

Lobster of the Inshore Waters of Québec

Background

Since the early 1990s, lobster landings have followed a downward trend almost everywhere along the Atlantic Coast. In Québec in 1998, landings were 23% below the peak level of 1992. Whether the decline will persist over the longer term is impossible to predict. In December 1997, the Minister of Fisheries and Oceans asked each fishermen's association to prepare a conservation plan containing measures designed to double egg production per recruit within a few years. The measures adopted so far to achieve this objective have consisted solely in increasing the minimum legal size. Over the past two years, the minimum size limit has been increased by 2 mm throughout Québec, from 76 mm to 78 mm, resulting in an increase in egg production per recruit of about 15-20% depending on the region. Other benefits of the increase in minimum legal size include better use of the resource and a reduction in growth overfishing. Ensuring that large females contribute partly to egg production is an important objective that should be addressed. Recent studies on the quality of eggs and larvae produced by large females indicate that these individuals may make a greater contribution to reproductive success than might be expected based only on their higher fecundity.

Summary

- In Québec, lobster landings rose by 4% between 1997 and 1998, from 2 825 t to 2 940 t. This is in contrast with the decline of 19% observed between 1996 and 1997. Whereas Magdalen Islands landings held steady from the 1997 level, the catch rose by 29% in the Gaspé but stayed 17 % below the peak of 1996. Overall, landings have been in decline since the early 1990s everywhere in Atlantic Canada.
- The exploitation rate imposed on lobster stocks is still high. No lobsters ≥ 127 mm were recorded south of the Magdalen Islands in 1997 and 1998; lobsters this size accounted for less than 1% of landings in the Gaspé. Fishing success is largely dependent on annual recruitment. Maintaining high exploitation rates is risky and could lead to recruitment overfishing.
- Measures for doubling egg production per recruit have so far been limited to increasing the minimum legal size. The 2 mm increase has helped to increase egg production by 15% in the Magdalen Islands and 20% in the Gaspé. The target increase is 100%. Measures for enhancing the contribution of large females to egg production would be

potentially beneficial in view of the quality of eggs produced by them.

- In the Magdalen Islands, prerecruit abundance as determined from sampling at sea and the trawl survey was similar to the level computed in 1997, a situation which indicates that 1999 landings could be equal to those of 1998. In the Gaspé, although prerecruit abundance was high, this index has not proved very useful for predicting landings in recent years.

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, they have a two-year reproductive cycle, spawning one year and moulting the next. A female spawning for the first time can produce nearly 8,000 eggs, while a large female with a CTL of 127 mm (5 inches; jumbo) can lay up to 35,000 eggs. Once released, the eggs remain attached to the female's swimmerets for 9 to 12 months, until the larvae emerge the following summer. The larvae go through a planktonic phase of 3 to 10 weeks, depending on the water temperature.

Following metamorphosis, the postlarvae (Stage IV), which now resemble adults, drift down from the surface layer to 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. Lobsters reach minimum legal size between 6 and 8 years of age, after 15 to 20 moults.

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 1998, there were 656 active licences in Québec's three maritime sectors: the Magdalen Islands (329 fishers), the Gaspé (226) and the North Shore (101). Fishermen are distributed among eight main fishing areas (areas 15 to 22) (Figure 1) and 38 sub-areas. The trap limit is 250 in most areas, except for the Magdalen Islands and Anticosti Island, where the limit is 300. The use of traps larger than the standard size is limited by a policy of equivalence, in force since 1995, which is designed to stop the increase in fishing effort. In all, 175 or 210 large traps respectively are permitted in areas where 250 and 300 standard traps are authorized. In the Magdalen Islands, however, large traps were completely banned in 1997. To reduce the catch of non-commercial size lobster, escape vents on traps have been mandatory since 1994.

The lobster fishery takes place in spring and lasts 9 to 12 weeks, depending on the area. The season starts around the time of ice break-up and generally ends before the lobsters moult. The fishery is regulated by a minimum size limit and a requirement to return berried females to the sea, with the intention of conserving reproductive potential. A minimum size limit of 76 mm was established in Québec in 1957, after being raised gradually from 64 mm to 76 mm between 1953 and 1957. In 1997, the size limit was increased to 77 mm in the Magdalen Islands (Area 22) and to 78 mm in the Gaspé (Areas 19, 20AB and 21AB). A further increase of 1 mm in 1998 raised the legal size to 78 and 79 mm in the Magdalen

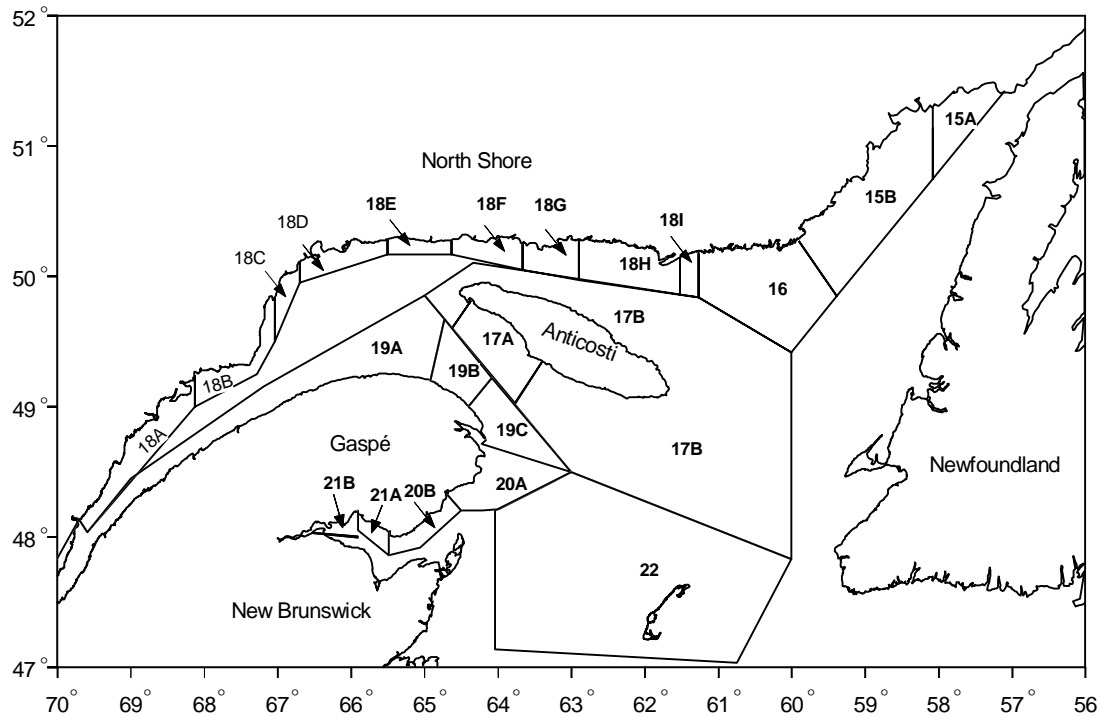


Figure 1. Lobster fishing areas in Québec.

Islands and the Gaspé (Areas 20A1 and 20A2) respectively. The size limit was also increased to 78 mm throughout the North Shore region (Areas 15, 16 and 18) and Anticosti Island (Area 17). These increases were set out in conservation plans drawn up by fishermen's associations following recommendations from the Fisheries Resource Conservation Council (FRCC, 1995) and are aimed at doubling egg production per recruit from the 1995 level. V-notching of berried females is done on a voluntary basis in some sectors of the southern Gaspé. Since 1994, fishermen have been required to return V-notched females to the sea.

Conservation approach

The lobster conservation approach for all stocks in Atlantic Canada is founded on the FRCCC report of November 1995, which corroborated scientists' longstanding

concerns about overfishing. In its report, the FRCC provided a definition of conservation and set forth conservation objectives and a series of conservation measures that could be used to attain specific goals. One of the general conservation objectives consists in maintaining stocks at an optimum level that will satisfy the whole range of environmental conditions, by conserving a sufficient spawning biomass to allow a continuing strong production of young fish. The conservation measures proposed by the FRCC are aimed at increasing egg production, reducing the exploitation rate and effective fishing effort and improving stock structure. The FRCC's arguments were based on the concept of egg production per recruit, which is a relative measure of a population's reproductive potential. The FRCC considered that the current level of egg production per recruit was too low, and recommended that it be increased to 5% of

that for an unfished stock, not just in Québec but for all lobster stocks in Atlantic Canada. Although progress has been made in computing egg production per recruit, it is still very difficult to determine with accuracy the production level found in an unfished, or virgin, population. Most lobster stocks have been heavily fished and it is very difficult for biologists to obtain information on large individuals. A great deal of uncertainty therefore persists regarding the growth, spawning frequency and natural mortality of large females (jumbos, ≥ 127 mm carapace length). In the absence of such information, no precise determination can be made about whether the target of 5% for egg production (5% of that of a virgin stock) has been attained. In view of this situation, the conservation objective has been changed. In December 1997, the federal Minister of Fisheries and Oceans established a new requirement, namely that egg production per recruit be doubled from the 1995 level by 2000-2001.

From the standpoint of lobster stock conservation, the benefits of doubling egg production per recruit will vary depending on the present production level of individual populations. For example, in areas where egg production is currently very low, it will be easier to reach this target, but the conservation benefits may be minimal. Doubling egg production per recruit should therefore be seen as a provisional rather than a final target. In some areas, it would be better to triple or even quadruple the present level of egg production since it is extremely low.

Effects of the increase in minimum legal size

So far, the measures adopted to achieve the above-mentioned conservation objective have been limited to increasing the minimum legal size. A size limit of 84 mm is to be phased in by the year 2004. The

conservation plan objective of doubling (100% increase) egg production per recruit from the 1995 level will be achieved at that point. Size limit increases entail changes in the level and composition of catches. In a context of steady recruitment, the number of lobsters landed should decline. Individuals not caught in a given year will be available to the fishery the following year but their numbers will have been reduced by natural mortality, estimated at 10-15 % annually. The lobsters will be larger, however, because of the opportunity to undergo another moult, permitting a weight gain of 45%. Thus, the catch should increase in terms of weight, with weight gains more than offsetting the decrease in the number of lobsters caught. This will be true for males and immature females.

The size limit increase will allow a larger proportion of females to reproduce before being harvested. The number of berried females in the population should increase, resulting in a decline in catches of nonberried females. Females not available to the fishery in a given year because they are berried will become available the following year, after completing their reproductive cycle. They will be larger then because of the additional opportunity to moult. However, in the case of berried females, the weight gains may barely make up for the reduction in number of individuals taken (natural mortality over two years). Overall, however, catches will increase in weight. In addition, the benefits resulting from earlier increases should lessen or completely offset the effects of subsequent increases.

Despite the increase in minimum legal size, fishing pressure on the harvestable portion of the population will remain high, and even greater pressure is a possibility that cannot be ruled out. Hence, the population structure will continue to be dominated by newly recruited lobsters, and the fishery will remain just as dependent on annual

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

	1991	1992	1993	1994	1995	1996	1997	1998*
<i>Area 15</i>	32	37	26	8	12	14	19	18
<i>Area 16</i>	12	16	14	10	12	18	12	11
<i>Area 17</i>	76	98	108	143	137	155	184	109
<i>Area 18</i>	12	5	12	8	17	6	19	3
<i>Area 19</i>	17	18	25	25	40	36	23	38
<i>Area 20</i>	621	797	751	730	985	1016	648	835
<i>Area 21</i>	64	58	59	51	46	39	37	39
<i>Area 22</i>	2642	2806	2593	2007	2142	2219	1883	1887
TOTAL	3476	3835	3588	2982	3391	3503	2825	2940

recruitment. Harvesting pressure on nonberried females will stay high, thereby precluding an increase in the number of large females in the population, whose contribution to reproductive success may be important.

Stock status in 1998

Lobster landings in Québec rose by a moderate 4% between 1997 and 1998, from 2 825 t to 2 940 t (Table 1; Figure 2). While Québec's total catch remained high in 1998 compared with the 25-year average of 2 273 t, it was lower than the 10-year average (3 209 t). Since the early 1990s, landings have been in decline throughout the Atlantic region. In 1998, the Canadian catch stood at 37 000 t (preliminary data) versus about 46 000 t in 1990. In Québec, total landings were 23.4% below the peak level of 3 835 t recorded in 1992. Landings rose steadily between the mid-1970s and the early 1990s almost everywhere along the Atlantic coast of Canada. In Québec, this upturn was concentrated mainly in the

Magdalen Islands, where landings nearly tripled between 1976 and 1992. The geographic extent of this expansion and the recent decline suggest the influence of common factors with a broad impact on lobster recruitment. In some sectors, higher landings may be partly attributable to an increase in certain components of fishing effort.

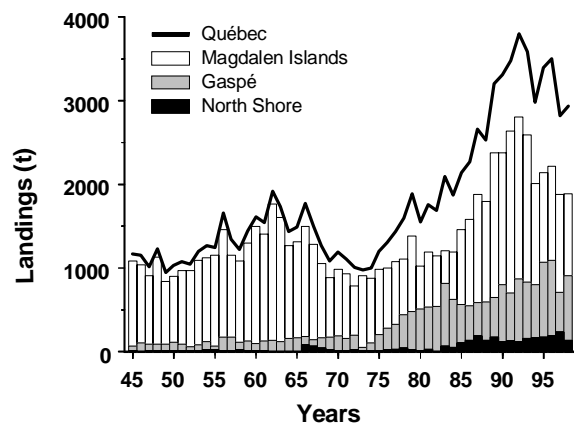


Figure 2. Lobster landings (t) in Québec from 1945-1998.

In 1998, 64.2% of Québec catches came from the Magdalen Islands (Area 22), 31% from the Gaspé (areas 19, 20 and 21) and 4.8% from the North Shore (areas 15, 16 and 18) and from Anticosti Island (Area 17).

Magdalen Islands (Area 22)

Landings

In the Magdalen Islands in 1998, lobster landings totalled 1 887 t, which is comparable to the 1997 catch of 1 883 t. The 1998 figure is 32.8% below the record catch of 2 806 t posted in the region in 1992 and 16.1% below the average of 2 249 t for the past 11 years (1988-1998). Going back even farther, the 1998 catch is basically on a par with the 25-year average of 1 964 t (1973-1998). This 25-year period includes a downturn in landings during the 1970s. Between 1969 and 1976, lobster catches were lower than 1 000 t (average of 919 t).

Landings in the southern area (from Old Harry to Havre-Aubert) were down by 1% from 1997, at 1319 t, whereas those in the north were up by 3.1%, at 568 t. The increase observed in the northern region is small, however, considering the drop that occurred between 1996 and 1997 (21%). Over the past two years, the northern region's catch accounted for about 30% of the total landings in the Magdalen Islands, compared with 35 % historically.

In the Magdalen Islands region as a whole, the 1998 lobster fishing season was characterized by favourable meteorological and climatic conditions. In view of the mild winter and lack of ice cover, there was a call to open the fishery a week earlier and it began on May 2. When the season opened, the water temperature was about 2°C (Shag Island, 10 m deep), which is equal to the temperature recorded over the past three years. The water temperature in the northern fishing grounds was comparable, an unusual

situation for that time of year. The water generally warms up more slowly in the north, and temperatures close to 2°C are not usually seen until around the end of May. The spring warming trend occurred more quickly than usual, and the number of degree-days recorded in the southern area for the entire 1998 fishing season was 31% higher than in 1997. Average wind speed was recorded at Havre aux Maisons airport in May 1998 at 9.8 knots, compared with 12.1 knots in May 1997, and no major storms were reported. In June 1998, average wind speed was 9.6 knots, which is close to the value recorded in June 1997 (9.9 knots).

Based on data from the index fishermen program, fishing effort during the season was 87% of the maximum level. In 1998, 59.7% of the season's landings were made by the end of the first three weeks of fishing, compared with 56% and 52% in 1996 and 1997 respectively. The fishers' strategy of pursuit results in rapid harvesting of the resource when meteorological and climatic conditions are favourable.

The adverse impact on catches of the increase in minimum legal size (1 mm increase, from 77 to 78 mm) instituted in 1998 was probably diminished, as expected, by the benefits resulting from the previous increase, implemented in 1997 (from 76 to 77 mm). In fact, the increased lobster biomass attributable to the moulting of 76-77 mm individuals that survived the 1997 fishery should theoretically more than compensate for the decreased catch due to the return to the water of 77-78 mm lobsters in 1998. In 1997, it was believed that the 1 mm size limit increase alone could not explain the lower catches observed at the time. In 1997, landings were down by 15% from 1996. It was estimated that lobsters in the 76-77 mm size range made up about 4% of catches from the southern area and 2% from the northern area. The lower landings observed in 1997 and 1998 compared with

1996 were attributed to a decrease of resource abundance. This conclusion is backed up by the fact that in 1998 no climatic or other events have been identified which could have had a negative impact on lobster catchability.

Abundance indices

An abundance index of commercial-size lobster (≥ 76 mm before 1997, ≥ 77 mm in 1997 and ≥ 78 mm in 1998) is computed using catch per unit effort (CPUE) data obtained from at-sea sampling operations, conducted by DFO since 1985. In 1998, the abundance indices were slightly lower than those of 1997 (Figure 3) for the Magdalen Islands as a whole. In 1998, the CPUE for commercial-size lobsters at the start of the fishing season was 1.24 individuals per trap, down slightly (4.6%) from 1.30 in 1997. The mid-season CPUE was 0.63 versus 0.71 in 1997, a drop of 11%. At the end of the season, the CPUEs were equal to those of 1997, at 0.34 lobster per trap (0.35 in 1997). In 1998, mean biomass by trap was equal to that recorded in 1997 throughout the Magdalen Islands region. However, going beyond this general pattern, a decline in CPUEs was noted in the south, versus an increase in the north, particularly early in the season. As mentioned in connection with conservation measures, the number of individuals caught should decline as a result of the size limit increase, but the weight yield should increase.

Overall, since the late 1980s CPUEs have been markedly higher than those of the mid-1960s and late 1970s. In the Magdalen Islands, CPUEs are generally higher at the beginning of the season, partly as a result of the higher catchability of lobster and the strategy of pursuit that fishers have developed to take advantage of this situation. Mid-season CPUEs have been in decline since 1994, a downturn which is attributed to the fact that the lobster biomass

is not strong enough to support high yields until mid-season.

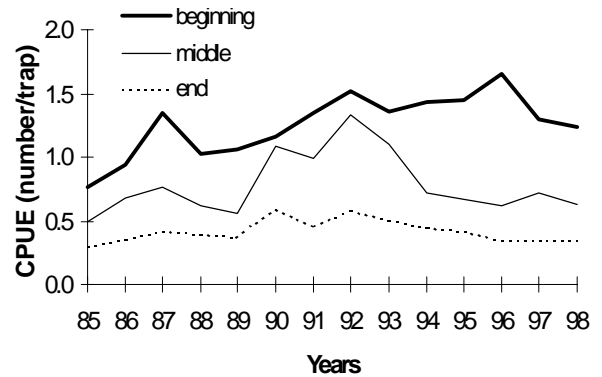


Figure 3. Catches per unit effort (CPUE) based on number of commercial-size lobster per trap at the beginning, middle and end of the fishing season in the Magdalen Islands, 1985 to 1998.

Catch composition

In 1998, the average size of lobsters caught rose by 2 mm compared with 1996, and landings were made up of slightly larger individuals in comparison with the catches made between 1993 and 1996. These changes are consistent with the anticipated results of the increase in minimum legal size. Between 1985 and 1996, a downtrend was noted in the average size of lobsters caught, along with a decrease in the size difference between the north side of the Magdalen Islands, once reputed to have large lobsters, and the south side. A low abundance of large specimens was also noticed, and these represented less than 1% of landings. The proportion of large lobsters is still low and no individuals ≥ 127 mm were recorded on the south side in 1997 or 1998. Exploitation rates remain high in both areas, at 68% and 57% (mean for 1985 to 1997).

The percentage of berried females observed in the southern area at the end of the season increased in 1998 (24%) compared with 1996 (9%) and 1997 (18%). This trend was foreseeable since the increase in minimum legal size gives more females a chance to

reproduce before they are caught. Further to the 2 mm increase in minimum legal size, the level of egg production per recruit has risen 15% over the 1996 value.

The Magdalen Islands lobster stock is heavily exploited and harvesting intensity has increased over the last 15 years largely as a result of technological and strategic changes. The high capacity and efficiency that characterize today's lobster fishery allow fishers to remove a larger proportion of the recruitment than was formerly possible. Exploitation of new bottom areas that might once have served as refuges, new trap designs targeting the largest lobsters and the pursuit strategy adopted by fishers are all factors contributing to increased fishing pressure on the stock. Maintaining high exploitation rates is risky and may lead to recruitment overfishing, imperilling the stock. The stricter conservation measures that have been imposed on the lobster fishery by the federal Minister of Fisheries and Oceans are fully justified.

Recruitment

The abundance of undersized lobsters (prerecruits) may be an indicator of the numbers that will enter the fishery over the next few years. Abundance indices for prerecruits are derived from sampling with traps with blocked escape vents and from a survey conducted off Grande-Entrée with a *Nephrops* bottom trawl. Prerecruit abundance in 1998, as determined from at-sea sampling or the trawl survey, is similar to that recorded in 1997. Landings in 1999 might thus reach levels on a par with those of 1998. The data series is still too short, however, for its predictive value to be rated.

Gaspé (areas 19,20AB, 21AB)

Landings

Whereas in 1997 lobster landings dropped 35% from the 1996 level, in 1998 a reverse

trend was noted in most fishing areas along the Gaspé Peninsula. For the Gaspé as a whole, 1998 landings totalled 912 t, up 29% from the 1997 catch of 708 t (Table 1; Figure 4). Though the 1998 catches were 17% lower than the peak levels recorded in 1995 and 1996 (1 072 t and 1 089 t respectively), they were well above the average value posted during the 1980s (575 t).

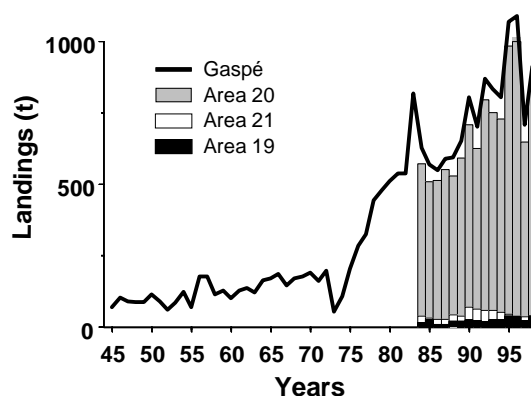


Figure 4. Lobster landings (t) in the Gaspé from 1945 to 1998.

In areas 20A (Cape Gaspé to Chandler) and 20B (Chandler to Bonaventure), which are exploited by 206 fishers and provide 92% of the Gaspé's total catch, landings stood at 835 t in 1998 versus 648 t in 1997. This represents an increase of 29% over 1997, but a drop of 16.5% from 1996 (1 016 t). In Area 19, which is fished under 7 licences and produces about 4% of the Gaspé's total landings, 38 t of lobster was landed, which is equal to the 1995 and 1996 catches but 65% higher than the 1997 catch. Landings in areas 21A and 21B, which are exploited by 12 fishers and contribute 4% of Gaspé landings, amounted to 29 and 10 t respectively, on a par with the levels seen in 1996 and 1997. Area 21B was also fished in the fall of 1997 (Mi'gmaq of Listuguj Band), but the amount of lobster landed is not known.

In 1998, the fishery began on April 25 in most areas, although the opening date was a week later in Gaspé Bay and Malbaie (20A1 and 20A2), as well as in the Bonaventure sector (20B8 and 21A). In the Anse-à-Beaufils sector, the water temperature rose from 1°C to 3°C during the first week of the fishery. The water warmed up faster in 1998 than in previous years. In fact, the number of degree-days recorded for the whole 1998 season was 8 to 16% higher than in 1997, depending on the region. Early May was very calm. The wind speed value recorded at Miscou was lower in 1998 than in both 1997 and 1996 (7.6, 9.3 and 8.4 knots respectively). In June, wind speed was 7.9 knots, compared with 7.0 knots in 1997 and 8.4 knots in 1996.

Data obtained from index fishermen indicate that the 1998 fishing effort was equal to that recorded between 1994 and 1997. Fishing conditions appear to have been favourable during 1998, in contrast with what was reported in 1997.

In 1997, we conducted an exhaustive analysis of the factors potentially responsible for the observed decline in landings. Interviews with fishers revealed that most of them blamed the drop in landings on unfavourable environmental conditions (winds, currents, capelin) rather than a decline in the resource. They felt that the increase in minimum legal size was partly to blame for the lower catch. Based on our estimates, lobsters ranging in size from 76 to 78 mm may have made up as much as 15% of total landings in weight, in some sectors of the Gaspé. Environmental factors likely to affect lobster catchability (temperature, wind speed and direction, presence of capelin), along with fishing effort deployed during the season (index fishermen data) were also examined. In this analysis, we applied a model capable of discriminating between lobster catchability and abundance in terms of their effect on

catch rates and determined that a biomass decrease due to some factor other than the increase in minimum legal size probably caused the reduction in catches. The drop in landings could not have been caused solely by a decrease in catchability. The fact that 1998 landings were smaller than those of 1996 supports this hypothesis. If the decline observed in 1997 had resulted solely from reduced catchability, lobsters not caught in 1997 would have been taken in 1998, thus allowing landings to rebound completely. However, this did not happen.

Abundance indices

In most subareas of the Gaspé, minimum legal size was not increased in 1998; the size limit was held at 78 mm, except in areas 20A1 and 20A2, where it rose to 79 mm. In 1998, early-season CPUEs rose by 8.6% to 0.70 lobster/trap from 0.64 in 1997 (Figure 5). CPUEs held steady in mid-season at 0.65 lobster/trap, versus 0.40 lobster/trap in 1997. At the end of the season, the values were just as high (0.50 lobster/trap) as in previous years (0.39 lobster/trap in 1997 and 0.24 lobster/trap in 1996). Catches thus remained stable throughout the season, varying between 0.50 and 0.70 lobster/trap.

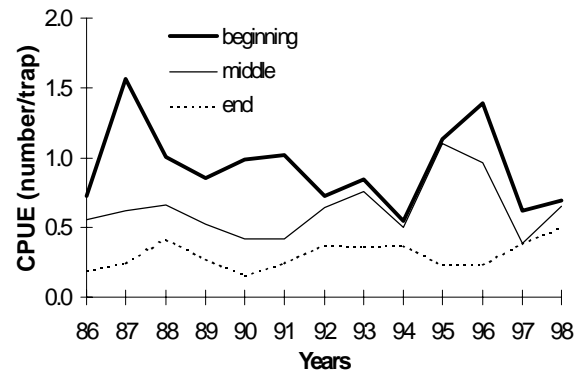


Figure 5. Catches per unit effort (CPUE) based on number of commercial-size lobsters per trap at the beginning, middle and end of the fishing season in the Gaspé, 1986 to 1998.

This pattern can also be seen in the catches made by index fishermen. CPUEs for these fishers in areas 20A, 20B rose in 1998. In Area 20A, the mean CPUE for the season was 0.37 kg/trap compared with 0.22 kg/trap in 1997 and 0.43 kg/trap in 1996. In Area 20B, the CPUE stood at 0.31 kg/trap versus 0.22 kg/trap in 1997 and 0.35 kg/trap in 1996. For areas 21A and 21B combined, the mean CPUE was 0.15 kg/trap in 1998, in comparison with 0.17 kg/trap in 1996 and 0.14 kg/trap in 1997.

Catch composition

In 1996, it was determined that the average size of lobsters caught at the beginning and middle of the season had been in decline since 1993, reflecting the effect of high exploitation rates, and the fishery's heavy dependence on annual recruitment. It is hardly surprising that the 2 mm increase in minimum legal size, introduced in 1997, had a visible effect on the average size of individuals landed. Average size rose by 1.1 mm, 1.7 mm and 2.8 mm respectively at the beginning, middle and end of the season in 1997 compared with 1996; in 1998 the corresponding values were around the same levels. This is a positive development, reversing the downturn that has been going on since 1993. Landings in 1998 were composed of slightly larger lobsters, compared with the sizes seen in 1996. These changes are consistent with expectations regarding the increase in minimum legal size.

The proportion of large lobsters is low. The percentage of catches composed of lobsters ≥ 127 mm varies between 0.3% and 0.8% depending on the site. The exploitation rate remains high (mean rate of 74% from 1986 to 1997). The percentage of berried females at season's end increased from 10% in 1997 to 20% in 1998, a foreseeable trend given the increase in the minimum size limit. Egg production per recruit rose by about 20%

from the 1996 level as a result of the 2 mm increase in minimum legal size.

Catch composition in Area 21, sampled for the first time in 1997, revealed differences from the rest of the Gaspé. The percentage of berried females was higher, and the average size of lobsters taken was greater overall. There are also fewer undersized lobster in the area. The sector may be dependent on more productive areas situated farther upstream.

Recruitment

The abundance of lobsters slightly smaller than commercial size (prerecruits) may be an indicator of the quantity of lobster that will enter the fishery. However, in recent years we have not been able to link prerecruit abundance of any given year to the landings of the following year. For example, at the end of the 1996 season, the number of prerecruits in traps was very high, presaging a year of very high landings. This was not the case, however. In 1997, the recruitment index was lower than in 1996, and yet 1998 landings were greater than those of 1997. At the end of the 1998 fishing season, prerecruits (72-76 mm) were more numerous than in 1997 (0.81 versus 0.41 lobster/trap). Perhaps the number of recruits depends also on the exploitation rate maintained during the season. If so, during a year of intensive harvesting, there would be a greater quantity of prerecruits late in the season, whereas with less intensive fishing, there would still be more commercial-sized individuals and fewer prerecruits. The lobsters returned to the water in 1998 (76-78 mm) will definitely make a greater contribution to 1999 landings than they would have to the 1998 catch, as they will have gone through an additional moult.

North Shore (areas 15, 16, 18) and Anticosti Island (Area 17)

In 1998, the minimum legal size was increased to 78 mm on the North Shore and Anticosti Island. Lobster landings in the North Shore region make up between 1% and 2% of Québec's total catch depending on the year, while Anticosti Island landings account for about 4%.

Catches around Anticosti Island (essentially on the east coast) fell to 109 t in 1998 from 184 t in 1997. At present, we are unable to explain this decrease because of uncertainty over the landings that were recorded. We are able to confirm, however, that the increase in minimum legal size from 76 mm to 78 mm cannot have had more than a marginal impact, given our estimate that only 2% of landings would be composed of lobsters in the 76-78 mm size range. The Anticosti Island lobster population was sampled at sea in 1997 in mid-season and at season's end. The CPUEs (number of lobsters per trap) were substantially higher than everywhere else, and the individuals caught were much bigger. Dockside sampling in 1998 revealed a population structure characterized by the presence of several moult classes, a situation already observed in 1997. These observations suggest that the exploitation rate is much lower than that in the Gaspé and the Magdalen Islands. It has previously been estimated at 20%. In addition, there are many large lobsters and the proportion of catches made up of individuals ≥ 127 mm was 8.7% in 1997.

The landings recorded in areas 15 and 16 in 1998 were comparable to those of 1997, at 18 t (Area 15) and 11 t (Area 16) versus 19 t and 12 t respectively in 1997. In Area 18, the catch totalled 3 t. An at-sea sampling program has been under way in areas 15 and 16 since 1993. In general, catch rates decline as one moves toward the northern

edge of the species' range. Catch rates on the North Shore are markedly lower than those observed in the other regions. They are comparable to those seen in the Gaspé and the Magdalen Islands late in the season and rarely exceed 0.5 lobster/trap. The CPUE for commercial-sized lobster at the start of the 1998 fishing season was 0.56 lobster/trap, but fell to 0.27 and 0.25 lobster per trap at mid-season and season's end respectively. The average size of the individuals caught was larger in 1998 than in 1997, which reflects the increase in the minimum legal size. The exploitation rate is believed to be high, not as high perhaps as in the Gaspé, since the size frequency distributions show a few modes corresponding to large individuals. However, no lobsters ≥ 127 mm were observed among the specimens taken in 1998.

Egg production per recruit was not computed for the North Shore and Anticosti Island sectors. In view of the lack of information and as a precaution, we recommended that the conservation measures introduced in the Gaspé be adopted on the North Shore as well. We are assuming that egg production per recruit is not as low around Anticosti Island, as elsewhere. Additional conservation measures could be implemented in this particular sector as a precaution.

Outlook

Implementation of additional conservation measures will make it possible to attain the goal of doubling egg production per recruit from the 1995 level. This target will be achieved in 2001, primarily through increases in minimum legal size. The new conservation measures will cause major changes in the size and composition of catches. In the lobster stock assessment of 1998, we identified changes, which although not statistically significant, are nonetheless in keeping with the trends expected as a

result of the increase in minimum legal size. In principle, those changes should become more and more apparent over time.

The catch composition will change. The average size of lobsters caught will increase gradually, with this change being more noticeable at sites where the fishery is heavily dependent on recruitment. Since more females will have a chance to reproduce, the proportion of berried females will increase. The percentage of females vulnerable to the fishery will then decrease, modifying the sex ratio in catches. These changes will be more evident in sectors where size at sexual maturity is smaller.

Catch rates will also change; however they will be more difficult to measure since they may be masked by fluctuations in recruitment. However, in a context of steady recruitment, catches can be expected to decline in number of individuals but increase in weight. Males that are not caught in a given year will be available to the fishery the following year, but their numbers will be lower owing to natural mortality. However, these individuals will be bigger, because of the additional opportunity afforded them to moult before being caught. The weight gains associated with this moult will more than offset the reduced number taken. Females that are not caught in a given year will not all be available to the fishery the following year. Those ready to spawn will not be available to the fishery for two years. It is believed that, for females, the weight gains at this point will at most offset the smaller number of individuals caught (natural mortality over two years). However, it can be predicted that, overall, the benefits resulting from earlier increases will lessen or completely offset the impacts of later ones.

The increase in minimum legal size will not lessen the fishing pressure exerted on the harvestable portion of the population. Unless there is a significant reduction in fishing

effort, it can therefore be expected that the population will still be dominated by newly recruited lobsters and that the fishery will be just as dependent on annual recruitment. In such a case, egg production will still depend almost exclusively on small females reproducing for the first time (primiparous). It might be beneficial to lobster populations if large females (multiparous) had the opportunity to contribute to egg production. Studies currently in progress suggest that the larvae produced by large females develop more quickly than those from small females do. Large females may make a more significant contribution to reproductive success than what might be expected based solely on their higher fecundity.

Although it is difficult to establish a direct link between the quantity of eggs produced and recruitment to the fishery, higher egg production should at least ensure that this factor does not become limiting. When environmental conditions are favourable, increased egg production should translate into improved recruitment. Under unfavourable environmental conditions, higher egg production could reduce the risk of stock collapse.

Our ability to predict landings is still poor for most lobster stocks of the inshore waters of Québec. However, in both the Magdalen Islands and the Gaspé, through trap sampling during the commercial fishery and the trawl survey, we were able to identify lobsters that will make up 1999 catches. In the Magdalen Islands in 1998, prerecruit abundance appeared to be similar to that of 1997. This suggests that 1999 landings may reach levels equivalent to those of 1998, if fishing conditions are suitable. In the Gaspé, prerecruits were found in large numbers, but the relationship between their abundance and catch size the following year has not been borne out in recent years. Hence, it is difficult to make a prediction for the Gaspé.

For more information:

FRCC, 1995. A Conservation Framework for Atlantic Lobster. 49 p. + appendices.

Gendron, L. 1996. État des stocks de homard des côtes du Québec en 1995 et analyse des mesures de conservation. MPO Pêches des l'Atlantique. Document de recherche 96/123. 55 p.

Gendron, L. and J. Archambault. 1997. Change in fishing capacity in the American lobster (*Homarus americanus*) fishery of the Magdalen Islands (Québec) from 1975 to 1995. Can. Tech. Rep. Fish. Aquat. Sci. 2189: vi + 16 p.

Prepared by:

Louise Gendron

Tel. (418)775-0618

Fax. (418)775-0542

E-mail: gendronl@dfo-mpo.gc.ca

Correct citation for this publication

DFO, 1999. Lobster of the Inshore Waters of Québec. DFO Science Stock Status Report C4-05 (1999).

Published by

Regional Stock Assessment Office,
Department of Fisheries and Oceans,
Maurice-Lamontagne Institute,
P. O. Box. 1000, Mont-Joli,
Québec, Canada
G5H 3Z4

Email: Stocksrl@dfo-mpo.gc.ca

ISSN 1480-4913

Additional copies can be obtained from the above address.

La version française de ce document est disponible à l'adresse ci-dessus.



<http://www.qc.dfo-mpo.gc.ca/ml/en/intro.htm>



Pêches et Océans
Canada

Fisheries and Oceans
Canada

Sciences

Science