly from year-to-year and no clear trends are discernable in the 1980s and early 1990s (Figure 11). Size compositions for the 1990-93

surveys give no indication of significant recruitment to the population.

In summary, there is no indication in either research survey or commercial catch rate data that there has been a significant change in stock status in 1993.

Review of Stock Structure

Area of capture by 10-minute rectangles as provided by the Regional Statistical Branches, was plotted for catches by Scotia-Fundy, Gulf and Quebec vessels in 1991-93 (illustrated for early 1993 in Figure 12). Information for Newfoundland vessels was not available on a geographic breakdown smaller than DFO statistical unit areas. The information refers mainly to Units 1 and 2. The redfish in Unit 1 are considered to be highly migratory and to overwinter in the southern Gulf and Cabot Strait area before moving north during the spring and early summer. Thus catches in the winter (Jan-May) have come predominantly from southern Division R and from Subdivision 3Pn. There have been high catches along the 3Pn3Ps border in some months, and there were catches in northern 3Ps in March of 1992 and 1993. Beginning in May, directed redfish catches increased in Division 4V. Redfish fishing progressed in a northwesterly direction along the southern edge of the Laurentian Channel in Division 4TV during May-August. There was a continuous distribution of catches along the Channel edge in Division 4T and Subdivision Vn during the months of July and August. Directed catches increased in the deeper water areas of the Gulf, south and east of Anticosti island in July and August. In September, directed redfish fishing in the northern part of 3Pn was greatly reduced and the fishery moves southward in subsequent months. There was little redfish catch along the Laurentian Channel edge in Division 4T in September and the main catches within the Gulf came from southern Division 4R and Subdivision 3Pn in October and November, and these extended into the centre of the Laurentian Channel in Division 3P and Subdivision 4Vn in December. More redfish were taken in Subdivision 4Vn in 1993 during the summer than in 1992.

The commercial fleet has reported that the area of fishing has moved southwards earlier in 1992, and particularly in 1993, than in previous years. In 1993, fishing in October is already at the 4R3Pn border.

Research surveys in Division 4RST have shown that the southward extent of the winter movement of Gulf redfish is variable from year-to-year and may possibly extend into SubDivision 3Ps. The spring surveys in Division 3P show most catches are made in the northeast (Burgeo Bank) and along the southern edge of St. Pierre Bank (Figure 13). The catches near Burgeo Bank straddle the 3Ps/3Pn border in some years,

It is, thus, possible, particularly in the most recent years, that Gulf redfish may extend into Subdivision 3Pn in November-December, may migrate as far as northern Subdivision 3Ps, and may linger in Subdivision 3Pn in June to possibly as late as August. These conclusions must be regarded as very preliminary since they are based on an initial examination of catches without examining abundance or fleet fishing patterns. Further study of this requires more detailed information on fleet locations, and particularly for Newfoundland vessels. It will also be

necessary to analyze fleet operating strategies, incorporating vessel size, the effects of regulations (seasonality, by-catch, etc.). A meeting of scientists concerned with environmental influences on redfish and cod is to be held in spring 1994 and should provide insight on migrations in the southern Gulf of St. Lawrence.

Research Surveys

In general, research vessel surveys are designed to investigate a number of species and utilize otter trawls of various designs. Acoustic surveys for redfish in 3P/4V, conducted from 1989 to 1992 were discontinued in 1993 because the data were not amenable to assessing stock size. Plans for research surveys in 1994 that will provide information on redfish are:

January	3Pn-4R-4S-4T with some sets in 4Vn
March	4VsW
March-April	3P
July	Scotian Shelf
August	3P, 4VW
August-Sept.	4RST 3Pn

The August survey will be dedicated to redfish, and will be conducted using an otter trawl.

Appendix

Scotia-Fundy:	R O'Boyle, R.G. Halliday, R.Branton
Newfoundland:	B. Atkinson, D. Power
Gulf:	A. Sinclair
Québec:	B. Morin
NCR:	J.S. Beckett (Chair).

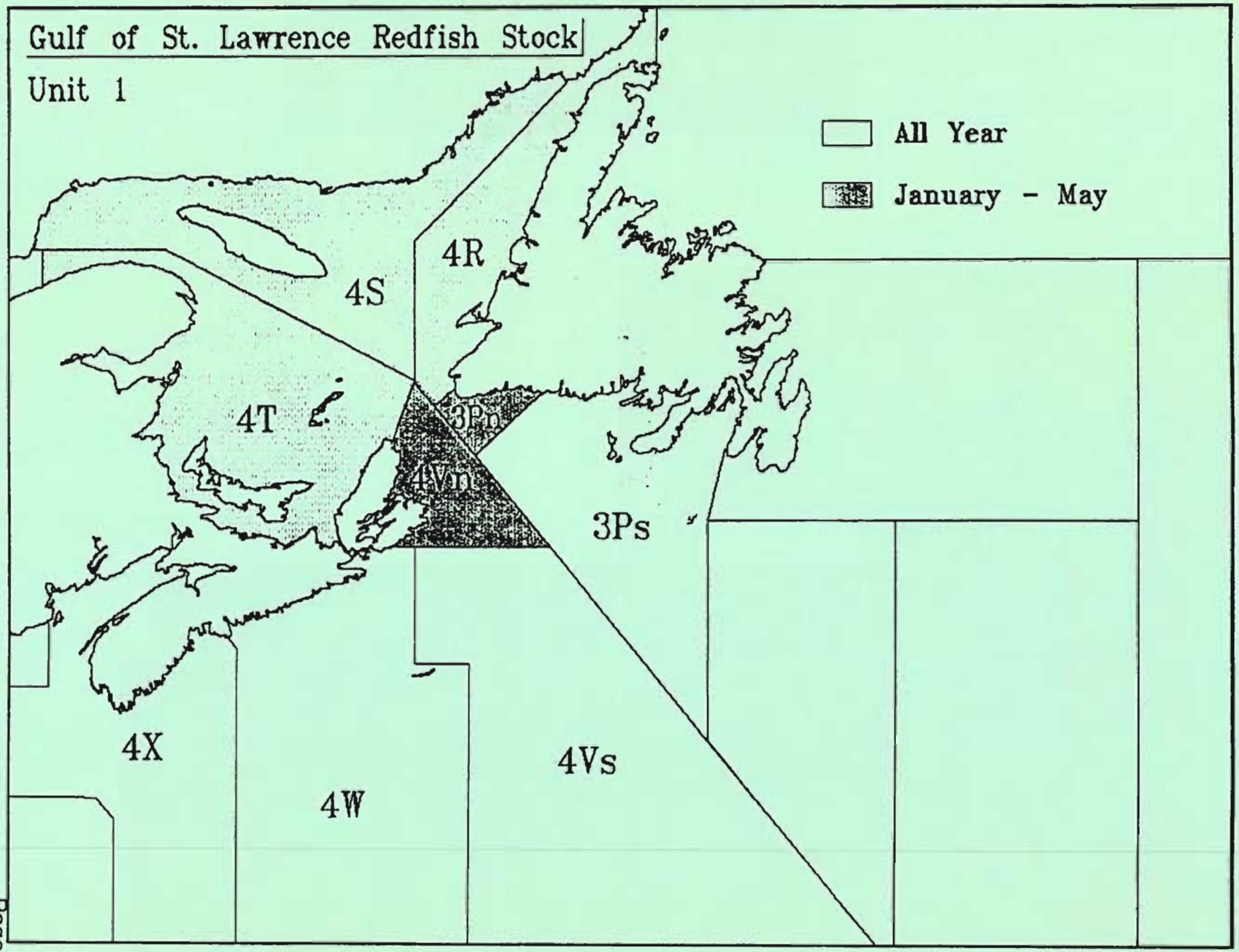

Gulf of St. Lawrence Redfish Stock
Unit 1
All Year
January - May
4R
4S
4T
3Pn
4Vn
3Ps
4X
4W
4Vs

Figure 1

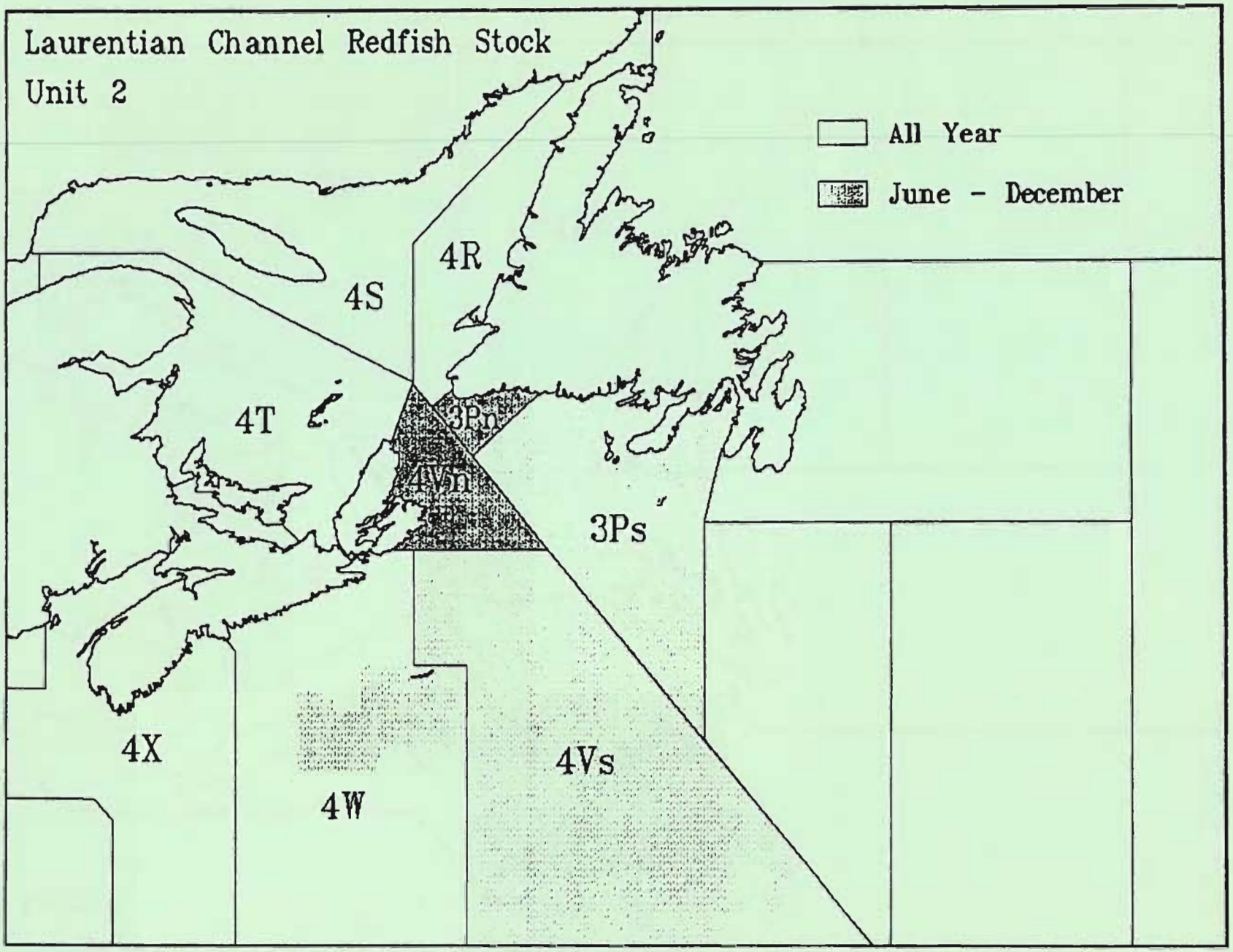

Laurentian Channel Redfish Stock
Unit 2
All Year
June - December
4R
4S
4T
3Pn
4Vn
3Ps
4X
4W
4Vs

Figure 2

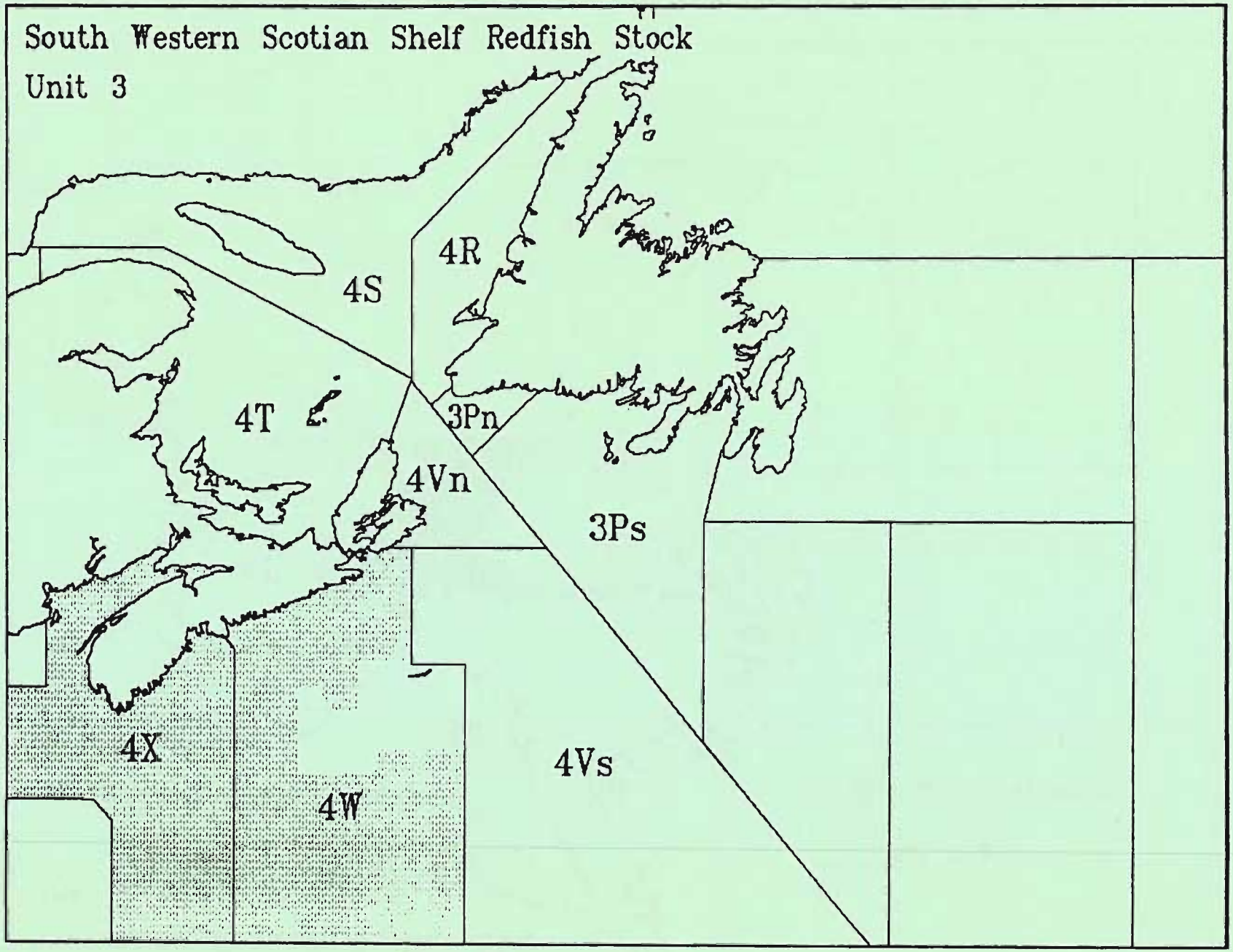

South Western Scotian Shelf Redfish Stock
Unit 3
4S
4R
4T
3Pn
4Vn
3Ps
4X
4W
4Vs

Figure 3

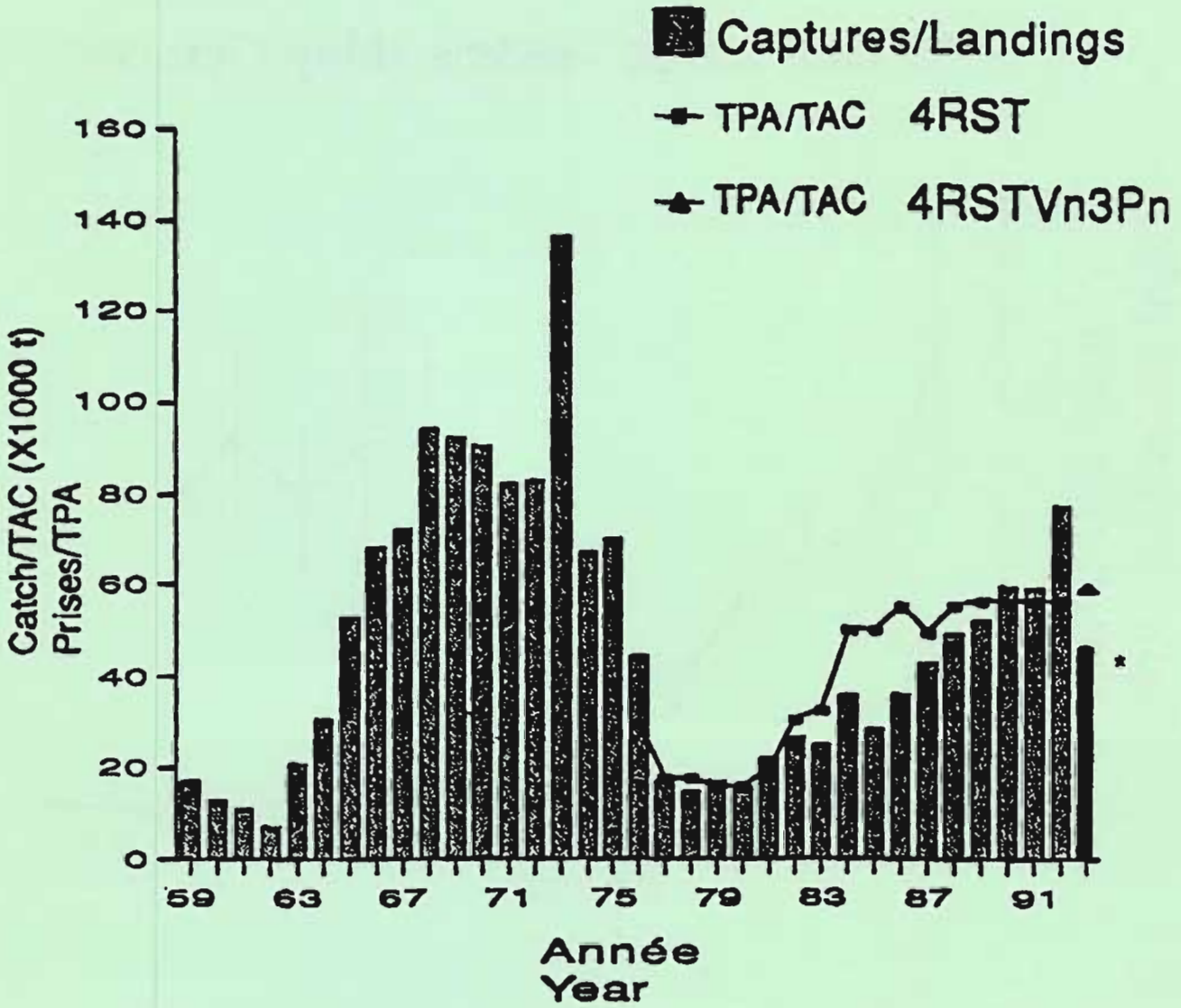


Figure. 4. Série historique des débarquements de la pêche commerciale du sébaste du golfe du Saint-Laurent (4RSTVn3Pn).
Historical commercial landings of redfish in the Gulf of St.Lawrence (4RSTVn3Pn).

* Données préliminaires (jan.-oct.)/Preliminary data (Jan-Oct)

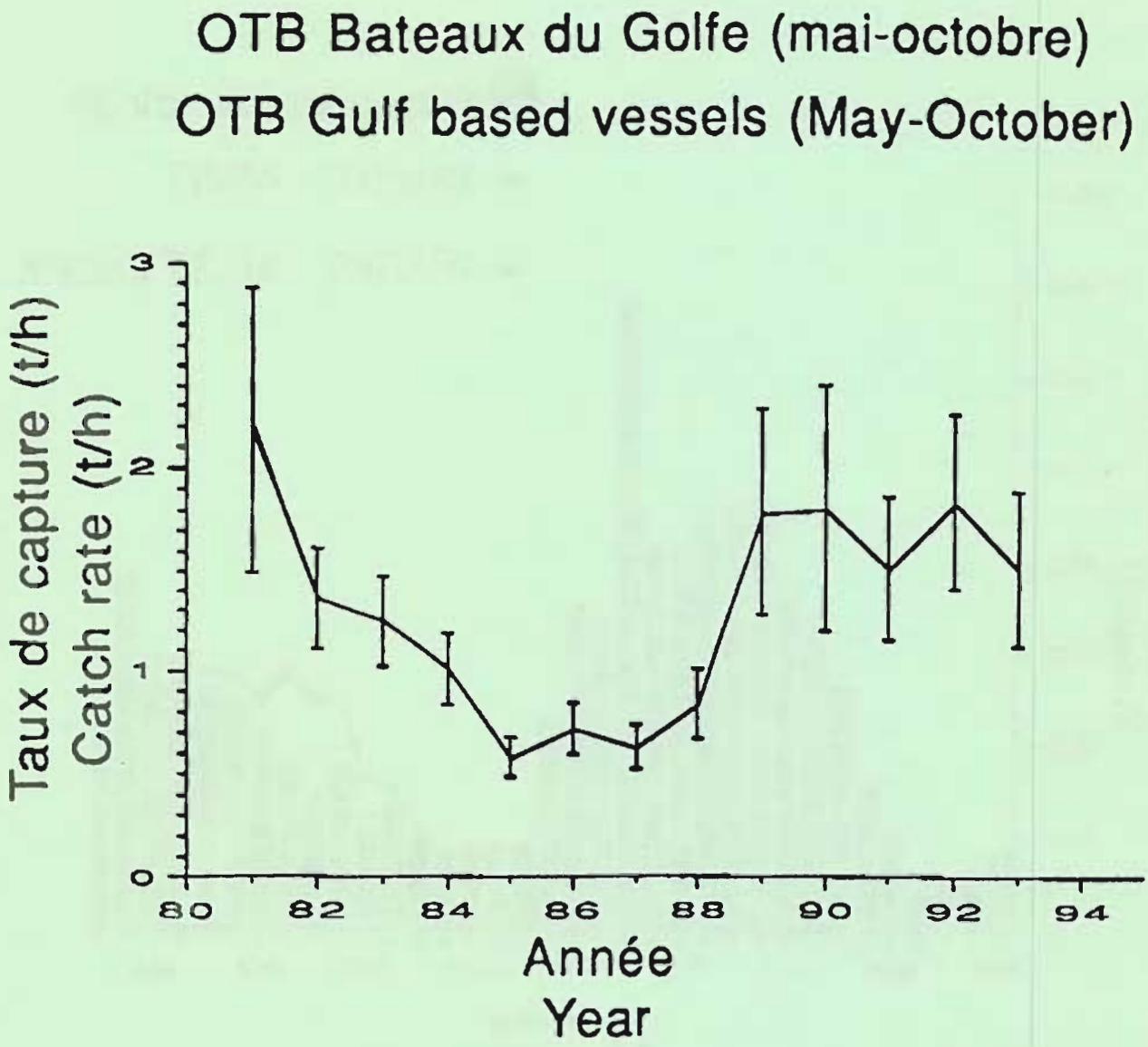


Figure 5. Taux de capture standardisés des chalutiers des classes de tonnage 4 et 5 pêchant du sébaste de l'unité 1 et utilisant des chalut de fond (OTB). (1993= mai à septembre)

Standardized catch rates of bottom trawlers (OTB) of tonnage classes 4 and 5 fishing unit 1 redfish. (1993= May to september)

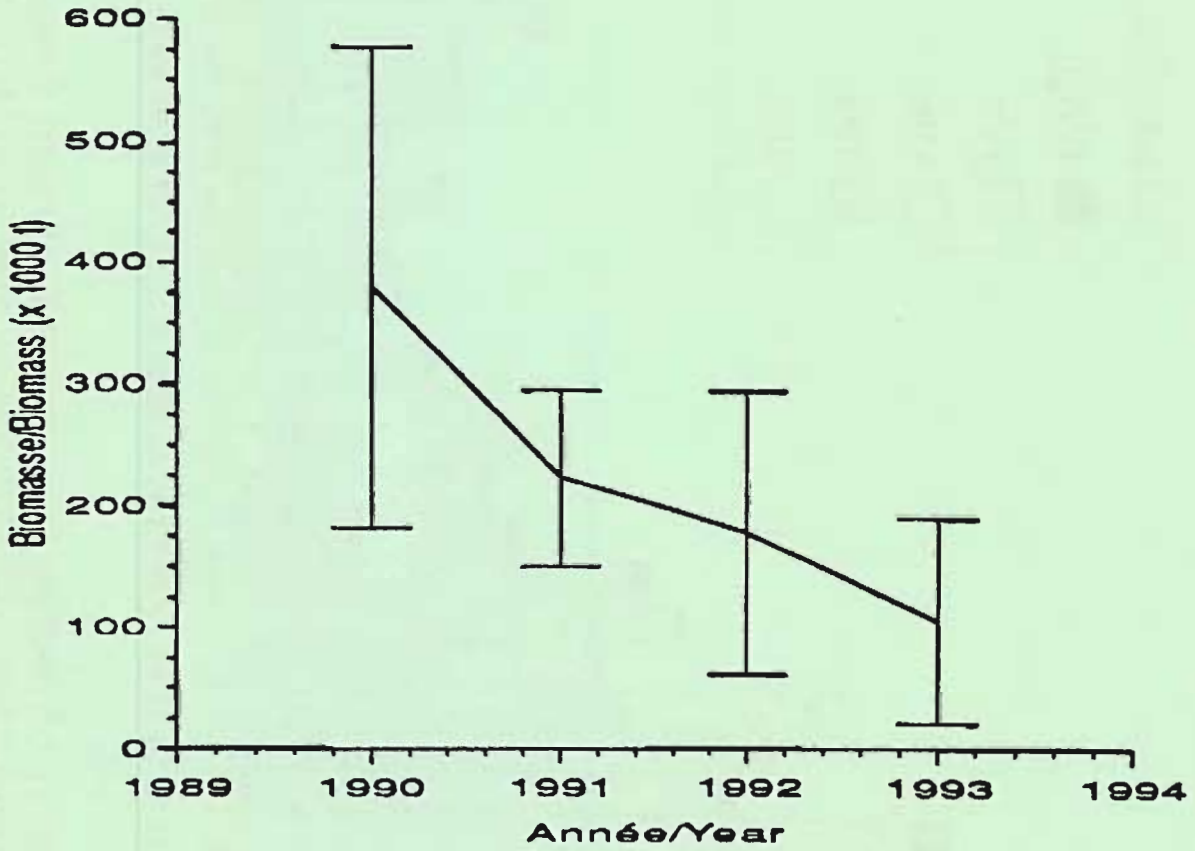


Figure 6. Biomasse esploitable minimale (± IC 95 %) de sébaste estimée à partir des relevés de recherche d'été.

Minimum exploitable biomass (± CI 95 %) of redfish as estimated from the summer RV survey.

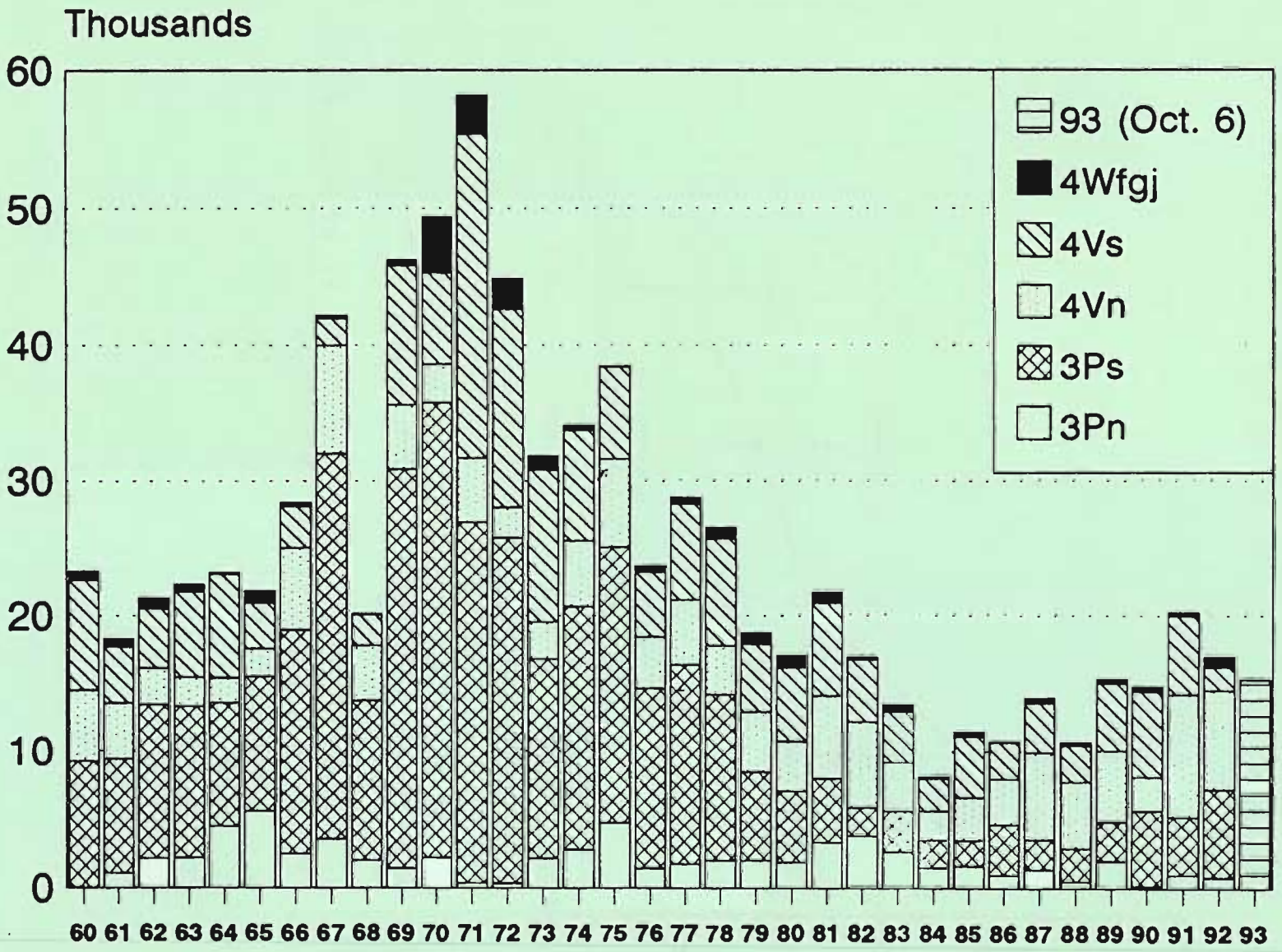


Fig. 7. Nominal catches ('000 t) of redfish from the "Laurentian Channel" management unit for the period 1960-1993(3Pn and 4Vn from Jun-Dec).

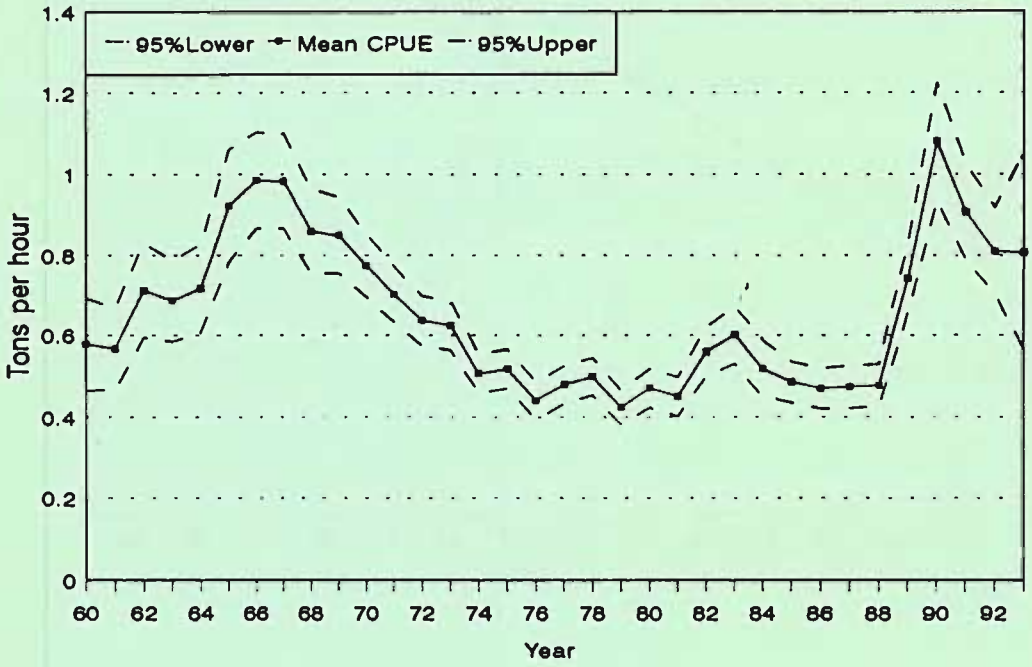


Fig. 8. Standardized CPUE for redfish in Unit 2 from 1960-93. (1993 only contain provisional Nfld. data)

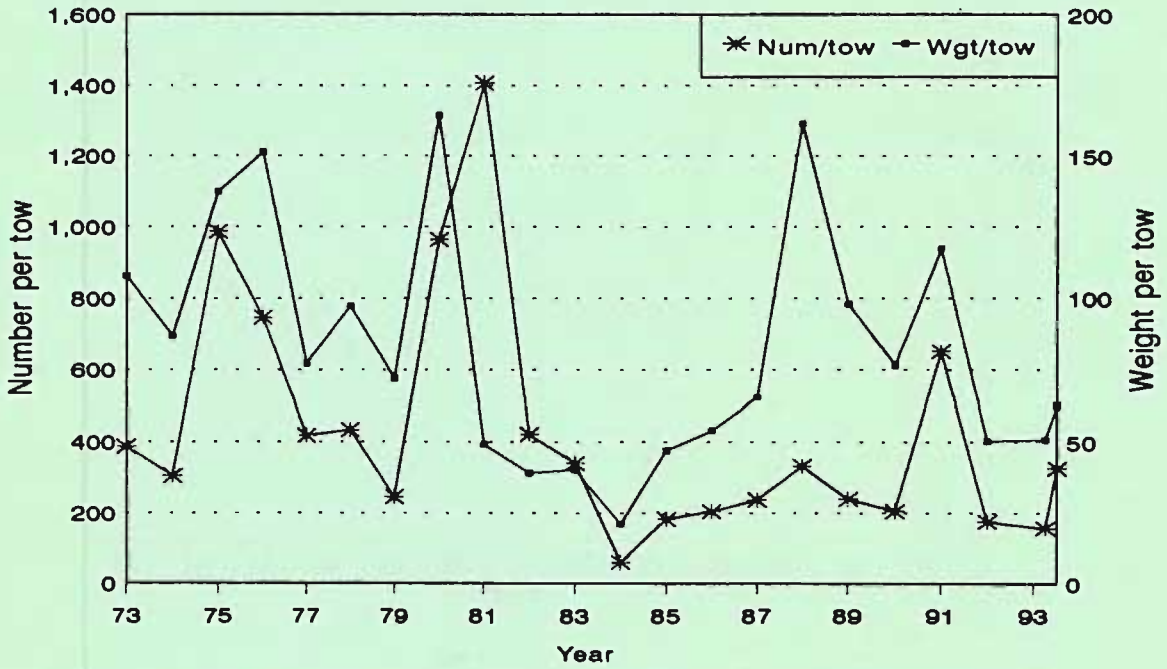


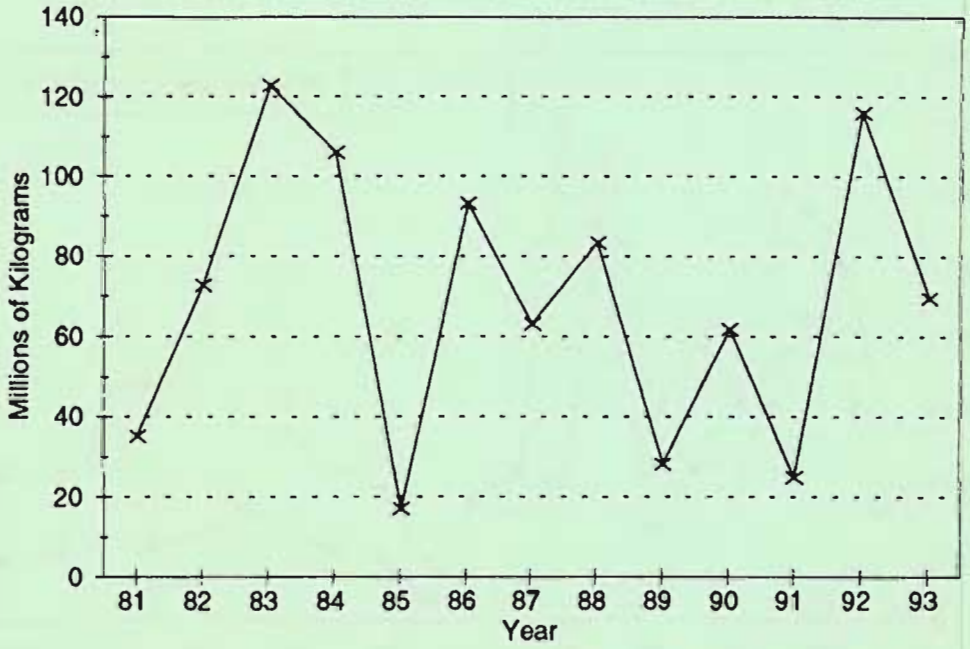
Fig. 9. RV mean numbers and weights per standard tow for redfish in Subdiv 3Ps. from 1973 to 1993

Fig 10. Unit 3 Redfish Annual Catch '80 to '93

Taken from CAFSAC ResDoc 92/65, NAFO Stata Bulls for 1980-1991 and Zonal Landings Database for 1992-1993

Fig 11. Unit 3 Redfish Biomass '81-'93

S.F. Summer Surveys Strata 456 458/495



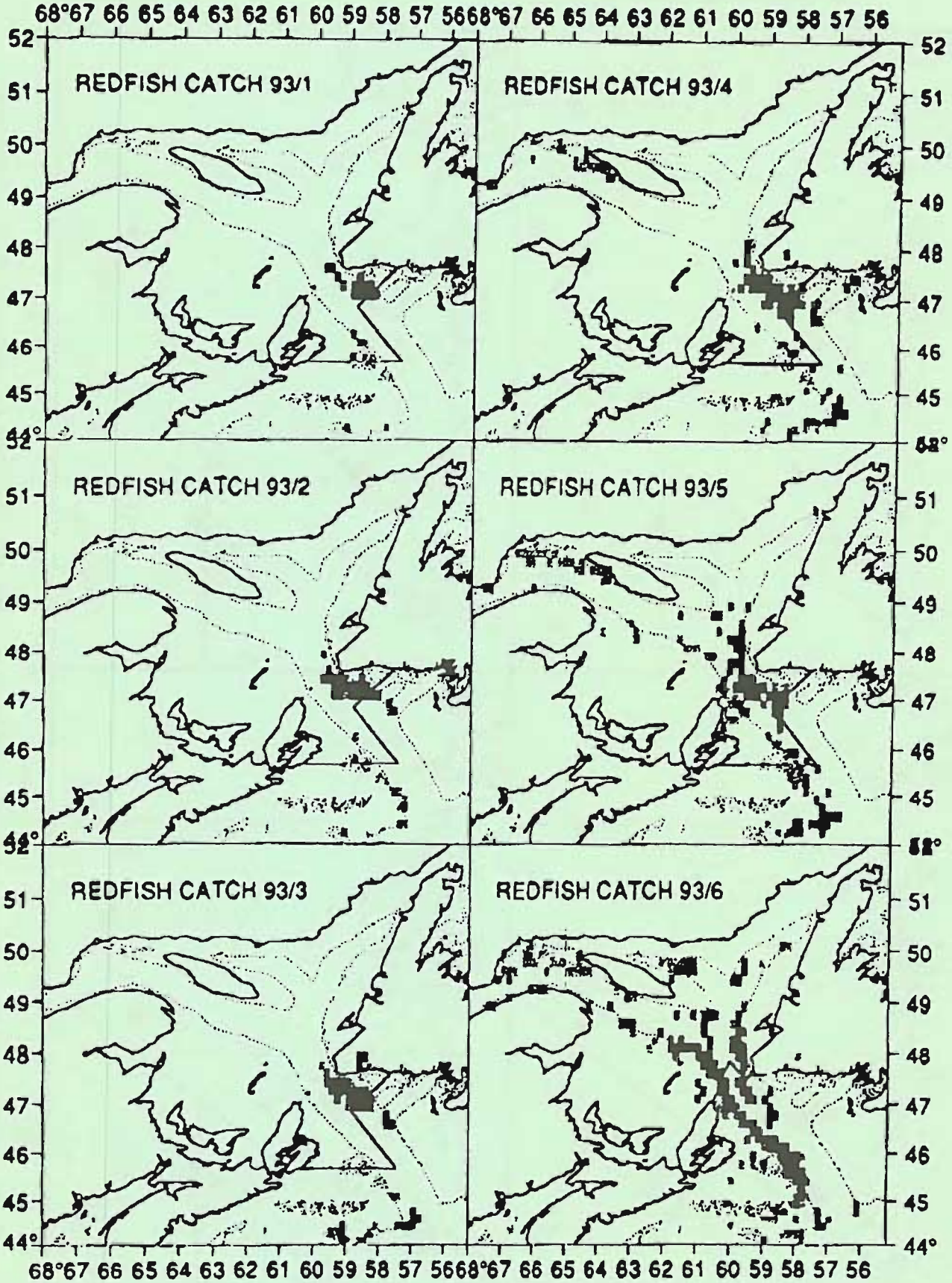


Fig 12: REDFISH catches 1991-93. Shading intervals are 0.2, 2, 20, and 100 t.

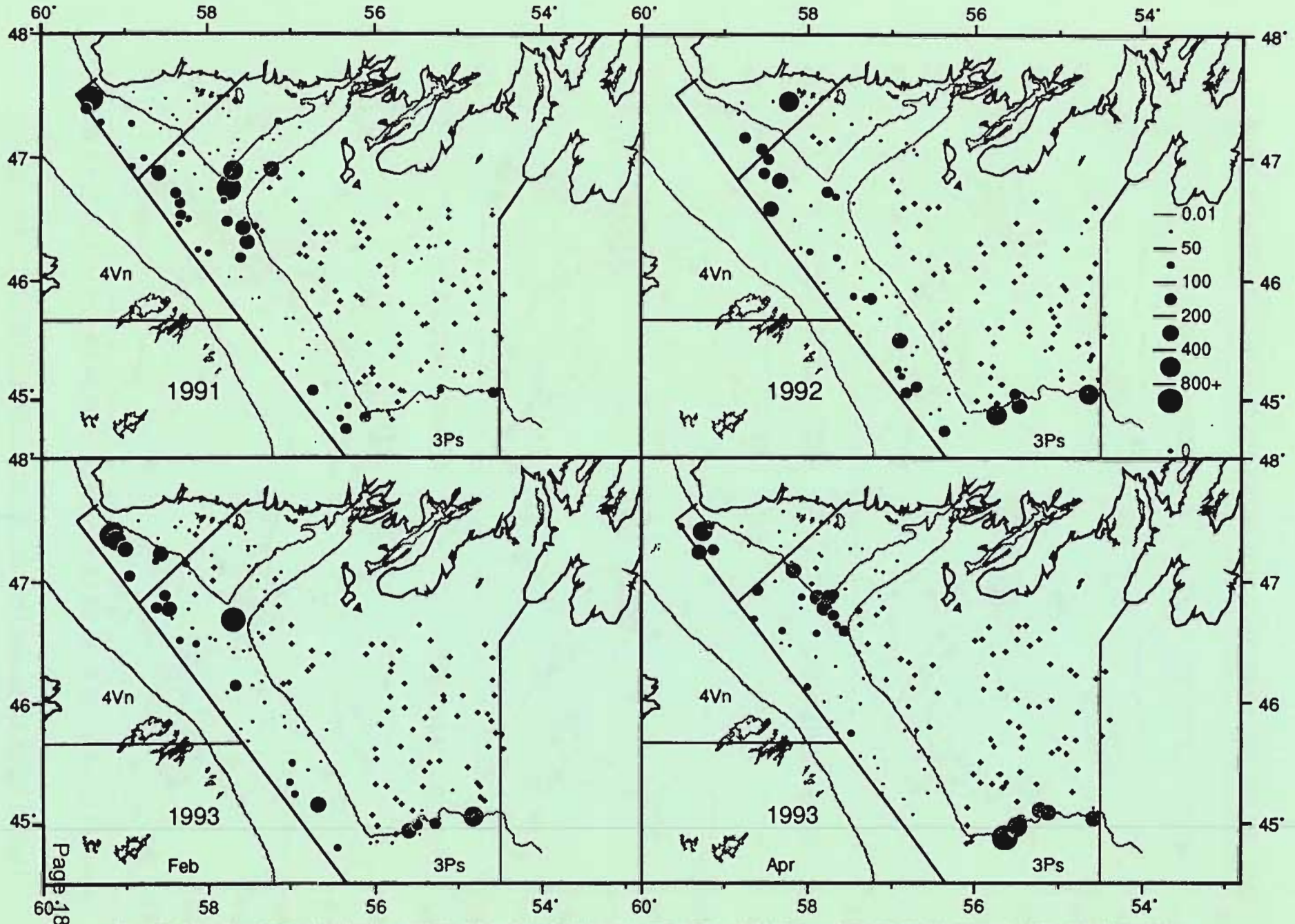


Fig. 13. Distribution of Redfish catches (Kg./standard tow) from 1991-1993 Canadian spring surveys to Div. 3P showing 250m depth contour.

APPENDIX 5

LIST OF MEMBERS OF THE FISHERIES RESOURCE CONSERVATION COUNCIL

LIST OF MEMBERS OF THE FRCC

Herbert M. Clarke	Chairman
Michael Belliveau	Executive Secretary, Maritime Fishermen's Union
Dr. Jean-Claude Brêthes	Professor of Oceanography, Université du Québec, Rimouski
Dr. Anthony Charles	Professor, Faculty of Commerce, Saint Mary's University
Samuel G. Elsworth	President, Sambro Fisheries Limited; Director, Eastern Fishermen's Federation
Frank Hennessey	Fisherman and President, P.E.I. Groundfish Association
Dr. Paul H. LeBlond	Professor of Oceanography, University of British Columbia
Dr. Jon Lien	Professor of Psychology, Memorial University of Newfoundland, and researcher, Ocean Science Centre
Dr. Victorin Mallet	Dean of Science, Université de Moncton
Jones R. Sheehan	Fisheries Consultant, former president and CEO of l'Association québécoise de l'industrie de la pêche
Max Short	Director, Inshore, Fishermen, Food and Allied Workers Union
Fred Woodman	Retired President of Woodman Fisheries
Maureen Yeadon	Vice-President, National Sea Products Limited

<u>Ex officio from the Department of Fisheries and Oceans:</u>

Dr. L. Scott Parsons	Director General, Biological Sciences
Jean-Eudes Haché	Executive Director, Fisheries Operations
Catrina Tapley	Director, Strategic Policy and Cabinet Affairs

From the Provincial Governments:

Jean-Paul Lussiaà-Berdou	Province of Quebec
Linda Haché	Province of New Brunswick
Art Longard	Province of Nova Scotia
David Gillis	Province of Prince Edward Island
Glen Blackwood	Province of Newfoundland and Labrador
Don Vincent	Government of the Northwest Territories