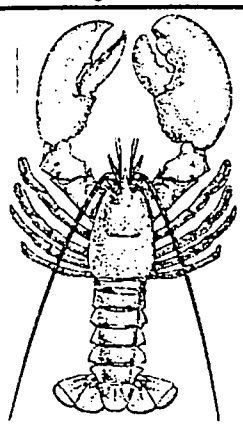

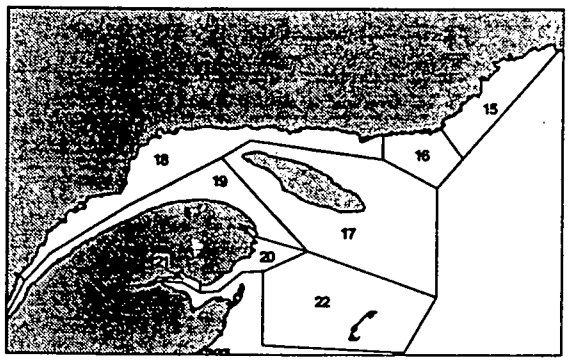

Lobster of the Inshore Waters of Québec

Background

Since the early 1990s, lobster landings have been down almost everywhere along the Atlantic coast. In Québec in 1997, landings were 31 % below the record peak of 1992. The geographic extent of this decline and of the increase that occurred between the mid 1970s and the early 1990s suggest that common variables may affect lobster recruitment on a broad scale. Whether the decline will persist over the longer term is impossible to predict.

Lobster conservation policy is dictated by the report submitted by the FRCC in 1995, which recommended increasing egg production. In the line of this report, the Minister of the Department of Fisheries and Oceans mandated a doubling of egg production per recruit over the next few years in all Atlantic stocks. We believe, however, that this objective should not be seen as an end in itself. An approach based on biological reference points should also be implemented, for instance increasing capture size beyond sexual maturity size and rebuilding the stock of large animals. Such a strategy would be more likely to generate real benefits in terms of conservation and would be equivalent in some cases to tripling or even quadrupling egg per recruit production from current levels.

Summary

- In 1997, Québec lobster landings were down 23 % from 1996 levels. In the Magdalen Islands, the drop was 17 % and in the Gaspé 41 %. There has probably been a decline in the biomass accessible for fishing other than the one attributable to the increase in minimum size.
- Lobster exploitation levels remain very high, and have risen in 1996. Maintaining such levels is very risky.
- Fishermen have been asked to prepare conservation plans aimed at doubling egg per recruit production over the next few years. Measures allowing the doubling are an increase in the minimum catch size to 82 or 84 mm, depending on the areas, and combinations of increased minimum size, establishment of a maximum size and a reduction in fishing effort.
- It would be important to raise minimum catch size above the size at sexual maturity and to rebuild a stock of large animals. This would help increase the breeding potential in terms of the quantity of eggs produced and perhaps also in terms of quality. Measures to cut back fishing effort are also desirable, though their effect is harder to quantify.

Biology

The American lobster *Homarus americanus* ranges along the west coast of the Atlantic, from Labrador to Cape Hatteras. Adults prefer rocky substrates where they can find shelter, but also live on sandy or even muddy bottoms. While lobsters are generally found in commercial numbers at depths less than 35 m, they are also fished by an offshore fleet along the outer Scotian Shelf at depths to 450 m.

Females reach sexual maturity at a cephalothorax length (CTL) of about 79 mm in the southern part of the Magdalen Islands and about 84 mm in the northern part and in the Gaspé. In general, females have a two-year reproductive cycle, spawning one year and molting the next. A female spawning for the first time can produce nearly 8 000 eggs, while one with a CTL of 125 mm (jumbo) can lay up to 35 000 eggs. After the eggs are laid, they remain attached to the female's swimmerets for 9 to 12 months, until they hatch the following summer. The newly released pelagic larvae go through a planktonic phase which lasts 3 to 10 weeks, depending on the water temperature. Once they reach Stage 4 of their development, following metamorphosis, the postlarvae drift down from the surface layer and settle on the bottom. During the first few years of their benthic life, or until they reach a CTL of about 40 mm, lobsters lead a cryptic existence, living in structurally varied habitats that offer numerous hiding places. In Québec coastal waters, they reach minimum legal size between 6 and 8 years of age, after 15 to 20 molts.

Fishery management

The lobster fishery is managed by controlling fishing effort. The number of licences and the number of traps per licence are limited. In 1997, there were 656 active licences in Québec's three maritime sectors: Magdalen Islands (329), the Gaspé (226) and the North Shore (101). Fishermen are distrib-

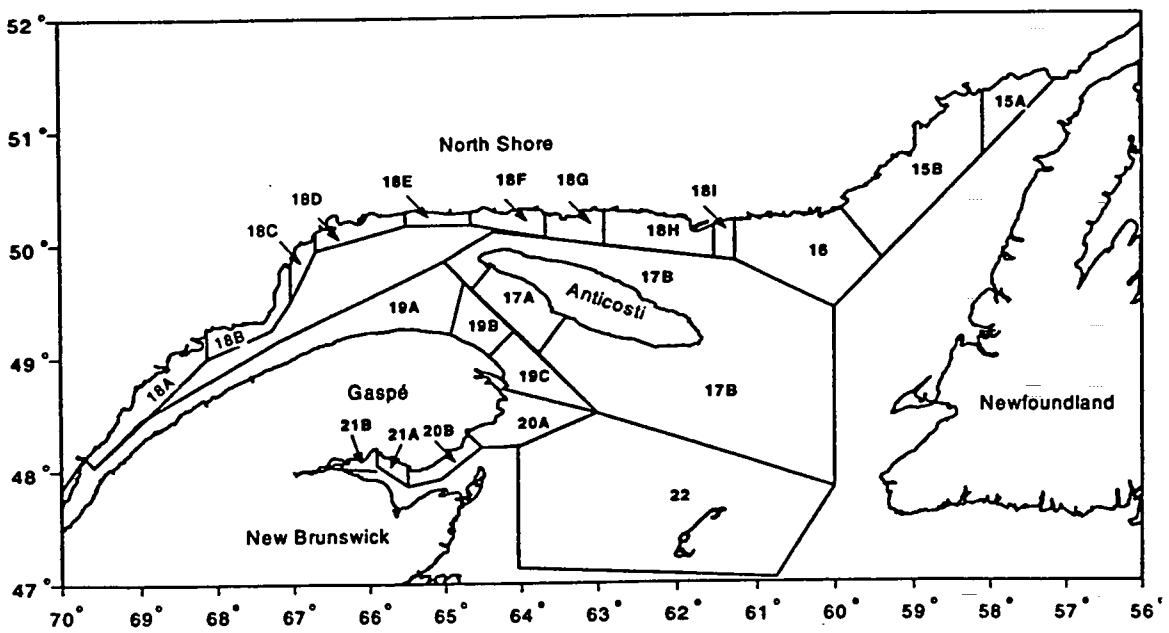

Figure 1. Lobster fishing areas in Québec.

uted among eight main fishing areas (areas 15 to 22) (Figure 1) and 38 sub-areas. The number of traps allowed per license is 250 in most places, except for the Magdalen Islands and Anticosti Island, where it is 300. The use of traps larger than the traditional size is limited by a policy of equivalence, in force since 1995 in all areas, which is designed to stop the increase in fishing effort. They are limited to 175 or 210 respectively in the areas where 250 and 300 standard traps are allowed. In the Magdalen Islands, however, their use was completely banned in 1997. To reduce the catch of non-commercial size lobster, escape vents have been mandatory since 1994. The lobster fishing season is in spring and runs for 9 to 12 weeks, depending on area. The start of the season coincides with the breakup of the ice and generally ends before the lobsters molt.

The lobster fishery is also regulated by imposition of a minimum catch size and a requirement to return berried females to the sea, with the aim of conserving the resource by maintaining a certain level of egg production. A minimum catch size of 76 mm was introduced in Québec in 1957, rising gradually from 64 mm to 76 mm from 1953 to 1957. In 1997, minimum catch size was raised to 77 mm in the Magdalen Islands (Area 22) and to 78 mm in the Gaspé (Areas 19, 20AB and 21AB). These increases are part of the conservation plans drawn up by the fishermen's association on the basis of recommendations from the Fisheries Resource Conservation Council (FRCC) (FRCC 1995). Québec fishermen want to raise the minimum catch size to 84 mm by the year 2004. V-notching of berried females is done on a voluntary basis in the southern Gaspé. Since 1994, females thus marked must be returned to the sea.

Conservation approach

The conservation approach for all Canadian Atlantic lobster stocks is founded on the FRCC report of November 1995, which confirmed the findings of overfishing made by scientists over many years. In its report, the FRCC defined conservation and specified both objectives and a series of conservation measures that could be applied to achieve certain specific objectives. One of the general conservation objectives is to maintain stocks at optimum levels over the whole range of environmental conditions likely to be encountered so as to maintain a breeding biomass capable of producing a strong and steady progeny. The conservation measures proposed therefore aim at increasing egg production, reducing actual harvesting rates and fishing effort and improving stock structure. The FRCC's arguments are based on the concept of egg production per recruit, a relative measure of a population's reproductive potential. The Council felt that egg production per recruit was too low and recommended the level be raised to 5 % of unfished stocks for all lobster stocks in Atlantic Canada.

The report's recommendations were expected to be implemented by the fishermen themselves through their associations, which would work with DFO to decide on the management measures they would apply in their respective fishing areas. Since the report was submitted, the Gaspé and Magdalen Islands fishermen's associations have prepared conservation plans to meet the egg per recruit egg production target of 5 % of an unfished stock over eight years. However, because of the slow progress in the elaboration of conservation plans throughout the Atlantic provinces, the canadian Minister of the Department of Fisheries and Oceans asked each fishermen's association for a conservation plan before the 1998 fishing

season starts. The Department has however modified the target and is now asking for a doubling of egg production per recruit over a period of two to three years.

In proposing its objective of 5 % of unfished stocks, the FRCC was relying on preliminary figures provided by scientists and taken from a calculation model developed in the United States. Over the last two years, scientists have been working on an egg per recruit production model better suited to Canadian conditions and have been discussing the parameters the model should include. Though the model has been considerably refined, scientists have yet not been able to define with certainty the characteristics of an unfished population. Many uncertainties still remain as to growth (molt frequency and molt increment), spawning frequency and the natural mortality of large females (carapace length of 5 inches or more). When alternative values are inserted into the model, different results are obtained, which means that it is difficult to properly estimate whether we are under or over the 5 % target. Because of this uncertainty, the Minister decided not to retain the 5 % target.

The benefits of a mandatory target of doubled egg per recruit production for conservation of lobster stocks will vary and will depend on present production levels. It will be much easier to reach this target in a stock whose level is low than in one whose level is already quite high. Thus, in areas where egg production is currently very low, reaching the objective may have very little benefit in terms of conservation. Doubling of egg per recruit production should therefore be seen as a provisional rather than a final target. A conservation strategy based on biological reference points would be more likely to bring real benefits.

An approach whereby the minimum catch size is set above sexual maturity size and where efforts are made to rebuild a stock of large lobsters would definitely improve breeding potential in terms of the quantity of eggs produced and probably also in terms of quality. Such a strategy would mean tripling or even quadrupling the present egg production in some areas.

Stock status in 1997

In 1997, Québec lobster landings were down 23 % from 1996. They reached 2 685 t compared to 3 503 t for the previous year (Figure 2, Table 1). In 1997, 69 % of Québec catches came from the Magdalen Islands (Area 22), 24 % from the Gaspé (Areas 19, 20 and 21) and 8 % from the North Shore (Areas 15, 16 and 18) and Anticosti Island (Area 17). Since the early 1990s, landings have been in decline throughout the Atlantic region. In 1997, Canadian landings amounted to 37 000 t (preliminary figures), compared to some 46 000 t in 1990. The geographical extent of this decrease and the expansion that occurred from the mid 1970s to the early 1990s almost everywhere along Canada's Atlantic coast suggest the influence of common variables with a broad impact on lobster recruitment.

Table 1. Lobster landings (t) in Québec by fishing area.

	1991	1992	1993	1994	1995	1996	1997[1]
Area 15	32	37	26	8	12	14	24
Area 16	12	16	14	10	12	18	13
Area 17	76	98	108	143	137	155	165
Area 18	12	5	12	8	17	6	2
Area 19	17	18	25	25	40	36	21
Area 20	621	797	751	730	985	1016	585
Area 21	64	58	59	51	46	39	33
Area 22	2642	2806	2593	2007	2142	2219	1842
TOTAL	3476	3835	3588	2982	3391	3503	2685

1 preliminary data

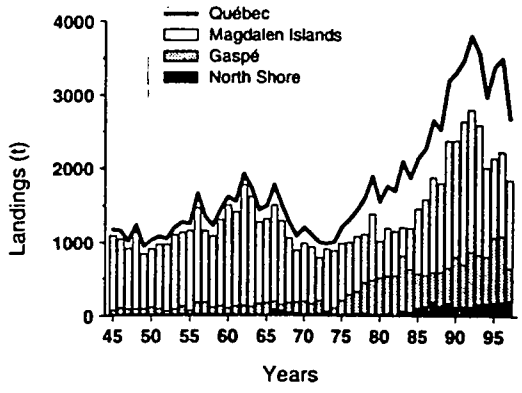

Figure 2. Québec lobster landings (t), from 1945 to 1997.

Magdalen Islands (Area 22)

Landings

In the Magdalen Islands in 1997, lobster landings were 1 842 t. This represents a drop of 17 % from 1996. Landings on the south side of the Islands (Old Harry to Havre Aubert) were 1 303 t and on the north side (Bassin to Grosse Île) 539 t, down 12 % on the south and 27 % on the north from 1996.

On the south side of the Magdalen Islands, the 1997 lobster season was undisturbed by any major adverse meteorological or climatic events. Water temperature on the fishing grounds (about 10 m deep) was around 2°C at the opening of the season, similar to the observations of the two previous years. According to the records of index fishermen, fishing effort in the first three weeks of the season was close to maximum potential and up 5 % from the 1996 season overall. In 1997, 52 % of landings were made after the third week of fishing, as opposed to 56 % in 1996. The fishermen's pursuit strategy, combined with the favourable meteorological and climatic conditions, allowed the resource to be harvested very rapidly. On the north side of the Islands, index fishermen's reports indicate that fishing effort at the start of the season was equal to that of 1996 and close to maximum capacity. For 1997, we have no water temperature data from the north side of the Islands by which to judge general lobster catchability conditions.

The 1 mm increase in minimum catch size (76 to 77 mm) alone is not enough to account for the fall in catches seen in 1997. Study of 1996 catch composition showed that lobsters between 76 and 77 mm made up about 4 % of catches in the south, but only 2 % in the north. The lower landings may be due to a decline in the resource, since it seems unlikely that any climatic event could have had a negative impact on lobster catchability, certainly not on the south side of the Islands.

Abundance indices

A commercial-size lobster abundance index (≥76 mm before 1997, ≥77 mm in 1997) is derived from catches per unit effort (CPUE) computed from sampling of commercial catches at sea, conducted by DFO since 1985. In 1997, CPUE (number of lobster per trap) recorded at the start of the season averaged 1.3, a drop of 21 % from 1996

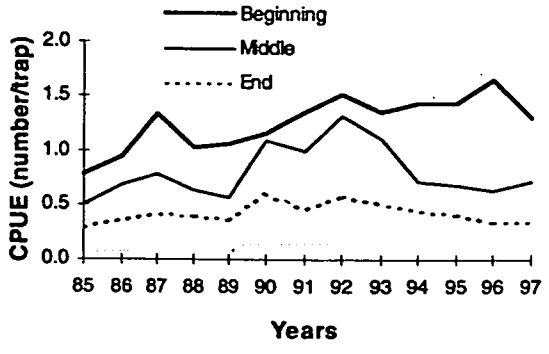

Figure 3. Catches per unit effort (CPUE) in number of lobster per trap at the start, middle and end of fishing season in the Magdalen Islands, from 1985 to 1997. Commercial size lobster (≥76 mm before 1997, ≥77 mm in 1997).

(Figure 3). This is the lowest level seen since 1990. The decline was much greater in the north (40 %) than in the south (5 %). By mid season, CPUE were 0.71 per trap, 16 % more than at the same time the previous year. Mid-season CPUEs have been lower than those recorded in 1990, 1991 and 1992, when lobster abundance was probably at one of its highest levels, allowing fishermen to maintain high catch rates longer. At the end of the season, CPUEs were equal to those of 1996 at 0.35 per trap. Abundance indices obtained through the index fishermen program generally confirm the trends emerging from commercial sampling data. There was an overall drop in the catch rate for the Islands of 16 %. The seasonal average fell from 0.5 kg per trap in 1996 to 0.42 in 1997. However, the decline was more severe in the north (23 %) than in the south (7 %). In 1997, eight fishermen took part in the program.

Exploitation levels

In 1996, it had been noticed that the average size of lobsters caught (≥76 mm) had been falling since 1985 and that the size difference between the north side of the Islands - once reputed to have larger lobsters - and the south was declining. Low abundance of large specimens was also noted, and these represented less than 1 % of landings. 1997 observations show no changes from the previous year. These indices reflect high harvesting levels. Exploitation rates calculated for 1996 (74 % on the south and 64 % on the north) were higher than those estimated for 1995 (70 % and 54 % respectively).

Magdalen Islands lobster is heavily fished, and exploitation levels have risen over the last 15 years, largely as a result of technological and strategic changes introduced over the years. The high capacity and efficiency that characterize today's lobster fishery allow some fishermen to take a larger proportion of the recruitment than was formerly possible. Exploitation of new territories that might once have served as refuges, new trap designs targeting the largest lobsters and the pursuit strategy adopted by some fishermen are all factors contributing to increased fishing pressure on the stock. Such an expansion of fishing capacity may mask a decline in stock abundance. Maintaining high harvesting levels is dangerous and may lead to recruitment overfishing, threatening the stock. The Department of Fisheries and Oceans' obligation made to fishermen to tighten conservation measures is entirely justified.

Prospects for 1998

The abundance of lobster under the commercial size (prerecruits) may be an indicator of the numbers that will enter the fishery over the next few years. Prerecruit abundance seen in sampling at sea was higher in 1997 than in 1996 on the south side of the Magdalen Islands, but lower on the north. In the latter case, when lobster between 76 and 77 mm in length, ie those returned to the sea in 1997, are taken into account, abundance is the same as over the last four years. Since the escape vent regulation came into force in 1994, there has clearly been a significant drop in the number of prerecruits in traps, and for now we do not know the exact predictive value of these data. Moreover experimentation on obstruction of escape vents was not properly done in 1997, so a reliable index cannot be derived from the data.

The lobster abundance survey done off Grande Entrée in 1997 using a *Nephrops* type bottom trawl showed that commercial size lobster, ie those that will be available for fishing in 1998, were more numerous than in 1996. It should be recalled that last year this class had exhibited a decline from 1995, which was reflected to a certain point

in 1997 landings. The data series is still too short for its predictive power to be assessed.

The Gaspé (Areas 19, 20AB, 21AB)

Landings

In the Gaspé in 1997, lobster landings reached 645 t, a drop of 41 % from the 1996 total (Figure 4, Table 1). In areas 20A (Cape Gaspé to Chandler) and 20B (Chandler to Bonaventure), which accounted for 92 % of total landings for the Gaspé, landings were 347 and 244 t respectively, a decrease of 47 % and 33 % from 1996. Landings in Area 19 (21 t) were down 41 %. In areas 21A and 21B, the declines were 5 % and 34 % respectively. In these two areas, 1997 landings were 23 and 9 t. In Area 21B, the 1996 fall fishery (licence for the Listuguj Mi'gmaq Band) took between 3 and 10 t of lobster.

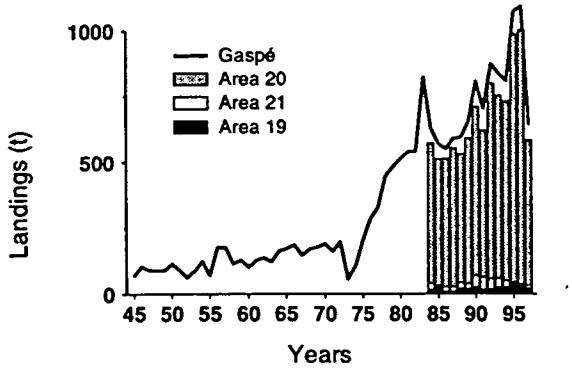

Figure 4. Lobster landings (t) in the Gaspé, from 1945 to 1997.

The landings recorded in 1997 were equivalent to those of the 1980s, except for the 1983 peak, when landings rose to 819 t. Starting in 1990, landings grew steadily to the peaks of 1995 and 1996, when they broke through the 1 000 t mark (1 072 and 1 089 t respectively). It should be recalled that landings grew by 33 % from 1994 to 1995. In 1995 and 1996 we saw record catches for the Gaspé.

Abundance indices

In 1997, commercial lobster CPUE (≥78 mm) early in the season was 0.62 lobster per trap, 2.2 times less than in 1996 (Figure 5). These data take into account the 2 mm increase in commercial size. In mid-season CPUEs were even lower, at 0.39 lobster per trap, compared to 0.96 in 1996. End-of-season CPUEs were 0.38 lobster per trap, a little higher than in recent years, suggesting that the biomass may have been less depleted by fishing than in past years.

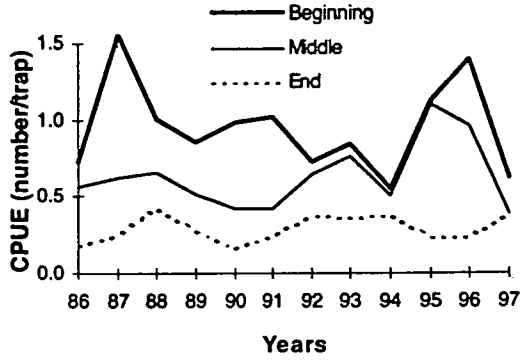

Figure 5. Catches per unit effort (CPUE) in number of lobster per trap at the start, middle and end of the fishing season in the Gaspé from 1986 to 1997. Commercial size lobster (≥76 mm prior to 1997, ≥78 mm in 1997).

Index fishermen's CPUEs in areas 20A, 20B and 21AB were all down. The decline was most marked in 20A, where average CPUE dropped from 0.43 kg per trap to 0.22 kg, a fall of 49 %. In 20B, average CPUE was likewise 0.22 kg per trap in 1997, a 37 % reduction from 1996. In areas 21A and 21B combined, average CPUE was 0.14 kg per trap in 1997, an 18 % drop from the previous year.

Various factors may account for the lower catches and catch rates seen in 1997. The increase in minimum legal size is one factor

that had an impact on landings. It has been calculated that in 1996 the proportion of landings made up of lobsters between 76 and 78 mm in length was 15 % in weight and nearly 20 % in number. However, this biomass will be available in 1998. A reduction in fishing effort may explain a small part of the decrease; according to information from index fishermen, 1997 fishing effort was 4 % down from 1996. Interviews with fishermen in the summer and fall of 1997 showed that for most of them the lower landings were attributable to adverse environmental conditions rather than to any decline in the resource. An exhaustive analysis of potential causes was conducted. Analysis of temperature data from thermographs attached to the lobster traps of some index fishermen showed that the 1997 season was as warm as the two previous ones, so that lobster catchability is unlikely to have been affected by this factor, even early in the season. Other factors, such as wind speed and direction, ice cover, the condition of the lobsters at the start of the season and the 1996 incidence of molting, were also examined; none alone seems able to account for the situation seen in 1997. The impact of other factors, such as capelin abundance, could not be determined, however. Seasonal changes in the catch rates of some index fishermen were analysed, and the results show that the profile seen in 1997 as compared to 1996 cannot be due solely to reduced catchability. It is likely that there was a fall in the biomass available for fishing, other than what could be attributable to the increase in minimum size.

Catch composition

Last year, it was noticed that the average size of lobsters caught had been dereasing since 1993, reflecting high exploitation rates and heavy dependence for fishing success on the year's recruitment. The harvesting rate calculated for 1996 was 84 %, as opposed to 71 % in 1995. Therefore, it is not surprising that the 2 mm increase in minimum size introduced in 1997 had a visible effect on the average size of lobsters landed, rising by 1.1, 1.7 and 2.8 mm respectively at the start, middle and end of the season from the corresponding 1996 figures. This is a positive development, reversing the trend seen since 1993. In general, lobster harvesting levels in the Gaspé are very high, and a tightening of conservation measures is justified.

At-sea sampling, conducted in Area 21 for the first time in 1997, revealed differences in catch rates and catch composition from other parts of the Gaspé. The percentage of berried females was much higher, reaching 32 % in mid season. Moreover, the average size of late-season catches, reaching 88.9 mm, was higher than what was ever seen in Area 20 at a comparable date (84.1 mm in 1997). This suggests that toward the end of the fishing season relatively large lobsters migrate to this area, which would also help explain the higher end-of-season catch rates, rising from 0.22 to 0.37 lobster per trap from mid to late season.

Prospects for 1998

The abundance of lobster under the commercial size (prerecruits) may constitute an indicator of the quantity of lobster available for fishing over the next few years. Late in the 1996 season, the quantity of prerecruits in traps was very high, presaging for 1997 a year of high landings. This was not the case. Late in the 1997 season, the quantity of prerecruits (72–76 mm or 72–78 mm) was lower than in 1996. These data are hard to interpret. Perhaps the quantity of prerecruits does depend on the exploitation level maintained throughout the season. If so, then during a year of intensive fishing, there would be a greater quantity of prerecruits late in the season, whereas with less inten-

sive fishing, there would still be more commercial lobster and fewer prerecruits. Certainly, those lobsters returned to the water in 1997 will make a larger contribution to 1998 landings, as most of them will undergo an additional molt, allowing them to gain considerable weight.

Anticosti (Area 17) and the North Shore (Areas 15, 16 and 18)

Catches around Anticosti Island (essentially on the east side) were 165 t in 1997, compared to 155 t in 1996. It is one of the few areas in Québec where catches have not fallen off. The Anticosti lobster population (Area 17) was sampled at sea in the middle of the 1997 fishing season. Reported CPUEs in numbers of lobsters per trap were distinctly higher than anywhere else (1.62 and 0.75 lobsters per trap in mid and late season respectively), and the animals taken were much larger than elsewhere (94.1 and 94.7 mm in mid and late season). The demographic structure, characterized by several molt classes, indicates a probable exploitation rate far lower than in the Gaspé and the Magdalen Islands.

Landings recorded in Area 15 in 1997 were much higher than in 1996, at 24 t vs 14 t. In Area 16, landings of 13 t were recorded, compared to 18 t in 1996, and in Area 18 only 2 t were recorded. At-sea sampling has been conducted in areas 15 and 16 since 1993. In general, catch rates fall off as one approaches the northern limit of lobster distribution. Lobster catch rates on the North Shore are noticeably lower than in other regions, comparable with end-of-season rates in the Gaspé or the Magdalen Islands. CPUEs for commercial lobster in the early, middle and late season were 0.39, 0.44 and 0.23 lobster per trap respectively. Higher catch rates at the start followed by a drop in mid season had been the characteristic pattern of the 1995 and 1996 seasons. Last year, it was noted that the average size of lobsters caught had declined between 1993 and 1996, and in 1997 it was smaller still, reinforcing the assumption that exploitation rates had increased. We have no data on lobster size at sexual maturity in this sector. In this region, washed by relatively colder waters than the Gaspé or the Magdalen Islands, one would expect sexual maturity to be reached at a larger size. If so, then the minimum catch size of 76 mm would not be large enough to guarantee adequate egg production per recruit. The same conservation problems as seen in the more thoroughly studied sectors of the Gaspé and the Magdalen Islands are likely to arise on the North Shore.

Conservation measures

The Department of Fisheries and Oceans has asked each fishermen's association to prepare a conservation plan by the start of the 1998 fishing season; plans should specify measures for doubling egg production per recruit: The current level of egg production per recruit and the effectiveness of the various management measures taken either alone or in combination have been evaluated. The calculation model that was applied is more accurate than the one used previously and allows to take into account the uncertainties regarding the data put into the model. This will provide us with a confidence interval for the results and allow us to determine *management risk*, ie the probability that a given management measure will or will not attain a given management objective. This risk analysis will subsequently be published. The data needed to calculate egg production per recruit are not available for the North Shore or Anticosti Island. However, it can be assumed that the situation on the North Shore is at best com-

parable to that in the Gaspé. For Anticosti Island, it can be assumed that egg production per recruit is much higher than anywhere else, and in this specific case additional conservation measures would have a preventive rather than a remedial value.

Magdalen Islands

Hitherto, the 1 mm increase in minimum catch size is believed to have increased egg production to about 1.06 times what it was with the minimum catch size at 76 mm. Average egg production per recruit prior to the increase has been estimated at 3 636 ± 1 199 on the south side of the Islands and 3 418 ± 1 097 on the north. There is no significant initial difference in egg production levels between the two sides of the Islands. Though size at sexual maturity is higher on the north side (84 mm) than on the south (79 mm), the lower fishing pressure on the north allows for egg production to be equivalent to the south.

Management measures for doubling egg production are displayed in Table 2. Measures pertaining solely to minimum catch size have a similar impact on both sides of the Islands, and increasing minimum size to 84 mm causes production to double. Implementation of a maximum catch size of 127 mm (5 inches) or 121 mm (4 ¾ inches) and marking of berried females (10 % v-notched) are effective when combined with measures for reducing fishing mortality or with a higher minimum catch size. The impact of these measures is more marked on the north side because of the lower exploitation rate, so more females can reach these sizes and benefit from these protections.

Table 2. Number of times egg production per recruit will be increased over 1996 levels (minimum catch size 76 mm) by applying various management measures.

	Increase in minimum catch size					
	76 mm	77 mm	78 mm	80 mm	82 mm	84 mm
Magdalen Islands, south	1.0	1.06	1.15	1.41	1.79	**2.24**
Magdalen Islands, north	1.0	1.06	1.14	1.38	1.72	**2.16**
Gaspé	1.0		1.20	1.59	**2.24**	**3.12**

	10 % reduction in fishing mortality from initial level			20% reduction in fishing mortality from initial level		
minimum size	78 mm	80 mm	82 mm	78 mm	80 mm	82 mm
Magdalen Islands, south	1.34	1.61	**1.99**	1.60	1.89	**2.29**
Magdalen Islands, north	1.38	1.64	**2.0**	1.72	**2.0**	**2.39**
Gaspé	1.47	1.90	**2.61**	1.86	**2.37**	**3.11**

	Combined measures: minimum, maximum sizes, reduced fishing mortality and marking of berried females (v-notching)								
Minimum size	78	78	78	78	80	80	80	82	84
Maximum size	127	127	121	121	127	127	127	127	127
↓mortality	10 %	10 %		10 %		10 %	10 %		
V-notch		10 %					10 %		
Magdalen Islands, south	1.9	**2.45**	1.68	**2.17**	1.74	**2.33**	**3.0**	**2.22**	**3.68**
Magdalen Islands, north	**2.41**	**3.05**	**2.56**	**3.49**	**2.33**	**2.92**	**3.57**	**2.95**	**3.77**
Gaspé	1.72	**2.41**	1.57	**2.18**	1.80			**2.54**	**3.6**

Gaspé

Because of a high exploitation rate and large size at sexual maturity, estimated egg production for the Gaspé is much lower than for the Magdalen Islands. Estimated egg production per recruit before the 2 mm size increase averaged 1 355 ± 544. This is barely a third of that in the Magdalens. Increasing the minimum catch size to 78 mm has increased production 1.2 times. The next 2 mm increase, planned for 1999, will increase production 1.6 times. Given the relatively low initial level of eggs per recruit, doubling egg production in the Gaspé will be easier than in the Magdalen Islands, but will probably bring fewer conservation benefits. If we decide to follow an approach based on biological reference points and that we wish to raise minimum catch size above size at sexual maturity, tripling or even quadrupling egg production will be necessary.

Conclusion

Reducing fishing mortality means reducing fishing effort: cutting the number of licences or the number of traps or shortening the season. To reduce fishing mortality by 10 %, fishing effort should theoretically be cut back by the same proportion. In practice, however, the desired mortality reduction may not be achieved because fishermen are able to make up for reduced effort through improved fishing efficiency. Shortening the season would have varying results depending on seasonal changes in lobster catchability. This in turn is determined by many factors, including environmental conditions and fishing strategy (pursuit or interception fishing). Hence, cutting the first week of the season would do more to reduce mortality than cutting the last week.

Additional conservation measures will reduce the exploitable fraction of the resource. Consequently, catches will be lower in terms of numbers, but increasing the minimum catch size will reduce growth overfishing. The lobsters returned to the water and surviving until the next year (85–90 %) will almost double their weight. This measure will produce a definite gain in the yield from these animals. Furthermore, reduced fishing mortality in the exploitable fraction will enable more individuals to achieve their full growth potential, thus creating a demographic structure characterized by more large specimens and less centered on newly recruited sizes. As a result, the fishery will be less dependent on the annual recruitment.

For more information:

Gendron, L. 1997. Lobster of the Inshore Waters of Québec. DFO Atlantic Fisheries. Stock Status Report C4-05.

Gendron, L. 1996. Status of Québec Coastal Lobster Stocks in 1995 and Analysis of Conservation Measures. DFO Atlantic Fisheries. Research Paper 96/123. 55 p.

FRCC, 1995. A Conservation Framework for Atlantic Lobster. 53 p.+ appendices.

Prepared by:
Louise Gendron
Tel. (418)775-0618
Fax. (418)775-0542
Email: gendronl@dfo-mpo.gc.ca

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Department of Fisheries and Oceans,
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