



ASSESSMENT OF THE LOBSTER POPULATIONS OF THE NORTH SHORE (LFAs 15, 16 AND 18) AND ANTICOSTI ISLAND (LFA 17) IN 2008

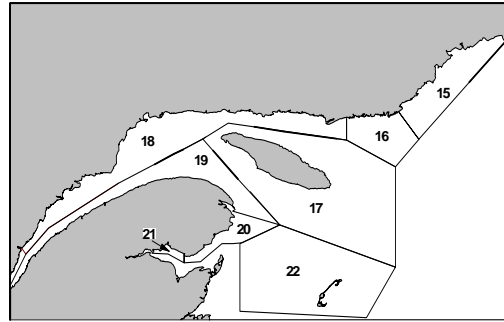
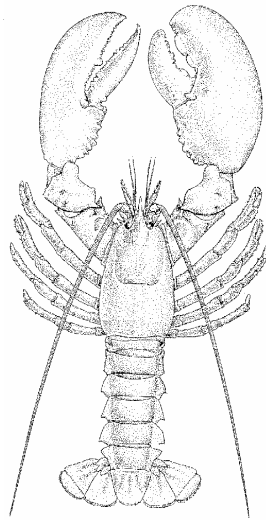


Figure 1. Map showing the lobster fishing areas (LFAs) in Quebec (LFAs 15 to 18, North Shore and Anticosti, LFAs 19 to 21, Gaspé Peninsula, and LFA 22, Magdalen Islands).

Context

The lobster fishery along the North Shore is practiced by some forty fishermen covering 3 lobster fishing areas (LFA 15, 16 and 18) (Figure 1). Most of the North Shore fishermen are in LFA 15 (around 30). There are 5 fishermen in LFA 16 and only one or two in LFA 18 depending on years, in sub-areas G and H (Figure 2A). The lobster fishery at Anticosti Island is practiced by 15 fishermen from the Middle North Shore, Gaspé Peninsula or the Magdalen Islands. They are spread out around the Island's easternmost tip in sub-area 17B (Figure 2AB). The lobster harvested at Anticosti Island is landed at the ports where the fishermen are from.

The lobster fishery is managed, throughout Quebec, by controlling the fishing effort (number of licences, number and size of traps, length of the fishing season) and by escapement measures: release of berried females and minimum catch size. The management plans introduced over the last decade were developed in accordance with the recommendations made by the Fisheries Resource Conservation Council (FRCC).

Resource status assessments were conducted annually until 2004 in order to closely monitor the impacts of increasing the minimum catch size on the lobster populations. This advice describes the situation in 2008 and the changes observed over the 2004-2008 period. Lobster population assessments in LFA 15 to 18 will now be conducted every three years.

SUMMARY

- Lobster landings on the Lower North Shore in LFAs 15 and 16 have been dropping since the early 2000s. They dropped from 38 to 14 tons and from 11 to 5 tons between 2000 and 2008 respectively. Landing data may be somewhat partial however. The fishing effort index has also dropped over the same period. Only a small proportion of the authorized fishing effort is being deployed. Landings from Anticosti Island (LFA 17) increased from 87 tons in 2004 to 151 tons in 2008, after a sharp decrease period (50%) from 1999 to 2004.
- Catch rates from sampling at sea and dockside were weak but stable in LFAs 15 and 16 between 1983 and 2008, averaging 0.3 lobster/trap and 0.17 kg/trap. At Anticosti Island, the catch rates recorded in logbooks were slightly higher from 2006 to 2008 (0.68 kg/trap on average) than in 2004 (0.54 kg/trap). Overall, they seem to be lower on the north side of the island.
- In LFAs 15 and 16, the mean size (carapace length, CL) of commercial lobster has continued to increase, even after 2005 when the minimum legal size increase had ended (92.4 mm CL in 2008 and 91.1 mm CL in 2005). Size structures were less truncated from 2005 to 2008 than in 2004, suggesting a drop in the exploitation rate. As opposed to 2004, jumbo lobster (≥ 127 mm CL) were observed, although their proportion was weak (<1 %). The sex-ratio was in favour of males and appears suitable for reproduction.
- At Anticosti Island, the size structures of lobster were characterized by the occurrence of large individuals. The structures observed over the last 3-4 years suggest an improvement compared to 2004, when a significant drop in the number of large individuals had been recorded. In 2008, the size structure showed several modes, suggesting a relatively low exploitation rate. The proportion of jumbos (≥ 127 mm CL) increased from 2% in 2004 to 7% in 2008. The sex-ratio was in favour of males and appears suitable for reproduction.
- Lobster populations on the Lower North Shore and Anticosti Island are near the species' northernmost range limit. They are characterized by slow growth and late sexual maturity (92-94 mm CL). These populations are likely more vulnerable to over-harvesting because of lower productivity compared to other areas further south and possibly exacerbated by a colder environment over the last few years. Therefore, it is important to maintain low exploitation rates. It would also be important if the minimum legal size was closer to the size at sexual maturity because in the current context, the fishery also harvests immature lobster.

INTRODUCTION

Biology

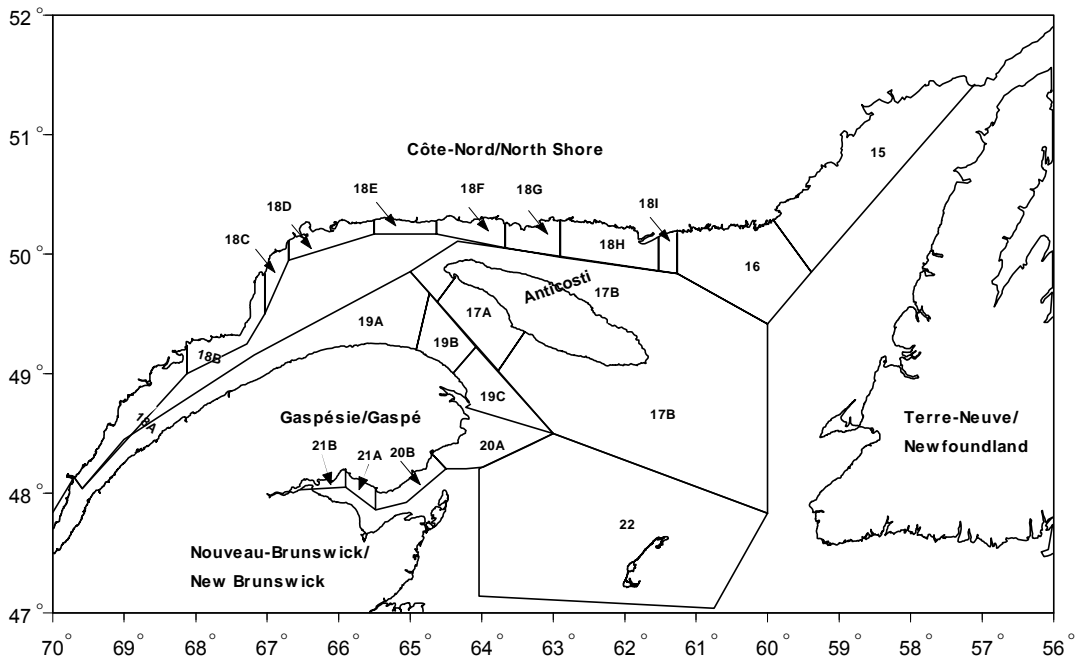
American lobster (*Homarus americanus*) occurs along the west coast of the Atlantic Ocean, from Labrador to Cape Hatteras. Adult lobsters prefer rocky substrates where they can find shelter, but can also live on sandy and even muddy bottoms. Commercial concentrations are generally found at depths of less than 35 m.

At Anticosti Island, females reach sexual maturity at around 92 mm of carapace length and around 94 mm on the Lower North Shore. Elsewhere in Quebec, in areas further south, sexual maturity is reached sooner (79-84 mm). Males reach sexual maturity at a smaller size. Females generally have a two-year reproductive cycle, spawning one year and moulting the next. Females spawning for the first time can produce nearly 8,000 eggs, while large females measuring 127 mm (jumbo size) can lay up to 35,000 eggs. In addition to being very fertile, some larger females can spawn two consecutive years before moulting. Once released, the eggs remain attached to the females' swimmerets for 9 to 12 months, until the planktonic larvae emerge the following summer. Spawning and emergence of eggs could occur earlier in the season for multiparous females (females spawning for the second time at least) than for primiparous females. It has also been observed that larvae could be larger upon emergence for multiparous females than for primiparous females. The larvae's planktonic phase lasts from 3 to 10 weeks, depending on the temperature of the water. Following metamorphosis, postlarval lobsters (stage IV), which now resemble adult lobsters, drift down from the surface layer to settle on the sea floor. The survival of lobster from the larval stage to the first cryptic benthic stages (i.e. they live hidden in habitats providing many shelters) is affected by predation and by hydrodynamic factors that determine the advection or retention of larvae near the areas that are favourable for their benthic settlement. During the first few years of benthic life or until they reach approximately 40 mm, lobsters lead a cryptic existence. In areas further south, lobsters are estimated to reach the minimum legal size (82 mm) around 8 years of age, after having moulted approximately 16 times since their benthic settlement. The age at which lobster enter the fishery could be higher in areas located further north.

Fishery Management

The lobster fishery is managed by controlling fishing effort by restricting the number of licences, the number and size of traps, and the duration of the fishing season. In 2008, there were respectively 33, 5 and 1 active fishermen in LFAs 15, 16 and 18 respectively. Fifteen fishermen were active at Anticosti Island (17B). One exploratory licence was also issued in LFA 17A. The number of traps is limited to 250 on the North Shore and 300 at Anticosti Island. Fishermen can use traps that are larger than the standard size. However, the number of traps is limited to 175 (North Shore) or 210 (Anticosti). The presence of escape vents on traps has been mandatory since 1994 and the size of their vertical opening increased from 43 mm to 46 mm in 2004 (LFAs 15 and 16), to 47 mm in 2003 (LFA 17) and in 2004 (LFA 18). The lobster fishery is a spring fishery lasting ten (LFA 17) or 12 weeks (LFAs 15, 16 and 18). Fishery management also includes escape measures. Along with a minimum legal size (carapace length, CL), the release of berried females is mandatory. The minimum legal size was increased in 1998 in order to double egg production per recruit. It has been at 82 mm since 2005 in LFAs 15 and 16, and at 83 mm since 2003 in LFAs 17 and 18. It was at 76 mm from 1957 to 1997.

A)



B)

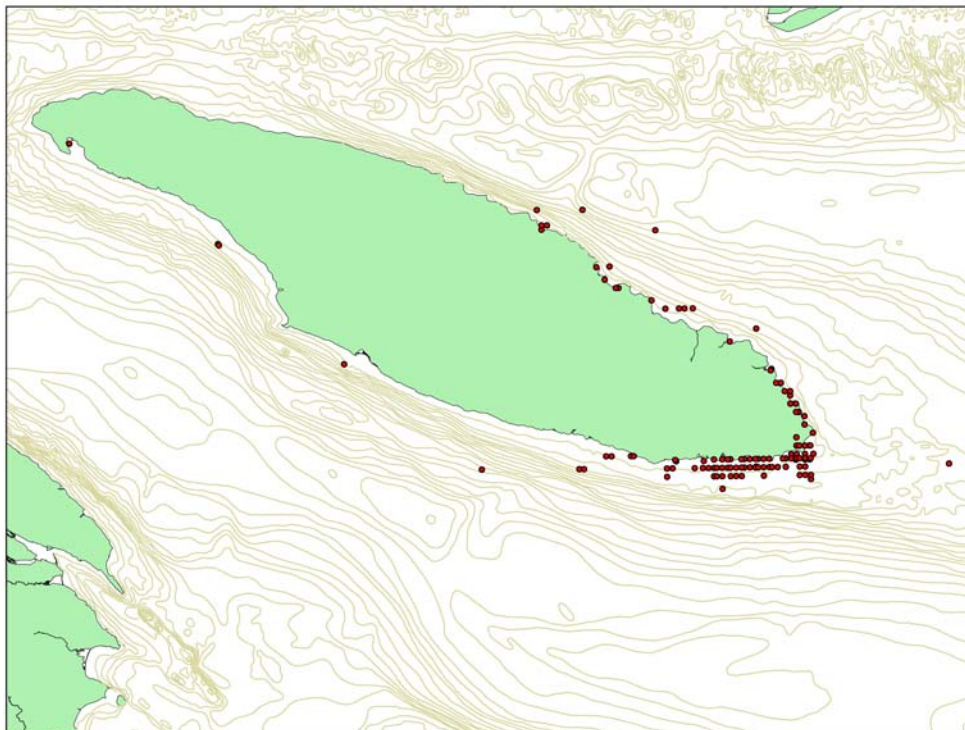


Figure 2. A) Lobster fishing areas (LFAs) on the Lower North Shore (LFAs 15 and 16), Upper and Middle North Shore (LFA 18, A to I) and at Anticosti Island (LFAs 17A and 17B). B) Map of Anticosti Island showing the fishing effort distribution in 17B between 2006 and 2008.

ASSESSMENT

Source of Data

The stock status assessment is based on abundance and demographic indicators. Abundance indicators include the landings recorded on processing plant purchase slips and catch rates of commercial-size lobsters obtained from at-sea and dockside sampling and from logbooks (mandatory since 2004 in LFA 17B and since 2007 in LFAs 15 and 16) or kept on a voluntary basis by a few index fishermen (1996-2007).

Demographic indicators for LFAs 15 and 16 were based on at-sea sampling conducted annually between 1993 and 2004 in the Tête-à-la-Baleine (LFA 15) and La Romaine (LFA 16) sectors. In 2005, they were replaced by dockside sampling in the same sectors. The demographic structure of lobsters harvested at Anticosti Island (Area 17B) was obtained from a dockside sampling program (Rivière-au-Renard and Havre St-Pierre) which was introduced in 1998. The demographic indicators were taken from size structure analysis of lobsters and include mean size, jumbo abundance (≥ 127 mm CL) and sex-ratio. The indicators also help in assessing fishing pressure.

The absence of at-sea sampling in these sectors does not provide any productivity indicator (reproduction) based on the abundance of berried females and on egg production or any recruitment indicator based on the abundance of pre-recruits in traps. There was no sampling done in LFA 18.

Abundance Indicators

Landings

In 2008, lobster landings from the North Shore and Anticosti Island represented 1% and 4% respectively of the total landings in Quebec (3,443 tons). In LFA 15 in 2008, they totalled 14 tons, and 5 tons in LFA 16 (Figure 3). Landings in these two areas have been dropping since the early 2000s. Between 2000 and 2008, they dropped from 38 to 14 tons in LFA 15, and from 11 to 5 tons in LFA 16. The landing data obtained over recent years may be incomplete however. The fishing effort index has also dropped over the same period. Trap hauling may be spread out over 2-4 days, according to lobster abundance and weather conditions. Temperature data obtained from thermographs installed on the traps of the index fishermen revealed that the 2004, 2006 and 2007 fishing seasons were relatively cold compared to the 1997-2008 series. Temperature also showed a downward trend since 1999. The drop in fishing effort and landings could partly be the result of the colder temperatures. Data has also been incomplete in LFA 18 and since 2006, landings did not exceed 1 ton (Figure 3).

Landings from Anticosti Island (LFA 17B) totalled 151 tons in 2008 (Figure 3). Only two tons were harvested in LFA 17A. Landings have almost doubled since 2004 when they totalled 87 tons. In 2008, they were 33% above the 1985-2007 average, which was 114 tons. Landings had dropped sharply (50%) between 1999 and 2004. Temperature data from the thermographs installed recently on the traps of a few fishermen indicated that the 2008 fishing season was warmer than in 2007, which may have improved lobster catchability. However, the temperature in this area during the fishing season rarely exceeds ten degrees.

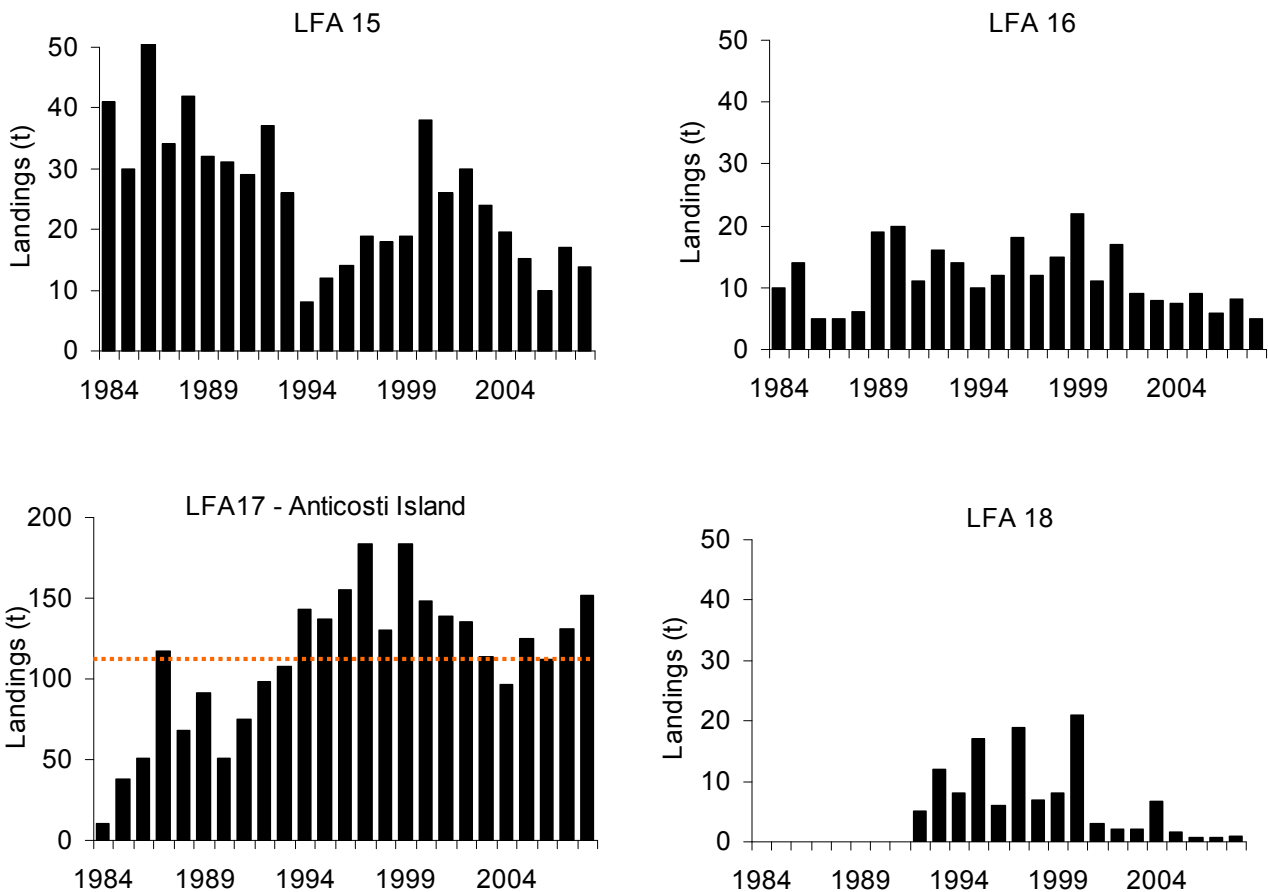


Figure 3. Lobster landings on the North Shore (LFAs 15, 16 and 18) and at Anticosti Island (LFA 17) from 1984 to 2008. The dotted line represents the average landings (1984-2008) for LFA 17.

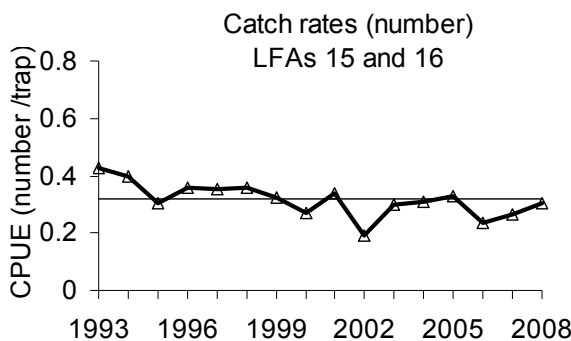
Catch Rates for Commercial Lobster

Catch rates correspond to the catches per unit of effort (CPUEs) expressed in number or weight of lobster per trap. Since 1993, in LFAs 15 and 16, average annual CPUEs of commercial-size lobsters derived from sampling at-sea (1993-2004) and dockside (2005-2008) ranged between 0.19 and 0.43 lobsters per trap (l/t) (Figure 4A). For the same period, CPUEs in weight varied between 0.12 and 0.22 kg per trap (kg/t) (Figure 4B). The CPUEs in number and in weight have increased since 2006. In 2008, the CPUE in number totalled 0.31 l/t, which corresponds to the 1993-2007 series average. The CPUE in weight was 0.22 kg/trap, which was 29% higher than the series average of 0.17 kg/t. Contrary to what was observed in the Gaspé Peninsula and Magdalen Islands, the effect of increasing the minimum legal size from 76 to 82 mm between 1998 and 2005 was difficult to detect in the CPUEs and they are likely hidden by changes in catchability and in recruitment. However, in recent years, CPUE increases in weight appear to be more noticeable than the CPUE increases in number because the lobsters harvested are larger. Logbooks were kept by 42 and 34 fishermen in 2007 and 2008 respectively. Catch rates recorded in the logbooks, for the fishermen who deployed at least 1,000 traps during their fishing season, totalled 0.18 kg/t in 2007 (28 fishermen) and in 2008 (27 fishermen), which

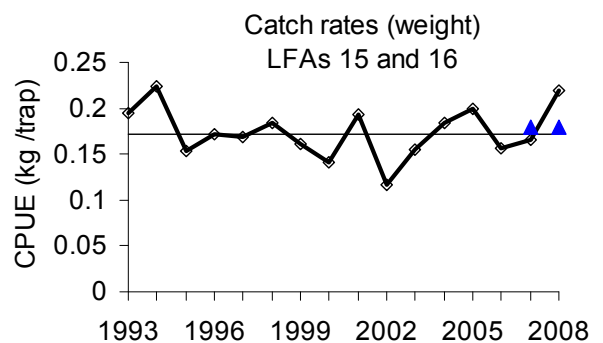
corresponds to the commercial sampling series average. In 2007 and 2008, for most of the fishermen (80%), the average catch rate totalled between 0.1 and 0.3 kg/trap.

At Anticosti Island, the average CPUEs (kg/trap) compiled since 2004 using logbook data has shown a slight increase since 2004; from an average of 0.54 to 0.73 kg/trap in 2008 (Figure 4C). The 2004-2008 average was 0.66 kg/trap. The CPUEs vary from one fisherman to another and overall, yields appear to be better south and at the eastern tip of the island than on the north side of the island. Yields at Anticosti Island are the highest in Quebec (2008 average of 0.41 kg/trap at the Magdalen Islands, 0.24 and 0.51 kg/trap for LFAs 20 and 19C in the Gaspé Peninsula respectively).

A)



B)



C)

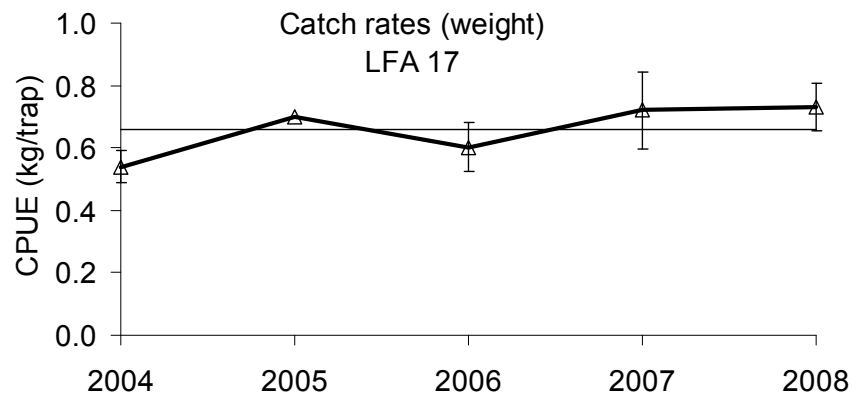


Figure 4. Catch rates (CPUEs) of commercial-size lobster in LFAs 15 and 16 on the Lower North Shore from 1993 to 2008 A) in number and B) in weight per trap obtained from commercial sampling (the two triangles represent the values calculated from logbooks), and C) the CPUE in weight (\pm standard deviation) for LFA 17B at Anticosti Island from 2004 to 2008. The horizontal lines represent the series averages.

Demographic Indicators

The size structures of commercial-size lobsters in LFAs 15 and 16 improved from 2004 to 2008 (Figure 5A). The average size has increased from 88.9 mm to 92.4 mm over this period. In

2004, the average size was already 5 mm larger than before the increase of the minimum legal size. The size structures are multi-modal and less truncated than before (1990s), which could indicate a drop in the exploitation rate, which had previously been estimated at 73%. In 2008, for the first time since sampling began, jumbo lobsters were observed (≥ 127 mm) in the catches although in small numbers ($< 1\%$). The sex-ratio (number of males/number of non-berried females) for all commercial-size lobsters is close to one, which seems suitable for mating.

Size structures of lobster in LFA 17 are clearly more expanded than on the Lower North Shore or elsewhere in Quebec (except for LFA 19C) (Figure 5B). There are several modes indicating that the fishery is not dependant on annual recruitment. During the 2004 stock assessment, a significant decrease in large-size lobsters was observed. It was also mentioned that the situation could become of concern if it occurred again. The structures observed over the last 3-4 years have suggested there has been some improvement compared to 2004. In 2008, the size structure showed several modes, suggesting a relatively low exploitation rate (around 20-30%). Average sizes increased from 93.5 mm in 2004 to 96.8 mm 2008. The average size was around 100-102 mm in 2001 and 2002. The proportion of jumbo lobsters (≥ 127 mm) increased from 2% in number in 2004 to 7% in 2008, which is an improvement. Overall, the sex-ratios are in favour of males and seem suitable for reproduction. They are above one for all the commercial lobsters and vary between 2 and 4 for lobsters ≥ 100 mm, which is positive for the mating of very large females (up to 147 mm), observed in the Anticosti Island population.

Sources of Uncertainty

It is very difficult to obtain reliable abundance indices for the Lower North Shore sector (LFAs 15 and 16). Until very recently, the landing data presented corresponded only to the landings recorded on the processing plant purchase slips. There is always some uncertainty as to unrecorded lobster catches, corresponding to amounts kept for personal consumption and to poaching. The introduction of mandatory logbooks can help monitor how much is really landed. Although it is considered that catch rates reflect the abundance of lobster on the seafloor, they can also be affected by both intra and inter-annual variations in lobster catchability. Cold temperatures, winds and currents are factors that have a negative impact on catchability. More specifically on the Lower North Shore, soaking time varies (2-4 days or more), which also affects the catch rates. These effects are difficult to quantify and introduce uncertainty into the interpretation of catch rates. The absence of at-sea sampling does not provide any indicator on stock productivity in terms of egg production and recruitment. It is therefore more difficult to measure in this regard the impacts of the conservation measures.

A) Lower North Shore (LFAs 15 and 16)

B) Anticosti (LFA 17)

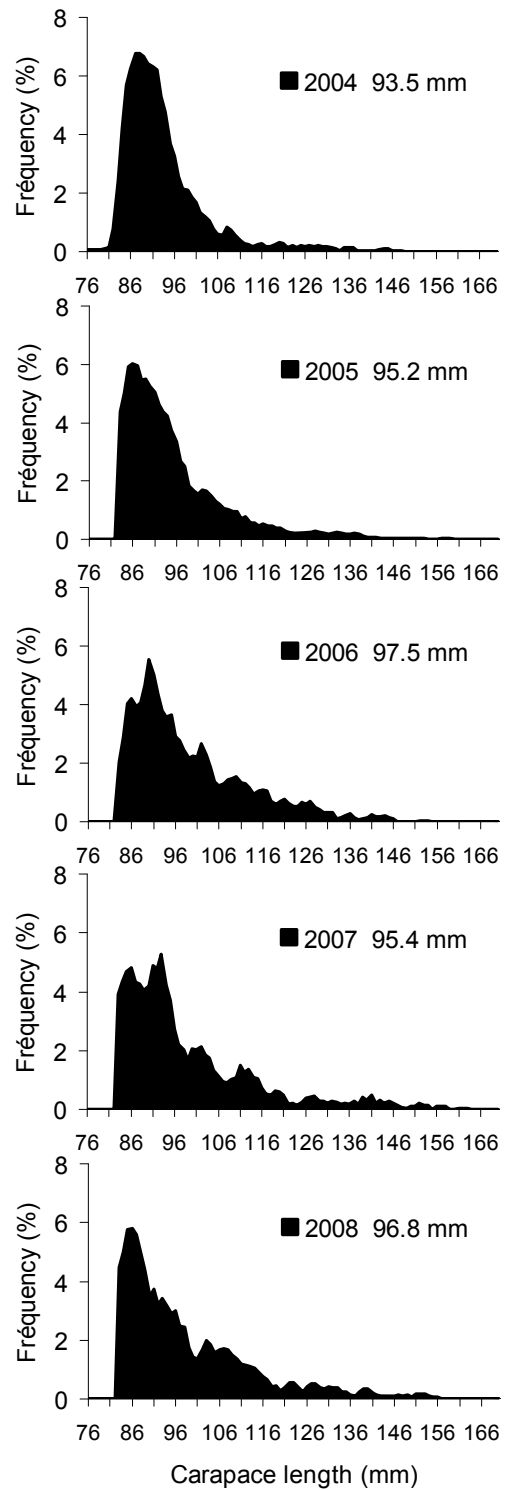
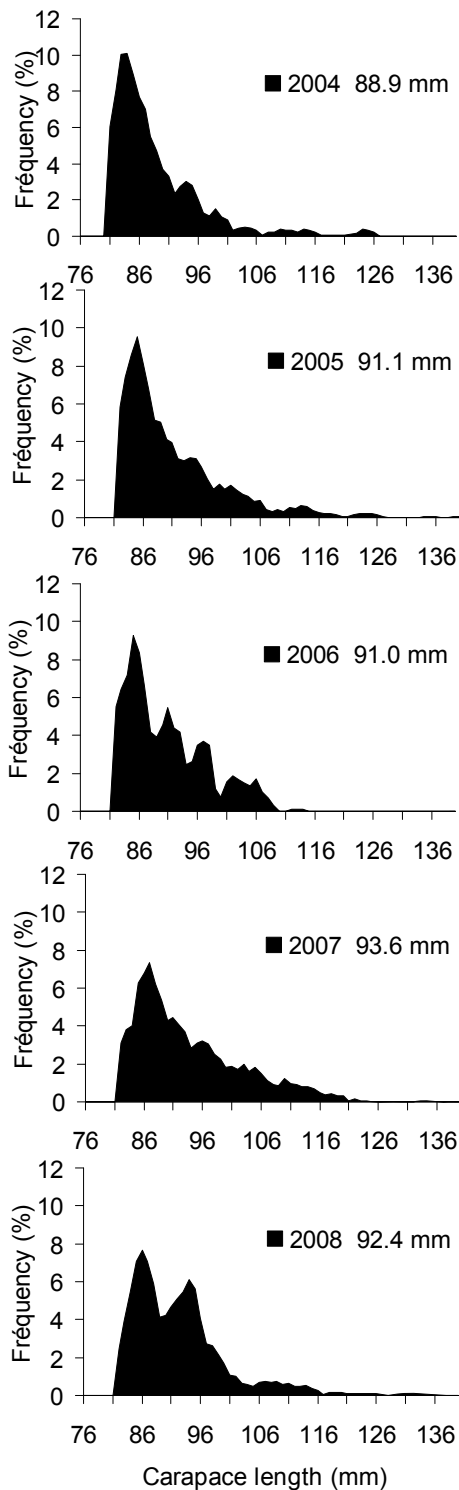


Figure 5. Size frequency distribution for lobster caught (commercial-size) A) on the Lower North Shore (LFAs 15 and 16) and B) at Anticosti Island (LFA 17) from 2004 to 2008. Average sizes (CL) are indicated.

CONCLUSIONS AND ADVICE

Lobster populations on the North Shore and Anticosti Island are near the species' northernmost range limit. They are characterized by slow growth and late sexual maturity (around 92 mm for Anticosti Island and 94 mm for the Lower North Shore). These populations are likely more vulnerable to over-harvesting because of lower productivity compared to other areas further south. Therefore, it is recommended to maintain low exploitation rates. It would also be important if the minimum legal size was closer to the size at sexual maturity because in the current context, the fishery also harvests immature lobsters.

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