

Lobster of the Inshore Waters of Québec in 2000

Background

The conservation plans set out for lobster fishing areas (LFAs) in Québec since 1997 call for the minimum legal size to be increased gradually, by 1 to 2 mm per year. The purpose of these increases is to double egg production per recruit (E/R) from 1996 levels, as required by the Minister of Fisheries and Oceans in the fall of 1997. From 1957 to 1996, the minimum legal size (carapace length) was 76 mm throughout Québec. In 2000, the minimum legal size was 80 mm in LFAs 17, 19, 20, 21 and 22, and 79 mm in LFAs 15, 16 and 18. So far, these size increases appear to have enabled egg production per recruit to increase by 40 to 60%, depending on the region. However, this conservation measure actually promotes egg production only among females that are spawning for the first time (primiparous). Measures to increase egg production among larger females that are spawning for at least the second time (multiparous) would be desirable, because of potential benefits associated with the quality of their eggs and larvae. The exploitation rate for Québec's lobster stocks is still high and has increased gradually over the past 15 years, so continued increases in minimum legal size remain justified. A substantial reduction in fishing effort should also be considered, to reduce the fishery's dependence on annual recruitment and obtain the full benefits of the increase in minimum legal size, which are reduced if the exploitation rate increases.

Summary

- Québec lobster landings reached 3 231 t in 2000, which is comparable with the figures for 1998 and 1999. In 2000, 62% of the landings came from the Magdalen Islands, 33% from the Gaspé, 4% from Anticosti Island, and 1% from the North Shore. In the Magdalen Islands in 2000, landings reached 2 004 t, up 4% from the 1999 figure of 1 936 t. Over the past four years, landings in the Magdalen Islands have been relatively stable, but nearly 30% lower than the peak figure of 2 806 t reached in 1992. Landings for the Gaspé as a whole totalled 1 054 t, which was comparable to the figures for 1998 and 1999 and for 1995 and 1996 and exceeded the average for the past ten years (892 t). Landings on the North Shore fell slightly in 2000, totalling 28 t, whereas landings at Anticosti Island remained at a relatively high level (142 t) and exceeded the average for the past ten years (126 t).
- In 2000, catch rates were up in the southern Magdalen Islands, and as high as in 1996. But in the northern part of the Islands, they did not increase, and were lower than in 1996. In the Gaspé, for LFAs 20A and 20B, the catch rates

were equivalent to those for 1999 and exceeded the average for the past 15 years. The catch rates for LFA 21, like those along the North Shore (LFAs 15 and 16), held steady in 2000, but were only one-third to one-half those for LFA 20. Along the North Shore, the catch rates were lower than in past years. In general, catch rates follow the same trend as landings. We have no yield values for LFAs 17 (Anticosti Island), 18 (North Shore), or 19 (Northern Gaspé).

- The increase in the minimum legal size has caused perceptible changes in the structure of the lobster populations of the Gaspé and the Magdalen Islands. The mean size of the lobsters landed has increased by 3 mm on average, while the mean weight has risen by about 10%.
- The exploitation rates are still high in the Magdalen Islands (around 75%) and the Gaspé (around 80%), and probably also on the North Shore. They have been rising since 1995, despite nominal control over fishing effort, thus increasing the fishery's dependency on annual recruitment. The exploitation rate at Anticosti Island is lower (about 20%).
- Since the imposition of the 4 mm increase in the minimum legal size, egg production per recruit as calculated by a computer model appears to have increased by 40% in the Magdalen Islands and 60% in the Gaspé, compared with the 1996 figures. The target is an increase of 100%.
- In the Magdalen Islands, fishery recruitment indices are up, suggesting that total landings for 2001 could be comparable to those for 2000. The recruitment index observed in the Gaspé was lower in 2000 than in 1999, suggesting that landings in 2001 may be lower than in 2000.

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 take shelter, but also live on sandy or even muddy bottoms. While commercial-size lobster are generally found at depths of 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 (CL) of about 79 mm in the southern part of the Magdalen Islands, about 84 mm in the northern part of these islands and in the Gaspé, and over 90 mm along the North Shore and around Anticosti Island. In general, the females 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 CL of 127 mm (jumbo size) 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 planktonic larvae emerge the following summer. The larvae's planktonic phase lasts from 3 to 10 weeks, depending on the water temperature. Following metamorphosis, the postlarval lobster (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 CL of about 40 mm, lobsters lead a cryptic existence, living in structurally varied habitats that offer many hiding places. In the Magdalen Islands and the Gaspé, lobsters are estimated to reach minimum legal size between 6 and 8 years of age, after having moulted 15 to 20 times.

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 2000, there were 656 active licences in Québec's three maritime sectors: the Magdalen Islands (329), the Gaspé (226) and the North Shore (101). There are 8 main lobster fishing areas (LFAs 15 to 22) (Figure 1) and 38 subareas. The trap limit per licence is 250 in most LFAs, except for the Magdalen Islands and Anticosti Island, where it is 300. The use of traps larger than the standard size is limited by a policy of equivalence, in force since 1995. In LFAs where 250 standard traps are authorized, a total of 175 large traps are permitted, and in LFAs where 300 standard traps are authorized, 210 large traps are permitted. In the Magdalen Islands, however, large traps were completely banned in 1997. To reduce the catch of undersized 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 LFA. 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 objective of conserving reproductive potential. A minimum legal size of 76 mm was established in Québec in 1957, after being raised gradually from 64 mm to 76 mm between 1953 and 1957. In 2000, the size limit was 79 mm in LFAs 15, 16, and 18 and 80 mm in LFA 17 and LFAs 19 to 22. These increases are part of conservation plans aimed at doubling egg production per recruit from the 1996 levels. V-notching of berried females is done on a voluntary basis in some sectors of the southern Gaspé. Since 1994, V-notched females must be thrown back.

Conservation Approach

The conservation approach for all lobster stocks in Atlantic Canada is founded on the 1995 Fisheries Resource Conservation Council (FRCC) report, which confirmed an earlier finding that stocks were being overfished. The FRCC's general conservation objective is to maintain stocks at an optimum level for the whole range of possible environmental conditions, by conserving a sufficient spawning biomass to allow continuing strong production of juveniles. The aims of the conservation measures proposed by the FRCC are to increase egg production, reduce the exploitation rate and effective fishing effort, and improve stock structure by increasing the number of moult-groups. The FRCC's reasoning was based on the concept of egg production per recruit (E/R), which is a relative measure of a population's reproductive potential. The FRCC considered that E/R was too low and recommended that it be increased to 5% of that of an unfished stock, not just in Québec but throughout Atlantic Canada. However, the current conservation objective is to double the E/R from the 1996 level.

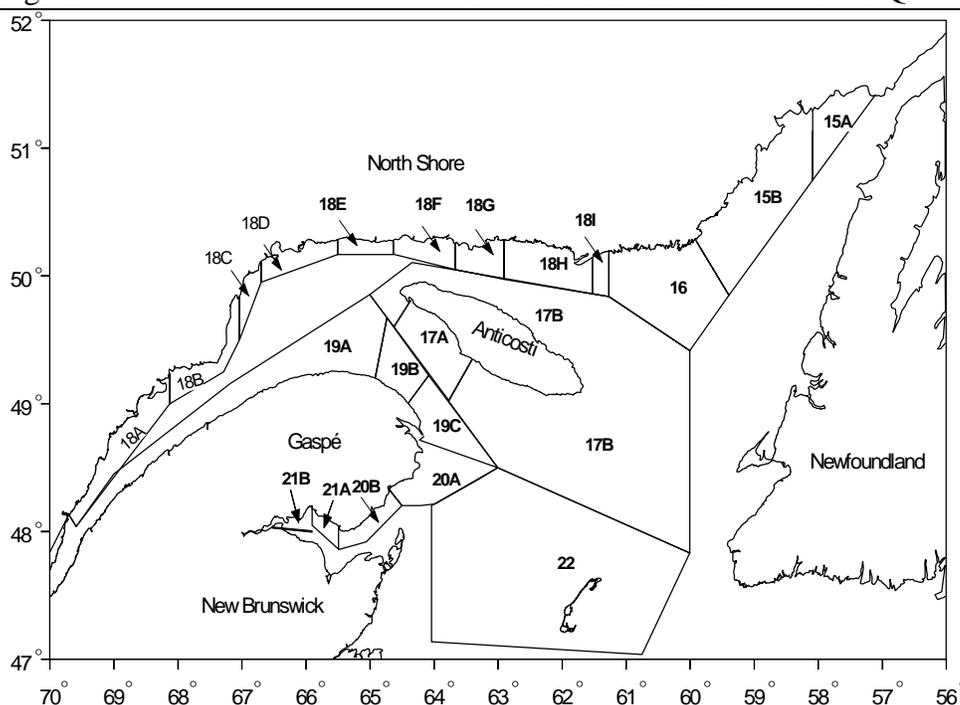


Figure 1. Québec lobster fishing areas.

Stock Status in 2000

Stock status assessments are based on analyses of data from three sources: landings, sampling done on board fishing vessels at sea, and catch and effort data from index fishers' logbooks.

Québec lobster landings totalled 3 231 t in 2000 (Table 1; Figure 2), which is comparable to the 1998 and 1999 figures of 3 049 t and 3 214 t, respectively. Landings for Québec as a whole have been on the decline since 1992, when they hit an historic peak of 3 835 t. They fell in 1997, the year that the program for increasing the minimum legal size began. The total landings for 2000 were below the 10-year average but equivalent to the 25-year-average. The percentage distribution of landings among the eight main lobster fishing areas in 2000 was as follows: 62% from the Magdalen Islands (LFA 22), 33% from the Gaspé (LFAs 19, 20, and 21), 4% from Anticosti Island (LFA 17), and 1% from the North Shore (LFAs 15, 16 and 18).

Magdalen Islands – LFA 22

For the fourth consecutive year, the minimum legal size for lobster taken in the Magdalen Islands was increased by 1 mm, bringing it to 80 mm, compared with the 76 mm limit in effect from 1957 to 1996.

Landings

Lobster landings in the Magdalen Islands totalled 2 004 t in 2000, an increase of 4% compared with the figure of 1 936 t in 1999. The 2000 total was still almost 30% lower than the peak landings of 2 806 t made in 1992. The 2000 figure was also below the average for the past ten years (2 253 t, 1990-1999). In 2000, 70% of lobster landings in the Magdalen Islands came from the southern part of the Islands (Old Harry to Havre-Aubert), while 30% came from the northern part (Grosse-Île to Millerand). The proportion of landings from the north side has been on the decline for the past few years. For the area as a whole, the 2000 fishing season took place under weather and climate conditions favourable for the harvesting of lobster.

Table 1. Québec lobster landings (t) by lobster fishing area, 1990-2000

LFA	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000*
15	31	32	37	26	8	12	14	19	18	18	17
16	20	12	16	14	10	12	18	12	15	22	11
17	51	76	98	108	143	137	155	184	130	178	142
18		12	5	12	8	17	6	19	7	8	3
19	26	17	18	25	25	40	36	23	32	40	36
20	709	621	797	751	730	985	1016	648	889	981	990
21	70	64	58	59	51	46	39	37	42	30	28
22	2380	2642	2806	2593	2007	2142	2219	1883	1915	1936	2004
TOTAL	3287	3476	3835	3588	2982	3391	3503	2825	3049	3214	3231

* preliminary data

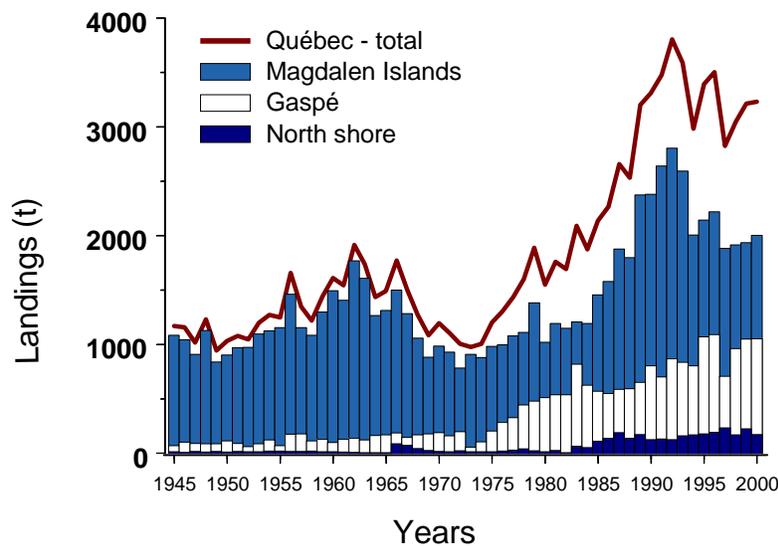


Figure 2. Québec lobster landings in tonnes, 1945 to 2000.

Catch rates

Catch rates represent the lobster catch per unit effort (CPUE), expressed in number of lobsters per trap. Over the past 16 years, for the Magdalen Islands as a whole, the average annual CPUE of commercial-size lobster has ranged from 0.5 lobster/trap in 1985 to 1.1 lobster/trap in 1992, for an overall average of 0.77 lobster/trap (Figure 3A). In 2000, the average CPUE was 0.8 lobster/trap, a 12% increase over 1999. The 2000 average CPUE was slightly lower (4%) than the average for 1996, the year before the increases in minimum legal size began. It was also lower than the average for 1992, suggesting a decrease in

the abundance of the resource. The northern and southern parts of the Magdalen Islands show differences in CPUE (Figure 3B). In the southern part, the indices are on the rise (0.9 lobster/trap); they are equivalent in number and superior in weight to the 1996 figures. On the northern side, however, though the abundance indices remain stable (around 0.6 lobster/trap), they are below the levels for 1996 and 1992 (0.8 and 1.0 lobster/trap, respectively). CPUE is generally higher at the start of the fishing season, partly because of greater catchability. The catch rates calculated from logbooks that have been obtained from index fishers in a program begun in 1991 display the same trends.

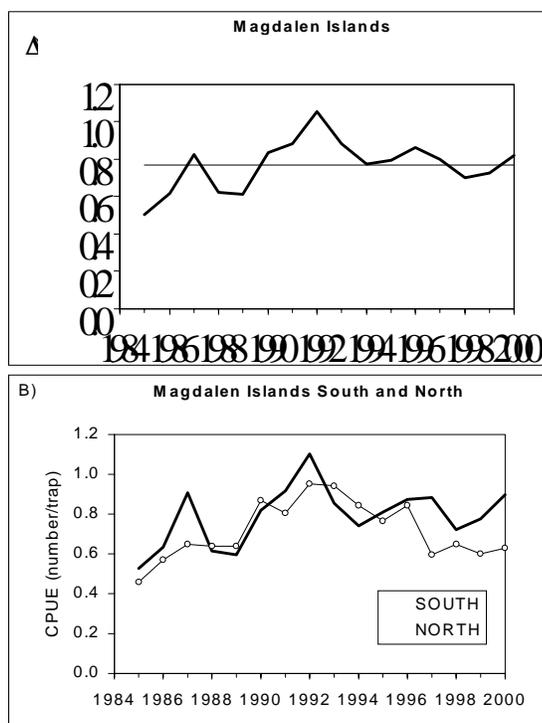


Figure 3. Catch rates (CPUE), in number of commercial-size lobsters per trap A) Annual averages, 1985-2000, for the Magdalen Islands as a whole. The straight line represents the average for the years 1985-2000. B) Annual averages for the southern and northern Magdalen Islands.

Catch Composition

Following the increases in minimum legal size, there have been changes in the size structure of the lobster catch (Figure 4). The average size of the lobsters caught increased by about 3 mm in 2000 compared with 1996, and the average weight increased by about 10%. The 2000 landings consisted of larger lobsters, and the proportion of “market” lobsters (CL \geq 81 mm) was 94% in 1999, compared with only 72% in 1996. These changes are significant and represent the kind of results expected from an increase in minimum legal size. The lobster fishery in the Magdalen Islands is a recruitment fishery, so it is normal that such changes are already perceptible.

The exploitation rates for male lobster remain high, however, in both the southern and the northern parts of the Magdalen Islands, and are increasing steadily (Figure 5). The 1999 exploitation rates for the southern and northern parts were 74% and 64%, respectively. The exploitation rates are calculated for the males and are obtained by measuring the change in abundance of the first moult-group recruited to the fishery (76-86 mm), compared with the second moult-group (87-99 mm) one year later. Recently, the moult-groups have been adjusted to reflect the increases in minimum legal size, so that the 79-90 mm moult-group in 1999 was compared with the 91-103 mm moult-group in 2000. The proportion of “jumbo” lobster (\geq 127 mm CL) is still very low (< 1%).

The number of berried females is always low at the start and in the middle of the fishing season. Their proportion generally increases at the end of the season. The percentage of berried females observed in the southern part of the Magdalen Islands was 25% at the end of the 2000 season, compared with 23% in 1998. The catch rates (CPUE) for berried females also increased in the southern part in 2000. In the northern part of the Islands, the percentage of berried females at the end of the fishing season was 19%, just as in 1999. With the increase in minimum legal size, more berried females will have the chance to spawn before being caught. Over time, the number of berried females in the samples should get higher.

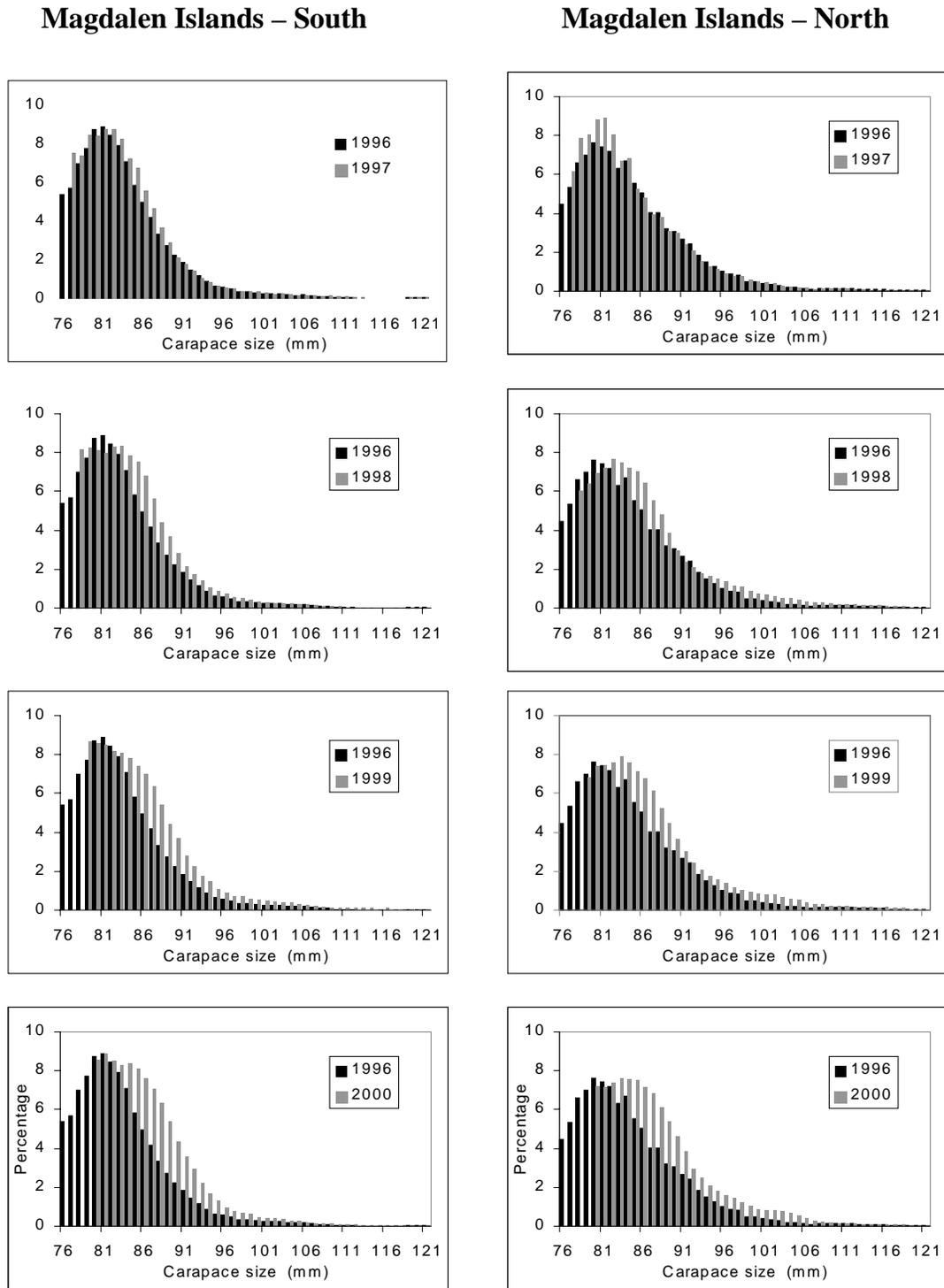


Figure 4. Size frequency distribution of commercial-size lobster caught in the southern and northern parts of the Magdalen Islands in 1997, 1998, 1999, and 2000, compared with the distribution for 1996, before the increases in minimum legal size began.

For the moment, the observed increases cannot be interpreted with any certainty as being the result of the increase in minimum legal size. The increase in the number of berried females could also be the result of an increase in the exploitation rate, or of changes in fishing locations and strategies.

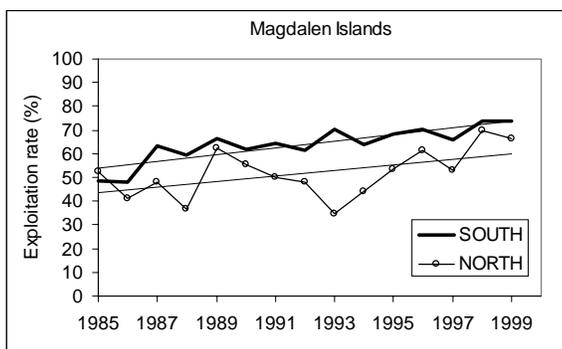


Figure 5. Exploitation rate indices for lobster populations of the southern and northern parts of the Magdalen Islands. The straight lines illustrate the data trend.

Outlook

According to a computer model, compared with 1996, egg production per recruit (E/R) in the Magdalen Islands has increased by an average of 40% with the 4-mm increase in minimum legal size. The objective of the conservation plan is to double E/R (increase by 100%) compared with 1996 levels. These theoretical results assume that the other major factors in the dynamics of the lobster populations such as growth, natural mortality, fishing mortality, fecundity, and sexual maturation have remained unchanged since 1996. The increase in minimum legal size enables the egg production of small females (primiparous) to increase. Studies now in progress show that it would also be advantageous to increase the reproductive contribution of multiparous females.

The lobster stock of the Magdalen Islands is being fished heavily. Though the abundance indices are generally high and encouraging,

especially in the southern part of the Islands, the biological indicators suggest that there is still a danger of recruitment overfishing. Continued increases in the minimum legal size are therefore still justified. In addition, a sizeable reduction in the fishing effort must also be considered to achieve the objective set, because the model used to calculate egg production per recruit shows that the expected benefits of increasing minimum legal size are reduced if the exploitation rate increases. The objective of doubling the egg production per recruit may therefore be compromised if the exploitation rate continues to increase. A reduction in this rate would also help to reduce the fishery's dependence on annual recruitment. As regards egg production, additional measures should be considered to ensure that a certain portion of the eggs come from multiparous females.

The abundance of prerecruits (72-75 mm) as determined from at-sea sampling and of commercial-size lobster (≥ 81 mm) as determined from the trawl survey is high, which suggests that the current landing levels could be maintained in 2001. However, the abundance of juveniles (around 50 mm) in the fall trawl survey has declined over the past few years, suggesting that the catch too may decline in a few years' time. The ongoing monitoring of the postlarval lobster (5-10 mm) that settle on the bottom shows that the abundance of the cohorts fluctuates from year to year. There is still some uncertainty about the geographic extent of this phenomenon and the growth of these cohorts, and we cannot yet say what impact these fluctuations may have on recruitment to the fishery.

Gaspé – LFAs 19, 20, and 21

In 2000, the minimum legal size for taking lobster in the Gaspé was increased by 1 mm, to 80 mm. This was the third increase since 1997. The minimum legal size remained unchanged at 76 mm from 1957 to 1996.

Landings

In 2000, in LFA 20, lobster landings reached 990 t, equivalent to the 1999 figure of 980 t (Table 1; Figure 6) and only 12% lower than the peak attained in 1995 and 1996. In 2000, 95% of the landings in the Gaspé came from LFAs 20A and 20B. In LFA 19, landings totalled 36 t, and they have held steady at around 30 to 40 t per year since 1995. In LFA 21, landings reached 28 t. Landings in this LFA have declined since the early 1990s, when they ran at 60 t to 70 t per year.

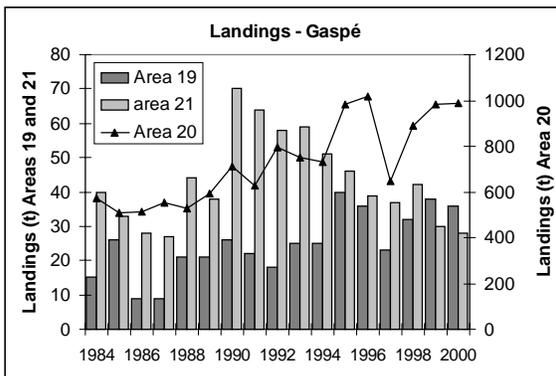


Figure 6. Gaspé lobster landings (t) in LFAs 19, 20, and 21 (1984 to 2000).

Catch rates

Catch rates represent the lobster catch per unit effort (CPUE), expressed in number of lobsters per trap. Since 1986, the average annual CPUE of commercial-size lobster in LFA 20 has ranged from 0.5 to 0.9 lobster/trap (Figure 7). In 2000, the CPUE averaged 0.6 lobster/trap, slightly higher than the average for 1986 to 1999. The catch rates determined from index fishers' logbooks in 2000 displayed the same pattern on the whole. Catch rates vary a great deal

over the course of the fishing season, with marked peaks and troughs reflecting changes in catchability linked to fluctuations in prevailing winds and water temperatures. The CPUE figures for LFA 21 are one-half to one-third those for LFA 20. Over the period 1997 to 2000, they ranged from 0.3 to 0.4 lobster/trap. We have no abundance index for LFA 19.

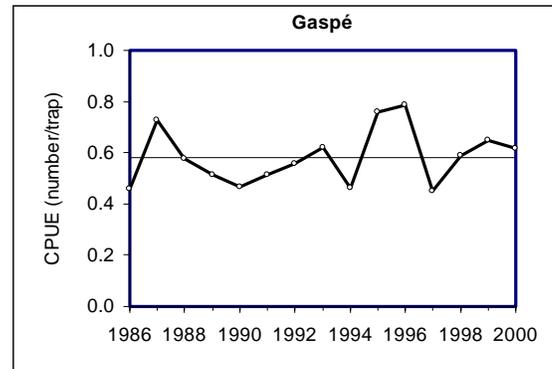


Figure 7. Catch rates (CPUE), in number of commercial-size lobsters per trap. Annual averages, 1986-2000, for the Gaspé (LFA 20). The straight line represents the average for the years 1986-2000.

Catch composition

Following the increases in minimum legal size, there have been changes in the size structure of the lobster catch in the Gaspé (Figure 8). The average size of the lobsters caught in LFA 20 increased by about 3 mm in 2000 compared with 1996. The 2000 landings consisted of larger lobsters, and the proportion of “market” lobsters (CL \geq 81 mm) was 91% in 2000, compared with only 68% on average from 1993 to 1996. These changes are significant and represent the kind of results expected from an increase in minimum legal size. The lobster fishery in the Gaspé is a recruitment fishery, so it is normal sense that such changes are already perceptible. The lobster are larger in LFA 21, and the relative abundance of prerecruits is lower. LFA 21 may be a tributary of LFA 20.

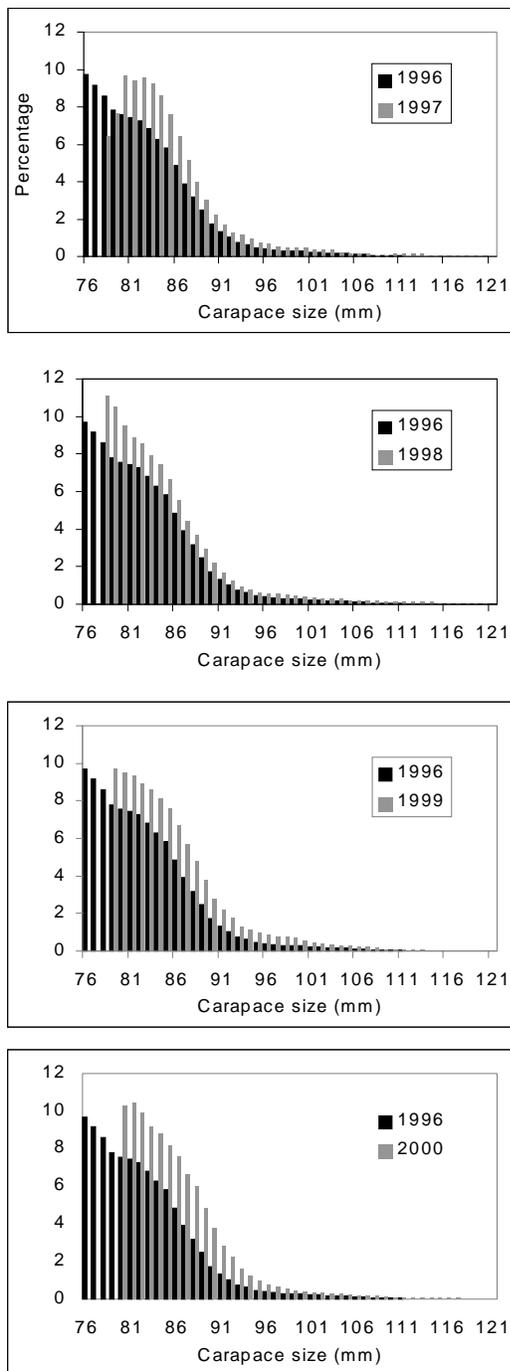


Figure 8. Size frequency distributions of commercial-size lobster for the Gaspé in 1997, 1998, 1999, and 2000 compared with 1996, the year before the increases in minimum legal size began.

The exploitation rate in LFA 20 has increased in recent years, reaching 78% in

1999 (Figure 9). The proportion of large lobster remains low; and “jumbo” lobster (CL \geq 127 mm) accounted for only 0.07% of the catch, by weight, in 2000.

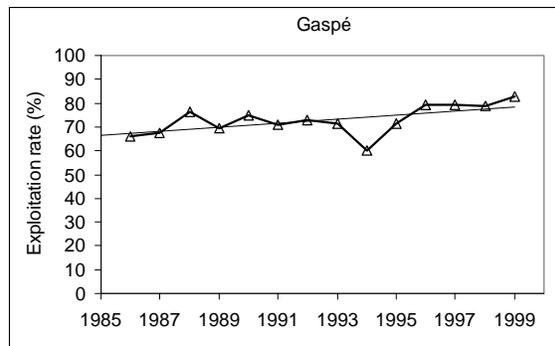


Figure 9. Exploitation rate index for the Gaspé lobster population (LFA 20), 1985 to 1999. The straight line represents the data trend.

The number of berried females is always low at the start and in the middle of the lobstering season. Their proportion generally increases at the end of the season. The percentage of berried females observed in the Gaspé at the end of the 2000 season was 20%, lower than the figures of 45% for 1998 and 32% for 1999, but twice as high as at the end of the 1980s. In 2000, the average size of berried females at the end of the lobstering season was 80 mm, compared with 82 mm in 1997 and 1998. With the increase in the minimum legal size, more females will have the chance to spawn before being caught. Over time, the number of berried females in the samples should get higher and higher. Since the size at sexual maturity is estimated at 83-84 mm, a minimum legal size of 80 mm in principle gives 35% of the females the chance to spawn, compared with 21% at a minimum size of 76 mm. The number of females who actually spawn will depend, however, on fishing pressure. For the moment, the observed increases in the proportion of berried females cannot be interpreted as a result of the increase in minimum legal size and could just as well be the result of an

increase in the exploitation rate, or of changes in fishing locations and strategies.

Outlook

According to a computer model, compared with 1996, egg production per recruit (E/R) in the Gaspé has increased by an average of 60% with the 4-mm increase in minimum legal size. The objective of the conservation plan is to double E/R (increase by 100%) compared with 1996 levels. These theoretical results assume that the other major factors in the dynamics of the lobster populations—such as growth, natural mortality, fishing mortality, fecundity, and sexual maturation—have remained unchanged since 1996. The increase in minimum legal size enables the egg production of small females (primiparous) to increase. Studies now in progress show that it would also be advantageous to increase the reproductive contribution of multiparous females.

The Gaspé lobster stock is being fished heavily. Though the abundance indices are generally high and encouraging, the biological indicators suggest that there is still a danger of recruitment overfishing. Continued increases in the minimum legal size are therefore still justified. In addition, a sizeable reduction in the fishing effort must also be considered to achieve the objective set, because the model used to calculate E/R shows that the expected benefits of increasing minimum legal size are reduced if the exploitation rate increases. The objective of doubling E/R may therefore be compromised if the exploitation rate continues to increase. A reduction in this rate would also help to reduce the fishery's dependence on annual recruitment. As regards egg production, additional measures should be considered to ensure that a certain portion of the eggs produced come from multiparous females.

The abundance of prerecruits (72-75 mm) as determined from at-sea sampling suggests that the landings projected for 2001 could be lower than the landings in 2000.

North Shore and Anticosti Island – LFAs 15, 16, 17, and 18

The minimum legal size for taking lobster on the North Shore and at Anticosti Island was raised to 78 mm in 1998, but not raised at all in 1999. In 2000, it was increased to 79 mm in LFAs 15, 16, and 18 and to 80 mm at Anticosti Island (LFA 17).

Landings

Depending on the year, lobster landings from the North Shore account for 1% to 2% of total lobster landings in Québec, while those from Anticosti Island account for about 3% or 4%. The landings recorded in LFA 15 totalled 17 t in 2000. They have remained below 20 t since 1994, compared with an average of 35 t for the period 1984 to 1993. Landings in LFA 16 totalled 11 t in 2000, compared with 22 t in 1999. The 2000 figure for this area was slightly lower than the average of 15 t for the 1990s, but the 2000 data are still preliminary. Since 1984, landings in LFA 16 have fluctuated between 10 and 20 t, without showing an overall trend. The Anticosti Island catch has increased steadily over the past decade. In 2000, landings totalled 142 t, exceeding the average for the past 10 years (127 t). A dockside monitoring program involving counting of crates was instituted in 2000 to obtain more reliable landing data.

Catch rates

Catch rates represent the lobster catch per unit effort (CPUE), expressed in number of lobsters per trap. The observed catch rates for the North Shore are low. From 1993 to 2000, they ranged from 0.3 to 0.4

lobster/trap. For the 2000 lobstering season, the CPUE averaged 0.3 lobster/trap. LFAs 15 and 16 are close to the northern limit of the lobster's range. These areas are characterized by much colder water than in the Gaspé and the Magdalen Islands, which very likely slows the processes of growth, reproduction, and recruitment. No catch rates were recorded for Anticosti Island for the 2000 season, but high catch rates (1.6 lobster/trap in the middle of the lobstering season and 0.8 at the end) were observed in at-sea sampling conducted in 1997.

Catch Composition

In 1998, following the increase in the minimum legal size, a slight increase was observed in the average size of the lobster landed in LFAs 15 and 16. However, this average size decreased in 1999 and 2000. Moreover, in 2000, the size structures appeared much more truncated toward the minimum size, which indicates a higher exploitation rate. In the course of the 1990s, the size distributions occasionally showed a few modes in the larger size groups, but no jumbo lobsters (CL \geq 127 mm) were ever observed in the samples. Over the years, berried females have been observed, mainly at the end of the season, in proportions that ranged from 5% to 35% between 1993 and 2000. The average size of the berried females is about 90 mm. Observations made in 2000 showed that in LFA 15, sexual maturation of females is delayed until they have reached about 92 mm.

The demographic profile of the Anticosti Island lobster population is characterized by several modes (around 88 mm, 98 mm, 107 mm, 115 mm, 123 mm, and 140 mm) (Figure 10). The exploitation rate in this fishing area is far lower than elsewhere (around 20%), so that a population structure characterized by several moult-groups has been maintained. This situation, which the

FRCC considers ideal, is very different from that observed in other LFAs, where additional conservation measures are needed. The average length of commercial-size lobster measured at dockside in 2000 was 95 mm, and jumbo lobster (\geq 127 mm) accounted for 2.4% of the total number in the catch. The berried females that were observed in sampling at sea in 1997 were large, because sexual maturation is delayed until they have reached around 92 mm.

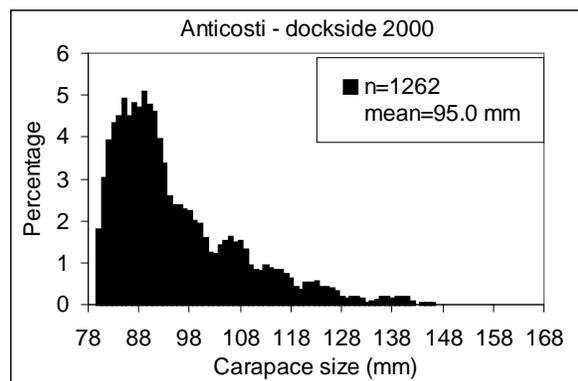


Figure 10. Size frequency distribution for lobster caught at Anticosti Island. Dockside sampling conducted in July 2000.

Outlook

Egg production per recruit (E/R) has not been calculated for the LFAs of the North Shore and Anticosti Island. On the North Shore, because of large size at sexual maturity and high exploitation rates, E/R can be expected to be low, which justifies the introduction of additional measures to increase it. At Anticosti Island, because of the lower exploitation rates, E/R can be assumed to be higher than elsewhere. However, this fishery might not be able to withstand high exploitation rates, because of the lobsters' slow growth and late sexual maturation. It is therefore important to keep the exploitation rate low in this area, and to increase the minimum legal size to reduce the taking of immature lobster.

General Outlook

The increase in the minimum legal size is reducing fishing pressure on immature lobster and should therefore promote the production of eggs by primiparous females—those that are spawning for the first time. Studies now in progress also show that it would be advantageous to increase the contribution of multiparous females (those spawning for at least the second time). The larvae from larger females are themselves larger and heavier at emergence. It has also been observed that larger, heavier larvae grow faster and are larger at the time that they settle on the bottom. All of these characteristics may indicate better survival potential.

The increase in the minimum legal size will continue to cause changes in both the size and the composition of the catch. If recruitment remains constant, then the number of lobster caught can be expected to decrease. Some lobster will not be taken until a year or two later, and their numbers will have been reduced by natural mortality, estimated at about 10 to 15% per year. On the other hand, they will be bigger, because the additional moult will have enabled them to increase their weight by about 45%. The greater weight should more than offset the lower numbers, as far as males and immature females are concerned.

As regards the mature females, increasing the legal size will enable a larger proportion to spawn before being caught. The number of berried females in the population should rise and by the same token, the number of unberried females caught should decline. To date, however, no significant changes in this regard have been observed in the populations.

So far, nothing has been done to reduce fishing effort and exploitation rates, so the fishery will remain just as dependent as before on annual recruitment. Modelling of egg production per recruit demonstrates that the anticipated benefits of increasing the minimum legal size are reduced if the exploitation rate increases. To protect the resource better, a major reduction in fishing effort or some type of control on catches will eventually have to be considered.

Though it is hard 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 never becomes 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, the trawl survey that has been conducted since 1995 in the southeastern Magdalen Islands seems to offer some potential in this regard. In 2000, the abundance of the lobster that will be available to the fishery in this area in 2001 was high, suggesting that the 2001 landings could be at least as good as those in 2000. In the Gaspé, an index of recruitment to the fishery is being derived from samples taken using traps with blocked escape vents. The abundance index determined in this way in 2000 was lower than in 1999, which could suggest, at first glance, that landings in the Gaspé may be lower in 2001 than they were in 2000.

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