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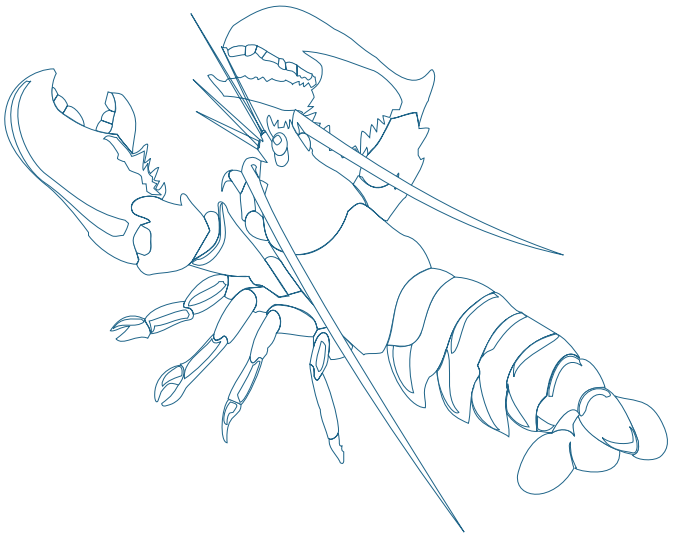

A Conservation Framework for Atlantic Lobster

Report to the Minister of Fisheries and Oceans

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LETTER TO THE MINISTER

The Honourable Brian Tobin, P.C., M.P.
Minister of Fisheries and Oceans
200 Kent Street
Ottawa, Ontario
K1A OE6

Dear Minister:

The Fisheries Resource Conservation Council (FRCC) is pleased to present you with its report entitled A Conservation Framework for Atlantic Lobster . This report is in response to your request to review the current approaches to lobster conservation and to recommend conservation strategies. It reflects over nine months of discussion, consultation and analysis during which the FRCC held 10 public consultation meetings (attended by more than one thousand stakeholders in the lobster fishery including fishermen, members of advisory committees and aboriginals), received and reviewed fifty three high quality briefs and engaged in extensive discussions with DFO biologists, oceanographers and fisheries managers.

During this process the FRCC was most impressed with the level of confidence that the lobster industry puts in the management approaches currently in place. These approaches have evolved over the past seventy years and have guided a relatively productive lobster fishery. Fishermen have clearly stated that they want to maintain the general philosophy of the current management system based upon protection measures and input controls and they want to fully participate in conservation and management decisions. The FRCC accepts these basic tenets and wants to reinforce and strengthen them and to make them more workable than at present. Our recommended New Conservation Framework builds on the strengths of the current system. The FRCC believes that this conservation framework, if implemented and adhered to, will, over time, enable both you and fishermen stakeholders to maintain a sufficient level of confidence that optimal sustainable use of the lobster resource is being realized.

Your request of last September presented the FRCC with a significant and interesting challenge. Unlike our experiences with groundfish stocks, this was the first opportunity that the Council had to study and review a resource that was not already in, or approaching, a state of collapse.

Aggregate lobster landings in Atlantic Canada peaked at about 48,000 t in 1991 but have decreased each year since then through 1994, when landings totalled 39,000 t - a reduction of over 18%. In some areas the reductions have been much more dramatic. Nevertheless, total landings are still significantly higher than the long term (1915-1980) average catches. Reports on the 1995 fishery, although very preliminary at this stage, indicate overall landings somewhat similar to those in 1994. It is important to note that these current landings are of animals which, for the most part, come from eggs produced 6-8 years ago under what now appears to have been unusually favourable environmental conditions.

An important general objective of conservation is to keep stocks in a “healthy” state under various environmental conditions which can cause large natural fluctuations. To dampen the effects of such fluctuations in a fishery necessitates sufficient long term recruitment rates and sufficient biomass to maintain reasonable catch levels when recruitment conditions become unfavourable. The key elements in achieving this are **good egg production, a reasonable fishing mortality and a biomass composed of several year classes.**

Based on its analysis, the FRCC believes there is a resource conservation problem in that **“we are taking too much, and leaving too little”**. Considering the available data, the current fishery is designed towards high exploitation rates (estimated to be as high as 85% in many areas), harvests primarily immature animals, and results in very low levels of egg production (estimated to be as low as 1%-2% of what might be expected in an unfished population). In these circumstances, although lobster stocks have traditionally been quite resilient, the risk of recruitment failure is unacceptably high.

Many responsible stakeholders are quite concerned about the current situation, as is the FRCC. Furthermore, the Council believes the current high-risk situation is worsening in that fishing effort continues to increase as does the geographical range of the fishery in many areas, thereby eliminating margins of safety that may have existed previously. As we have seen in so many other fisheries, the presence of a very high and increasing fishing effort exerts a pervasive pressure both on the resource and on the ability of fisheries management to attain agreed conservation objectives - irrespective of the other conservation measures which might be put in place.

Minister, if we were faced today with a virgin lobster population and the need to develop a conservation and management strategy for that fishery, it is practically inconceivable that anyone would design a fishery at such high levels of exploitation and such low levels of egg production as currently exist. A more prudent or precautionary approach is required. The FRCC is therefore recommending that conservation measures be taken to increase the level of egg production and to significantly reduce both exploitation rates and the effective fishing effort.

However, our report is not prescriptive in the micro-sense as to the specific measures to achieve these goals. For example, we are not recommending the appropriate specific number of traps, or the hoop size or the minimum carapace size for any of the Lobster Fishing Areas (LFAs). Rather, we are recommending a mechanism and the tools whereby stakeholders, if they are willing, can participate in the decisions required to ensure a sustainable fisheries. There are no easy solutions and our recommendations put a significant amount of responsibility on fishermen themselves and on local managers to find the right solutions. As well, their decisions must be in line with overall conservation reference points determined by you. We believe this recommended approach is consistent with the thrust of practically every input received by the Council. We also believe it is the best way to achieve long lasting conservation.

Our report has six chapters. **Chapter 1: Introduction** includes the mandate and approach taken, consultation highlights, and a brief overview. **Chapter 2: Background** pro-

vides a compendium of relevant information on lobster biology and management. This was prepared with considerable help from DFO scientists and will hopefully assist in better understanding the complexities of the issues and the rationale of our recommendations. **Chapter 3: Conservation Issues** details our analysis of the current resource situation and other conservation issues facing the Atlantic lobster fishery. **Chapter 4: A New Conservation Framework** recommends a mechanism for resolving conservation issues. It includes:

- a definition of lobster conservation with related objectives;
- conservation principles;
- a conservation strategy;
- a more appropriate geographical basis for considering lobster conservation strategies
  - Lobster Production Areas (LPAs); and
- a series of tool kits of conservation measures that can be drawn upon selectively by a specific area or region to meet conservation objectives and targets. Tool kits are provided for:
  - increasing egg production;
  - reducing the exploitation rate and effective fishing effort;
  - improving stock structure; and
  - minimizing waste.

This approach envisages that the Minister of Fisheries and Oceans establishes the conservation principles, objectives and targets. Fishermen, working through their organizations and the Lobster Advisory Committees, and in partnership with DFO, select the detailed measures which are most suitable to their fishing areas but consistent with these principles and objectives.

Fishermen generally like the current LFA units of management in that they associate these units geographically with their traditional grounds, resource dependence and fishing colleagues. For many management considerations this delineation has been extremely effective. However, there is no properly defined geographical basis from which to consider conservation strategies. Atlantic wide approaches are not appropriate because of the well-known and significant variations in lobster production characteristics. LFAs are too small when considering oceanographic features and possible biological interactions, but they can be effective in implementing agreed management measures towards achieving the conservation strategy once one is decided upon.

This lack of an appropriate spatial framework for considering lobster conservation caused the FRCC some difficulty. We did not want to unnecessarily tamper with the existing LFA system but recognized a serious need for the industry to come to grips with existing conservation problems. Although stakeholders want to ensure the optimum sustainable use of the lobster resource we do not believe this is achievable unless conservation issues are considered on a geographical basis which more closely reflects the biological characteristics of different lobster populations.

Following detailed analysis, discussion with DFO biologists and physical oceanographers and consideration of what might mesh with the current LFA system, the FRCC is recommending the establishment of seven conservation units which we are calling Lobster Production Areas (LPAs). Within these areas, the production characteristics of lobster are more or less homogeneous and accordingly, comparable conservation measures should yield comparable effects on the whole lobster population within the LPA. Fundamentally, LPAs are areas of influence for conservation and are used in establishing conservation strategies. However, LPAs are not intended to be operational management units nor units in which the management measures in place for the various LFAs are necessarily standardized.

Chapter 5: Program Improvements recommends improvements in the current enforcement system, in the lobster science program, and in conservation education and communications. The final chapter is **Chapter 6: Conclusions and Recommendations.**

Minister, the FRCC believes that the complex and sensitive issues in lobster conservation can best be dealt with through the New Conservation Framework and recommends its implementation to you. Fundamental to success is a shift in attitude among participants in the lobster fishery from the prove it approach to a prudent approach with respect to the necessity and efficacy of various conservation measures. As well, each participant must recognize that he/she is part of a larger system and, as inconceivable as it may seem to some, actions contrary to conservation by one participant can and do have negative impacts on conservation and on sustainability within the whole production area. The FRCC is confident that success can be achieved and with it the enjoyment of long and continuing benefits from this important Atlantic fishery.

Finally, this report would not have been possible without the significant contributions by those who attended public meetings and/or provided written briefs; without the input, advice and analysis provided by the DFO lobster biologists; without the dedication of members of the FRCC lobster team; or without the expertise and long hours contributed by the Secretariat in its physical production. The FRCC sincerely thanks them all and hopes their efforts are helpful to you.

Sincerely,

H.M. Clarke
Chairman

INTRODUCTION

1.1 MANDATE AND APPROACH

On September 29, 1994, the Honourable Brian Tobin, Minister of Fisheries and Oceans, announced that he had asked the Fisheries Resource Conservation Council (FRCC) to review the current approaches to lobster conservation and to recommend conservation strategies for Atlantic lobster. On October 7, Mr. Herb Clarke, Chairman of the FRCC, communicated that the Council would consult extensively with stakeholders in the Atlantic fishery before arriving at conclusions and providing recommendations to the Minister. He also pointed out that the FRCC viewed its work on lobster conservation as a special one time review, unlike the Council's ongoing work on groundfish.

The Council established a small team to coordinate the lobster analysis. During the period January 10 to February 7, 1995, that team held 10 meetings with approximately 1000 stakeholders knowledgeable in the fishery, including fishermen and processors, fishermen's associations, Aboriginals, DFO officials from Science and Operations Branches and Provincial Governments. Consultations were as follows: Magdalen Islands and Gaspé, Québec; Corner Brook and Gander, Newfoundland; Moncton, Newcastle and Saint John, New Brunswick; Charlottetown, Prince Edward Island; Yarmouth and Port Hawkesbury, Nova Scotia.

The Council received and reviewed fifty three high quality briefs that provided relevant inputs from industry stakeholders. The Council also benefited from the logistical support of DFO fisheries regional managers in organizing local public consultations and engaged in extensive discussions with DFO enforcement representatives, biologists and oceanographers, who provided technical information and data (sometimes revisited) to meet our requirements. The FRCC wants to here acknowledge the contributions of all those persons who took the time to help the Council to achieve its mandate.

1.2 PUBLIC CONSULTATIONS

To help focus the consultation process the Council sought stakeholder views on five specific areas:

1. Do you perceive a lobster conservation problem? In any event, how do you interpret the increase in landings during the 1980s and decrease during the past few years?
2. Are there basic conservation principles or conservation targets, such as reproductive capacity, that should be established?
3. Is there an acceptable definition of conservation that can guide us?
4. What are your views of the conservation effects of measures currently employed, including: fishing areas; limited entry; trap limits; escape mechanisms on traps; seasons; release of berried females; carapace size restrictions? Are there other measures such as: v-notching females; maximum carapace size restrictions; additional protected spawning areas; biodegradable trap materials; and, limits on trap size that could help?
5. The Sparrow decision of the Supreme Court of Canada outlines an Aboriginal right to fish for food, social and ceremonial purposes, subject to conservation. Recognizing that this obligation can not be constrained by commercial lobster management plans, the Council would be grateful for stakeholder and First Nation views on possible ap-

proaches that should be required for lobster conservation to ensure that lobster harvests by First Nations are included in the conservation equation leading to the development of lobster management plans.

The resulting discussion was frank and very helpful to the Council. Many of the briefs received represented the views expressed during stakeholder association meetings held in preparation for the FRCC consultations. Some commonly expressed views are outlined below:

- There is a genuine concern for lobster conservation, which is most pronounced in areas where landings have declined. Many fishermen believe the declines will continue. Nevertheless, they do not want new measures introduced that would jeopardize their economic returns.
- The current management measures are widely accepted and implemented with the belief that they have positive impacts on lobster conservation. The total package of measures is what has worked for lobster conservation.
- Generally, stakeholders do not want a centralized management system and they do not want a quota based system of lobster management. While there is no widespread leaning towards implementing a range of new measures, there is interest, in some areas, in v-notching to protect mature females, escape mechanisms, and maximum size restriction.
- Many stakeholders reported good rapport with their regional lobster biologists. However, they believe more effort is required by DFO Science and they want greater involvement in science projects. There were requests for a more comprehensive exchange of information on the scientific underpinnings of lobster management decisions.
- The minimum carapace size issue in the southern Gulf of St. Lawrence needs to be resolved.
- There is a desire for more enforcement in order to curtail illegal fishing activities. Many stated that the first priority is to enforce current regulations before bringing in new measures."
- Renewed efforts to improve communications between all parties involved in the harvest of lobsters are necessary.
- Conservation measures need to be implemented for all users including Aboriginal groups.
- The FRCC should identify the problems - the industry should find the solutions.

Views on conservation and the dynamics of the lobster fishery varied between areas. While, on occasion, there was concern expressed over FRCC involvement in the lobster fishery, there was also general recognition that a review of the current approach to lobster conservation was appropriate at this time. In general terms, the consultations underscored significant differences in the issues considered most important in various parts of the Atlantic area:

- the decline in landings in the Magdalen Islands and the lack of specific scientific tools for predicting landings;
- the impact of effort redirection, increases in illegal fishing, and the need for strong sanctions in Newfoundland;
- sharply divergent views regarding the appropriate minimum carapace size in the southern Gulf;
- the increased effort beyond 60 fathoms in southwestern Nova Scotia;
- the significant decline of lobster stocks on the eastern shore of Nova Scotia;

A list of briefs is provided in Appendix 2 and copies are available upon request from the FRCC.

1.3 OVERVIEW OF REPORT

In Atlantic Canada, lobster fisheries have many common characteristics, of which the following are of concern: high landings, based essentially on new immature recruits; increasing fishing pressure; inadequate enforcement; and, an over-dependence on scientific analysis, despite the fact that even the best science is unable to provide precise answers to many relevant questions.

The Atlantic fishery is subdivided into 47 different Lobster Fishing Areas (LFAs) within which management measures are recommended by local Lobster Advisory Committees made up of fishing industry representatives and DFO managers. Those measures (trap limits, seasons, minimum legal size, etc.) can differ from one area to the next without consideration of the possible conservation spill-over effect between areas.

The Council concluded early in its review that to look at lobster conservation means that one must evaluate the whole lobster management system. This is the approach we have adopted. As was heard in one of the consultations you cannot do only one thing and from the Council's view-point, you cannot evaluate lobster conservation by evaluating only one aspect.

The FRCC observed that the present management regime based on input controls at the LFA level appears to be functioning to the satisfaction of most stakeholders. We found no reason to recommend significant modifications to the current approach nor any evidence to suggest a totally new management system, such as one based on quotas, for instance. We also consider the existing decentralized decision making system, a participatory process involving the industry and managers, to be very positive. However, we believe that the system should be reinforced and improved and this report makes recommendations towards that end.

Regarding the lobster resource, while there are no signs of impending collapse, or reasons to panic, it is clear from our analysis that there are reasons to be concerned. Our current fishery, which has been designed or targeted towards high exploitation rates and low levels of egg production, is, in the Council's view, taking too much and leaving too little. This report recommends that conservation measures be put in place to ensure good egg production, reasonable fishing mortality and a biomass composed of several year (size) classes.

We recommend that all conservation issues be addressed through a **"New Conservation Framework"** for lobster. This proposed framework includes a specific definition of lobster conservation , conservation objectives, conservation principles, a conservation strategy and a different geographical or spatial dimension (based on common biological and environmental factors) in which conservation matters can most effectively (or best) be considered. A list of tools or conservation measures, which may be used to achieve conservation objectives, is provided to assist local selection and decision making at the LFA level.

Finally, program improvements are recommended in the areas of enforcement, science and education.

2. BACKGROUND

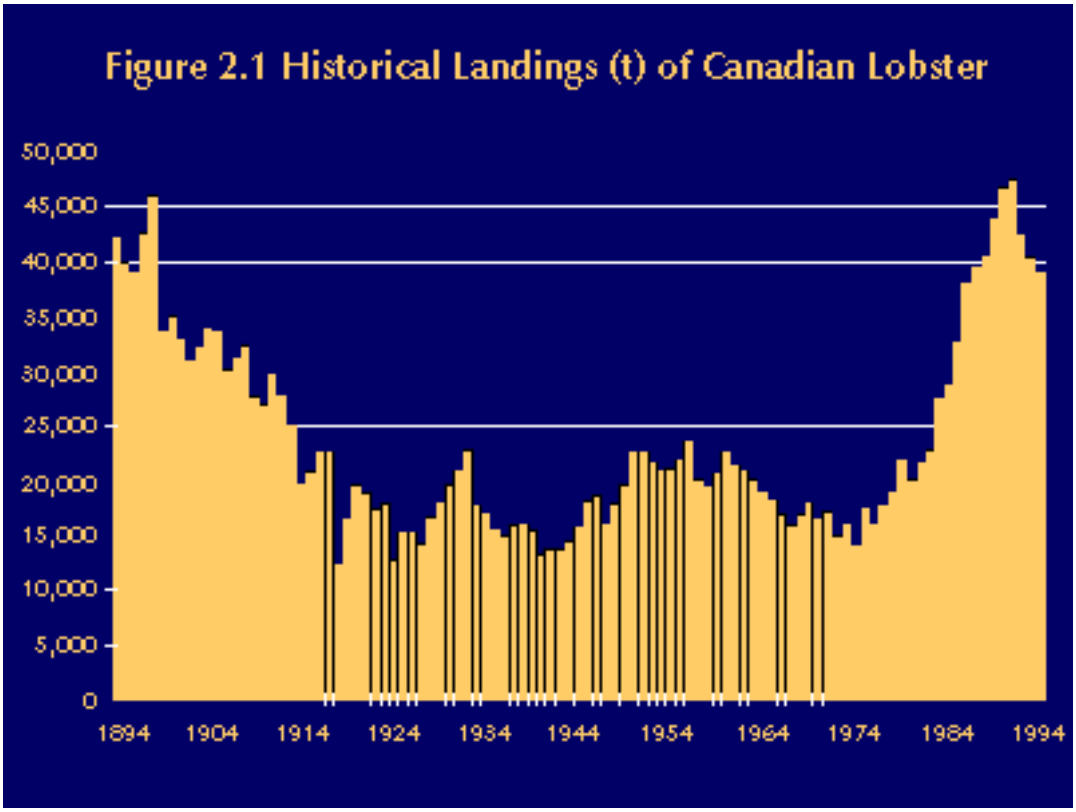
The Canadian lobster fishery has provided a means of income for many in Atlantic Canada since the mid-1850s. Motorised boats, mechanized haulers and the parlour trap were introduced in the early 1900s. Since its early days the lobster fishery has instituted many management measures that, in the view of scientists and industry, have had positive conservation effects. In fact, present landings are much higher than the long term average (Figure 2.1). Recent declines (over 15% per year in some areas) have raised concern in the fishing industry and some fishermen have expressed the feeling that the decline would continue.

The Council believes that we must strive to better manage declines and prevent local stock collapse. This chapter is designed to provide the necessary background information on the lobster fishery, the biology of lobsters, and the conservation management system currently in place. It will provide a basis to understand the Council's rationale for its conclusions and recommendations.

Insert figure 2.1 here

2.1 FISHERY

The lobster fishery has been essentially a small-boat inshore fishery, using passive gear,

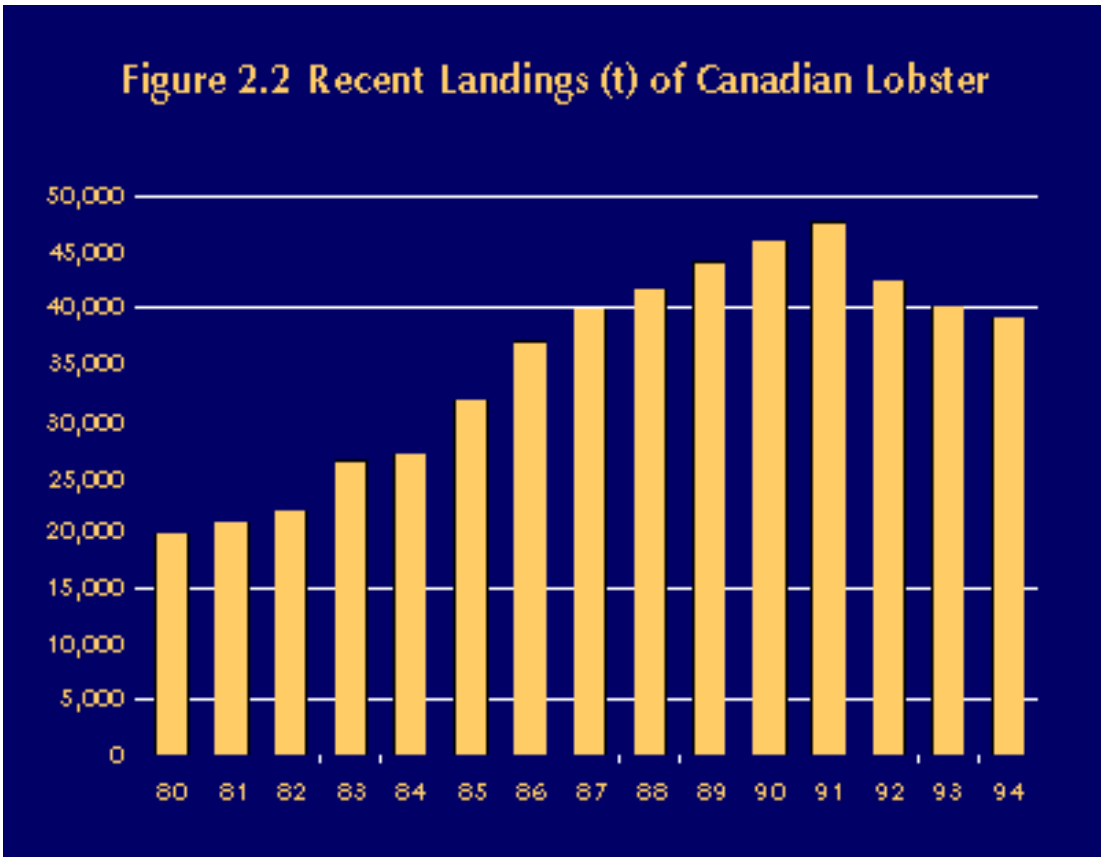


for much of its history. Around 12,000 lobster licences are active in Atlantic Canada and the fishery is estimated to provide seasonal employment for upwards of 32,000 people. Traditionally, many lobster fishermen also fished for groundfish, pelagics and salmon. The increase in landings in recent years combined with an increase in market prices have made the lobster fishery the most valuable individual fishery on the Atlantic coast by a considerable margin. Benefits from the fishery are widely spread and its overall economic impact on Atlantic communities is substantial.

In addition to the widespread small-boat fishery, an offshore lobster fishery is conducted near the shelf edge by large boats and accounts for a small proportion of total Canadian Atlantic lobster landings.

The Canadian lobster fishery grew in the mid-19th Century when American operators set up canneries to compensate for declining catches in the USA. After an initial increase, landings underwent a long decline from the late 1800s to the mid-1920s apparently as the pristine unexploited populations were fished down.

Following the mid-1920s, total landings in the Atlantic region showed little overall trend until the mid-1970s, although long-term fluctuations were observed with peaks in the early 1930s and in the 1950s. Beginning in the mid-1970s annual landings underwent a remarkable, sustained increase from around 15,000 t to a peak around 48,000 t in 1991. Total Canadian landings have since declined to around 39,000t in 1994 (Figure 2.2).



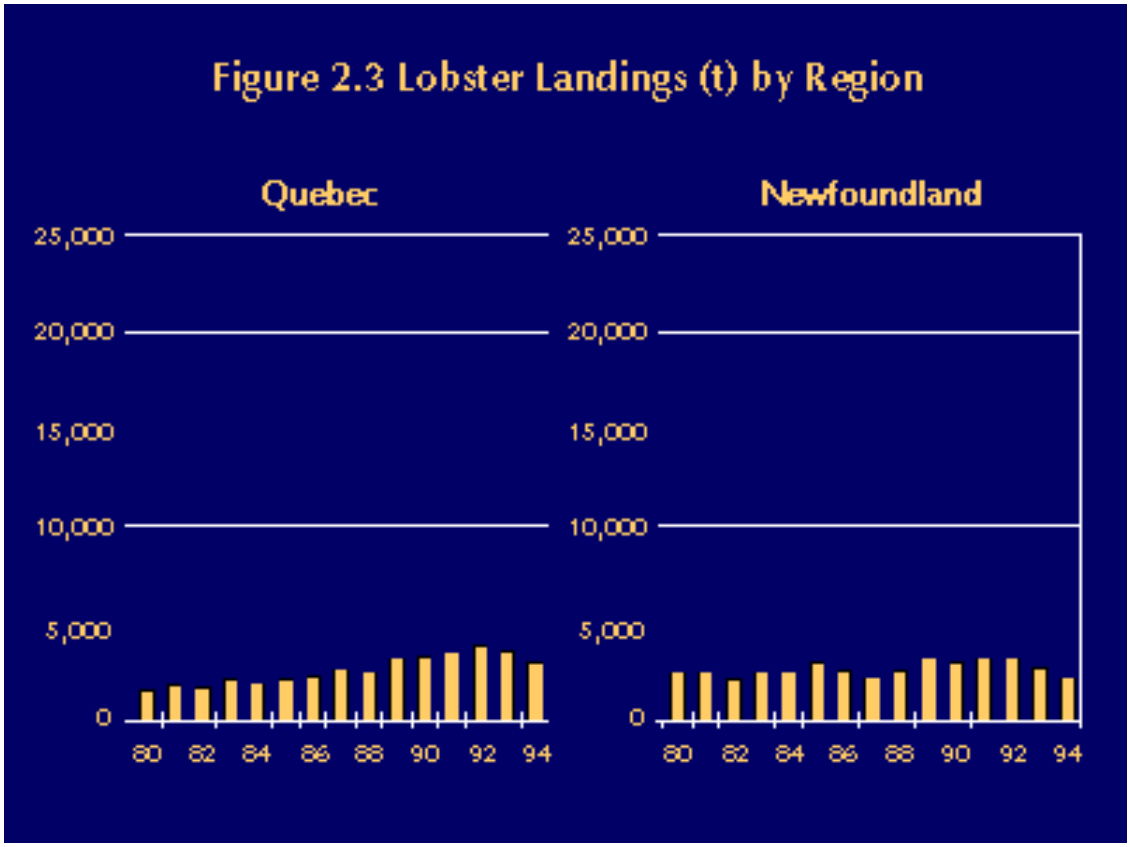
Landings in the northeast USA followed a similar pattern of sustained increase from the mid-1970s to the early 1990s. Record landings were recorded in Maine in 1994.

All Lobster Fishing Areas (LFAs) have experienced an increase in landings since the mid-1970s, but the timing and extent of the increase and the subsequent decrease have been quite variable between them. Lobster landings also vary between larger geographical areas, the highest production regions being southwest Nova Scotia and the southern Gulf of St. Lawrence.

In Newfoundland, landings were relatively high in the early 1990s but there was not an obvious and sustained increase from the 1970s as in most other areas (Figure 2.3).

In Quebec, landings peaked in 1992 and have since declined (Figure 2.3). The decline has been pronounced in the Magdalen Islands where landings rose from 1,000 t in 1980 to a peak of 2,700 t in 1992, then declined to 2,000 t in 1994. In the Gaspè Peninsula, the situation is similar to Newfoundland with a gradual increase in the 1980s and slight decrease since the early 1990s.

In Scotia-Fundy, landings increased substantially during the 1980s, from just over 5000 t in 1980 to almost 20,000 t in 1991 (Figure 2.4). Subsequently landings declined to 1993 and then increased again in 1994 to 16,000 t. Southwest Nova Scotia (LFA 34) accounts for most of Scotia-Fundy landings and showed the same pattern. In the Bay of Fundy the situation generally has been similar to that in

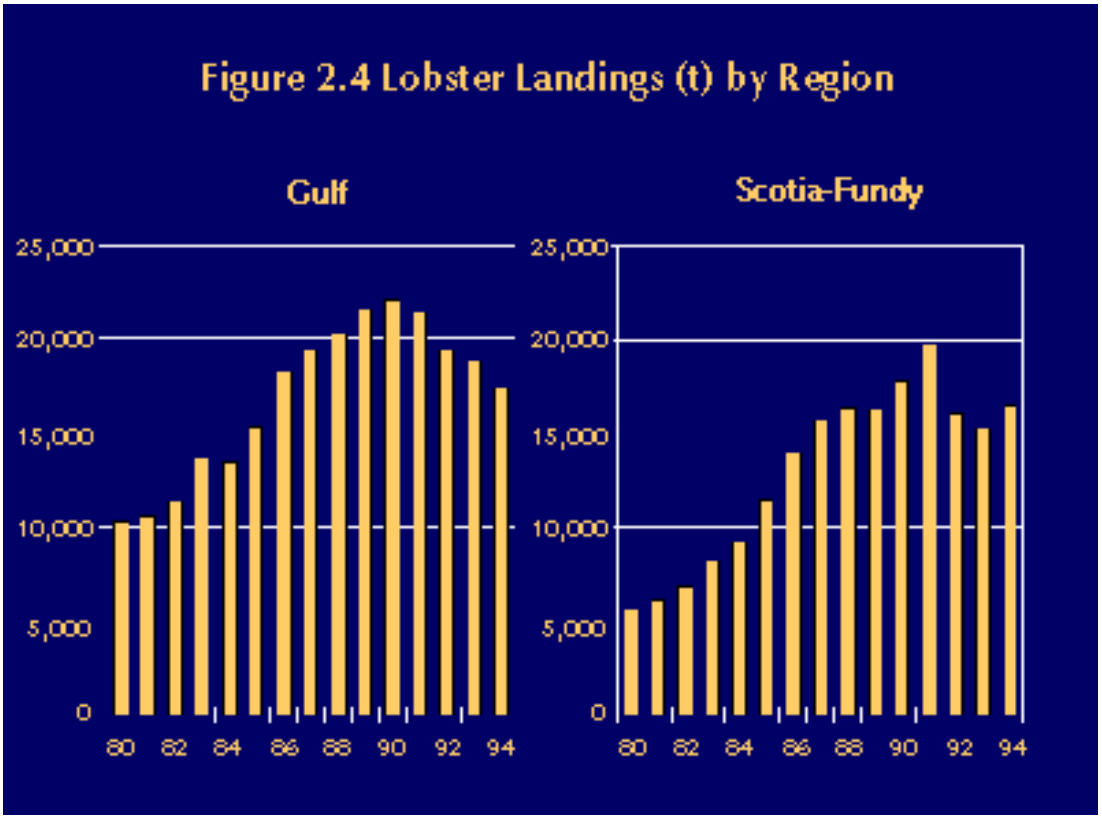


Newfoundland, with a gradual increase to a maximum in the early 1990s, while along the east coast of Cape Breton and the eastern shore of Nova Scotia landings have declined significantly in recent years, from a maximum of 7000 t in 1991 to 4500 t in 1994.

Landings in the Gulf Region (southern Gulf of St. Lawrence) peaked in 1990 at 22,000 t, having increased from 10,000 t in 1980, and have since declined to 17,000 t (Figure 2.4). In Northumberland Strait, landings peaked earlier than in other areas (1985 in LFA 25, western Northumberland Strait; 1988 in LFA 26A, eastern Northumberland Strait) and the subsequent decline has been severe; in LFA 26A landings in 1994 were down to 50% of the maximum. Landings have declined only slightly in northeast New Brunswick (LFA 23) and northern Prince Edward Island (LFA 24) since peaking in 1989-91.

Gear and harvesting practices changed relatively little for many years but changes during the past two decades have increased fishing pressure significantly. This trend continues, but the extent varies from region to region, as does the relative importance of the factors which contribute to it.

The total increase in effort has not been fully quantified. For management purposes, effort is measured in total traps permitted. For monitoring catch per unit effort, effective effort is measured in trap hauls. In Scotia-Fundy, where estimates of trap hauls are



available for most LFAs, annual trap hauls have increased 3-6 times over the past decade everywhere except in the Bay of Fundy where the increase has been no more than 1.5 times and in the offshore where the number has decreased. In the Gulf Region, total trap hauls are estimated by LFA and have increased. In Newfoundland, fishermen report a significant, sustained increase in fishing effort (both traps fished and number of trap hauls) over the past several years. In Quebec, fishermen indicated that considerably more effort was being applied off the Magdalen Islands than in earlier years. Also, studies have shown that large traps catch 1.4 - 1.5 times as much per haul as do standard traps in Gaspè and 0.9 - 1.4 times as much in the Magdalen Islands. To reflect those differences regulations regarding the numbers of traps permitted have been introduced for 1994.

In some areas the effort increase results from 'more effective fishing' related to the use of bigger and better boats, better navigational equipment, better traps (size, design, material), improved bait (with the widespread availability of frozen bait), and smarter fishing. Consequently, fishermen can fish in more adverse weather conditions and haul their pots more frequently - twice a day in some instances. Better boats, electronic sounders and Loran 'C' allow fishermen to go further from port to fish particular escarpments which were perhaps never fished previously, thus taking away what can be considered as traditional refuges. In the Magdalen Islands, some fishermen estimate that only 50% of the lobster grounds were exploited before the introduction of echo-sounders; now 100% of the grounds are exploited.

In other areas, localized increases result from transfers of licenses from one harbour to another, re-activation of in-active licenses or fuller utilization of active licenses. As an example, the following case was outlined in a recent newsletter of the Fishermen's Resource Center. At Barr'd Harbour (St.John's Bay, West Coast of Newfoundland) there were three licenses fishing at the beginning of the fishery in that harbour; these increased to seven licenses in 1985 and twenty-seven in 1994. This increase is considered to be the result of the groundfish decline as groundfish fishermen bought lobster licenses from retired fishermen in a neighbouring sub-area and eventually moved to the most productive one.

Furthermore, as has been explained to the Council in Gaspè and in Newfoundland, fishermen who previously fished lobster for the first four weeks of the season only, before moving to groundfish, are now fishing lobster the full season because there are no alternatives. Even though these latter weeks may be uneconomical as a fishing activity, the current social safety net system appears to provide an incentive to continue this effort.

Fishing by First Nations, which accounted for very low removals for many years, has recently been increasing, particularly in some localized areas.

Finally, unfavourable economic circumstances have reportedly contributed in many areas to a significant increase in poaching activities including the retention of undersized and berried lobsters and under-the-table sales which distort landing statistics.

For reference, a map of the different LFAs and selected statistics may be found in Appendix 3.

2.2 LOBSTER BIOLOGY

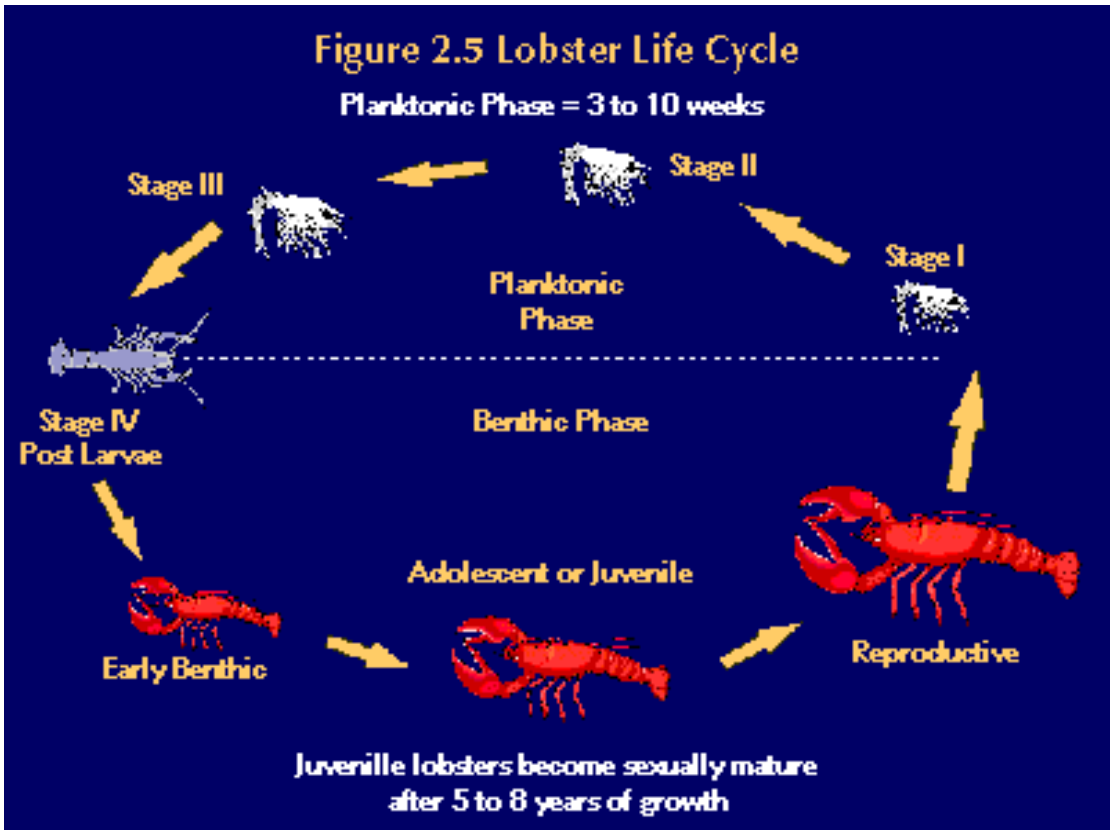
Several aspects of lobster biology and ecology are considered to be well established and are generally accepted; others are less understood.

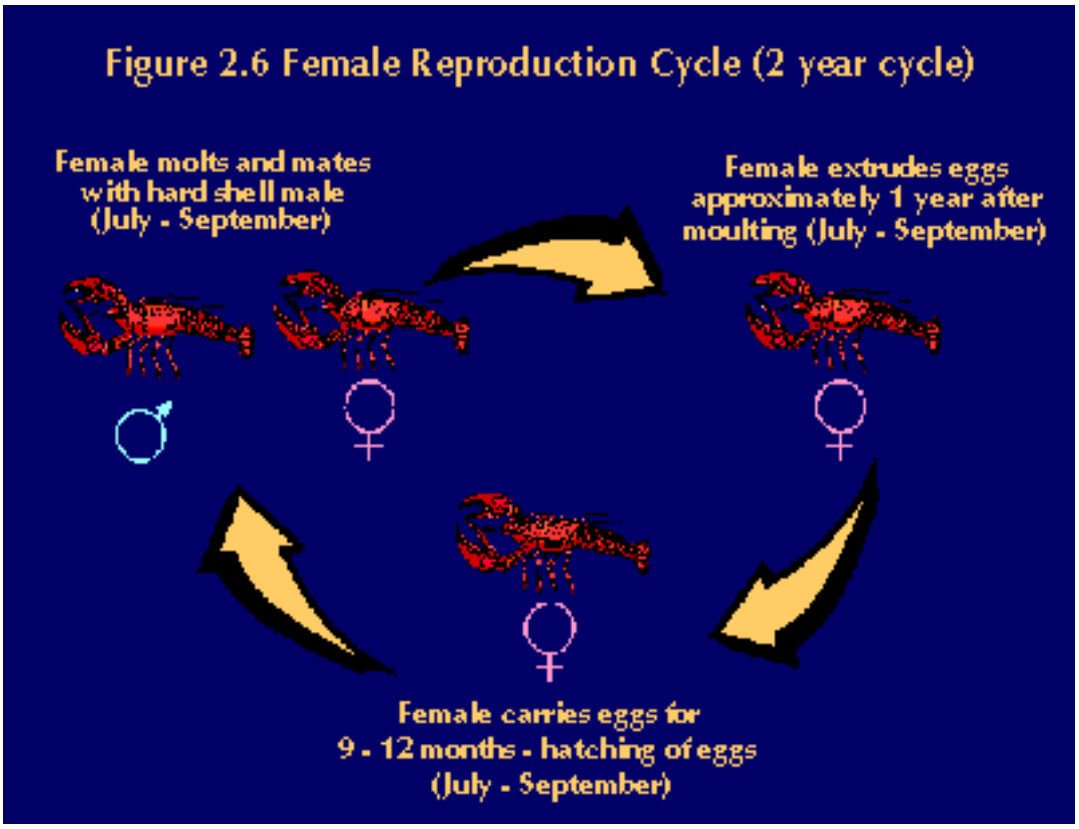
Lobsters live on a variety of combined bottom types from mud/silt through to bedrock. The most common near-shore habitat is rock and boulders overlying sand. While generally lobsters are found in commercial numbers at depths less than 35 m, they are also commercially fished by the offshore fleet along the outer Scotian shelf at depths to 450m.

A seasonal migration related to depth is well documented. In spring, lobsters move towards shallow waters to reproduce or hatch eggs. Scientists believe that exchanges between large geographical areas due to adult migrations are limited, except in the Bay of Fundy, but information is inadequate to assess this fully.

Larvae are hatched between July and September and are planktonic. The duration of the planktonic phase is between 3 to 10 weeks and is temperature-dependent. No precise information exists on larval drift for most areas. Cold water years may be a significant cause of mortality at this stage.

Generally, lobsters reach the minimum legal size after 15 to 20 molts, at age 6 to 9 years, depending on the area. Time to recruitment may be longer in particular marine environments such as the Bay of Fundy, or shorter, such as in the southern Gulf of St. Lawrence.





Scientists are unable to precisely age lobster due to the loss of the carapace at each molt.

Mating occurs immediately following female molt with eggs becoming evident on the underside of the female approximately one year later (berried female). The relative size between sexes may be important to mating success as small males tend not to mate with large females. In general, 50% of the females mature at a carapace size of 81 mm (3&LT+&GT3/16") in Newfoundland, 79-84 mm (3" - 3&LT+&GT3/8") in the Magdalen Islands, 71 mm (2&LT+&GT3/4") in the southern Gulf of St.Lawrence and over 102 mm (4") in the Bay of Fundy. Males mature at a smaller size than do females. The number of eggs produced by a female increases exponentially with size. As well, first spawners produce eggs of lower quality than those of older females. Small sexually mature females (around 0.5 kg) molt and produce eggs in alternate years (molt - eggs -molt). These smaller females only produce one clutch of eggs per mating. Larger females (1 kg) may molt (and then mate) only once every 3-5 years. These large females can produce two (maybe three) clutches of eggs per mating.

It is unknown how many eggs are sufficient and necessary to ensure the sustainability of the biomass, since there are no evident stock-recruitment relationships. Important factors are the survival of eggs and larvae under different environmental conditions and the carrying capacity of the environment to sus-

tain only a certain number of young lobsters settling on the bottom.

The actual biomass of lobsters on the bottom is not known. Because it is not possible to age lobster, models of population dynamics such as those currently used for groundfish cannot be used. As well, tools are not well enough developed to forecas future recruitment. Scientists and fishermen believe that lobster biomass fluctuations have been experienced but they do not fully understand the causes, especially the increase of the past decade that produced the increases in catch. Many hypotheses have been proposed, including those related to water temperature, more kelp and fewer sea urchins, spawning beds, lower predation by groundfishes, increase in fishing effort, expanded fishing grounds, improved management, and other unidentified environmental factors, but it is unlikely that a single factor can explain the current situation. A more comprehensive or ecological approach is required.

Predator-prey relationships are not well understood. It is known that lobsters feed on various types of animal prey, including dead animals, mollusca, sea urchins and rock crab. It is believed that there is a predation by groundfish on lobster (the amount is undefined and no evident relationship can be drawn) and by seal on lobster (the number of lobsters observed in sealsí stomach contents are, however, negligible).

Scientists have been studying lobster for a long time. Prior to the mid-1970s, lobster research focussed on general biological issues: growth, distribution, general movements of adults, fecundity, etc. In the mid-1970s, models which combine several kinds of biological information to assess stock status in relation to exploitation (in particular yield per recruit) were adapted for use with lobster, especially through ICES Working Groups. A 1978 US-Canada workshop on lobster assessment science summarized previous assessment work, provided comprehensive recommendations for research and management and stimulated further assessment work during the 1980s.

Current science activities include ongoing monitoring of the fishery (index fishermen, at-sea sampling) and working with fishermen and fishing organizations on specific problems (juvenile settlement, habitat questions). In response to a major initiative by DFO, the Science Program is undergoing a major interdisciplinary overhaul which is seen by the FRCC as extremely positive. The proposals for future lobster work will result in a multidisciplinary research approach that fosters regional cooperation.

One of the major issues challenging science is the gap between assessment results (which indicate severe over-exploitation of lobster stocks) and fishery performance (which has been remarkable).

2.3 CONSERVATION MANAGEMENT

The lobster fishery has been one of the most closely regulated fisheries in Canada. Regulation, which is heavily influenced by the biological characteristics of lobster, is essentially based on input controls (instead of output controls such as catch limits as is the case in groundfish fisheries). Major regulatory measures include:

- prohibition against landing egg-bearing females;
- minimum size limits;
- lath spacing in traps to permit escape of small lobsters (trap selectivity);
- licensing of fishermen (limited entry);
- restriction of gear type (traps);
- limitation of the number of traps;

- division of the coastal area into fishing districts (LFAs);
- fishing seasons determined by district.

Many of the management measures in place today were first implemented many decades ago, and in many cases the justification was economics as well as conservation. The first conservation measure for the lobster fishery was the protection of egg-bearing females which was put in place in the early 1870s and is now widely accepted.

Fishing seasons were also implemented in the 1870s and have remained, with some changes, since then. Closed seasons were introduced for several reasons that appear to respond to mixed concerns: limiting exploitation rates; marketing; protecting lobsters during egg-laying, molting and hatching; fishing in good weather conditions; or improving the quality of lobster meat.

Minimum size limits have also been in effect since the early years of the fishery. This measure experienced several problems in implementation and enforcement and was abandoned in most areas before being re-introduced. In 1932, a 9" (229 mm) total length limit was adopted in southern Nova Scotia and was changed to 3 1/16" (78 mm) carapace length in 1934. A similar limit was applied in Newfoundland in 1939. In other lobster areas, size limits were re-introduced in the early 1940s.

Effort limitation was introduced in the 1960s with limits on licences and on the number of traps per licence. In 1969, it was decided to limit the number of operators in the lobster fishing industry by licensing boats and, as well, a minimum trap limit was implemented. No fisherman who fished fewer traps in 1968 than the lower limit for his district could add traps in the future. Two classes of licences were established: class B licences were issued to all boats using less than 100, 75 or 50 traps, depending on the district, and were not subject to renewal at the retirement of the fisherman; class A licences were issued to all other boats and were transferable.

In 1974, a Lobster Fishery Task Force was created. Its 1975 report suggested that the level of fishing effort be decreased by reducing the number of fishermen and the amount of gear. The Task Force supported trap limits as a necessary measure to control fishing effort and concluded that the commercial fleet must be reduced by 25 to 50 % if the fishery is to become economically viable. The Federal Government responded to this report with measures to exclude from the lobster fishery those who earned their living elsewhere, thereby increasing returns to ëlegitimateí fishermen. An experimental lobster licence buy-back program was implemented in Prince Edward Island in 1976 and extended later to New Brunswick and Nova Scotia.

Carapace size was increased in LFA 26B (west Cape Breton) at the request of fishermen between 1987 and 1990 from 2 1/2" (64 mm) to 2 3/4" (70 mm). In 1991, a change in US regulations applying to Canadian imports led to a proposal to increase the minimum carapace length from 3 3/16" (81 mm) to 3 1/4" (83 mm) in Newfoundland and most of Scotia Fundy, but, in the end, this change was not accepted by all sectors of industry and did not take effect. Size increase programs were begun in several LFAs in the southern Gulf in 1990 but these were delayed in 1992 and have not been implemented everywhere. As a result, four size limits are in place in the southern Gulf: 2 1/2" (64 mm) in Northern PEI, 2 9/16" (65 mm) in east Northumberland Strait, 2 5/8" (67 mm) in west Northumberland Strait and east New Brunswick, and 2 3/4" (70 mm) in west Cape Breton. Carapace size limit regulations may reflect both economical considerations (optimizing the income from the resource) and conservation considerations (minimizing waste and protecting reproductive capacity.)

The trap lath spacing regulation has the same rationale as does the mesh size in groundfish fisheries. The intent is to permit release, while the lobster traps are still on the fishing grounds, of sublegal size lobsters to survive and grow to a larger size before capture. First experiments were carried out in the 1940s. Regulations on lath space were implemented in 1949 but faced enforcement problems. Escape mechanisms, plastic laths with rectangular openings reducing the capture and handling of undersized lobsters, and biodegradable mechanisms that prevent ghost fishing of lost traps after a short period of time, have recently become, or will soon become, mandatory in many LFAs in Atlantic Canada.

Specific management measures for lobster are quite variable between LFAs. Conservation management decisions are developed through a participatory mechanism involving fishermen and management officials. Under this approach, as outlined in Figure 2.7, recommendations for the management of the fishery within each LFA are made to the Regional Director General of DFO. Under most circumstances the Regional Director General is responsible for issuing the lobster management plan for that region. The lobster advisory committee structure can allow for considerable local input from fishermen and fishermenís organizations in the development of management measures, such that management can be tailored to local biological, social and economic conditions.

Insert figure 2.7 here

The lobster management regime continues to evolve based on discussions in advisory committees and other fora.

3. CONSERVATION ISSUES

The Council has received and reviewed vast amounts of input from industry and statistical and scientific information from DFO. Analysis of this material has been difficult. Three key factors have contributed complexities and it is important that these be kept foremost in mind in considering the conservation issues identified below.

First, the FRCC concluded early in this project that to look at lobster conservation required looking comprehensively at the lobster resource and at the whole lobster fishery, including its management system. We have done this and have reached certain conclusions which we believe accurately reflect the current situation as a whole in Atlantic Canada; each conclusion may not, however, be fully reflective of the specifics in each and every area where lobsters are fished.

Second, there is much variability between regions and there are widely diverging views on most issues. As we have seen in the previous chapter, lobsters and the lobster fishery are extremely important in Atlantic Canada and have been for decades. From practically every coastal community, fishermen, totalling thousands, participate using relatively small boats either as individual enterprises or with a crew of one or two. Fishing practices and opinions have been molded by tradition and by direct knowledge of, and dependence on, a resource immediately adjacent to the fishermanís community, or fishing harbour. Views about the fishery are strongly held as is the affinity to the resource and the feeling of ownership with respect to a particular lobster population. Many fishermen have ëtheir owní lobster grounds. At the same time, it is well known that the ocean environment often varies significantly from one region to the other - and with it so does the characteristics of the lobster resource in terms of abundance, growth rates, productivity, etc.

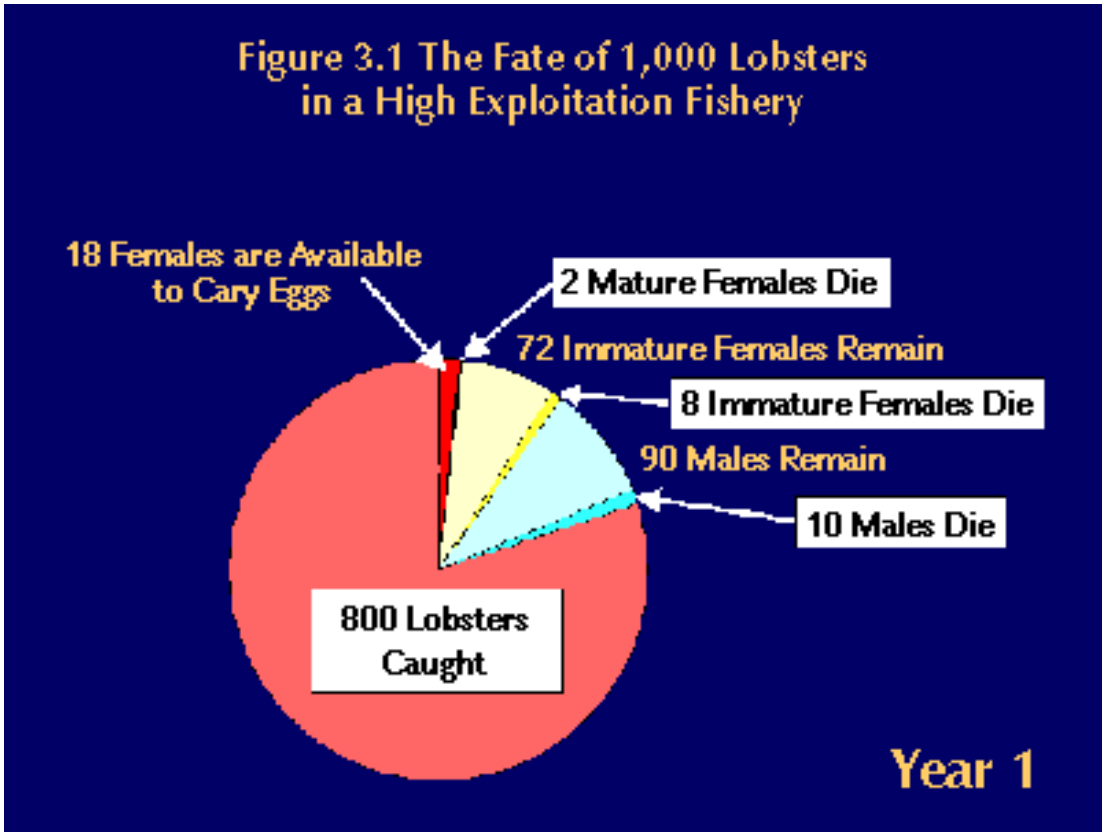
Third, there are significant limitations resulting from the fact that current scientific knowledge cannot answer a number of key questions.

3.1 IS THERE A RESOURCE CONSERVATION PROBLEM?

A casual look at todayís fishery might lead one to the conclusion that there is no resource conservation problem. Despite the fact that aggregate landings have declined in each of the past four years, they are, nevertheless, still significantly higher than the long term (1915-1980) average catches. There have always been peaks and valleys, and significant variability between individual LFAs, perhaps just reflective of normal cycles, as some fishermen believe. Coupled with this is the fact that the lobster management system is quite different both in measures and approach from the management regime for other species, and is considered by many in the industry to have contributed to the on-going high productivity of this fishery. Certainly, the FRCC heard on many occasions that the current system works and should be left alone. If it is not broken - donít fix it . If we were to take this at face value, we could stop here.

However, there are many responsible stakeholders who are quite concerned about the current situation, as is the FRCC. There are good reasons for this concern. Generally, the fishery is thought to exert a very high level of mortality on the resource, and this level is increasing with the increase in fishing effort and reported increases in illegal fishing. **We are potentially in, or are moving towards, a recruitment overfishing situation, where the level of fishing is such that it reduces subsequent recruitment.**

The exploitation rate is defined as the proportion of the fishable stock of lobsters that is



removed by fishing in a given year. Estimates of the exploitation rate are made by scientists using detailed calculations on data from very small sample areas which are considered to be representative of larger areas. There are obvious limitations in these calculations - not the least of which are the catchability of lobsters and the uncertainty of whether or not the estimates can be applied to the total lobster population. Estimates of exploitation rate fluctuate from year to year and confidence limits of the calculations make it practically impossible to distinguish between rates of, say, 80% and 90%. **The most important thing is that exploitation rates are clearly very high.** Current estimates vary from 50% in Guysborough County (LFA 31) to 85% in Newfoundland, the southern Gulf of St. Lawrence and parts of southwest Nova Scotia.

Secondly, most of the fishing mortality is on immature animals. It is well known that the age and size at sexual maturity varies considerably from region to region based primarily on environmental conditions such as water temperatures. Consequently, the percentage of animals which are mature at the molt when they first reach the minimum fishable size ranges from very low levels to about 75%. However, in most areas, few lobsters reach maturity before they become vulnerable to the fishery. Further, because of lobster growth patterns, where females are mature for a year before producing eggs (thereby gaining protection), fishing small mature animals is as harmful as fishing immature ones.

This combination of high exploitation levels and low levels of maturity at the time of capture results in very few females surviv-

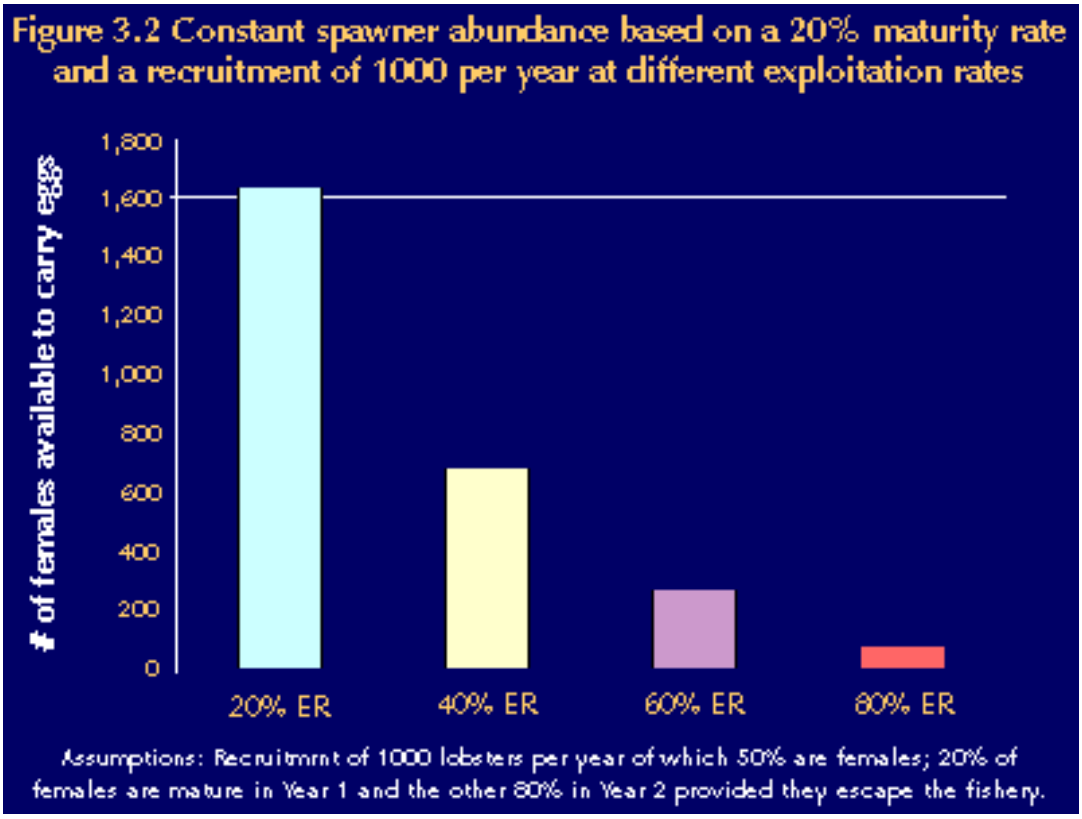


Figure 3.2 Constant spawner abundance based on a 20% maturity rate and a recruitment of 1000 per year at different exploitation rates

ing to reproduce and very low levels of egg production.

There are two sources of egg production:

> *First-time spawners:* Lobsters which last year became mature and mated for the first time, survived both the fishery and natural mortality, are now berried and will release eggs.
>
> *Repeat Spawners:* Larger females which have been mature for two molts or more.

The relative importance, or contribution, of these two sources to the overall egg production is not well understood. However, at high levels of exploitation and low levels of maturity at legal size, only a very small proportion of females actually produce eggs. This can best be demonstrated with a simple example using assumptions typical of the current fishery. Letís assume:

a constant recruitment of say, 1000 lobsters reaching legal size each year, of which 50% are females;

- an exploitation rate of 80%;
- a natural mortality rate of 10%; and,
- 20% of the females being mature when first reaching legal size.

The result at the end of the year is dramatically shown in the pie chart (Figure 3.1) where only 18 females will be able to release eggs in year two. Of course, the 72 females who were immature in year one will be ma-

ture in year two, but only those who survive the fishery for a second time (14 animals) can first produce eggs in year three.

If we were to look at the impact of this phenomenon over a number of years, the resulting level of constant spawner abundance would be quite low as demonstrated in Figure 3.2.

If, however, a portion (say 10%) of the population is protected, its contribution to egg production can be quite dramatic as shown in Figure 3.3.

Relatively, where exploitation rates are high it appears that the potential importance of egg production by females located in unexploited areas (e.g. low density or unknown concentration) may be quite significant to maintenance of the population even though the number of lobsters in these areas might be relatively small.

While we do not know exactly what level of egg production is necessary to sustain the resource, we do know that the lobster population has been very resilient under circumstances similar to the above. Patterns of landings for many areas in Atlantic Canada since the early 1970s indicate that very high levels of recruitment can follow very low levels of egg production. Although the stocks may have been subjected to recruitment overfishing during that time, it appears that very favourable environmental/ ecological conditions resulted in a high level of recruitment from the low level of egg production at relatively

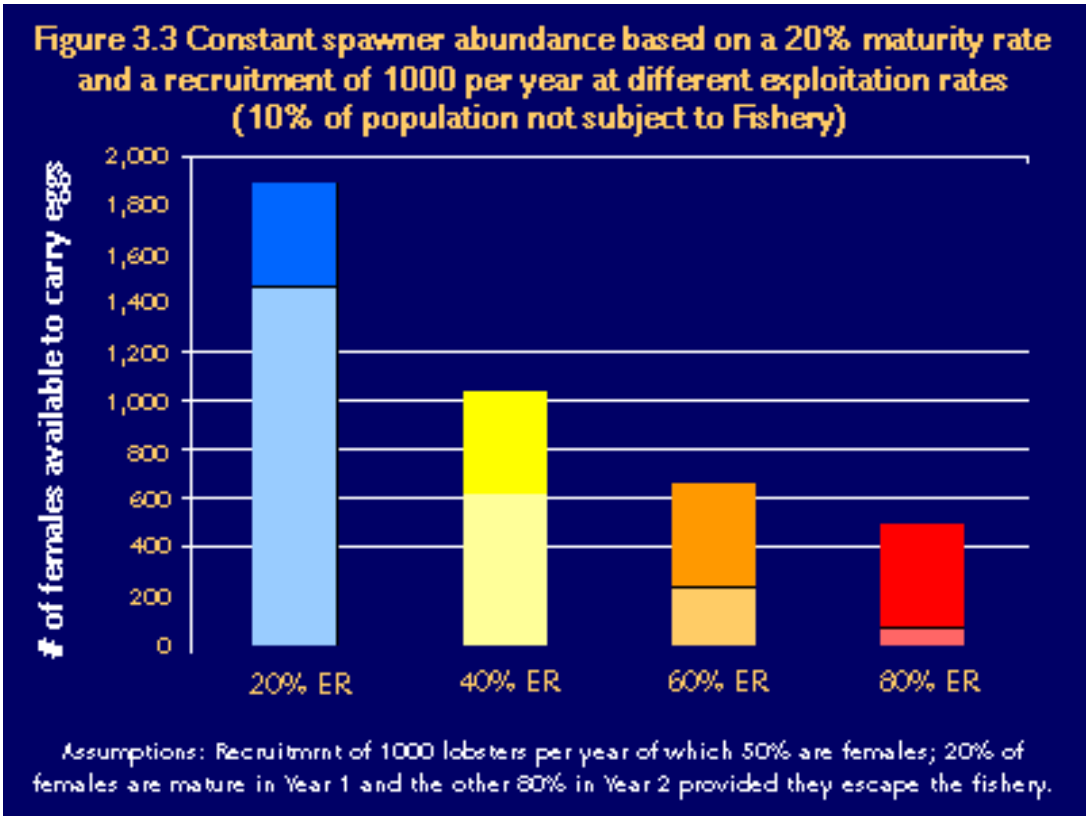


Figure 3.3 Constant spawner abundance based on a 20% maturity rate and a recruitment of 1000 per year at different exploitation rates (10% of population not subject to Fishery)

low population levels during the early 1970s. The extent to which the generally high level of recruitment of the past 15-20 years has been maintained by favourable environmental conditions, as compared to an increased level of egg production at high population levels, or, by a combination of the two, is unknown.

Situations of high exploitation and low egg production in lobster fisheries in other countries have led to management actions to protect spawning capacity. In the northeast United States, lobsters are considered overfished when egg production per recruit is below 10% of what it would be if there were no fishery. Most of their populations are overfished according to this definition and Effort Management Teams, made up of scientists, managers and industry people, have been working to develop acceptable ways of moving toward the 10% target through reductions in fishing effort. Their recommendations will be considered for implementation by the New England Fisheries Management Council. In Australia, the most valuable rock lobster fishery has been characterized in recent years by increasingly effective fishing (despite effort limitation), due to more frequent hauling and improved navigation systems which permit fishing deeper areas. The most recent management plan introduced a maximum size limit, a prohibition on retaining mature females during part of the season, and some further limits on effort with a view to maintaining the breeding stock.

In Canada, there is a lot of evidence that the portion of the population not being fished is rapidly declining as effort increases into previously unfished areas and as high prices permit fishing to continue even at very low density levels. Nevertheless, it is still not easy to rationalize current estimates of egg production with the continuing good recruitment in recent times and the resulting relatively high landings. Perhaps there are inadequacies in the calculation techniques; an inappropriate spatial scale to the data; and/or uncertainty as to whether we are measuring the whole population or just part of it.

It is unrealistic, however, to expect strong recruitment to continue indefinitely and the recent decline in landings in many areas could represent the early stages of a widespread downward trend. The concern with recruitment overfishing that prevailed during the 1970s was largely ignored as recruitment increased and continued relatively strong. This concern, however, has reemerged in that recent analyses indicate that relative egg production in most lobster populations around Atlantic Canada is only about 1%-2% or less of what it could be potentially if females were not exploited.

Keeping egg production at such an extremely low level has to be considered a very high-risk management regime. It could be too low to maintain high recruitment under average environmental/ ecological conditions and could lead to recruitment failure under unfavourable conditions.

Our current fishery, which has been designed or targeted towards high exploitation rates and low levels of egg production, is, in the Councilís view, taking too much and leaving too little .

Furthermore, the FRCC believes the current high-risk situation is worsening as there are fewer and fewer unexploited areas and fewer and fewer unfished portions of the population. Thus, we believe the estimated exploitation rate for the exploited stock is becoming more and more representative of the actual exploitation rate on the population as a whole with the resultant very low egg production. While we are unable to precisely define the minimum level of egg production that would eliminate all risk of recruitment failure, the risk under present conditions is unacceptably high in a prudent management regime.

Improvements are required in the form of conservation measures to reduce exploitation rates and to increase egg production.

3.2 IMPACT OF HIGH AND INCREASING FISHING EFFORT

As outlined in the previous chapter, the FRCC believes the increase in effort is significant and is increasing the exploitation rate in traditional areas and extending fishing pressure to areas which might previously have been unfished.

Surprisingly to us, fishermen express different views regarding the impact of increased effort on the resource itself. While some are extremely concerned, there is a feeling among others that effective effort is already very high and that the marginal effects of even substantially increased effort on stocks might not be very great. They and some scientists believe it is more of an economic issue than a conservation one in that, in the final analysis, this increased effort is only catching the same aggregate number of lobsters - but catching them earlier in the first few weeks of the season or by a larger number of fishermen, thereby spreading the returns. **This view ignores the possibility that increased fishing effort, marginal though its effects on the total catch may be, may push the exploitation rate beyond a critical threshold.**

Fishermen are generally aware of the economic costs of what they are doing but are often unwilling to voluntarily shorten their own season or reduce the number of traps they fish because of fear that others will step in to fill the gap.

F**rom a conservation perspective, the FRCC believes that industry and management may have been unjustifiably downplaying the impact of excessive fishing effort. As we have seen in so many other fisheries, the presence of a very high and increasing fishing effort exerts a pervasive pressure both on the resource and on the ability of fisheries management to attain agreed conservation objectives - irrespective of the other conservation measures which might be put in place.**

3.3 ADEQUACY OF ENFORCEMENT

Illegal fishing is seen as a major conservation issue in that it increases pressure on the resource, distorts resource management statistics and encourages others to be dishonest. It is conducted by both licensed and unlicensed fishermen and often promoted by the practices of buyers.

A commonly expressed theme in many of our public consultations was that enforcement of current measures is woefully inadequate and needs to be improved before new measures are introduced. Fishermen also expressed the desire to be more involved in solving this problem.

3.4 LOBSTER MANAGEMENT SYSTEM

Lobster stakeholders are adamant that they want to continue to participate meaningfully in conservation and management decisions. They do not want detailed decisions dictated by any external body, including the FRCC. Similarly, stakeholders unanimously want to maintain the current system based upon protection measures (such as minimum sizes and release of berried females) and input controls (such as limited entry and trap limits). They do not want a system based upon resource quotas, for example. Generally, they like the LFA units of management in that they associate these geographically with their traditional grounds, resource dependence, and fishing colleagues.

The FRCC fully supports the basic tenets (protection measures and input controls; local participation in conservation management decisions) of the current system and wishes to reinforce them. However, these strengths should be preserved and built upon to enhance local decision making with

respect to conservation. We envisage analyzing resource data and considering conservation issues on a geographical basis which more closely reflects the biological characteristics of different lobster populations; and in an overall lobster conservation framework which does not currently exist. In that system, management decisions would be taken at the current LFA level, but broad conservation issues would be considered on a larger geographical basis.

3.5 LIMITATIONS OF SCIENCE

Although there is a significant amount of knowledge on lobster biology and ecology, many key points are still poorly understood. As we have noted above, scientists are unable to provide definitive answers to a number of key questions including minimum required levels of egg production and stock recruitment relations.

Unfortunately, this provides an excuse for those who want to use science (or its limitations) for their own convenience, invoking a prove it rather than a prudent or precautionary approach. **Having said this, there seems to be a good working relationship between the lobster biologists and members of Lobster Advisory Committees in most areas and a willingness to work together in addressing these questions to reach a better understanding of the system.**

Additional details on science requirements and recommendations on science priorities are provided in 5.2.

3.6 CARAPACE SIZE

Over time, a number of different minimum legal carapace sizes have been established in the Atlantic lobster fishery and these currently range from 21/2" (63.5 mm) in some areas to 3 3/16" (81 mm) in others.

Implementation of size limit regulations has always been the subject of considerable debate, probably related to the fact that there are different reasons for selecting a particular size as well as different consequences dependent upon the choice made. Some might desire a particular size for market reasons; for example, the traditional canner industry in the southern Gulf utilized relatively small lobsters, while the fresh market is oriented towards larger lobsters. Others might desire a particular size to optimize the yield-per-recruit (i.e. to take the maximum yield from each animal) and thus to minimize the waste, or to protect the reproductive potential of the stock by allowing a sufficient number of females to produce eggs, thereby providing a buffer against conditions adverse to recruitment. Thus, the minimum legal carapace size may have both economic and conservation justification and implications.

What should be the appropriate size is an important question in all lobster fishing areas, but has taken on considerable prominence in the southern Gulf where, whether or not minimum size is even a conservation issue is also debated. No doubt minimum carapace size is not the only contributing factor to maintaining a stock given the high landings in LFA 24 where the minimum carapace size is the smallest at 2 1/2" (63.5 mm), while in areas with larger minimum sizes there have been decreases in landings. On the other hand, it would not be logical to conclude that it is not a conservation factor just because of landings data. It is entirely possible and quite probable that one LFA is benefiting at the expense of another.

In addition, there is the question of a common minimum legal carapace in the different LFAs making up the southern Gulf. Taking both issues together, the resulting debate has become extremely emotional involving both fishermen stakeholders and Provincial governments and is unnecessarily diverting attention from other conservation issues requiring action.

A resolution is required.

The FRCC considers minimum legal size a conservation issue. What specific size is most appropriate, however, varies with different environmental conditions (and their resultant impact on lobster production characteristics), with different levels of fishery indicators, such as exploitation levels, and also with the other conservation tools in use.

We are proposing a New Conservation Framework in Chapter 4 which will allow this issue to be addressed rationally by focusing on the appropriate level of egg production for the overall lobster production area.

3.7 ABORIGINAL FISHERIES

Hunting and fishing were the main source for food of the Aboriginal Peoples of Canada well before the arrival of Europeans. The involvement of Aboriginal Peoples in marine fisheries in Atlantic Canada, however, remained at low levels well into the 20th Century. In 1990, the Supreme Court of Canada, in its judgement of the Sparrow case, found that the Indian Band in that case had an Aboriginal right to fish for food, social and ceremonial purposes, subject, among other things, to conservation requirements. This judgement led to the development by DFO of the Aboriginal Fisheries Strategy (AFS) and to a greater participation by Aboriginal Peoples in marine fisheries including the Atlantic lobster fishery. Quite apart from the Supreme Court decision in the Sparrow case, which did not involve a right to fish for commercial purposes, Native groups in Atlantic Canada want guaranteed access to the commercial lobster fishery in accordance with their belief that they have a right to fish for food and for sale as a result of various treaties signed during the 18th Century with the British.

There is much variation in the understanding of Aboriginal and treaty rights and aspirations with respect to the lobster fishery among Aboriginals, between Aboriginal and commercial fishermen, and among commercial fishermen.

Aboriginal people do not want to be viewed as new participants in the lobster fishery. They believe they are entitled to an equitable share of the resource and that their share should be decided immediately after conservation requirements (that they would define) and before any decision is taken regarding a non-native fishery. In this context, their view is that, if the lobster fishery is now being exploited at the maximum sustainable level, steps would have to be taken to reduce the efforts of commercial fishermen in order to provide for the requirements of Aboriginal fishermen. Even if some Aboriginal groups agree, at least in principle, to abide by the current fishing regulations (for instance, in the issuance of regular commercial fishing licenses), others have expressed the view that these current regulations are set for, and by, non-native people and that Aboriginal Peoples would abide only by their own rules which would be negotiated directly with the Government of Canada.

Many commercial fishermen do not question that Aboriginal groups should be involved in the lobster fishery to meet their requirements for food, social, and ceremonial purposes, but concerns have been raised about this increasing presence in the lobster fishery in localized areas.

Commercial fishermen are very concerned with respect to the controls and monitoring of Aboriginal food fisheries for lobster and about the impact of the sale of lobsters caught in

such fisheries, particularly when they are conducted outside of the commercial season. This concern also includes the involvement of non-Aboriginals in Aboriginal food fisheries. Commercial fishermen want to see Aboriginal participation in the fishery confined to the same seasons that apply to commercial fishermen and under the same regulatory system.

Since the Supreme Court decision on the Sparrow case, DFO has entered into discussions with Aboriginal organizations across Canada to develop harvesting plans to provide for Aboriginal fisheries to meet food, social, and ceremonial requirements. The Aboriginal Fisheries Strategy has provided funding to Aboriginal groups to hire and train fishery guardians who are employed by the Aboriginal groups to monitor the Aboriginal fisheries. DFO has also assisted in improving the efficiency of fisheries by Aboriginal organizations.

It is clear that Aboriginal participation in the lobster fishery will continue to increase in the near future. The question of treaty rights is not yet resolved and may stay in front of the courts for many years.

Both Aboriginal and non-Aboriginal groups feel that communications have to be improved significantly between them and with DFO in order to clarify the respective positions and to improve the relationships between groups. The FRCC strongly supports initiatives in this regard.

All removals from a resource are important and must be properly monitored and controlled. Consequently, the Council believes that all fisheries should take place within the same conservation framework.

4. A NEW CONSERVATION FRAMEWORK

In Chapter 3 we discussed a number of lobster conservation issues requiring attention.

Regarding the current lobster resource situation, the FRCC concluded that exploitation levels are too high, egg production levels are too low, and the risk of recruitment failure under these conditions is unacceptable. The general objective of conservation is to keep stocks in a healthy state, under various environmental conditions which cause large natural fluctuations. To dampen such fluctuations in a fishery necessitates sufficient long term recruitment rates and sufficient biomass to maintain catch levels when recruitment becomes unfavourable. Applied to our lobster stocks, conservation measures should be put in place to ensure good egg production, reasonable fishing mortality and a biomass composed of several year (size) classes.

Regarding the current lobster management system, fishermen want to fully participate in conservation and management decisions and they want to maintain the general philosophy of the current management system based upon protection measures and input controls. The FRCC wants to reinforce and strengthen these basic tenets and to make them more workable than at present.

Further, the sensitive questions around the carapace size issue in the southern Gulf and Aboriginal fisheries need be addressed and resolved.

The FRCC is proposing a New Conservation Framework for the resolution of these and other conservation issues. The framework includes:

- **a definition of lobster conservation with related objectives;**
- **conservation principles;**
- **a conservation strategy;**
- **a more appropriate geographical basis for considering lobster conservation strategies - Lobster Production Areas (LPAs);**
- **a series of tool kits of conservation measures that can be drawn upon selectively by a specific area or region to meet conservation objectives and targets.**

Under this general approach, the Minister of Fisheries and Oceans would establish the conservation principles, objectives and targets. Fishermen, through their organizations and the Lobster Advisory Committees, would work out, in partnership with DFO, the detailed measures that would be most suitable to their fishing areas and consistent with these principles and objectives.

4.1 CONSERVATION DEFINITION AND OBJECTIVES

The FRCC Terms of Reference provide a general definition of conservation and identify two conservation objectives. Together these have provided the underlying focus for all of the FRCCís work over the past two years and are worth repeating here:

- “Fisheries conservation is that aspect of the management of the fisheries resource which ensures that its use is sustainable and which safeguards its ecological processes and genetic diversity for the maintenance of the resource. Fisheries conservation ensures that the fullest sustainable advantage is derived from the resource and that the resource base is maintained. “

- Conservation objectives include 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.

Building on the general FRCC conservation model, and adapting it specifically for lobster, we propose the following:

Definition: **Lobster conservation ensures that the fullest sustainable advantage is derived from the resource and that the resource base is maintained.**

Objective: **To maintain the resource base requires, over the whole range of environmental conditions:**

- **sufficient levels of egg production;**
- **protection of quality and quantity of lobster habitat.**

Objective: **To derive fullest sustainable advantage means minimizing resource waste through:**

- **targeting to catch lobsters of "optimal size" ;**
- **targeting to catch lobsters at the "optimal time";**
- **proper lobster handling procedures.**

4.2 CONSERVATION PRINCIPLES

To realize conservation as defined and to achieve those conservation objectives will require an effective conservation strategy and the selection of appropriate conservation measures in accordance with agreed "conservation principles". **The FRCC recommends the following principles be adopted as an essential part of lobster conservation:**

1. ***Sustainability*****:** the conservation strategy must be designed to maintain the lobster population at an optimal level of biomass, subject to natural fluctuations; there must be a sufficient spawning biomass to allow a continuing production of young lobsters and a wide enough size structure to mitigate low recruitment periods.
2. ***Precautionary Approach****:* where there is risk and uncertainty, the selected conservation measures must be precautionary in nature, in line with the Governmentís commitment to err on the side of caution
3. ***Accountability:*** local lobster fishermen must have a definite and enhanced role in selecting the conservation measures most appropriate to their area; and some accountability with respect to achieving overall conservation targets.
4. ***onsistency:*** within defined lobster production areas, conservation measures must be selected with the consistency principle in mind so that no lobster fishing area (LFA) is expected to unreasonably bear the costs or reap the benefits of differing conservation measures (fishing practices) in another LFA.
5. ***Inclusiveness:*** all fisheries for lobster, whether commercial, or for food, social and ceremonial purposes, must take place within the overall lobster conservation framework agreed to by the Minister

for the lobster production area in question.

6. ***Responsiveness:*** to be effective, conservation measures must be accompanied by an accurate and reliable feed back system to monitor impacts and progress towards achieving targets. Furthermore, there must be a predetermined time frame for review.

4.3 CONSERVATION STRATEGY

A conservation strategy is really a plan or a sequence of actions designed to tie the various other elements of the conservation framework together to give the desired results. **The steps in our proposed strategy are:**

STEP 1: Define, where possible, targets or goals which reflect the conservation definition and objectives. (Targets might be specific, eg. reduce the exploitation rate to 60%; or general, eg. improve the stock structure.)

STEP 2: Evaluate conservation measures (options or tools) in terms of their contribution towards achieving these targets.

STEP 3: Select and implement desired tools appropriate for the area in question while respecting the established conservation principles.

STEP 4**:** Choose a realistic timeframe for achieving these targets.

STEP 5: Measure performance faithfully; monitor progress towards the targets; and, adjust the measures as appropriate.

To be successful such a strategy requires a conservation environment where:

- there are well informed stakeholders (aboriginals, commercial fishermen, processors/buyers, scientists and managers) and a commonly held conservation attitude;
- there is an appropriate scientific response;
- there is an effective enforcement system; and,
- there is a working conservation partnership between Government and stakeholders.

4.4 LOBSTER PRODUCTION AREAS (LPAs)

In studying the available information on lobsters, we often found similar biological characteristics as well as similar environmental characteristics between groups of adjacent LFAs. This observation led the FRCC to conclude that conservation measures are, quite probably, better considered in relation to an area broader than a single LFA.

We were, therefore, motivated to look for a broader geographical basis which, from a biological perspective, would be more meaningful, and thus more appropriate, when establishing lobster conservation strategies. But what should be the appropriate scale? LFAs are too small, and the whole Atlantic region is obviously too large because of the well-known and significant variations in lobster production characteristics.

The FRCC considered several important biological and physical environment indicators, namely, temperature, substrate, currents, and lobster growth rates. **Based on data provided by DFO biologists and physical oceanographers, we have designed a spatial framework for lobster conservation consist-**

ing of seven units which we identify as Lobster Production Areas (LPAs). These units provide a useful way of looking at common conservation objectives for a lobster population which has certain common biological characteristics (growth, maturation) and which lives in an environment that has common or comparable characteristics (temperature, substrate).

It should be noted that the units being proposed make biological and geographical sense based upon present data -but this is just a good start. They may be refined and improved with more study and use.

LPAs - *What they are:* Lobster production areas are areas in which the production characteristics of lobster are more or less homogeneous. Accordingly, comparable conservation measures should yield comparable effects on the whole lobster population within an LPA. While it is known that there can be small-scale variations in lobster biological characteristics even within very small areas, in general, variations within LPAs will be less than those between LPAs. As well, LPAs are areas within which some interchange of lobsters (through movements of adults and larval drift) occurs. This interchange within LPAs may help smooth out production rates throughout the area.

Fundamentally, LPAs are conservation units or, put in another way, areas of influence for conservation.

LPAs - *What they are used for:* LPAs are used in establishing conservation strategies (see section 4.3). Such strategies will define conservation targets (or goals) for a Lobster Production Area as a whole and must reflect the conservation definition and objectives as set out by the Minister. Specific conservation measures (tools) to achieve those overall LPA conservation targets are chosen and implemented by individual LFAs, as in the past, but in a way that adheres to the conservation principles set out by the Minister. The combined impact of all conservation measures in the relevant LFAs is what is used in evaluating conservation performance and resource status in the LPA.

LPAs - *What they are not:* LPAs are not operational management units and this concept does not change the system of LFAs which remain the appropriate units for lobster fishery management. Furthermore, LPAs are not units in which the management measures in place for the various LFAs are necessarily standardized.

LPAs - *Definition Indicators:* Lobster production depends primarily on growth, which is also related to maturation rates, and the level of recruitment. Growth rates are highly dependent on temperature (more particularly, the time a lobster can spend at temperatures high enough to allow it to feed and grow). The carrying capacity may depend on substrate characteristics. Accordingly, LPAs should be defined on the basis of homogeneity of biological rates (growth, maturation), of important physical variables (temperature regime, vertical temperature structure, substrate characteristics), and of the potential for interchange (hydrological circulation patterns, adult movements). We have used the following specific indicators:

- ***Temperature.*** Lobster growth increases with temperature. A critical variable is the duration of warm temperatures in the lobsterís habitat: are temperatures high enough to allow the processes of feeding, molting and reproduction to continue? The vertical temperature structure is also important. If temperatures in offshore deep water are below those preferred by lobster, offshore movement will be constrained; but if high temperatures are available offshore (as off southwest Nova Scotia and the Bay of Fundy) lobsters can and do move offshore during winter to remain in their preferred temperatures. We have used temperature at 20m

depth in August as a general temperature index for defining LPAs. Cumulative degree-days or the length of time at which temperatures lie above a critical value would be a more representative variable but this information is not presently available.

- ***Substrate.*** As a benthic animal, lobster is dependent on bottom characteristics. We have used available information on bottom type in defining LPAs.
- ***Currents.*** Water circulation patterns influence larval drift. We have used existing information on general average surface current patterns in defining LPAs. It should be noted that small-scale currents driven by wind or tide may be superimposed on these average current patterns and could contribute to larval drift from one area to adjacent ones, or, on the contrary, to favour larval retention in one specific area.
- ***Lobster maturation rates*.** Maturation rates are important to lobster production and conservation and are relatively simple to determine. As an indicator, we have used the size at which 50% of the animals are mature. It is generally considered that size at maturity is lower in areas of rapid lobster growth than in areas of slower growth.

Qualification: Current biological and oceanographic knowledge does not permit precise boundary definition. Further, while it is recognized that there may be considerable small-scale variations in lobster biology within LPAs, the data used are indicators of differences between LPAs. There are some apparent contradictions, particularly between the August 20m temperatures and the size at 50% maturity. These may reflect inconsistent coverage of temperature observations in the various areas or that the August 20m temperature value does not capture fully the duration of warm temperatures in the lobsterís habitat. Moreover, size at 50% maturity appears to be a complex function of growth rate and may not have a simple relation to temperature.

Despite these limitations, the available information makes a strong case for a series of areas which can be considered more or less homogeneous with respect to lobster production. **The benefits and usefulness of this concept in formulating conservation strategies are obvious. However, this is the starting point, not the end. As further research is undertaken and as experience in using this concept and process is gained, a fine-tuning of the precise areas can and should occur.**

The proposed units, based upon present data are shown in figure 4.1 and described below.

LPA 1. Eastern Newfoundland:
This area is characterized by relatively low temperatures and a short warm season. The August 20m temperature to the north of the Avalon Peninsula is 5°C. Temperatures suitable for lobster are found in a narrow band along the coast with permanent cold temperatures at depth preventing offshore movement. The bottom is rocky. The surface current is generally southerly along the coast (inshore branch of the Labrador Current). Growth is relatively slow. Size at 50% maturity is around 80 mm. While there is probably some exchange of adults and larvae along sections of the coast, it is unlikely that there is interchange throughout this LPA. Nonetheless, the response of lobsters to conservation measures is considered likely to be similar throughout. Temperature and current considerations suggest that the boundary between the eastern and southern Newfoundland LPAs should be in the northeast part of the Avalon Peninsula.

LPA 2. Southern Newfoundland:
Most characteristics of this area are similar to those in eastern Newfoundland. However,

temperatures are generally higher and these can persist for a longer period than off the eastern coast. The August 20m mean temperature off the east coast of the Avalon Peninsula is 7.5oC. Rocky bottom, a narrow coastal band of suitable temperatures and deep-water temperatures cold enough that lobsters cannot move offshore characterize this LPA. The inshore branch of the Labrador Current flows westward along this coast but the volume of cold water flowing in this branch of the current is lower than that further north on the east coast. Growth is somewhat more rapid than off northeast Newfoundland although size at 50% maturity (80mm) is similar.

LPA 3. Western Newfoundland/ Gulf North Shore/ Anticosti/ Gaspè North and East Shore:

This area is characterized by relatively low temperatures. August 20m temperatures are around 6.2 to 6.7oC in the area north and south of Anticosti and the north shore of the Gaspé peninsula, and are similar but more variable on the lower north shore and west coast of Newfoundland. Currents in the area are characterized by a counterclockwise drift northward along the west coast of Newfoundland, westward along the north shore, and southward west of Anticosti to meet the easterly flowing Gaspè current along the north shore of Gaspè. Wind-driven drift may foster movement of larvae from the north shore to the west coast of Newfoundland. Bottom substrate in the depths inhabited by lobster is generally rock outcroppings with a mixture of coarse sand and gravel between rock outcroppings. Growth is relatively slow. Size at maturity is in the order of 80 mm on Newfoundlandís west coast (information is

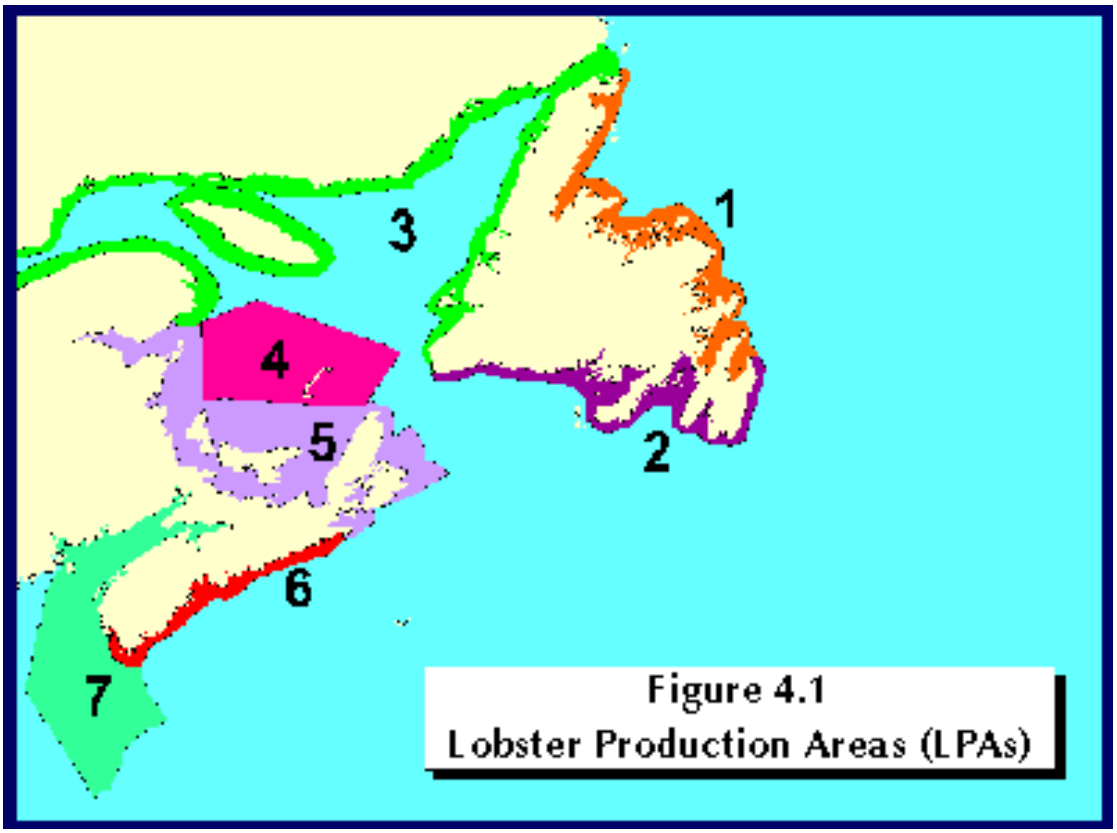


Figure 4.1
Lobster Production Areas (LPAs)

limited elsewhere). There is unlikely to be interchange between all areas within this LPA but there is some evidence that interchange of larvae between the Gulf north shore and the northern part of western Newfoundland occurs.

LPA 4. Magdalen Islands:

Summer temperatures in the upper 30 m or so are high due to seasonal warming but bottom temperatures, at some distance from the Islands, are cold enough to prohibit movements of adults to and from other areas of the southern Gulf. The August 20m temperatures are 7 - 9oC in waters surrounding the Magdalens and warm temperatures persist longer in summer than in the LPA3. Bottom substrates include outcroppings of reddish brown sandstone intermixed with areas of mixed sand and gravel. The mean surface drift is northwesterly to southeasterly across the Magdalen shallows (the southern part of the Gulf of St. Lawrence), including the Magdalen Islands; there is evidence of a tidally generated counterclockwise circulation around the Islands, suggesting that larvae could be retained in this area. Growth rates and maturation rates are more rapid than in the LPA3. To the south of the Magdalen Islands carapace length at 50% maturity is 79 mm but to the north it is 84 mm. Despite this difference in maturation rates between northern and southern areas, this is considered to be a single LPA. Environmental conditions and lobster biology are generally similar to those in the southern Gulf but interchange between the southern Gulf and the Magdalens is probably limited (if any) at the larval stage and nonexistent at the adult stage due to cold deep water.

LPA 5. Gaspè South/ Baie des Chaleurs/ Southern Gulf of St Lawrence/Eastern Cape Breton/ Chedabucto Bay:

This large LPA is characterized by warm summer temperatures for a relatively long growing season. August 20m temperatures are above 9oC from PercÈ throughout the southern Gulf (Baie des Chaleurs, Shediac, north shore of PEI, Northumberland Strait), along the west and east coasts of Cape Breton to just south of Cape Canso on Nova Scotiaís eastern shore. Surface drift is generally northwest to southeast from the GaspÈ/Baie des Chaleurs area across the Magdalen Shallows, through the southern part of Cabot Strait and southerly along Cape Bretonís east coast, suggesting that larval drift could occur throughout the LPA. Bottom substrate within the southern Gulf is similar to that for the Magdalen Islands: red sandstone overlain in patches by sand, often mixed with gravel. Lobster growth is relatively rapid. Sizes at 50% maturity are 71 mm in western Northumberland Strait, including Gaspè south, 73 mm off northeastern Cape Breton and range up to 79-83 mm off eastern Cape Breton and northeast mainland Nova Scotia. Bottom temperatures are low enough to limit lobster movement in deeper areas but because depths are relatively shallow throughout much of the southern Gulf movement of adults throughout this part of the area is possible. There is evidence of some movement between these areas but no evidence of large-scale migrations. Relatively deep water with cold bottom temperatures between eastern Northumberland Strait and western Cape Breton limit movement of adults between these areas.

LPA 6. Eastern and South Shore Nova Scotia:

Temperatures are lower than in the LPA5; August 20m temperatures are below 9oC but above 7oC along the eastern shore from Cape Canso as far as Yarmouth. Surface drift is generally southwest along the coast (the Nova Scotia Current), suggesting that some movement of larvae through the area is plausible. Substrate is generally rocky. Water temperatures in deeper offshore waters are cold, constraining offshore movement of lobsters. Lobster growth is slower than in the southern Gulf. Carapace lengths at 50% maturity are in the order of 95 mm throughout the LPA.

LPA 7. Southwest Nova Scotia/Bay of Fundy/ Offshore:

Much of the area (in particular the Bay of Fundy and near shore southwest Nova Scotia) is characterized by relatively cold water. However, offshore temperatures (midshore areas off southwest Nova Scotia and along the edge of the Scotian shelf) are relatively warm August 20m temperatures are above 9oC offshore southwest Nova Scotia and onto northeastern Georges Bank. These high temperatures permit the development of offshore and midshore lobster populations and movement of adult lobsters over relatively long distances in the area. Lobster growth is relatively slow. Carapace length at 50% maturity is 102 mm in the Bay of Fundy and 95 mm in offshore populations. The Nova Scotia Current continues westward and northwestward around southwest Nova and into the Bay of Fundy; a counterclockwise gyre in the Gulf of Maine could contribute to movement of larvae throughout this LPA. This general current pattern is locally influenced by the very strong tidal currents which mix the water column vertically. Inshore bottom substrate is rocky with areas of gravel, boulder and sand. Offshore there are large expanses of sand and mud/clay, with patches of harder rock and gravel bottom. Environmental conditions are more varied in this LPA than in others; for example the existence of cold water in the Bay of Fundy might appear inconsistent with the warmer temperatures elsewhere in the LPA. However there is evidence of significant movements at adult stage into and out of the Bay of Fundy and on and off banks in the offshore area; currents are such that exchange of larvae throughout much of the area is plausible. For these reasons this is proposed as a single LPA.

4.5 CONSERVATION MEASURES (TOOL KITS)

Conservation objectives can be achieved by a variety of measures that can be arranged in tool kits . Conservation Tool Kits or Reference Guides are proposed in this section for each of the following objectives:

- **increasing egg production;**
- **reducing the exploitation rate and effective fishing effort;**
- **improving stock structure;**
- **and minimizing waste.**

The general approach we envisage is that the management process in a particular LFA would choose a specific conservation measure, or a combination of measures, towards the objective in question. Within each LPA, the conservation principles outlined at the beginning of this chapter must be adhered to. This means that, while the chosen tools may be different between LFAs, their contribution towards the conservation objective should be in accordance with the consistency principle . Some measures or tools may help to achieve more than one objective.

Regional biologists would help the local management organizations in providing data to design the conservation system for their LPA. Biologists would also establish a monitoring system to evaluate the effect of accepted measures. For this purpose information could come from regular scientific activities and from signals derived from industry (such as landings and catch-rates trends, size structure of catches, or signals coming from the fishermenís own perception of the resource). Most importantly, none of the proposed tool kits are full. We strongly encourage the development of

additional tools at the local level as the process evolves.

Please note that the numbering of the tools in a kit is not a ranking of either the priority or effectiveness of a tool.

4.5.1 MEASURES TO INCREASE EGG PRODUCTION

At present, egg production relative to a virgin biomass is very low and corrective measures are needed. A larger egg production would provide a buffer against fluctuations in recruitment and would ensure that the lobster habitat could be fully utilized by the species. Increasing egg production is, however, a precautionary measure, not an absolute guarantee against stock decrease.

Figure 4.2

Reference Guide for Increaseing Egg Production

TOOLS

1. Reduce exploitation rate
2. Close fishing areas
3. Increase minimum carapace size
4. V-notch berried females
5. Introduce a maximum size limit
6. Release berried females
7. Trap selectivity mechanisms

1. **Reduce exploitation rate.** Reducing the exploitation rate by reducing fishing effort allows more lobsters to survive the fishery and grow to larger sizes. More females are allowed to remain in the population, each of them living longer and producing more clutches of eggs. Females of larger sizes produce more eggs per clutch and eggs of females spawning for the second and subsequent times are of higher quality than those of first-spawners. Further details on reducing exploitation rate can be found in the Reference Guide for Reducing Exploitation Rate and Effective Fishing Effort (Figure 4.4).
2. **Close fishing areas.** Closing a part of the total fishing area allows an unexploited portion of the population to develop in this protected area. An example is the Browns Bank closure in 1979. Egg production is higher in unexploited populations than in exploited ones since lobsters are more likely to survive to maturity and beyond. Thus, total egg production for the population (closed plus open areas) is higher than in a population all of which is subject to exploitation. Combining closed areas with maximum sizes (see below) would serve to protect any large animals above that size which moved out of the protected area.
3. **Increase minimum carapace size.** An increasing proportion of lobsters are sexually mature with increasing size, so the larger the minimum legal size, the greater the egg production (up to the point where the increase in fecundity with size no longer compensates for mortality.)
4. **V-notch berried females.** V-notching means cutting a shallow notch into an element of the tail fan of an egg bearing female. When marked animals are recaptured later, after having released eggs, they are returned to the water. This measure has the effect of protecting known spawners. Marks are retained for up to two molts. Under present practice in Maine, V-notching by fishermen is voluntary but landing

of V-notched animals is prohibited by regulations. There are currently experimental programs in the Gaspè and on the west coast of Newfoundland.

5. **Introduce a maximum size limit**. Prohibiting the landing of animals over a certain size serves to protect large fecund females and the males to mate with them. This measure is not very effective when exploitation rates are very high as few animals survive the fishery to reach the maximum size. However, if combined with closed areas (see above) this measure could be quite effective. There is evidence to suggest that larger females produce eggs of higher quality than those of first spawners or younger spawners.
6. **Release berried females.** This is one of the oldest conservation measures for lobsters and serves to preserve existing clutches of eggs to hatching. However, because female lobsters are only berried every second year in many areas, this measure is not fully effective in protecting productive females.
7. **Trap selectivity mechanisms.** Escape mechanisms allow animals below a certain size to leave traps easily. This measure has essentially the same impact as minimum sizes but lobsters can leave traps before being hauled to the surface and subjected to possible discarding mortality (handling, predation on sinking to the bottom). Entrance hoop size limits are intended to prevent lobsters above a certain size from entering the traps. It has the same objective as a maximum size limit but, as is the case for escape mechanisms, it avoids handling the animals in the fishing activity.

We want to increase egg production - but, what is a reasonable level? How do we get there?

Because population abundance is not routinely estimated for lobster, estimates of population egg production cannot be made. Instead, scientists use egg production per recruit the number of eggs which would be produced by an average female recruiting to the fishery during her lifespan as an indicator of egg production. Eggs/recruit can be estimated using available models incorporating information on growth, maturation, fecundity, fishing and natural mortality , and minimum carapace size. Thus, for example, when fishing mortality levels decline (allowing more females to survive to spawn), estimated egg production per recruit would increase. When fishing mortality is set to zero, an estimate of egg production per recruit in an unfished (virgin) population is obtained. On this basis, we have seen in the previous chapter that estimates of current egg production per recruit levels are less than 1%-2% of potential in some areas.

Considering various factors, including the uncertainties of computation techniques, the FRCC recommends an egg production per recruit target of 5% of that for an unfished population. We believe this is a reasonable and achievable medium term target. More importantly, it is a prudent approach! While the precise level may appear somewhat arbitrary, and as such, may be criticized by some, the absolutely essential requirement is that each LPA move soon and decidedly down the road towards this target.

Fortunately the egg-per-recruit models can also be used to compute the contribution of each tool towards the egg production target. These computations have been done by DFO biologists taking into account growth rates, mortality and fecundity/size relationships in each LPA. They are presented in Table 1 and are quite useful in looking at the **relative conservation effect** of various tools in the Reference Guide for Increasing Egg Production.

For example, the current estimate of the egg production level in **LPA4 - Magdalen Islands** - is 2.4%. The tool Reducing Exploitation Rate by 10% would increase the current level of egg production 1.0% to a total of 3.4% compared to the target of 5.0%. Using the tool Increase Carapace Size by 1/8 inch would increase the current level by 1.1%. Using the tool V-Notching 25% of Captured Females would increase the current level by 0.4%, etc.. It should be noted that the contributions are not additive and that, if a combination of measures is chosen, a more precise estimate of the combined contribution towards achieving the target can be provided to the LFA through working with the local lobster biologists. In this example the process is relatively straightforward as LPA4 is also LFA22.

The situation would be more complex in **LPA5, Gaspé South/ Baie des Chaleurs/ Southern Gulf of St. Lawrence/ Eastern Cape Breton/ Chedabucto Bay** - where a number of LFAs are involved. The tool Reducing Exploitation Rate by 10% , if used throughout the LPA (i.e. if implemented by all relevant LFAs irrespective of their current level) would increase the current level of egg production by moving it 0.6% closer to the target of 5.0%. Using the tool Increase Carapace Size by 1/8 inch would increase the current level by 0.2% provided it were implemented in each of the LFAs. Using the tool V-Notching 25% of Captured Females would have no impact under the present levels of high fishing mortality. What is more likely, and expected, is that the different LFAs might chose different tools, depending upon their current situation, towards achieving the target. Table 1 will help in this process by showing the relative merits of various tools. In the final

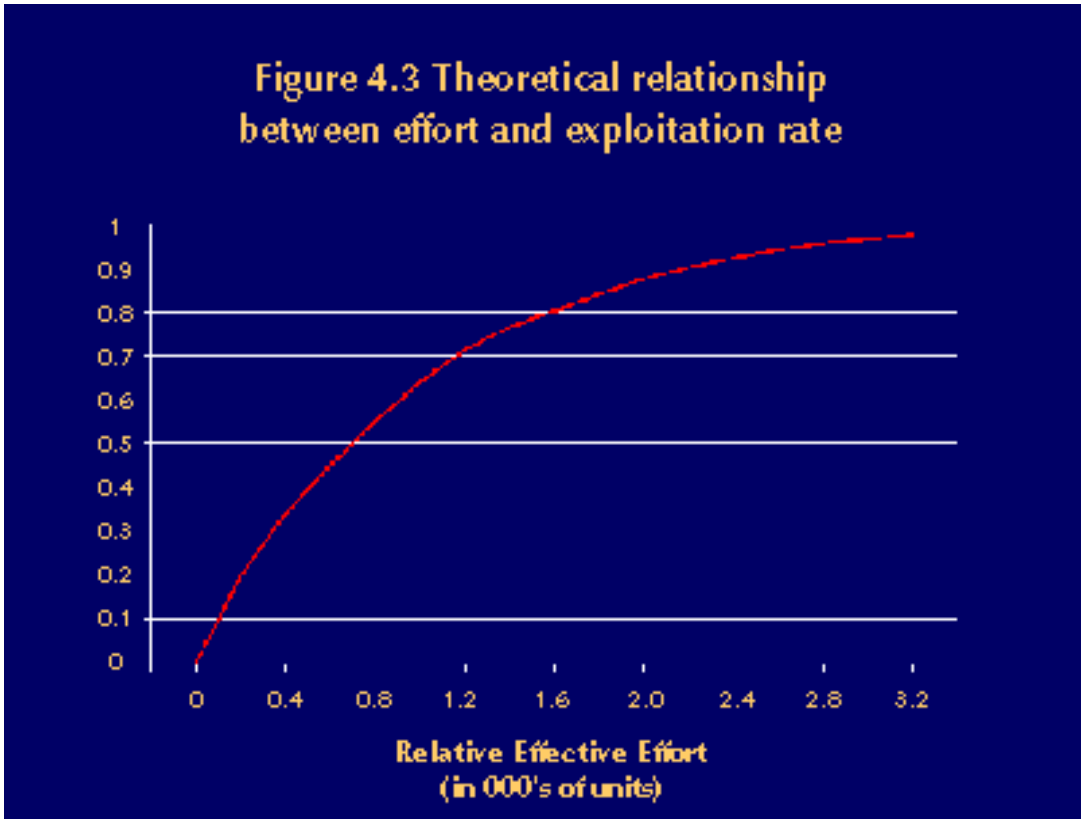
TABLE 1 HERE

analysis, however, the combined effect of all these measures would have to be calculated by the local lobster biologists and used in the decision making process. As well, local fisheries managers will need to ensure that the conservation definition, objectives and principles are not compromized in the development of conservation management plans for each LFA.

4.5.2 MEASURES TO REDUCE EXPLOITATION RATES

Exploitation rates are estimated to be very high. Lower exploitation rates would have several positive impacts on the whole fishery. They would result in increased egg production, improved yield per recruit and an enlarged size structure. Reduction in exploitation rates can be for the whole accessible biomass or for a particular segment (such as mature females or a particular designated protected area).

The exploitation rate is related to the effective fishing effort. We have seen in many other fisheries that an increasing effective effort creates a pervasive pressure on the resource and decreases the ability of management to attain agreed conservation objectives, irrespective of the other conservation measures which might already be in place. The FRCC recommends that significant reductions be made in both exploitation rates and effective fishing effort. Reductions can be made progressively over a reasonable period of time. The extent of the problem, and therefore the required reduction, varies from region to region.



The effective effort depends on the number of traps (effort pool), the number of trap hauls over a period of time, and the fishing efficiency related to the equipment and the knowledge of the fisherman. The relationship between exploitation rate and effective effort is certainly complex due to the variation in lobster catchability with time, the physical environment, and other factors. All of these inter-act so that reducing only the effort pool may not be sufficient to reduce exploitation rate as it could be compensated for by increasing hauling frequency.

Theoretically, there is a simple curved relationship between effective fishing effort and exploitation rate (Figure 4.3). The curve rises rapidly from the origin and flattens out at higher levels of effort. This means that at high levels of total effort, a greater reduction in effort is needed to attain a given reduction in exploitation rate than at lower effort levels. In this example, reducing the exploitation rate from 90% to 70% requires a reduction in relative effort from 2300 to 1200 units, a reduction of 1100 units; but reducing the exploitation rate from 50% to 30% requires an effort reduction from 690 to 360 or 330 units. **This means that substantial effort reduction is required to produce a real impact on exploitation rate when effort levels are very high, as in the present situation with lobster.**

Figure 4.4

Reference Guide for Reducing Exploitation Rate and Effective Fishing Effort

TOOLS

1 Reduce the number of licences and/or the number of traps per licence.

2 Reduce the number of trap hauls.

3 Shorten the fishing season.

4 Reduce the number of fishing days.

5 Reduce illegal fishing by improved enforcement.

6 Limit the transfer of licences; Limit the reactivation of inactive licences

1. **Reduce the number of licences.** This would reduce the total number of traps in the effort pool , which would serve to reduce exploitation rate if other factors (traps per licence, hauling frequency, catchability) remained constant.

   Reduce the number of traps per licence. Such a measure would reduce the total number of traps in the effort pool and would serve to reduce exploitation rate if other factors(number of licences, hauling frequency, catchability) remained constant.

2. **Reduce the number of trap hauls.** The number of trap hauls (the measure of effective fishing effort) must be reduced if exploitation rate is to be reduced; this can be done through actions such as reducing the number of licences, reducing traps per licence, reducing the length of the season and reducing hauling frequency.

3. **Shorten the fishing season.** The effects of shortening the season on effective fishing effort and exploitation rate are not simple, depending, in particular, on the seasonal pattern of fishing in each area. Where there is a short season of approximately 2.5 months (Newfoundland, Quèbec, southern Gulf, Nova Scotia from eastern Cape Breton to LFA 32), shortening the season at the end would tend to cut off

days at a time when the population has been reduced by fishing, leaving effort in a period when the population is abundant and where effort would have maximum effect. Because some populations become depleted quite quickly in the early weeks of the season, the effect of a small reduction in the season on reducing effective effort is quite limited in those areas. The same conclusion can be drawn for areas with long seasons (Nova Scotia south of LFA 32, Bay of Fundy, offshore). Thus, for this tool to be really effective, large reductions (perhaps in the order of 50%) would have to be made in most areas.

4. **Reduce the number of fishing days.** This would mean allowing lobster fishing only for certain days during the week. For example, forbid hauling traps on Sundays (as suggested by some fishermen), which would reduce the number of trap hauls over the entire season. As with reductions in season length, a substantial reduction in fishing days would be necessary to produce a marked effect on the exploitation rate.
5. **Reduce illegal fishing by improved enforcement.** We have been unable to quantify the effect of improved enforcement on effective effort since reliable data on the present situation has been impossible to obtain. However, anecdotal information is extensive. We emphasize that the first priority is to bring harvesting practices in line with existing regulations in areas where this is not presently the case.
6. **Limit the transfer of licences; Limit the reactivation of inactive licences.** One could reduce the amount of fishing effort re-distributed from one segment of an LFA to another by limiting the transfer of licences and the re-activation of inactive licences. Both measures are related to reducing the effective effort in localized areas by limiting the number of licences and the number of traps in the effort pool.

4.5.3 MEASURES TO IMPROVE STOCK STRUCTURE

The objective is to allow more animals to grow to enlarge the size (age) structure of the population and to prevent the fishery from being almost exclusively dependent on newly recruited animals. A broad size range of animals in the population, including a significant proportion of large animals, has benefits independent of its positive effect on egg production. A range of sizes enhances stability in the face of recruitment fluctuations and provides a buffer against uncertainties due to environment and assessment techniques.

Figure 4.5

Reference Guide for Improving Stock Structure

TOOLS

1. Reduce exploitation rate by reducting effort
2. Protect components of the population

1. **Reduce exploitation rate.** This measure, discussed above, allows more animals to survive the fishery and grow to larger sizes.
2. **Protect components of the population.** This protects certain categories of animals in the population allowing them to grow. Various tools can be

considered and have been discussed earlier, eg., protected area, maximum size limits, v-notching.

4.5.4 MEASURES TO MINIMIZE WASTE

Minimizing waste is related to the objective of deriving the fullest sustainable advantage from the resource . Fishing too small or recently molted individuals may result in waste in the sense that a greater advantage might have been taken at a later time from the same individuals by letting them grow in size or in meat yield.

Figure 4.6

Reference Guide for Minimizing Waste

TOOLS

1. Target lobsters at “optimal” size.
2. Target seasons when lobsters are at their best condition to esnure they are “full of meat”
3. Code of Practice - proper handling procedures at sea to minimize mortality and prevent injury and / or egg loss when releasing lobsters; proper handling through the processing chain.

1. **Target lobsters at optimal size.** During early life, lobster growth rates are high and compensate for mortality that occurs in the population. During the second part, growth is slow and is not able to compensate for mortality. Fishing too early results in growth overfishing , since letting those animals survive would provide a higher production in weight. According to yield per recruit models, targeting optimal size would optimize the yield. Generally, this would mean increasing the minimum carapace size limit in most geographical areas. However, considering the natural fluctuations in recruitment, optimizing yield per recruit does not guarantee an increase in overall catches. Furthermore, optimizing the yield does not necessarily mean maximizing the yield per recruit in terms of weight.
2. **Target seasons when lobsters are at their best.** A lobster grows through a series of molts during which the animal leaves its carapace, increases the volume of its body with water and builds a new carapace. A recently molted lobster is full of water with a low meat content of poor quality. It appears prudent to leave animals in this condition in the sea to allow them to restore their meat content.
3. **Code of Practice.** Injuries to lobsters such as loss of legs, carapace breaks, etc., may occur at sea due to bad handling practices. These injuries diminish the survival probability of lobsters. Releasing an injured animal at sea (berried female, undersized individual), creates an additional mortality that adds to the exploitation rate; bringing it ashore represents an economic loss. Bad procedures, such as violent throwing on the sea surface, may also induce egg losses on berried females and thus diminish the egg production. Proper procedures during handling at-sea and on-shore also minimize the waste while ensuring that lobsters landed are fully utilized. Losses during processing and holding for fresh sale may create additional pressure on the resource in order to maintain the profitability of these businesses.

4.6 CONSERVATION CO-ORDINATION

The FRCC believes that the resolution of all conservation issues must be worked out by fishermen and managers within the New Conservation Framework. In practice, this means that each LFA will have to recognize that it is part of a larger LPA and that the conservation measures it adopts must support, and not be contradictory to, the conservation objectives for the LPA as a whole.

If, for example, the objective is to increase egg production towards an agreed target, the measures used to achieve more egg production would be drawn from the tool kit of measures appropriate to this objective. Fishermen , in partnership with DFO, would have to decide the most appropriate ones for their LFA to help achieve the objective of the LPA, consistent with the conservation definition, objectives and principles recommended earlier. The specific process would be to follow the steps recommended in section 4.3. **The importance of Step 5 - measure performance faithfully; monitor progress towards the targets; and adjust the measures as appropriate - cannot be overstated.**

A similar approach would be used in dealing with the other lobster resource issues of reducing exploitation, improving the stock structure and minimizing waste.

Further, the sensitivies associated with the carapace size issue in the southern Gulf and the Aboriginal fisheries can and should be addressed and dealt with within the conservation framework. First, it is necessary that all parties accept that their actions will have an impact, either favourable or unfavourable, on others within their lobster production area. Second, the other elements of the framework, (specifically the conservation definition, objectives and principles) have to be rigorously applied by all lobster interests in the conduct of their fishery.

The importance of education and communication at various levels cannot be overstated. At a minimum, the advisory process will have to include consultations at the level of an LPA as well as at the level of the specific LFA. We expect the appropriate consultation process will evolve according to the respective LPA and the present Lobster Advisory Committees, following adoption of the New Conservation Framework.

5. PROGRAM IMPROVEMENTS

In addition to the New Conservation Framework for the resolution of conservation issues, the FRCC is recommending **improvements in three program areas of the Department of Fisheries and Oceans.**

5.1 ENFORCEMENT

During each consultation on lobster, the FRCC was told of increasing illegal fishing, both by licensed and non-licensed fishermen. Illegal activities include fishing out of season, recreational fishing, setting illegal traps, sale of undersized lobsters from one LFA in an LFA with a smaller carapace size, and scraping (and bleaching) eggs from berried females. We have also been told that these illegal activities are encouraged and in fact, accommodated by the unscrupulous activities of certain buyers.

Reasons put forward for the increase in illegal fishing vary and include: declines in other fisheries, the lucrative nature of the lobster fishery, the ease of engaging in illegal activity, the uncontrolled nature of the Aboriginal food fishery, the inadequate penalty structure and the lack of an enforcement presence. Numerous fisherme indicated that it had been years since they have been inspected by a Fishery Officer and many believe that recent declines in the fishery in some areas could have been avoided if there had been more effective enforcement.

It is clear that fishermen believe illegal fishing is on the increase and is affecting conservation. However, the actual extent of illegal fishing, and its conservation impact, could not be determined. DFO Enforcement personnel, while helpful, were not able to provide the Council with a quantification of illegal activities or a definitive view as to whether or not they were increasing.

All agree that the new sanction program can be an extremely effective deterrent. However, it was pointed out by many fishermen that, while effective, sanctions were discriminatory in that unlicensed fishermen received small fines that in no way were equivalent to the penalty effects of license sanctions on licensed fishermen. For conservation measures to be effective the penalties for abuses must be applied consistently.

The FRCC treats these claims by fishermen seriously and recommends they be acted upon through the following enforcement approaches:

1. **Improve enforcement visibility by:**

- **increasing the time spent by fishery officers in the field by reducing offic paper burden;**
- **continuing to encourage and promote Community Watch/ Oceanwatch programs;**
- **continuing to announce publicly enforcement actions and the names of offenders.**

2. **Involve stakeholders more directly in enforcement activities.**

3. **Improve sanctions and the penalty system by:**

- **better informing the Judiciary of the negative conservation impacts illegal fishing and seeking parity in penalties against fishermen, non-fishermen and buyers;**
- **ensuring its continuing effectiveness through periodic and meaningful reviews with stakeholders.**

5.2 SCIENCE

A significant amount of information has been gathered on the lobster fishery and on lobster biology. Data on sizes at maturity, exploitation rates, and the models of egg per recruit provide useful information for establishing conservation principles and strategies. Further scientific effort must, however, be pursued under defined priorities.

Conservation of lobster stocks requires improvements in the definition of targets, the selection of measures to achieve these targets, and the monitoring of stoc status in relation to these targets. To achieve this requires an appropriate response and commitment from the science sector.

The gathering of scientific knowledge is an on-going process and the related definition and implementation of conservation measures will evolve with the progress in obtaining this knowledge. It must be recognized, however, that science will never be able to provide absolute certainty about stock status. Between prudent and prove it approaches, the former has to be preferred. In this context, a good feed-back system must be implemented to know if the conservation measures are being successful. This is in accordance with the principle of responsiveness proposed earlier (Section 4.2).

In many respects the lobster fishing industry and DFO scientists have good working relationships already. However, scepticism exists among fishermen regarding the theoretical models presently in use. Fishermen expect more evidence that the model reflect what is actually happening in the fishery and they want to be informed and to understand the scientific basis for decisions. Fishermen also want to be more involved in research and they are ready and willing to cooperate with scientists on research projects, but the information must flow both ways; from the scientists towards the fishing industry and from fishermen towards scientists. An adequate exchange allows industry to evaluate how it is doing and it provides scientists with ground-truthing of their results.

The FRCC recommends the following science priorities and research activities which are grouped according to the following interrelated needs:

1. **Definition and assessment of conservation measures;**
2. **Monitoring current stock status;**
3. **Understanding long term trends.**

1. Definition and assessment of conservation measures

The first priority is to gather precise information regarding conservation measures and targets and to more fully assess the actual benefit of such measures.

Reproductive capacity: Reproductive capacity of the lobster stocks is presently the subject of intense concern and requires special attention. As we have stated earlier, since spawning biomass is not known, it is not possible to calculate the actual population egg production. For the time being, biologists calculate a potential egg production relative to one recruited female (using a model of egg production per recruit that takes into account growth rates, mortality rates and fecundity rates with size.) According to this theoretical model, the present egg production is less than 2% of the potential in a situation with no exploitation. Models of eggs per recruit are useful tools. However, they can only be used as indicators, since they cannot be translated into actual reproductive capacity of stocks. We may need a more applicable definition of egg production (for instance population egg production per unit area) and practical indicators which are easy to monitor. A way suggested to optimize the reproductive capacity is

to diminish the mortality of the females. In this regard a better understanding is required of:

- the effect of female V-notching, which should be monitored and assessed in the areas where it takes place;
- the validity of protecting large females (e.g. is maintaining a few large females better than protecting a large number of small females?)
- the capacity of the bottom environment as a bottle-neck in limiting the effect of increasing egg production.

Definition of the geographical scale of conservation: The LPAs proposed in this report are based on currently available information on common biological parameters and physical oceanographic features. The definition of an LPA is based on our hypothesis that lobster production is influenced over a relatively large area and that conservation measures implemented within a small geographical area (such as an LFA) may affect other areas, either positively or negatively. Certainly, some fishermen believe that some areas may be a source of larvae for other areas. In order to better understand and fine tune the LPA process over time, the following is needed:

- a further determination of oceanographic features (hydrodynamics, nature of lobster habitats) that could be used to more precisely establish LPA boundaries;
- a better definition of the displacement and migration patterns of adult lobsters; and,
- an examination of larval drift, which may be responsible for most of the exchanges between areas, to understand the interaction between fishing areas.

As well, the role and effect of protected areas (in time and/or in space) should be studied (e.g. permanent protection of refuge areas and nursery grounds; temporal protection of spawning grounds). To define some possible protected areas, it is necessary to describe and map, in both time and space, nursery grounds, reproductive grounds, and the diffusion of animals from these areas toward exploited areas. The potential benefit of artificial habitats may also be assessed in the same general theme.

Gear and technology: Selectivity of gears is a common tool to protect part of the biomass (e.g. immature animals, large animals). Clear answers should be provided on the effect of trap selectivity and escape vents on the protection of small lobsters; and, on the effect of the size of entrance rings on avoiding the capture of large lobsters.

2. Monitoring current stock status

Secondly, monitoring of the lobster population is necessary to understand what has happened and what is happening to it.

It also permits assessing the effectiveness of conservation measures and provide the rationale for adjusting them accordingly.

Current scientific data are able to provide a perspective of lobster stock status on a large geographical scale but are unable to say what is really happening at the scale of the LFAs. Key subjects which should be addressed more precisely include:

- estimates of exploitation rates;
- the relationship between exploitation rates and effort;
- catchability, including the impacts of selectivity mechanisms like escape vents and size of entrance rings.

An appropriate data base is required to follow trends in effort, over space and time, and trends in catch rates. An on-going measurement of exploitation rates, related to the distribution of effort, is also needed.

3. Understanding long term trends

Thirdly, research on understanding long term trends should be intensified as soon as possible.

Several aspects of the lobsterís ecology must be better understood. The physical environment (e.g. hydrology, type of habitat throughout the life cycle) appears to be a key issue. Settlement and establishment of young lobsters on the bottom, which determines future stocks, needs to be addressed as well. Some of the specific areas are:

- the dynamics of benthic settlement;
- the source of post-larvae (related to the larval drift);
- the determination of early benthic stage abundance.

Parallel exploitation activities may occur on lobster habitat, eg, kelp harvesting, rock crab fishing and use of space for marine aquaculture. Fishermen also feel that the expected rebuilding of groundfish stocks may have an impact on lobster recruitment.The impact of these various factors on lobster stocks has to be addressed in order to understand the general predator-prey system involving lobster. Predictive tools have to be improved and developed. These might include population dynamic models including biological parameters as well as environmental parameters; and, spatial fishery models incorporating much of the available information. Such models would enable scientists and fishermen to:

- examine the results of management measures;
- analyze the interactions between LFAs;
- examine the potential effect of other fishing activities on lobster stocks;
- simulate, on a mean-long term basis, the possible effect of conservation action at the scale of geographical conservation areas (LPAs).

SUMMARY

We recognize that these recommendations represent a significant scientific package which will take a number of years to complete. The knowledge obtained will be ongoing and will provide better information for proposing accurate conservation targets and for monitoring the fisheries in relationship to conservation actions. In the meantime, much progress can be made with current information and the proposals put forth in this report. It is important to restate that conservation measures will be understood, accepted and implemented only if the fishing industry is properly informed and fully involved.

5.3 EDUCATION - COMMUNICATION

The implementation of conservation measures can be really effective only if those measures are widely understood and accepted by stakeholders, including the public in general. Resource conservation is not the result of regulation only but also the result of a general attitude that can be improved through a proper education and communication system.

A good fisheries conservation education/ communication initiative should ensure that clients receive all the necessary information regarding the fishery and its environment in a form which will allow them to make a judgement on how the fishery and the resource are doing. As well, they should feel fully involved in the conservation process, be able to actively and efficiently participate in the science data

gathering and analysis, and participate effectively in the decision making process.

Specifically, stakeholders need to receive on a regular basis and in a simple, easily understandable way, information on:

- science activities and scientific tools (data requirements and data processing: how it works, what does it mean);
- findings on fishery status, resource status, biological and ecological data and general marine environment (how we are doing with the resource;
- how the resource is doing in its environment); conservation principles and the regulatory system, with explanation of the rationale for regulatory measures (why constraints exist);
- enforcement system and results.

The information brochures already prepared by scientists in some areas are a good start. This approach should be expanded and completed through other media such as educational videotapes. The FRCC was particularly impressed with the fisheries information package developed by the Native Council of Nova Scotia and a similar approach could be used for education/ communication efforts for the New Conservation Framework. Regular articles in local newspapers and presentations on electronic media may also be considered, especially during the fishing season.

As mentioned earlier, fishermen strongly desire a greater involvement with science in assessing the state of the lobster fishery. They view this as a way through which they can provide input into the development and implementation of science projects, as well as obtain feedback on the results of projects carried out. This two-way communication system already exists in several regions, with regular workshops involving scientists and fishermen. Such workshops are positive and should be a continuing scientific activity to help fishermen provide accurate reliable data but also to help scientists better integrate knowledge gained from years of fishing experience into their own process. **In short, fishermen and their organizations should be actively involved in the development, implementation, and evaluation of science projects directed at the lobster fishery.**

The Lobster Advisory Committees can be excellent mechanisms to get information to the fishing industry as committee members have, for the most part, good contacts with fishermen and processors in their particular areas. Participation by DFO Science and Operations officials in the committee process is strongly supported. This process, however, is not working effectively everywhere, and needs to be strengthened as the major mechanism for input from the fishing industry into the management of the lobster fishery. Meetings should be scheduled regularly, with adequate representation from government and fishermen, and feedback provided on decisions reached as a result of recommendations coming from the committees to senior management in DFO. Aboriginal groups should be encouraged to participate in their local Lobster Advisory Committees.

As well, fishermenís organizations have a major role to play in the education/communication activities targeted at the lobster fishery. This was clearly demonstrated by the quality of briefs prepared and presented by these organizations during the FRCC consultation process.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The FRCC review of lobster conservation entailed over nine months of discussion, consultation and analysis. Vast amounts of input from industry and statistical and scientific data from DFO were considered. As a result, we have reached certain conclusions which we believe accurately reflect the current situation as a whole in Atlantic Canada; each conclusion may not, however, be fully reflective of the specifics in each and every area where lobster are fished.

Lobster conservation is complex and the issues are sensitive. Three key factors contribute to this complexity and it is important they be kept foremost in mind. First, to look at lobster conservation requires looking comprehensively at the lobster resource and at the whole lobster fishery, including its management system. Second, there is much variability between regions and widely diverging views amongst fishermen on most issues. Third, current scientific knowledge cannot answer a number of key questions.

The key elements in achieving a ëhealthy fisheryí are **good egg production, a reasonable fishing mortality and a biomass composed of several year classes.**

Based on its analysis, the FRCC believes there is a resource conservation problem in that "**we are taking too much, and leaving too little"** . Considering the available data, the current fishery is designed towards high exploitation rates (estimated to be as high as 85% in many areas), harvests primarily immature animals, and results in very low levels of egg production (estimated to be as low as 1%-2% of what might be expected in an unfished population). In these circumstances, although lobster stocks have traditionally been quite resilient, the risk of recruitment failure is unacceptably high.

Many responsible stakeholders are quite concerned about the current situation, as is the FRCC. Furthermore, the Council believes the current high-risk situation is worsening in that fishing effort continues to increase as does the geographical range of the fishery in many areas, thereby eliminating margins of safety that may have existed previously. As we have seen in so many other fisheries, the presence of a very high and increasing fishing effort exerts a pervasive pressure both on the resource and on the ability of fisheries management to attain agreed conservation objectives - irrespective of the other conservation measures which might be put in place.

A more prudent or precautionary approach is required and conservation measures are needed to increase the level of egg production and to significantly reduce both exploitation rates and the effective fishing effort.

In line with the input received during consultations, the Council concluded that rather than trying to prescribe specific measures for each Lobster Fishing Area (LFA), it would be more appropriate and effective to design a mechanism and the tools whereby stakeholders can participate in and take responsibility for the decisions required to ensure a sustainable fishery.

Fishermen have clearly stated that they want to maintain the general philosophy of the current management system and they want to fully participate in conservation and management decisions. The FRCC accepts these basic tenets and wants to reinforce and strengthen them and to make them more workable than at present. We envisage analyzing resource data and considering conservation issues on a

geographical basis which more closely reflects the biological characteristics of different lobster populations; and in an overall lobster conservation framework which, unfortunately, does not currently exist.

The sensitive questions around the carapace size issue in the southern Gulf and the aboriginal fisheries have conservation implications and need to be rationally addressed and resolved.

Illegal fishing is seen as a major conservation issue in that it increases pressure on the resource, distorts resource management statistics, encourages others to be dishones and leads to overall skepticism over the benefits of taking conservation measures. The enforcement of current measures needs to be improved.

Along with the prudent approach suggested in this report, lobster conservation should be supported by good scientific information in making conservation decisions and good scientific feed-back systems to know if the conservation measures are being successful. Similarly, conservation measures can only be effective if they are widely understood and accepted by stakeholders. A good fisheries education/ communication initiative is essential.

6.2 RECOMMENDATIONS

The Council's recommendations on lobster conservation and their rationale are detailed in Chapters 4 and 5. Key recommendations are identified below.

1. The FRCC recommends implementation of a **New Conservation Framework** which includes:

a. definition of lobster conservation with related objectives;

b. conservation principles;

c. a conservation strategy;

d. a more appropriate geographical basis for considering lobster conservation strategies - Lobster Production Areas (LPAs);

e. series of tool kits of conservation measures that can be drawn upon selectively by a specific area or region to meet conservation objectives and targets.

Under this New Conservation Framework, the Minister of Fisheries and Oceans would be concerned mainly with establishing the conservation principles, objectives and targets. Fishermen, through their organizations and the Lobster Advisory Committees, would work out, in partnership with DFO, the detailed measures that would be most suitable to their fishing areas, consistent with the principles and objectives.

2. The FRCC recommends the establishment of seven conservation units which we are calling Lobster Production Areas (LPAs). Within these areas, the production characteristics of lobster are more or less homogeneous and accordingly, comparable conservation measures should yield comparable effects on the whole lobster population within the LPA. Fundamentally, LPAs are areas of influence for conservation and are used in establishing conserva-

tion strategies. However, LPAs are not intended to be operational management units nor units in which the management measures in place for the various LFAs are necessarily standardized.

3. The FRCC recommends maintaining the general philosophy of the current management system based upon protection measures and input controls. The Lobster Fishing Areas (LFAs) should remain the geographical basis for the management system and steps should be taken to make them more workable than at present.

4. The FRCC recommends that egg production be increased.

   Considering various factors, including the uncertainties of computation techniques, an egg production per recruit target of 5% of that for an unfished population is recommended. We believe this is a reasonable and achievable medium term target. More importantly, it is a prudent approach! While the precise level may appear somewhat arbitrary, and as such, may be criticized by some, the absolutely essential requirement is that each LPA move soon and decidedly down the road towards this target.

5. The FRCC recommends that significant reductions be made in both exploitation rates and effective fishing effort.

   The exploitation rate is related to the effective fishing effort. We have seen in many other fisheries that an increasing effective effort creates a pervasive pressure on the resource and decreases the ability of management to attain agreed conservation objectives, irrespective of the other conservation measures which might already be in place. Reductions can be made progressively over a reasonable period of time. The extent of the problem, and therefore the required reduction, varies from region to region.

6. The FRCC recommends that the lobster stock structure be improved and that waste be minimized.

7. The FRCC recommends improvements in three program areas of the Department of Fisheries and Oceans:

   - Enforcement
   - Science
   - Education/ Communication.

APPENDICES

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APPENDIX 1: GLOSSARY

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Assessment, stock assessment: The process of determining what the status of a fishery stock is in relation to exploitation.

Benthic: Bottom-living; juvenile lobsters become benthic when they settle on the bottom after the planktonic larval phase.

Berried females: An egg-bearing female lobster in which the eggs are visible on its underside. Under regulation, berried females must be released.

Biodegradable trap materials: Materials that degrade over time such that the trap comes apart and therefore does not ghost fish.

Canners: Lobsters of less than 3 3/16" (81 mm) carapace length. The name derives from the fact that small lobsters were canned in the early days of the fishery. See market.

Carapace size restrictions: The back, or carapace, of the lobster is measured using a preset gauge. Depending on area, lobsters at a certain specific carapace length have common characteristics regarding maturity, number of moults, etc.

Catchability: The efficiency with which animals are captured by a given level of fishing effort. Mathematically, catchability is expressed as the proportion of the stock captured by one unit of fishing effort.

Effective effort: The amount of fishing effort actually applied in a fishery.

Effort, fishing effort: The amount of fishing used to obtain the catch; can be expressed in numbers of traps, hours trawling, numbers of hooks on longlines, etc. (see also effective effort.)

Egg production: The total number of eggs produced by the population of a specific area.

Eggs per recruit: An estimate of the number of eggs that one female recruited to the fishery would produce over her lifetime.

Escape mechanisms: Escape mechanisms are installed in traps to allow small lobsters to escape before being hauled to the surface. Sizes of lobsters released by the escape mechanism are related to the dimensions of the escape mechanism.

Exploitation rate: The percentage of lobsters vulnerable to the fishery which are harvested in a given year. Exploitation rate is another way of expressing fishing mortality.

Growth/ recruitment overfishing: Growth overfishing occurs when individual lobsters are caught before they can provide the maximum meat yield per recruit. Fishing too early results in a yield waste. Recruitment overfishing on the other hand, occurs when fishing reduces the stock to a level where subsequent recruitment is lowered. It is related to the level of egg production.

ICES: International Council for the Exploration of the Seas; an international body which encourages concerted oceanographic investigations and promotes a planned exploitation of the resources, primarily in the North Atlantic.

Input controls, input management: A form of fisheries management in which inputs (fishing effort, fishing gear characteristics, etc) are controlled; contrast with the output management approach in which fisheries outputs such as landings are controlled, for example by quotas.

Limited entry: A management tool whereby the number of licensed vessels or fishermen in the fishery is restricted or capped.

Limits on trap size: Lobster traps can catch more than one lobster at a time and increasing the size can, in the view of many fishermen, increase efficiency. Fishermen in individual Lobster Fishing Areas have agreed to maximum sizes for lobster traps and in some areas to equivalency criteria relating the size of trap to the number of traps that can be set.

Lobster Fishing Area (LFA): An area within which specific lobster management regulations apply.

Lobster Production Area (LPA): An area within which the production characteristics of lobster are more or less homogeneous. The report proposes that general conservation objectives and strategies be defined at the LPA level, but that specific measures for attaining these be defined and implemented at the LFA level.

Markets: Lobsters of 3 3/16" (81mm) carapace length and greater. The namederives from the fact that large lobsters went to the live market in early days, while smaller lobsters (see canners) were processed.

Model: A simplified description of phenomena allowing a practical analysis. Mathmatical models involve a set of relationships to quantify those phenomena; they are commonly used in assessments of the status of fish stocks.

Overfishing: The situation when a stock is being exploited beyond its long-term productive capacity; put simply, when the capital is being reduced rather than when the interest is being cropped. Two kinds of overfishing are often considered: growth overfishing, when animals are caught at a size where more growth would provide better production (fishing at too young an age results in yield waste); and, recruitment overfishing, when fishing reduces the stock to a level where subsequent recruitment is lowered; it is related to the level of egg production.

Planktonic: Drifting in midwater; many marine organisms such as lobster have a planktonic larval stage (contrast with benthic).

Recruitment: The process of becoming vulnerable to the fishery. For lobster and many other species, recruitment is generally associated with attaining legal size, but this can occur with movement into the fishery area.

Seasons: Times in the year when a lobster fishery can occur. Seasons vary from one area to another.

Stakeholders: All those who have an interest (a stake) in a fishery.

Trap limits: A limit per vessel of the number of traps that can be set in a Lobster Fishing Area.

V-Notching: Egg-bearing females (or any other group of lobsters targeted for protection) can have a shallow notch cut into an element of the tail fan; once marked, a regulation (or voluntary program) would be necessary to ensure that the animals would be released if recaptured.

Yield per recruit: The fishery yield obtained, on average, from each animal which recruits to the fishery (becomes vulnerable to the fishery). It is estimated from models including growth, mortality and size at recruitment; maximum yield per recruit is used as a reference point in considering whether a fishery suffers growth overfishing.

APPENDIX 2 - CONSULTATIONS

- LETTERS TO STAKEHOLDERS
- SUMMARY OF CONSULTATIONS
- LISTING OF BRIEFS
- REFERENCES AND CONTRIBUTORS

LETTERS TO STAKEHOLDERS

December 28, 1994
(revised)

TO THOSE CONCERNED WITH CONSERVATION OF ATLANTIC LOBSTER

The Minister of Fisheries and Oceans has asked the Fisheries Resource Conservation Council (FRCC) to review the current approach to lobster conservation and to provide him with recommendations on conservation strategies for Atlantic lobster.

The Council has prepared the attached discussion document for use in consultations throughout the Atlantic Provinces and Quebec. A small team composed of the Chairman of the FRCC, Mr. H. Clarke, two FRCC members, Mr. F. d'Entremont, a lobster and groundfish fisherman from Pubnico Nova Scotia and Dr. J-C. Brêthes, Professor of Oceanography, University of Quebec at Rimouski, with technical support from Mr. R. Johnston, DFO Fisheries Operations, Dr. H. Powles, DFO Fisheries Science and Mr. D. Rideout of the FRCC Secretariat will be responsible for conducting the consultations and reporting its findings to the Council.

The consultations will start at 9:00 AM with the presentation of formal briefs followed by general discussion and questions and answers. By way of this letter the Council is encouraging representatives of Lobster Advisory Committees to attend the appropriate consultations. It is the intent of the Council to look at conservation principles and strategies in the broader sense for long term conservation and not to duplicate the consultation mechanism already in place regarding fishery management for each Lobster Fishing Area (LFA) or to interfere directly in the establishment of local area lobster management plans.

The following schedule has been developed:

January 10	Les îles de la Madeleine, Québec - Château Madelinot, Cap aux Meules
January 11	Gaspé, Québec - Motel Adams
January 25	Corner Brook, Newfoundland - Glynmill Inn
January 26	Gander, Newfoundland - Albatross Motel
January 31	Newcastle, New Brunswick - Auberge Wandlyn Inn
February 1	Charlottetown, Prince Edward Island - Rodd Royalty Inn and Convention Centre
February 2	Saint John, New Brunswick - Delta Brunswick Hotel
February 6	Yarmouth, Nova Scotia - Yarmouth Fire Hall
February 7	Port Hawkesbury, Nova Scotia - Nautical College

The Council has also scheduled a consultation with leaders of First Nations and Native Councils for January 30 in Moncton, New Brunswick. As well, an Atlantic wide consultation will also be scheduled. The Council is encouraging the presentation of written or oral briefs and, if possible the submission of any written briefs prior to the consultations.

Presentations can be scheduled by contacting the FRCC Secretariat in advance by telephone at (613) 998-0433 or by fax at (613) 998-1146. Briefs that are available prior to the consultation should be sent to:

Fisheries Resource Conservation Council
200 Kent Street
Ottawa
K1A 0E6

H.M. Clarke
Chairman

December 28, 1994

LOBSTER CONSERVATION

Consultation by the Fisheries Resource Conservation Council

Introduction:

The Minister of Fisheries and Oceans has asked the Fisheries Resource Conservation Council (FRCC) to review the current approach to lobster conservation and to provide him with recommendations on conservation strategies for Atlantic lobster.

As previously announced, the FRCC will be consulting generally, and with established Lobster Advisory Committees. It is the intent of the Council to look at conservation principles and strategies in the broader sense for long term conservation and not to duplicate the consultation mechanism already in place regarding fishery management for each Lobster Fishing Area (LFA) or to interfere directly in the establishment of local area lobster management plans.

To-date, the FRCC has received presentations from Department of Fisheries and Oceans scientists and has had an initial look at the basic facts regarding lobster biology and the lobster fishery. A small team, with technical support, is taking the lead on this conservation review and has prepared the following brief summary and questions to help focus consultations.

Summary:

Lobsters fished in Atlantic Canadian waters, as well as in the Gulf of Maine, belong to one species, *Homarus americanus*. However, biological and physiological characteristics, such as growth rates and age and size to sexual maturity, vary considerably from region to region based upon genetic variations and environmental conditions, such as water temperatures. For example, scientists suggest that 50% of females mature at a carapace size of 81 mm in Newfoundland, 79-84 mm in les îles de la Madeleine, 71 mm in the Southern Gulf of St. Lawrence and 102 mm in the Bay of Fundy. Mixing of adjacent populations may occur as larvae drift with the currents for a period of 3-10 weeks after hatching, or through movement of adult lobsters from one lobster fishing area to another.

Biological data on lobster stocks is not sufficient for scientists to provide estimates of biomass and future recruitment, or to recommend biological reference points for harvesting levels, as is generally the case for groundfish and some other species of shellfish. Consequently. resource conservation is achieved through management measures that are focused on: 1) “protection measures” such as minimum carapace sizes and protection of “berried” females and 2) “effort controls” such as trap limits and fishing seasons. Although the general principles are common to all areas, specific rules are tailored for each lobster fishing area, according to its biological, ecological and socio-economic characteristics.

For unknown reasons, since the mid 1970's lobster landings in most regions have dramatically increased over a 15 year period and while still above historical averages, have been decreasing for most areas since peaks in the early 1990s. Overall, Atlantic wide lobster landings were down by 15% in 1993 compared to 1991. We have been told that fishing effort and exploitation levels are very high (the exploitation rate exceeds 60% of the estimated fishable biomass and reaches 85% in some regions) and that relative egg production, compared to what might be expected from an unfished population, is dangerously low, maybe as low as 1% in some regions. Some people think we may be experiencing the beginning of a collapse. However, there are considerable uncertainties associated with our level of knowledge and calculations in this regard.

Questions:

1. Do you perceive a lobster conservation problem? In any event, how do you interpret the increase in landings during the 1980s and decrease during the past few years?
2. Are there basic conservation principles or conservation targets, such as for reproductive capacity, that should be established?
3. Is there an acceptable definition of conservation that can guide us?
4. What are your views of the conservation effects of measures currently employed, including: fishing areas; limited entry; trap limits; escape mechanisms on traps; seasons; release of berried females; carapace size restrictions? Are there other measures such as v-notching females; maximum carapace size restrictions; additional protected spawning areas; biodegradable trap materials; and, limits on trap size that could help?
5. The Sparrow decision of the Supreme Court of Canada outlined an Aboriginal right to fish for food, social and ceremonial purposes, subject to conservation. Recognizing that this obligation can not be constrained by commercial lobster management plans, the Council would be grateful for stakeholder and First Nation views on possible approaches that should be required for lobster conservation to ensure that lobster harvests by First Nations are included in the conservation equation leading to the development of lobster management plans.

February 16, 1995

To Members of Lobster Advisory Committees and
Others Interested in the Atlantic Lobster

I am writing to thank those who presented briefs or otherwise participated in the recent round of consultations conducted by the Fisheries Resource Conservation Council (FRCC) with respect to lobster conservation.

By way of background, the FRCC has been asked by the Minister of Fisheries and Oceans, the Honourable Brian Tobin, to review the current approach to lobster conservation and to provide him with recommendations on conservation strategies for Atlantic lobster. In response, the Council arranged presentations from various scientists and lobster biologists within DFO, established a lobster "working team", prepared a discussion document to focus consultations, and organized a round of consultations which were conducted over the past several weeks.

Consultations, designed as open discussions with the established Lobster Advisory Committees, were held at Cap aux Meules and Gaspé, Quebec; Corner Brook and Gander, Newfoundland; Newcastle and Saint John, New Brunswick; Charlottetown, Prince Edward Island; and, Yarmouth and Port Hawkesbury, Nova Scotia. In addition, meetings were arranged to discuss lobster conservation with both the Native Councils and First Nations on January 30th in Moncton. Overall, these meetings attracted a tremendous amount of interest in that total attendance exceeded l,000 and some 45 briefs were presented. In most cases these briefs reflected a consensus developed at pre-meetings arranged by the presenters with groups of fishermen in their local communities and regions.

The FRCC's lobster working team was impressed with the excellent quality of the written briefs and verbal presentations which responded to the questions raised in the FRCC consultation document and which also raised subjects which were common to a number of areas, including the level of enforcement of current regulations; science requirements; and, the current Lobster Advisory Committee process.

In some areas there was a strong consensus that, while there may very well be ways of improving their effectiveness, Lobster Advisory Committees (with participation by local fishermen and local DFO managers and scientists) are best suited for advising on the specific measures most appropriate for the local Lobster Fishing Area (LFA). In fact, on a number of occasions a very real fear was expressed that there is an intent or plan to replace these Lobster Advisory Committees and the current Department of Fisheries and Oceans management system with the FRCC. **There is no such intent or plan**.

The Fisheries Resource Conservation Council is an advisory body to the Minister of Fisheries and Oceans. Its mandate is quite specific and relates exclusively to conservation. **The FRCC does not manage fisheries**. Rather, the Council makes recommendations designed to help rebuild and/or maintain fish stocks at "optimum" levels, and it does so by bringing together members of the fishing industry, DFO science and fisheries management, and external scientific and economic expertise in one body to:

- advise the Minister on research and assessment priorities;
- review DFO data and advise on methodologies;
- consider conservation measures that may be required to protect fish stocks; and
- review stock assessment information and conservation proposals, including through public hearings, where appropriate.

FRCC recommendations to the Minister of Fisheries and Oceans on fish stocks are public documents. Once those recommendations have been given to the Minister, the determination of whether they are accepted and how they are implemented rests solely with the Minister of Fisheries and Oceans. With respect to lobster, the FRCC's work will be completed upon submission of its recommendations to the Minister. As previously stated, this review of lobster conservation is directed at overall conservation requirements and broad conservation principles. To quote from our original consultative document of December 28, 1994, "It is the intent of the Council to look at conservation principles and strategies in the broader sense for long term conservation and not to duplicate the consultation mechanism already in place regarding fishery management for each Lobster Fishing Area (LFA) or to interfere directly in the establishment of LFA lobster management plans.". There is no intention to replace Local Lobster Advisory Committees.

We are very appreciative of your efforts in preparing for the recent round of meetings, and all your comments, both positive and negative, will be weighed carefully by the Council in its deliberations.

As outlined at the consultation meetings, the lobster team will shortly be reporting to the full FRCC who, in turn, will be reviewing the briefs and the work to date and determining our next steps. We will ensure that you are informed of these plans and the time frames for our recommendations.

Sincerely,

H.M. Clarke
Chairman

February 17, 1995

To First Nations And Native Councils Interested in
Atlantic Lobster Conservation

As you may be aware, the Fisheries Resource Conservation Council (FRCC) has been asked by the Minister of Fisheries and Oceans, the Honourable Brian Tobin, to review the current approach to lobster conservation and to provide him with recommendations on conservation strategies for this specie. The FRCC, who's only function is to provide conservation advice to the Minister, held a series of consultations on lobster conservation throughout Atlantic Canada and Quebec during January and early February of this year.

In an effort to ensure that both First Nations and Native Councils were aware of the FRCC's approach and, to allow for input, the FRCC invited discussions with Native Councils and with First Nations in Moncton, N.B. on January 30, 1995. Not all Native Councils or First Nations were represented at the Moncton meetings and I have become increasingly aware that communication problems might have been inadvertently created. I would like to address these communication problems and am open to suggestions that you may have.

I am attaching for your information a letter that was sent to attendees of the other consultation meetings to clarify the mandate and scope of the FRCC's work on lobster. See also the attached terms of reference for the FRCC.

Clearly, we all share a common concern for the conservation of the resource and it is my hope that the FRCC can develop sound conservation advice for the Minister's consideration. I would be grateful for your input and assistance.

Sincerely,

H.M. Clarke
Chairman

Attachments

SUMMARY OF CONSULTATIONS

A brief summary of each consultation follows:

Magdalen Islands, Quebec - January 10, 1995

Issues raised during the meeting included: concern about a decline in landings from the commercial lobster fishery of 30 % over the past two years; significantly increased fishing effort as a result of new technology/better methods; the need for more work by DFO scientists on lobster that should be carried out in close consultation with commercial fishermen examining such subjects as spawning and nursery grounds, egg production, and water temperature; and the importance of the lobster fishery to the local economy of the Magdalen Islands.

Gaspé, Quebec - January 11, 1995

Issues raised during the meeting included: increased dependence on lobster fishery as a result of declines in groundfish and pelagics fisheries; concern about impact of rock crab, snow crab, and spider crab on lobster stocks; strong concern about impact of increasing seal population on lobster stocks; strong support for existing conservation measures and need to provide more enforcement to ensure conservation measures are respected; interest in V - notching of females to increase egg production (pilot project being implemented by one Association); increase in number of undersized berried females; a desire to improve incomes of those remaining through a lobster licence buy-back; use of protected areas and creation of artificial reefs; and, the close relationship that exists between DFO and the industry.

Corner Brook, Newfoundland - January 25, 1995

Issues raised during the meeting included: increased effort in lobster fishery due to declining stocks in other fisheries; serious concerns about illegal fishing, the need to increase enforcement efforts, and impose more severe penalties to counteract the illegal activity; decline in landings in most areas in recent years; the need to remove part-time fishermen from the lobster fishery; suggestion that effort could be decreased through a government buy-out of licences; concern about the accuracy of DFO statistics on landings because of the underground market for lobsters as a result of TAGS Program and VI changes; concern about impact of seals and lump fish on lobster stocks; and some concern about gear conflict between the lobster and scallop fishery in certain areas.

Gander, Newfoundland - January 26, 1995

Issues raised during the meeting included: significant increase in effort in lobster fishery as a result of decline in fishing activity in groundfish and pelagics fisheries; concern about the numbers of small lobsters and egg-bearing lobsters being fished illegally and marketed underground; concern about the accuracy of DFO statistics; strong support for increased enforcement in the lobster fishery with higher penalties for illegal activity with emphasis shifted from other species such as salmon; strong support for increased science on lobster in such areas as spawning areas, egg production, and food chain; and concern about the impact of seals and other predators on lobster stocks.

Native Councils, Moncton, New Brunswick -January 30, 1995

Issues raised during the meeting included: the requirement that the needs of Aboriginals be addressed after conservation needs are met; the need to reduce effort by commercial lobster fishermen to allow access by Native groups into the commercial fishery; the need for better communication between Native groups, commercial fishermen, and DFO Managers and Scientists; a need to address impacts on lobster habitat of pollution and silt; and the absolute rights that Natives have to fish for sale and food under different treaties.

First Nations, Moncton, New Brunswick - January 30, 1995

Issues raised during the meeting included: the rights that Natives have to access the fishery based on treaties; the requirement that the needs of Natives must be addressed after conservation needs are met; the devastation that has taken place in the groundfish fishery due to mismanagement by government and over-exploitation by the commercial fishermen; re-action to concerns of commercial fishermen who blame problems in the lobster fishery on Native groups who they view as new participants; support of Native groups for conservation measures such as increasing carapace size, V -notching of females and releasing of berried females.

Newcastle, New Brunswick - January 31, 1995

Issues raised during the meeting included: strong support by fishermen for conservation measures including escape mechanisms, biodegradable panels, increase in carapace size in 1990 and 1991, and the Cape Breton pilot project from 1987-1990, co-management enforcement programs, minimum six inch hoop size, Ocean Watch, and release of berried females; strong support for increased enforcement activities by DFO with more severe penalties imposed for illegal activity; support for more emphasis placed on Science research in subjects such as V-notching, larvae drift, and . spawning areas as opposed to other species such as salmon; request for increase in carapace size to two and five-eighth inches (2 5/8") in all areas of southern Gulf with some fishermen supporting an increase to two and three-quarter inches (2 3/4") and others requesting more study and consultation before proceeding from two and five-eighth inches (25/8") to two and three-quarter inches (2 3/4"); request for more discussion on issues relating to trap size and number of traps; concern that harvesting plans for Native groups be developed in consultation and co-ordination with commercial fishermen so as not to increase illegal fishing and threaten resource; opposition to development of the offshore fishery controlled by processing companies; concern about effects of pollution on lobster stocks; concern about licence transfers into certain areas; and concern about gear conflict with scallop fishermen in certain areas.

Charlottetown, Prince Edward Island - February 1, 1995

Issues raised during the meeting included: the importance of the lobster fishery as the dominant component of the P .E.I. fishery; the different environment for lobsters in the southern Gulf of St. Lawrence causing lobsters to mature at smaller sizes; the support the industry has had for conservation measures put in place in the past such as trap limits, seasons, minimum size, release of berried females, escape mechanisms, biodegradable panels, and licence buy-back; support for increased enforcement efforts with more severe penalties; support for more scientific research in co-operation with fishermen, processors, and the Atlantic Veterinary College (A VC); the lack of scientific proof of the benefits of carapace size increase; the desire to have one minimum carapace size for all three Lobster Fishing Areas around Prince Edward Island with the majority preferring a

two and one-half inch (2 1/2") minimum size; concern about gear conflict with scallop and mobile gear groundfish fisheries; a desire for better handling practices and more marketing efforts to obtain greater returns from the market place; and a need for DFO to work with Native groups and the commercial fishermen to develop and implement harvesting plans to provide access for Native groups to the lobster fishery.

Saint John, New Brunswick - February 2, 1995

Issues raised during the meeting included: a general view that the lobster fishery is well-managed and not “in trouble” meaning no significant changes should be introduced into the management of the fishery at this time; support for the conservation measures now in place for the fishery such as seasons, carapace size, release of berried females, limited entry, trap limits, and escape mechanisms; a need for more resources for science on lobster and the impact of aquaculture operations on the lobster resource but strong support for the existing close working relationship between scientists and the industry; a concern about increased effort in the midshore zone because of better boats and fishing technology; and a desire expressed by the Native Council of New Brunswick for access to the lobster fishery.

Yarmouth, Nova Scotia - February 6, 1995

Issues raised during the meeting included: strong support for the lobster advisory committee process and a concern that FRCC was getting involved in the management of the lobster fishery; concern about impact of the offshore lobster fishery on the inshore fishery; a desire for more science with the involvement of fishermen on lobster to examine such matters as egg production, larvae drift, spawning areas, and migration; support for more enforcement and a desire for fishermen to become more involved in the sanction process; concern about the impact of a Native fishery that might be managed differently from the commercial fishery; concerns about gear conflict particularly the destruction of lobster habitat by fish draggers; and a concern about the transfer of licences into specific areas.

Port Hawkesbury, Nova Scotia - February 7, 1995

Issues raised during the meeting included: strong opposition to any consideration for boat quotas for the lobster fishery; a desire to increase the minimum carapace size in the Gulf of St. Lawrence to two and three-quarter inches (2 3/4"); concern about the lack of scientific research, in close co-operation with fishermen to look at issues such as larvae movement, water temperature and V -notching of females, in areas on the Atlantic Ocean; a concern about the impact of developing the sea urchin fishery on the lobster stocks; concern about the negative impact of seals on the lobster stocks and the need to take immediate measures to reduce the seal population; strong support for conservation measures presently in place; a serious concern about the lack of resources to carry out effective enforcement of the lobster fishery, including the lack of severe penalties for illegal fishing; concern about increase in harvesting levels and lack of monitoring of the offshore fishery; a concern about aspects of pollution on lobster stocks; and a concern about the impact of fishing pressure on other species such as herring that are part of the lobster food chain.

LISTING OF BRIEFS

1.	FRCC.95.BLl	Association des Pacers des Lies de la Medallion - Leonard Porrier
2.	FRCC.95.BL2	Brilliant Cove Fishermen's Association - Leeroy Leggo
3.	FRCC.95.BL3	Reg. des pacers professionals du sud de la Gaspésie - O'Neil Cloutier
4.	FRCC.95.BL4	Regional Fishermen's Committee, Highlands-Cox's Cove, Nfld - John Sheppard
5.	FRCC.95.BL5	Fixed Gear Committee, Port-Aux-Choix - Roy Gaslard
6.	FRCC.95.BL6	Protecting the West Coast Lobster Fishery, FFAW/CAW - David Decker Presented by: Dennis Coates
7.	FRCC.95.BL7	Fishermen's Committee - Burgeo - William Bow1es - Presented by Wayne Tucker - Bay of Islands
8.	FRCC.95.BL8	Eastern Fish Markets Ltd. - Fredericton, Nfld - Wayne Wheaton
9.	FRCC.95.BL9	Trinity Bay Representative - Gilbert Penny
10.	FRCc.95.BLl0	Lennox Island Food/Sustenance Fisheries, Fishery Proposal
11.	FRCc.95.BLll	Mi'kma'ki Aboriginal Fisheries Services - Charlie Dennis, Eskasoni, N.S.
12.	FRCC.95.BLI2	Netukulimkewe'l Commission - Tim Martin
13.	FRCC.95.BL13	Presentation -Native Council of PEI, (brief will be sent)
14.	FRCC.95.BLI4	L'union des pêcheurs des Maritimes - Reginal Comeau
15	FRCC.95.BLI5	L'union des pêcheurs des Maritimes - Leopole Guinard (Local 2)
16.	FRCC.95.BLI6	L'union des pêcheurs des Maritimes - Guy Cormier, Président
17.	FRCC.95.BLI7	Bill Cook, Little Cape Fishermen's Assoc. (EFF)
18.	FRCC.95.BLI8	Botsford Professional Fishermen's Assoc. - Steward Murray

19.	FRCC.95.BL19	Bathurst to New Bandon Fishermen's Assoc. - Sherwood Good
20.	FRCC.95.BL20	Miscou Island Fishermen's Assoc. (Assoc. des pêcheurs du Nord-Est) Adrien Ginet
21.	FRCC.95.BL21	PBI Minister of Fisheries - Honourable Waiter Bradley
22.	FRCC.95.BL22	PEI Seafood Industry Inc. - Mr. Garth Jenkins
23.	FRCC.95.BL23	PEI Fishermen's Assoc. - Buck Watts
24.	FRCC.95.BL24	Mr. Jim MacDonald, Souris, PBI
25.	FRCC.95.BL25	Canadian Atlantic Lobster Promotion Assoc. Inc. - Alan Baker, Exec. Dir.
26.	FRCC.95.BL26	Fundy North Fishermen's Assoc. - John Kearney
27.	FRCC.95.BL27	Stirling Belliveau, Woods Harbour
28.	FRCC.95.BL28	The Maritimes Fishermen's Union, Local 9 - Graeme Gawn
29.	FRCC.95.BL29	Independent Seafood Producers of N .S. - Don Cunningham
30.	FRCC.95.BL30	West Nova Fishermen's Coalition - Don Cunningham
31.	FRCC.95.BL31	The Maritimes Fishermen's Union - Hasse Lindblad, President, Loca14
32.	FRCC.95.BL32	The Maritimes Fishermen's Union - Jeff Brownstein, President, Local 6
33.	FRCC.95.BL33	Glace Bay Inshore Fishermen's Assoc. - Kevin Nash
34.	FRCC.95.BL34	Nova Scotia Dept. of Fisheries - Greg Roach
35.	FRCC.95.BL35	James H. Langley, Port Hawkesbury, NS
36.	FRCc.95.BL36	Fred Imlay, Big Bras d'or Fishermen's Group

37.	FRCC.95.BL37	Fishermen from 31B -Port Felix to Tor Bay - Cecil Cashin
38.	FRCC.95.BL38	Albert Capstick (brief to be sent)
39.	FRCC.95.BL39	Eastern Fishermen's Protective Assoc., Lobster Area 32 - Norma Richardson
40.	FRCC.95.BL40	"Discusted and Angry South Side Fisherman" (Charlottetown participant)
41.	FRCC.95.BL41	Independent Seafood Processors Assoc. of N.S. - Garth Dalton
42.	FRCC.95.BL42	Bonavista Bay Fishermen's Representative - George Feltham
43.	FRCC.95.BL43	Union of Nova Scotia Indians - Kevin Christmas
44.	FRCC. 95.BL44	Gulf N.S. Bonafide Fishermen's Organization - Percey Haynes, et al.
45.	FRCC.95.BL45	Representative of Lobster Advisory Committee Area 31B - New Harbour-Isaac's Harbour, Guysborough County - Claude Sangster
46.	FRCC.95.BL46	White Head, Larry's River, Nova Scotia - Mark Conway, Lobster Representative
47.	FRCC.95'.BL47	Bay de Chaleur Professional Fishermen's Assoc. - Keith Daley, President
48.	FRCC.95.BL48	Richmond County Inshore Fishermen's Assoc. - Ervin Touesnard
49.	FRCC.95.BL49	Lobster Advisory Member of The Maritimes Fishermen's Union - Chris Johnston
50.	FRCC.95.BL50	Avalon Ocean Products, Inc. - Kevin A. Wadman
51.	FRCC.95.BL51	N.B. Government, Dept. of Fisheries and Aquaculture - Sylvestre McLaughlin, DM
52.	FRCC.95.BL52	Scotia-Fundy Inshore Fishermen's Assoc. - E.L. Walters, Chairman
53.	FRCC.95.BL53	Cumberland North Fisherman's Assoc. - Eben Elliott, Chairman

REFERENCES AND CONTRIBUTORS

Scientific information and data used in this report come from several sources. The following persons were of particular assistance to the Council in gathering and processing information and data:

From DFO Geographical Information System Unit:

Ms. Erin O'Shaughnessy
Ms. Jennifer Vollrath

From DFO:

Dr. Denis d' Amours,
Dr. Gerry Ennis,
Ms. Louise Gendron,
Mr. Marc Lanteigne,
Dr. Peter Lawton,
Dr. Robert Miller,
Mr. Doug Peczak.
Mr. Ernie Collins
Ms. Carol-Ann Rose
Mr. Ted Marr
Ms. Julia Barrow

The Council used published and unpublished documentation. Information papers prepared by regional DFO scientists, for the stakeholders and for the FRCC, were particularly useful. In the present report, extracts were taken out of the following:

Parsons, L S. 1993. Management of Marine Fisheries in Canada, pp 104-116 and 173. Canadian Bulletin of Fisheries and Aquatic Sciences 225: 763p.

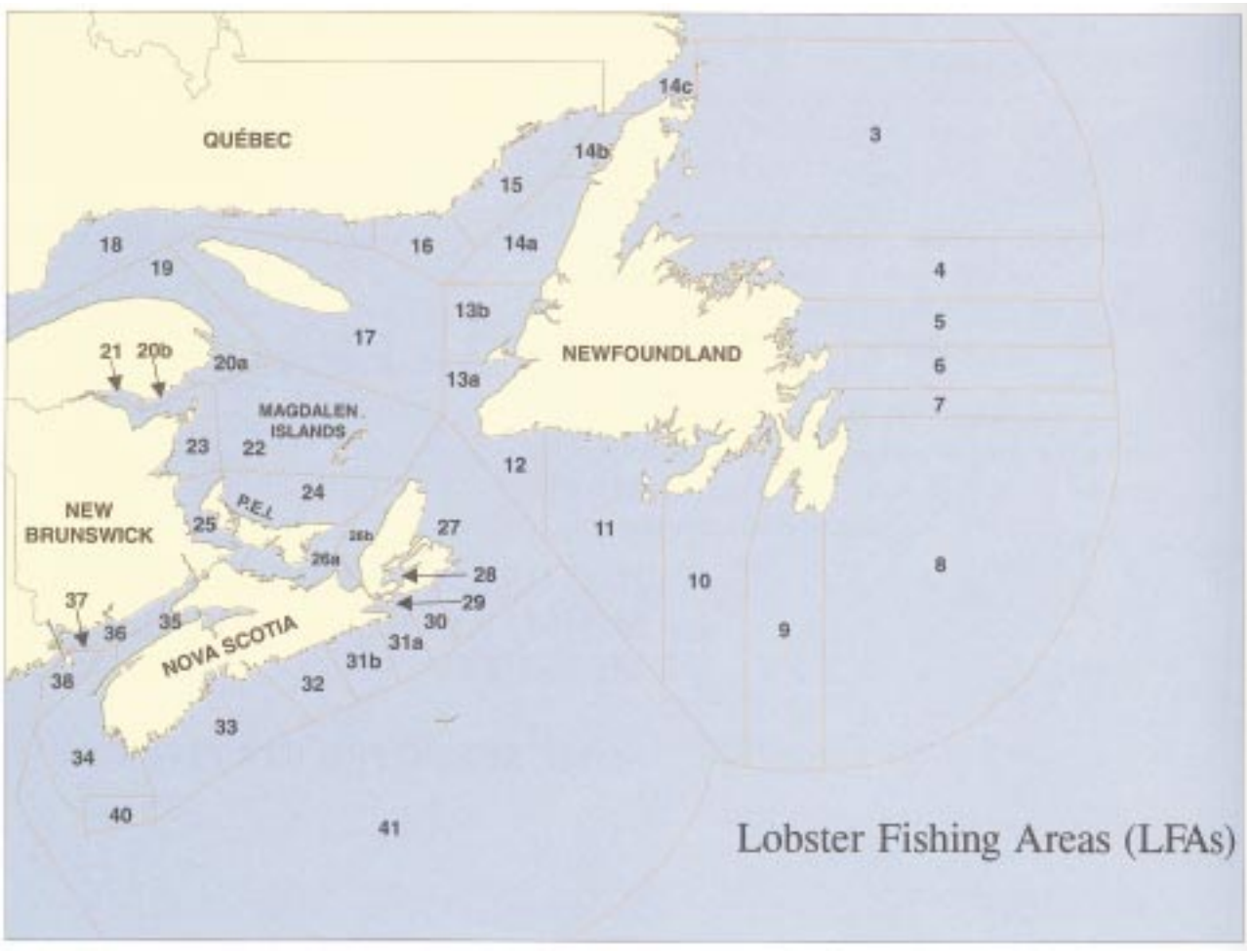
Pringle, J.D. and D.L Burke. 1993. The Canadian Lobster Fishery and its Management, with emphasis on the Scotian Shelf and the Gulf of Maine.

LS. Parsons and W.H. Lear (Eds), Perspective on Canadian Marine Fisheries Management. Canadian Bulletin of Fisheries and Aquatic Sciences 226: 91-122.

APPENDIX 3 - LFA'S

- MAPS
- HISTORICAL LANDINGS AND SUMMARY OF MANAGEMENT MEASURES
- SOME SELECTED STATISTICS

MAPS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NEW BRUNSWICK
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NOVA SCOTIA
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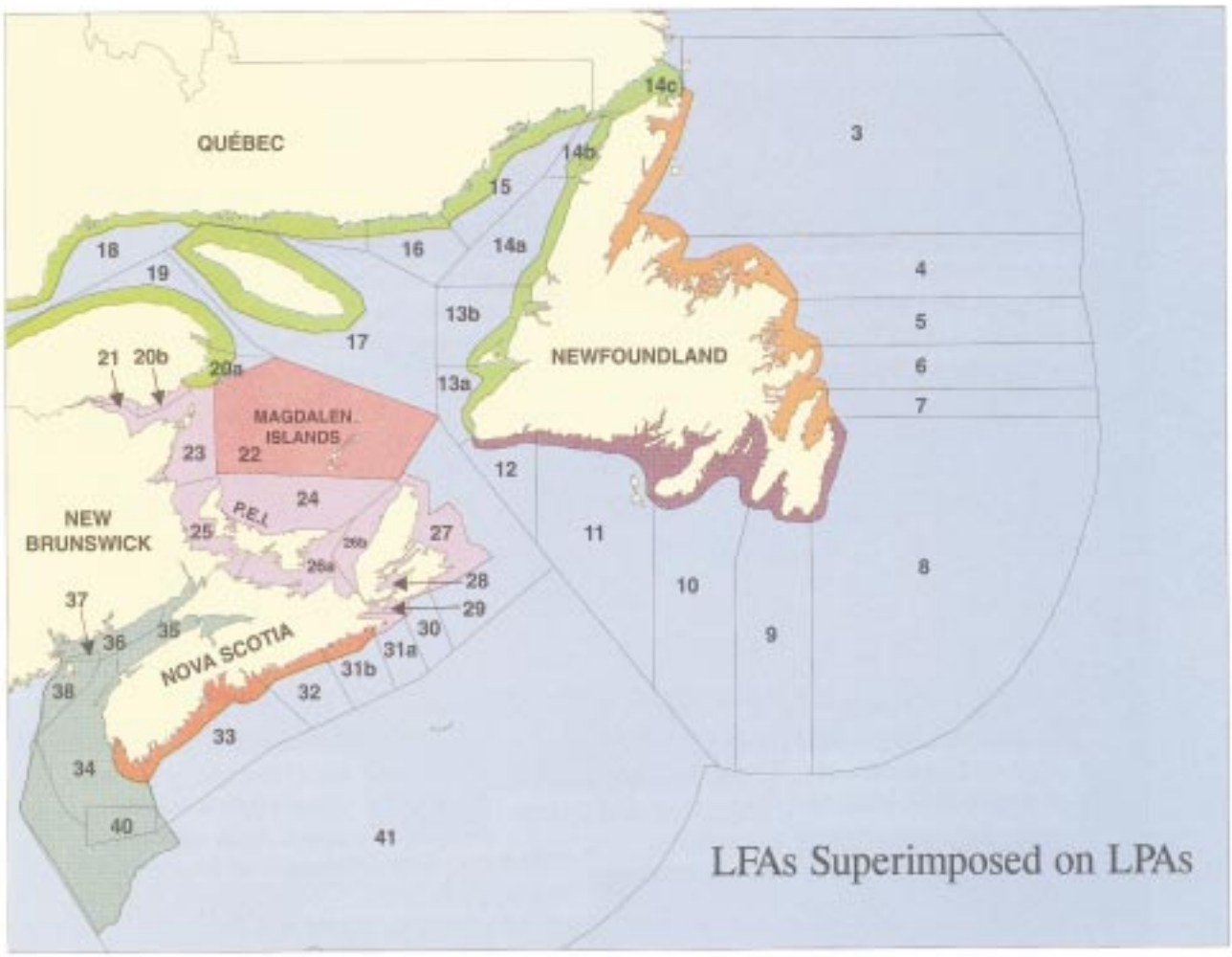
Lobster Fishing Areas (LFAs)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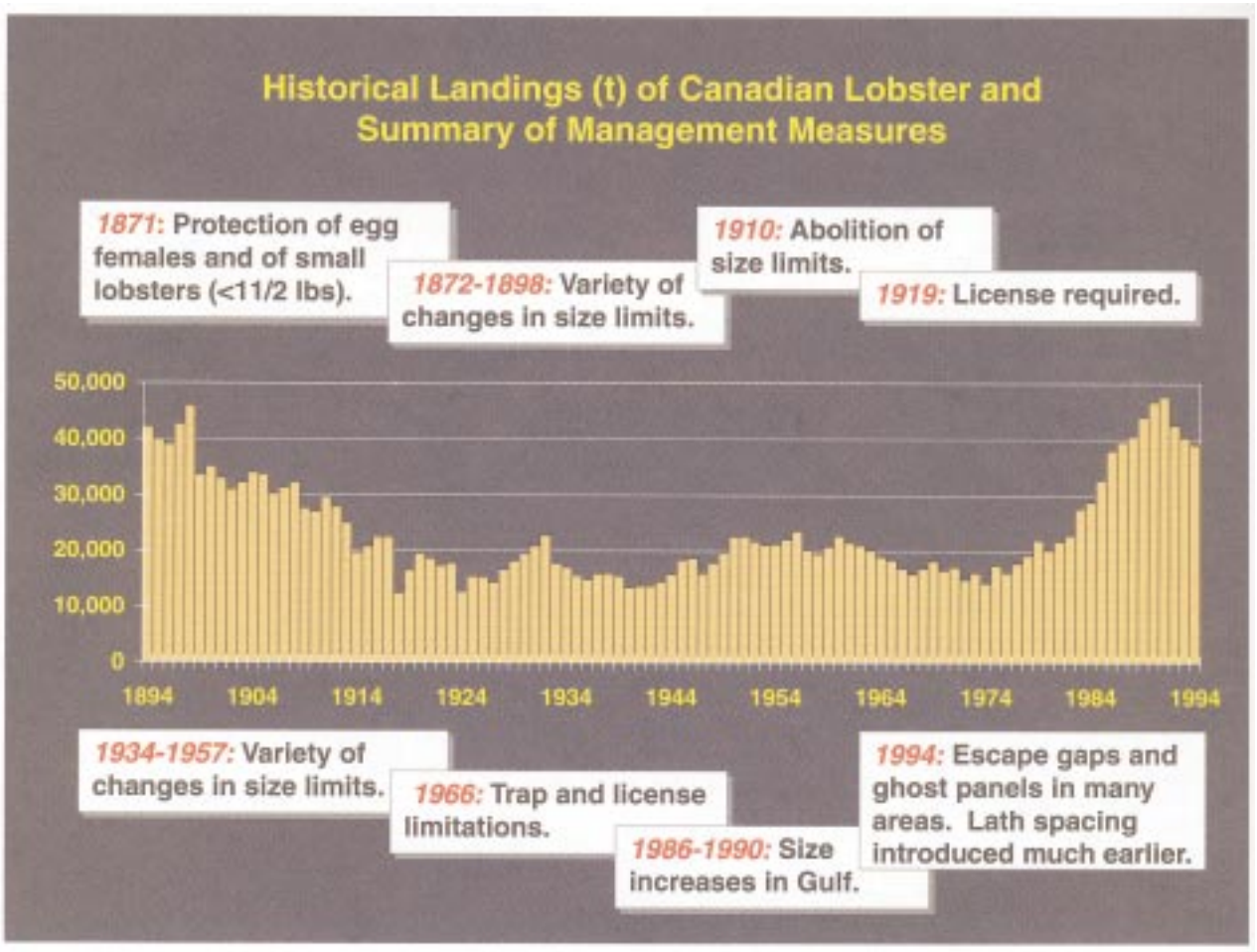
LFAs Superimposed on LPAs

HISTORICAL LANDINGS AND SUMMARY OF MANAGEMENT MEASURES



SOME SELECTED STATISTICS

NEWFOUNDLAND

Table A3.1

Landings (T)

LFA	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
3	5	10	9	8	3	13	6	6	6	6	6	2	5
4	458	496	496	572	464	414	501	539	575	539	513	335	390
5	126	159	144	159	130	100	107	118	135	200	167	105	88
6	15	23	20	30	33	21	19	16	17	21	34	25	25
7	13	42	23	26	33	28	21	26	17	16	16	29	20
8	5	8	2	5	6	4	4	5	3	2	3	6	2
9	14	14	11	12	18	11	16	17	13	14	17	9	3
10	191	273	308	347	322	305	328	332	328	408	427	288	258
11	351	412	365	360	347	295	345	386	335	398	500	529	344
12	5	17	37	36	38	25	28	42	33	13	44	27	49
13	414	496	433	636	542	499	600	772	674	663	642	652	540
14	425	460	601	730	615	503	540	844	789	795	752	613	484
TOT.	2022	2410	2449	2921	2551	2218	2515	3103	2925	3075	3121	2620	2208

Table A3.2

Newfoundland Management Measures and Stock Status

LFA	Minimum Size	Number Traps	Number Permits	50% Maturity	Expl. Rate	Eggs/ Rect.	SEASONS							
							M	A	M	J	J	A	S	O
3	81mm	300	98(100)	81mm	85%	1.4%		—	——	——	—			
4	81mm	300	1012(1062)	81mm	85%	1.4%		—	——	——	—			
5	81mm	200	313(324)	81mm	85%	1.4%		—	——	——	—			
6	81mm	100	254(262)	81mm	85%	1.4%		—	——	——	—			
7	81mm	200	180(190)	81mm	85%	1.4%		—	——	——	—			
8	81mm	100	89(90)	81mm	85%	1.4%		—	——	——	—			
9	81mm	200	41(44)	81mm	85%	1.4%		—	——	——	—			
10	81mm	300	432(440)	81mm	85%	1.4%		—	——	——				
11	81mm	200	366(375)	81mm	85%	1.4%		—	——	——				
12	81mm	150	69(75)	81mm	85%	1.4%		—	——	——				
13	81mm	200-275	521(571)	81mm	85%	1.4%		—	——	——	-			
14	81mm	350-500	631(652)	81mm	85%	1.4%			—	——	—			

Number of traps is for full-time fishermen; part-time trap limit is 50
Permits: full-time without parentheses, total including part-time in parentheses
Eggs/recruit: percentage of potential in an unfished population

QUEBEC

Table A3.3

Landings (T)

LFA	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
15			21	30	51	37	42	32	33	32	37	26	7
16			5	14	5	5	6	19	21	12	16	14	11
17	5	65	10	38	51	118	69	91	51	76	98	108	49
18			17	28	31	30	20	32	22	12	5	12	68
19			15	26	9	9	21	21	26	17	18	25	31
20	540	819	573	510	513	553	530	592	709	621	797	751	740
21			40	33	28	27	44	38	70	64	58	59	48
22	1149	1208	1193	1458	1581	1878	1798	2376	2380	2642	2806	2593	1995
TOT.	1694	2092	1874	2137	2269	2657	2530	3201	3312	3476	3835	3588	2949

LFAs 15-16, 18-19, 21: separate annual landings not available prior to 1984

Table A3.4

Quebec Management Measures and Stock Status

LFA	Minimum Size	Number Traps	Number Permits	50% Maturity	Expl. Rate	Eggs/ Rect.	SEASONS						
							A	M	J	J	A	S	O
15	76mm	250	73										
16	76mm	250	10										
17	76mm	300	15										
18	76mm	250	7										
19	76mm	250	7	84mm									
20	76mm	250	202	84mm	70%	1.2%							
21	76mm	250	14	84mm									
22	76mm	300	325	79-83mm	50-60%	4.1%							

GULF

Table A3.5

Landings (T)

LFA	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
23	1730	1864	2232	2009	2478	3009	3114	4529	4508	4186	4257	4352	4003
24	2754	3281	2828	2588	3114	3278	3698	3710	4591	5109	4605	4692	4748
25	3675	4291	4478	6312	5889	5925	5622	5879	5331	4739	4578	4027	4249
26A	2155	3277	3043	3520	5580	6024	6532	6283	6363	5844	4594	4432	3318
26B	994	921	860	918	1210	1111	1281	1130	1280	1546	1411	1308	1059
TOT.	11308	13634	13441	15347	18271	19347	20247	21531	22073	21424	19445	18811	17377

Table A3.6

Gulf Management Measures and Stock Status

LFA	Minimum Size	Number Traps	Number Permits	50% Maturity	Expl. Rate	Eggs/ Rect.	SEASONS							
							A	M	J	J	A	S	O	N
23	67mm	375	707(764)		80-85%	0.6%		—	——	—				
24	64mm	300	631(638)		80-85%	0.3%		——	——					
25	67mm	250	857(879)	71mm	80-85%	0.6%					—	——	—	
26A	65mm	300	755(776)	78mm	80-85%	0.5%		——	——					
26B	70mm	300	240(256)		80-85%	0.8%		——	——					

SCOTIA FUNDY

Table A3.7

Landings (T)

LFA	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
27	1227	1658	1421	1630	2317	2680	2961	3606	3673	3403	2671	2352	2078
28/9	50	63	74	113	154	200	203	257	172	168	150	104	101
30	27	62	69	60	85	99	77	132	119	151	152	132	128
31	94	120	169	183	223	303	326	482	365	401	358	284	223
32	70	109	140	180	284	258	222	239	303	298	304	279	241
33	484	768	1446	2072	2677	2574	2059	1927	2355	2664	1614	1815	1590
34	4051	4733	5368	5797	7473	7582	7878	8017	10801	11515	8482	8656	10438
35	143	127	195	228	263	333	254	285	238	248	254	221	248
36	235	207	220	301	295	343	308	249	282	250	244	264	291
38	406	330	325	304	325	327	446	431	504	510	490	514	586
41	450	470	435	777	799	618	526	449	567	714	610	542	700
TOT	7237	8647	9862	11645	14895	15317	15260	16257	16074	19379	15344	15173	16622

Table A3.8

Scotia Fundy Management Measures and Stock Status

LFA	Minimum Size	Number Traps	Number Permits	50% Maturity	Expl. Rate	Eggs/ Rect.
27	70mm	275	447(494)	73mm	60-70%	
28/9	81mm	275	75(97)		60-80%	1.3%
30	81mm	250	17(19)	79mm	50-70%	1.3%
31A/B	81mm	250	136(149)	83-95mm	60%	
32	81mm	250	148(166)	95mm	72%	1.8%
33	81mm	250	650(771)	95mm	75-85%	0.4%
34	81mm	375F/ 400S	951(970)	95mm	70-85%	0.7%
35	81mm	300	90(94)	102mm	70-85%	0.1%
36	81mm	300	166(186)	102mm	60-85%	0.1%
38	81mm	375	81(109)	102mm	60-85%	0.1%
41	81mm	1000	8	95mm	15-25%	

Table A3.9

Scotia Fundy - Seasons

LFA	J	F	M	A	M	J	J	A	S	O	N	D
27												
28/9												
30												
31A/B												
32												
33												
34												
35												
36												
38												
41												

APPENDIX 4 - INTERNATIONAL SITUTATION

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United States

Fisheries in the northeast USA on the same species as in Atlantic Canada are significant from Long Island north; most landings are made in the Gulf of Maine. Management is shared by coastal states (the Atlantic States Marine Fisheries Commission plays a coordinating role) and the National Marine Fisheries Service (regulations in the federal zone are developed by the New England Fisheries Management Council). Three assessment units are presently defined: Gulf of Maine; southern Cape Cod/Long Island Sound (SCC/LIS); and offshore from George's Bank south to Cape Hatteras.

Regulations include minimum size limits, protection of berried females, and presence of escape vents and ghost fishing panels. US minimum sizes are generally higher than in Canada, protecting a larger part of the spawning population. Parts of the US fishery have V -notching and maximum size limits which provide further broodstock protection. In the past there has been little control on fishing effort - access is open (although numbers of licenses were frozen in 1991 for 5 years in the federal zone), there are no trap limits (except in Massachusetts at 800, and in certain areas of Maine), and no closed seasons. Otter trawls are permitted in certain areas and recreational fishing with traps or SCUBA is permitted (daily bag limit). As in Canada, many of the regulations have been in effect for decades although frequent adjustments have been made.

Lobster landings off the northeast US increased in the late 1970's and 1980's, from 13,000 - 16,000 t in 1964 - 78 to a maximum of 29,000 t in 1991. As in Canada the increase in landings is considered to be due mainly to increased abundance, although fishing effort increased substantially in the same period which has probably also contributed. Lobster stocks are considered overexploited in most of the range.

To meet with requirements of the Fishery Management Planning process, a definition of overfishing was adopted for US lobster stocks: lobster are considered overfished when egg production per recruit is 10 % or less that in an unharvested population. To meet this definition in the Gulf of Maine, fishing mortality would have to be reduced 20 % or carapace size increased from 83 mm to 89 mm (or some combination of the two). For the SCC/LIS area, fishing mortality rates would have to be reduced by 50 %. Fishing mortality on the offshore stock is near the overfishing definition. Fishing mortalities are expected to increase in the Gulf of Maine area as a result of expected increases in effort.

Effort Management Teams including industry, science and management people have been considering options to reduce fishing mortality to or below the overfishing level over recent months. EMTs generally recommend a cap on fishing effort (trap limit plus licence limit) followed by a decrease in trap numbers over 5 years plus other measures such as Sunday closures, maximum size limit, return of captured females, trap size limits. These proposals will be considered by the NEFMC and state regulatory bodies. Industry believes that stock assessments showing lobster to be severely overexploited in much of its range are too pessimistic, but has participated in the EMT process in the belief that there would be economic benefits from reduction of fishing effort.

Europe

Fisheries on the European lobster (a species closely related to the American lobster) occur from Norway to the Spanish Atlantic coast. Tota1landings have fluctuated around 2,000 t/yr since 1950. The fishery is locally valuable despite low landings, since landed value is high.

In Norway catches remained more or less stable at 300 - 600 t/yr from 1700 to the early 1900's, increased to a maximum of 1,300 t in 1932, and remained above 600 t/yr from 1945 to 1960. They then declined until 1985 and have since remained around 30 t/yr. Effort was essentially unregulated through the history of the fishery and increased significantly during the 1960s in both commercial and recreational sectors. A minimum carapace size well below the size at maturity was in effect from 1893; following an increase in 1964 minimum size remained below size at maturity but was increased to a more effective level in 1992. The fishery is now regarded as a marginal fishery on a heavily overexploited stock; further restrictions will be considered in light of research results. The reasons for the recent decline in landings following years of constant catches are not known; it may be that refuge areas which formerly contributed to recruitment were increasingly exploited with the increase in effort since the 1960s. Conditions in much of Norway (except the southern coast) may be marginal for lobster, in particular summer temperatures may not be high enough to ensure successful recruitment in some years.

Off England and Wales the lobster fishery is managed by minimum size regulation only (no prohibition on landing berried females, no effort control). In many areas, catch per unit effort and effort decreased during the 1960's and 1970's; probably a decline in abundance caused inshore effort to move into other fisheries. Information on this fishery is not adequate to accurately assess stock status but the general impression is of heavy exploitation of a stock at a low abundance level. Increases in minimum size were carried out in the early 1980s.

Restocking of lobster stocks with juveniles has been attempted in several areas in Europe. In Norway, restocking has been conducted intermittently since 1885 with no indications of success. More recently, micro-tagging of 130,000 juveniles released since 1990 indicates that restocking is contributing to recent landings but further research is required to assess the impact fully. Off the UK some 90,000 micro-tagged juveniles were released between 1983 and 1990 and some have been recaptured in later years, including several berried females. Recapture rate appears low but may be biassed downward.

Western Australia rock lobster

The western rock lobster fishery is Australia's most valuable, with annual landings of 10,000 t. Effort was unrestricted up to the early 1960s; catches increased rapidly until stabilising in the late 1950s and early 1960s, but effort continued to rise at this time. Industry concern led to restricted entry to the fishery and a cap on number of traps per licence in the early 1960s. However effective effort continued to increase as a result of increases in efficiency and hauling frequency.

Management measures currently in place include a minimum legal size limit (too small to protect mature females in most of the range), a prohibition on taking berried females, closed seasons, limited entry and trap limits, escape gaps and trap size limits. Number of traps permitted was reduced 10% in 1986. A recreational fishery which takes some 4 % of total landings is subject to the same regulations plus a daily bag limit.

The stock is considered very heavily exploited. Exploitation rates are estimated at 60 - 70% annually but this is probably an underestimate.

Egg production and spawning biomass are estimated to be 15 - 20% of that in the original unexploited population. With the introduction of improved navigating equipment fishers are able to better fish deeper areas where the mature animals are concentrated; these may have acted as refuges previously. Recruitment has been maintained but there are concerns that recruitment overfishing may occur in future.

Since the early 1990s industry and government have been in intensive discussions about future management measures. Government established the objective of maintaining or slightly increasing the breeding stock during the period 1992/3 to 1997/8. The industry association made a number of proposals to government including progressive reductions in effort (traps permitted and days fishing) and a maximum size limit. Following consultations with all fishermen's organisations, the 1992/3 management plan included a maximum size limit for females, a prohibition on retaining mature females during the summer season, effort reduction for part of the season in part of the range, and limitation on movement of vessels in the other part of the range.

As a result of a long-standing intensive research program this is probably the best-known lobster stock. Recruitment is monitored and catch predictions made several years in advance. Assessments of the breeding stock are made annually; these will be improved through development of a fishery-independent stock survey and better estimates of growth and mortality. Studies of increases in fishing efficiency allow monitoring of effective effort. A spatial fishery model incorporating much of the available information has been developed and is used to examine the results of possible management measures.

APPENDIX 5 - FRCC MEMBERS

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Members:

Herbert Clarke, Chairman
Michael Belliveau
Dr. Jean-Claude Brethes
Dr. Tony Charles
Frank d'Entremont
Samuel Elsworth
Frank Hennessey
Dr. Paul LeBlond
Dr. Jon Lien
Dr. Victorin Mallet
Jones R. Sheehan
Trevor Taylor
Fred Woodman
Maureen Yeadon

Delegates:

Clarrie MacKinnon
Jean-Paul Lussiaa-Berdou
Marianne Janowicz
David Gillis
Don Vincent
Glen Blackwood

Ex Officio:

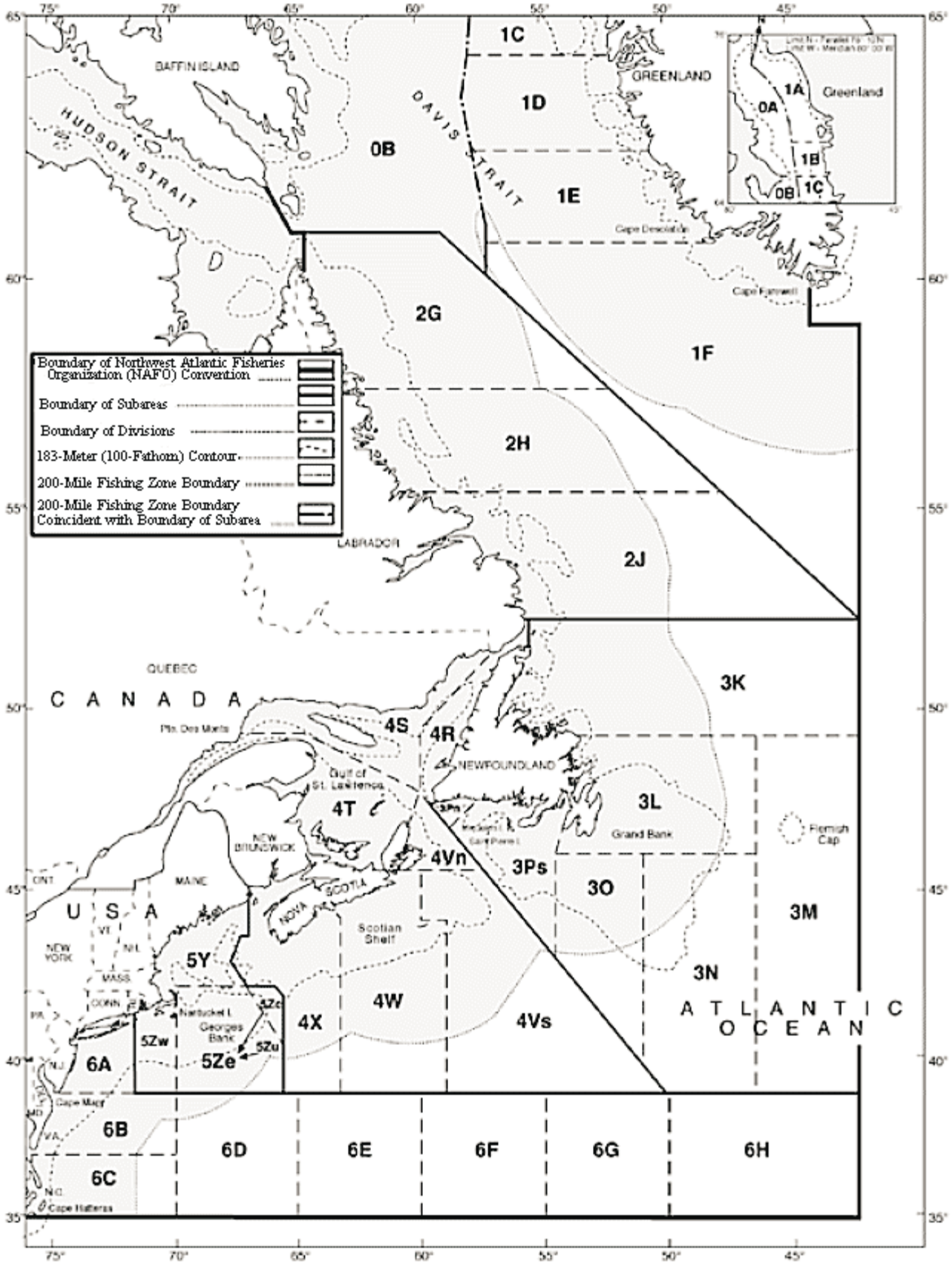
Dr. Bill Doubleday
Jean-Eudes Hache
Catrina Tapley

Lobster Working Group:

Herbert Clarke, Chairman
Dr. Jean-Claude Brethes
Frank d'Entremont

Ron Gelinas, DFO, GIS Unit
Robert Johnston, DFO, Area Manager
Dr. Howard Powles, DFO, Biological Sciences
David Rideout, FRCC Secretariat.

200 Mile Fishing Zone and NAFO Fishing Boundaries



Canada