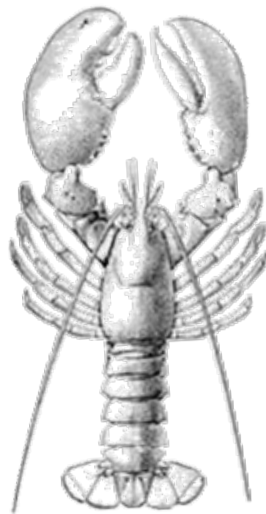




AMERICAN LOBSTER (*HOMARUS AMERICANUS*) STOCK ASSESSMENT ON THE NORTH SHORE (LFAS 15, 16, 17 AND 18), QUEBEC, IN 2022



American Lobster (*Homarus Americanus*)

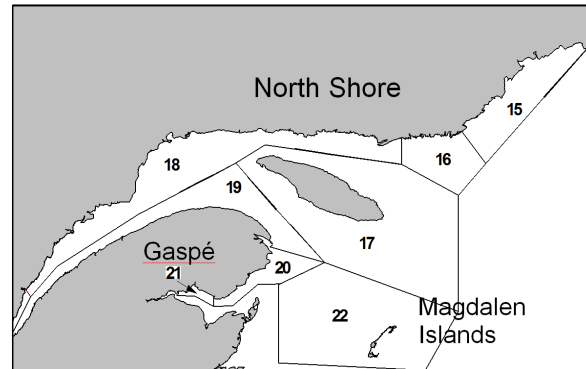


Figure 1. Map showing lobster fishing areas (LFAs) in Quebec (LFAs 15 to 18: North Shore and Anticosti, LFAs 19 to 21: Gaspé Peninsula and LFA 22: Magdalen Islands).

Context:

The lobster fishery along Quebec's North Shore is operated by fishers in 3 lobster fishing areas (LFA 15, 16 and 18) (Figure 1). Most fishers on the North Shore are in LFA 15 (59 active fishers on 66 licences), but 9 fishers are also active in LFA 16, and 8 fishers in LFA 18 (Figure 2). The lobster fishery at Anticosti Island is practiced by 16 fishermen from the Middle North Shore, Gaspé Peninsula and Magdalen Islands. They are spread out primarily around the Island's easternmost tip in sub-area 17B (15 licences). The lobster harvested off Anticosti Island is landed at the fishers' home ports.

The lobster fishery is managed by controlling the fishing effort (number of licences, number and size of traps and fishing season) and by escapement measures (escape vents, release of berried females and minimum legal size [MLS]). Management and conservation measures introduced over the past 27 years follow the recommendations of the Fisheries Resource Conservation Council (FRCC). The resource status is assessed every three years, with some exceptions. This report describes the situation in 2022 and the changes observed since the last stock status assessment in 2018.

SUMMARY

- Lobster landings on the North Shore increased sharply to 1,468 t in 2022, up 36.3% from 2018. In LFA 15, landings totalled 204 t in 2022, up 194.2% from 2018 and up 408.6% from the average of the past 25 years (1997–2021). In LFA 16, landings totalled 194 t in 2022, up 121% from 2018 and up 473% from the average of the past 25 years. In LFA 18, landings totalled 167 t in 2022, up 30.5% from 2018 and up 386.3% from the average of the past

25 years. The 2022 values are among the highest in the historical series. In LFA 17B, landings totalled 902 t in 2022, following an all-time high in 2021 (1,120 t). The 2022 landings were up 14.0% from 2018 and up 158.1% from the average of the past 25 years.

- The catch per unit effort (CPUE) by weight from logbooks has increased by 79% in LFA 15 and 16 since 2018, reaching 1.11 kg/trap in 2022. This value is 246% higher than the 1993–2021 average. In LFA 18D, the 2022 CPUE (6.04 kg/trap) was up 43.8% from 2018 and up 88.8% from the 2012–2021 average. In LFA 17B, the 2022 CPUE (4.1 kg/trap) was up 19.2% from 2018 and up 86.4% from the 2006–2021 average. Overall, fishing effort has been increasing since 2011 in the North Shore and Anticosti Island fishing areas.
- Very little sampling is done on the North Shore and Anticosti Island for the assessment of demographic indicators, particularly for LFAs 15 and 16 where data are missing for 2020, 2021 and 2022. Given the significant rise in fishing effort in these areas, scientific sampling effort should be increased. Size structures in LFA 17B are wide ranging, and the average size is stable for commercial-sized lobsters.
- Temperature indicators were examined in keeping with the ecosystem approach, but further work is required to incorporate them into the assessment of resource status. Small rock crab is a key prey source for lobster. However, over the past two years, no data has been available for the North Shore and Anticosti Island.
- Abundance indicators (landings and CPUE) have risen sharply on the North Shore and Anticosti Island. Lobster populations in these areas appear to be in good condition. Nevertheless, these populations may be vulnerable to overexploitation, given that the legal size is smaller than their size at sexual maturity, and they are slow-growing.
- It is not possible to provide comments from an ecosystem perspective because of the lack of data and/or their interpretation.

INTRODUCTION

Biology

American lobster (*Homarus americanus*) is found 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. On the North Shore and Anticosti Island, females would reach sexual maturity at sizes above 90 mm carapace length (or cephalothorax length, CL), according to a study published in 1988. Elsewhere in Quebec, in areas further south, females reach sexual maturity sooner (79–84 mm). Males reach sexual maturity at a smaller size than females in the same area. 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 CL (jumbo size) can lay up to 35,000 eggs. Once released, the eggs remain attached to the females' swimmerets for 9 to 12 months, until the planktonic larvae emerge the following summer. Differences exist between primiparous and multiparous females. In addition to being more fertile, certain large females may spawn for two consecutive years before moulting. It has also been observed that spawning and hatching can occur earlier in the season and that larvae can be larger upon emergence for multiparous females (having already span) than for primiparous females. After hatching, the larvae's planktonic phase lasts from 3 to 10 weeks, depending on the temperature of the water

and goes through three stages of development before undergoing metamorphosis. Following metamorphosis, postlarval lobsters (stage IV), which now resemble adult lobsters, leave the water surface to settle on the sea floor, initiating the benthic phase. The survival of lobster from their larval stage to their initial benthic stages is impacted by predation as well as by hydrodynamic factors that determine the advection or retention of the larvae near the areas that are favourable for benthic settlement. During the first few years of benthic life, until they reach a size of approximately 40 mm, lobsters are cryptic; i.e. they live hidden in habitats that provide many sheltered spaces. In areas further south of the Gulf of St. Lawrence, especially in the Magdalen Islands, lobsters are estimated to reach the MLS (83 mm) at around 7–8 years of age after having moulted approximately 16 times since their benthic settlement, and recruit to the fishery the following year. Recruitment to the fishery could be delayed in more northern areas because of slower growth (smaller moult increment and lower moulting frequency) in colder waters.

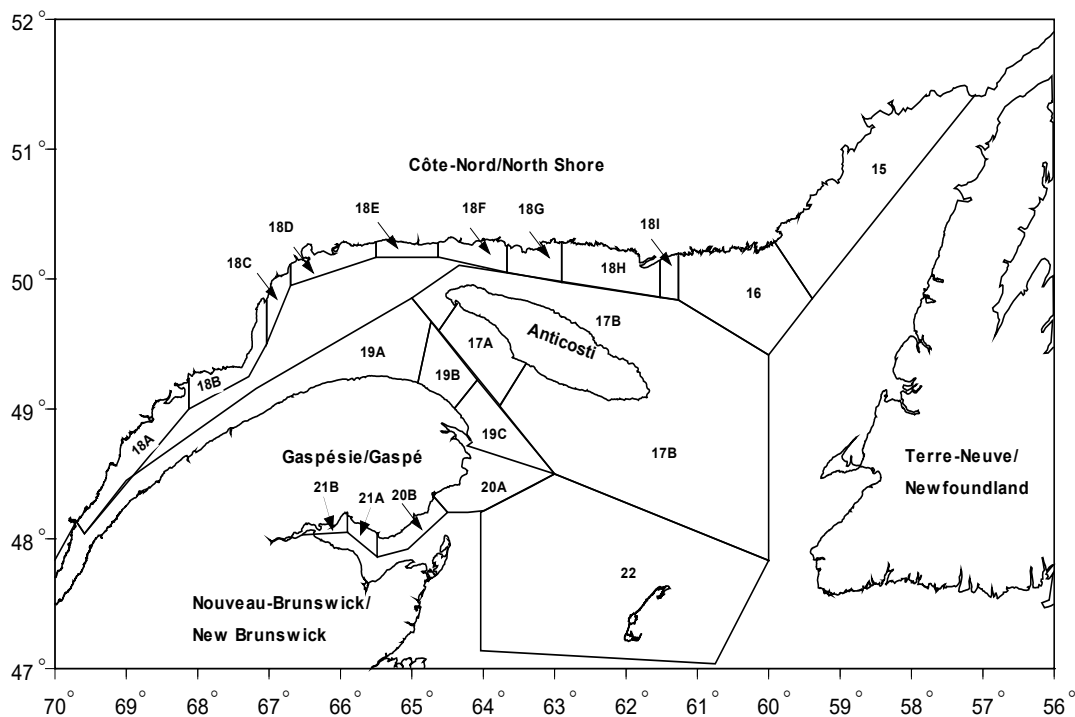


Figure 2. Lobster fishing areas (LFAs) on the Lower North Shore (LFAs 15 and 16), Upper and Middle North Shore (LFA 18, subareas A to I) and at Anticosti Island (LFAs 17, subareas A and B).

Description of the Fishery

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 (Table 1). In addition to having a minimum landing size (MLS), berried females must be released back into the water. The traps are lifted only once a day or less and the immersion time is at most 72 hours.

Table 1. Management rules for the North Shore (LFAs 15, 16 and 18) and at Anticosti Island (LFA 17) lobster fishery in 2022. MLS = minimum legal size.

LFA	Duration (week)	MLS (mm)	No. traps	Trap size (cm) (Length x Width x Height)	Escape vents	No. active licences (total)
15	12	82	175 large / 250 small / 175 mixed	124 x 90 x 50 92 x 71 x 50	2 circulars (65 mm) or 1 rectangle (127 x 46 mm)	59 (66)
16	12	82	175 large / 250 small / 175 mixed	124 x 90 x 50 92 x 71 x 50	2 circulars (65 mm) or 1 rectangle (127 x 46 mm)	9 (9)
18	11	83	175 large / 250 small / 175 mixed	124 x 90 x 50 92 x 71 x 50	2 circulars (65 mm) or 1 rectangle (127 x 47 mm)	8 (8)
17B	11	83	210 large / 300 small / 210 mixed	124 x 90 x 50 92 x 71 x 50	2 circulars (65 mm) or 1 rectangle (127 x 47 mm)	15 (15)
17A	11	83	35 large / 50 small / 35 mixed	124 x 90 x 50 92 x 71 x 50	2 circulars (65 mm) or 1 rectangle (127 x 47 mm)	1 (1)

ASSESSMENT

Source of Data

Lobster

The stock status assessment is conducted for LFAs 15 to 18. The assessment is based on abundance and demographic indicators. Given that there is no more at-sea sampling (since 2004) or fishery-independent surveys for these stocks, fishing pressure and productivity are not evaluated (spawning and recruitment). Abundance indicators include the landings recorded on processing plant purchase slips and catch rates of commercial-size lobsters obtained from at-sea (1993–2004) and dockside (since 2005) sampling and from logbooks filled out daily by fishermen on an initially voluntary basis, which became mandatory in 2004 in LFA 17B and 2007 in LFAs 15 and 16. Demographic indicators were taken from size structure analysis of lobsters and include mean size, jumbo abundance (≥ 127 mm) and sex-ratio based on commercial lobsters (male/non-berried females; 17B only). For LFAs 15 and 16, these indicators are compiled from at-sea (1993–2004) and dockside (since 2005) sampling data.

Sampling is conducted in the La Tabatière and Tête-à-la-Baleine (LFA 15) and La Romaine (LFA 16) sectors. For LFA 17B, sampling has been conducted dockside since 1998 on the North Shore and Gaspé Peninsula ports of landing. In the Magdalen Islands, dockside sampling of catches made in Sub-area 17B has been ongoing since 2015.

For each indicator, data from the last three years are reviewed and 2022 data are compared with the averages of the pre-2022 data series. Where data are highly variable, the average for the current evaluation period (2018–2022) is compared to the average for the previous period (2016–2018).

Rock Crab

This advisory report represents an initial attempt to incorporate the ecosystem approach into the lobster stock assessment. From this perspective, water temperature and rock crab stocks are now considered an essential component of the environment. The assessment of rock crab stocks is based on examining abundance indicators (processing plant purchase slips) and a demographic indicator (size structures obtained from dockside sampling of the commercial fishery).

Abundance Indicators

Landings

Lobster landings (purchase slips) in LFA 15 were 204 t in 2022, which represents an increase of 194.2% compared to 2018 (69 t) and 408.6% over the 1997–2021 average of 40 t (Figure 3A). In the LFA 16, landings in 2022 reached 194 t, an increase of 121% compared to 2018 (88 t) and 473% from the 1997–2021 average (34 t) (Figure 3B). Landings from the North Shore (LFA 15, 16 and 18) account for 5% of Quebec landings (11,984 t). The fishing effort deployed in these areas is fairly low, but increasing. Most fishing activities were conducted with soak times of 2 days or more. Since 2017, daily hauls have been much more frequent, resulting in an increase in fishing effort. In addition, the number of active licences increased from 59 in 2018 to 76 in 2022.

At Anticosti Island, in LFA 17B, landings have been increasing since 2004, reaching a maximum of 1,120 t in 2021, before declining to 902 t in 2022 (Figure 3C), which is a 14% increase from 2018 (791 t) and 158% of the average of the past 25 years (350 t). Landings from LFA 17B account for 8% of Quebec landings.

Data for LFA 18 is fragmentary. While annual landings were around 1 t from 2001 and 2011, landings grew exponentially between 2014 and 2021. In 2022, landings have reached 167 t. This landings represent a 30.5% increase over 2018 (128 t) and 406.1% increase over the average of the past 25 years (33 t) (Figure 3D).

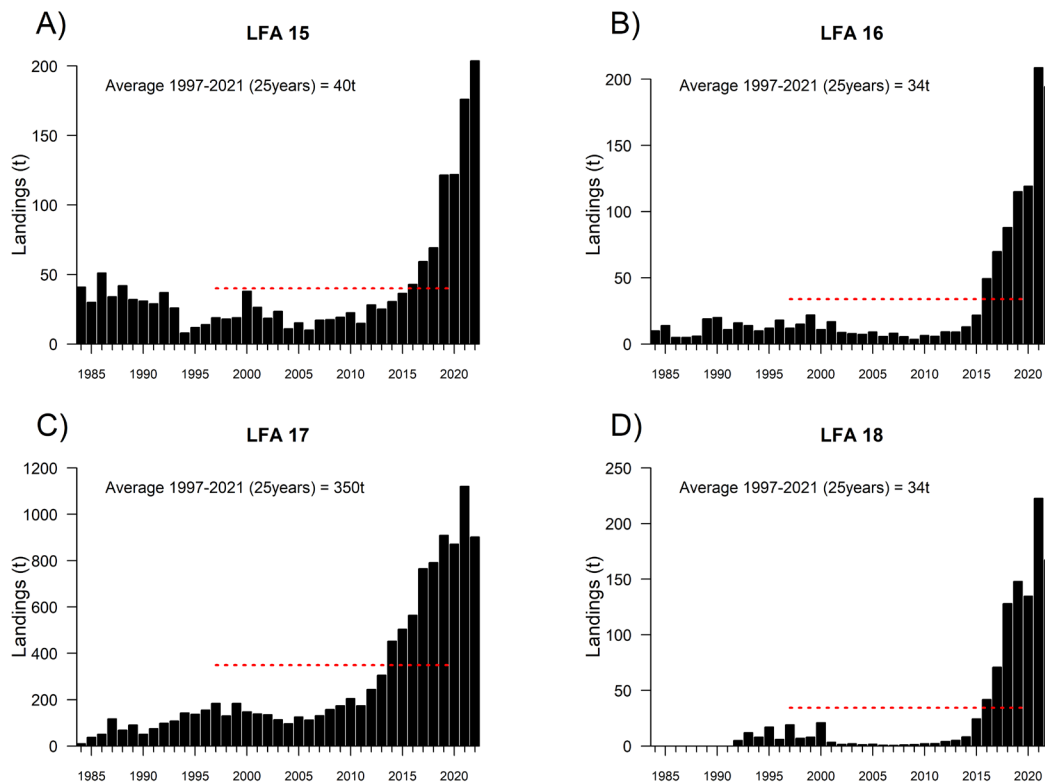


Figure 3. Lobster landings on the North Shore (LFAs 15, 16 and 18) and at Anticosti Island (LFA 17, subarea B) from 1984 to 2022. The dotted lines represent the average value for the past 25 years, excluding 2022.

Catch Rates for Commercial Lobster

Catch rates correspond to the catch per unit effort (CPUE) expressed in weight of lobster per trap (kg/trap). In 2022, CPUEs from logbooks in LFAs 15 and 16 combined were 1.11 kg of lobster per trap (Figure 4A). This is an increase of 79% from 2018 (0.62 kg/trap) and 246.8% compared to the 1993–2021 average (0.32 kg/trap). Since 2011, numerical estimates are no longer available due to insufficient data.

In LFA 17B, CPUEs reached 4.1 kg/trap in 2022, similar to the 2021 value, and represent one of the highest value since 2006. The 2022 CPUE represented a 19.2% increase over the 2018 CPUE (3.44 kg/trap) and 86.4% over the 2006–2021 average (2.2 kg/trap; Figure 4B).

In sub-area 18D, the CPUE reached 6.04 kg/trap in 2022. The 2022 CPUE was 43.8% higher than the 2018 CPUE (4.2 kg/trap) and 88.8% higher than the 2012–2021 average (3.2 kg/trap; Figure 4C).

Quebec Region

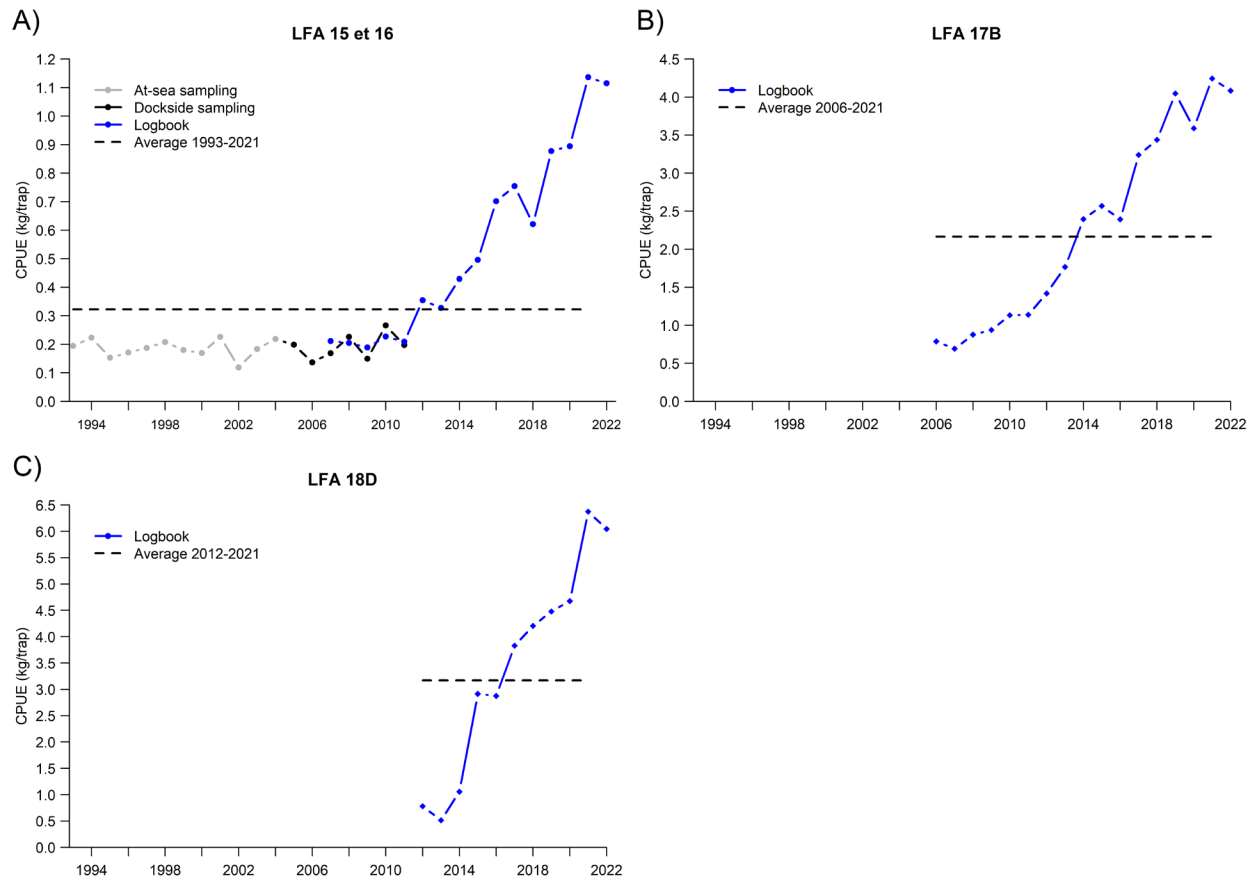


Figure 4. Catch rates (CPUE) of commercial-size lobster in LFAs 15 and 16 (A) on the North Shore from 1993 to 2022 in weight (kg) per trap and for LFA 17, subarea B (B) and LFA 18, subarea D (C). The dotted horizontal line represents the historical average.

Demographic Indicators

The size structures of commercial-size lobsters in LFAs 15 and 16 show at least three moult classes (Figure 5B), suggesting a lower exploitation rate than what is observed in the Gaspé Peninsula for example. Prior to the increase of the MLS (1998–2005), average size was around 83–91 mm, while for 2018 and 2019, it is 95.7 and 90 mm respectively. In general, it is difficult to interpret with confidence the demographic indicators from LFAs 15 and 16 due to the low number of lobsters measured in recent years.

In LFA 17B, size structures have always been characterized by the presence of several moult classes (Figure 5C). The mean size of commercial lobsters has increased to 94.5 mm in 2022, 1.5 mm more than the mean for the 2016–2018 period (93 mm). The sex ratio (number of males/number of non-berried females) remains above one, which appears theoretically suitable for mating.

In LFA 18, size structures are characterized by the presence of several moulting classes extending up to 150 mm (Figure 5A). The average size of commercial lobsters increased by 7 mm from 99.4 mm in 2018 to 106.4 mm in 2022.

Quebec Region

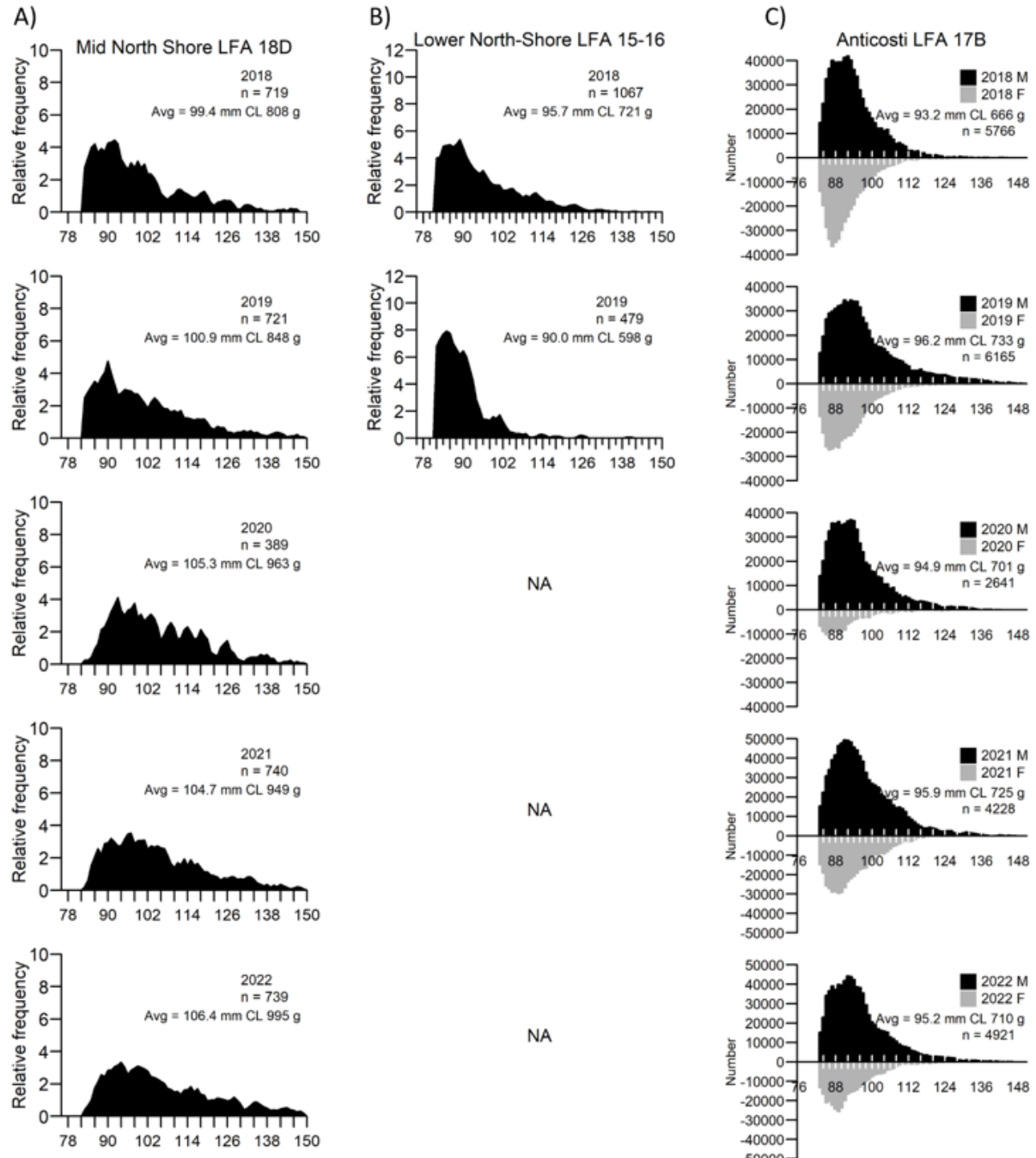


Figure 5. Size frequency distribution of commercial lobster for A) LFA 18D, B) LFAs 15 and 16, and C) LFA 17B, from 2018 to 2022. For A) and B), frequencies for males (black) and females (grey) combined are expressed as percentages; for C), the frequencies in numbers weighted by landings are shown for males and females separately. Note the change in scale (number landed) as of 2021 in C). The average (avg) size (mm) and weight (g), and number of lobsters measured (n) are shown.

Ecosystem**Temperature**

In LFA 15, water temperatures in 2021 fluctuated around the average for most of the fishing season, but data are missing for the end of the season (Figure 6A). In 2022, temperatures were warmer than average at the start and end of the season, and below average in the middle of the season. In Area 18D (Sept-Îles, Figure 6B), temperatures fluctuated around the average in 2021. However, no data are available for early 2019 or for 2022 as a whole.

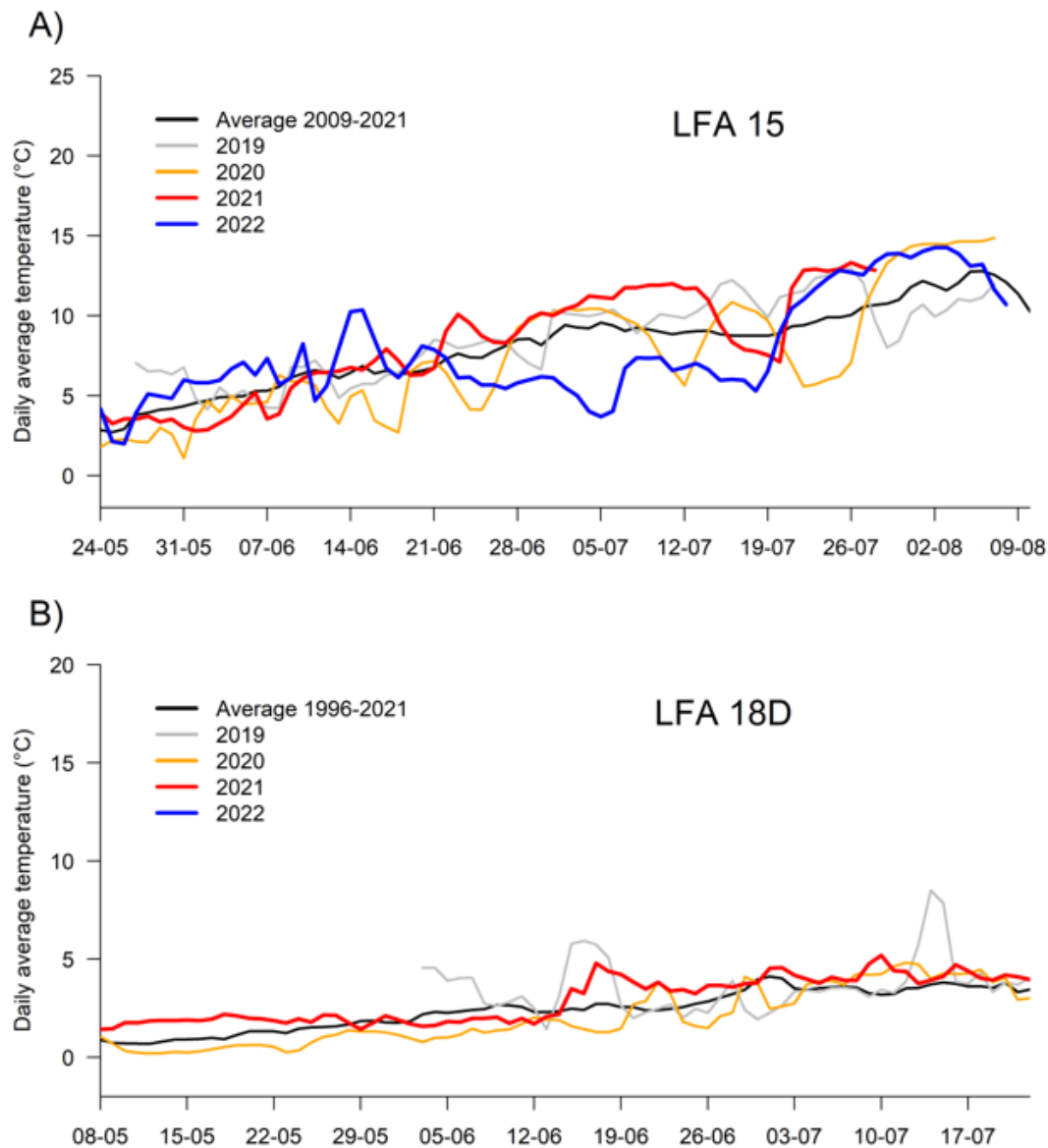


Figure 6. (A) Water temperatures in LFA 15 (Tête-à-la-Baleine), from May to August, at varying depths depending on which fisher's trap the thermograph was installed. (B) Water temperatures in LFA 18D (Sept-Îles) at a depth of 21 m, from May to July.

Prey Availability

Small rock crab is a key prey source for lobster. Monitoring of this species is therefore essential in order to determine the health of lobster populations from an ecosystem perspective.

The presence of small size classes near the legal size limit of 102 mm is considered an indicator of pre-recruitment to the rock crab fishery. Size structures (Figure 7) show a gradual decline for this indicator between 2016 and 2019, with an improvement in 2020. The lack of information for 2021 and 2022 makes it more difficult to assess the status of the rock crab population for the past two years.

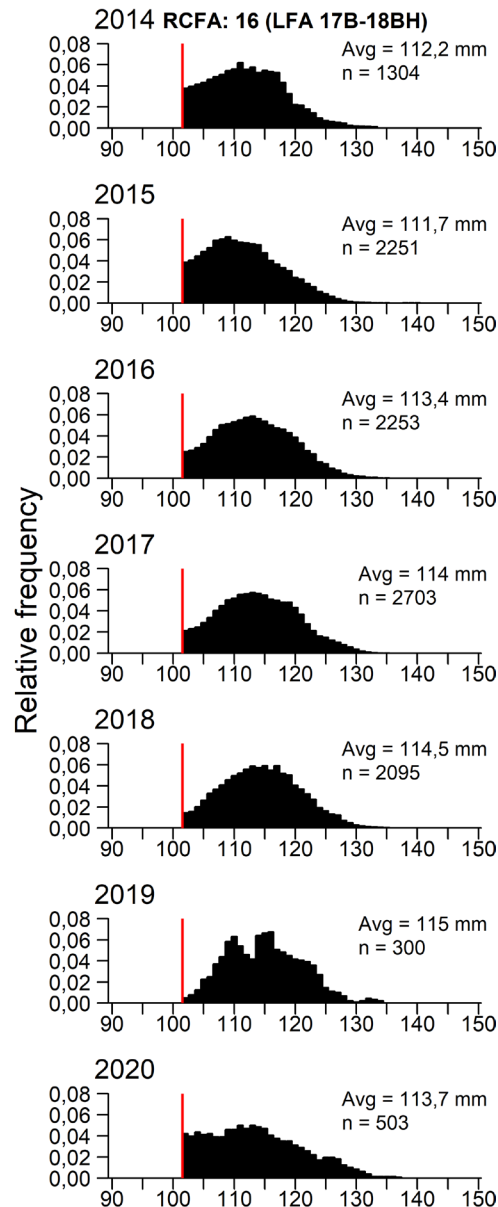


Figure 7. Size structures of rock crab in dockside sampling for the whole of the North Shore and Anticosti Island (LFA 17b_18BH). The minimum legal size of 102 mm (carapace width) is indicated by the red line. The average size (avg) and the sample size (n) are also shown.

The CPUE values in recent years (2019 and 2020) of sustainable rock crab fishing in LFAs 17B and 18BH were above the 2004–2021 average (Figure 8), indicating that rock crab populations in this area are doing well.

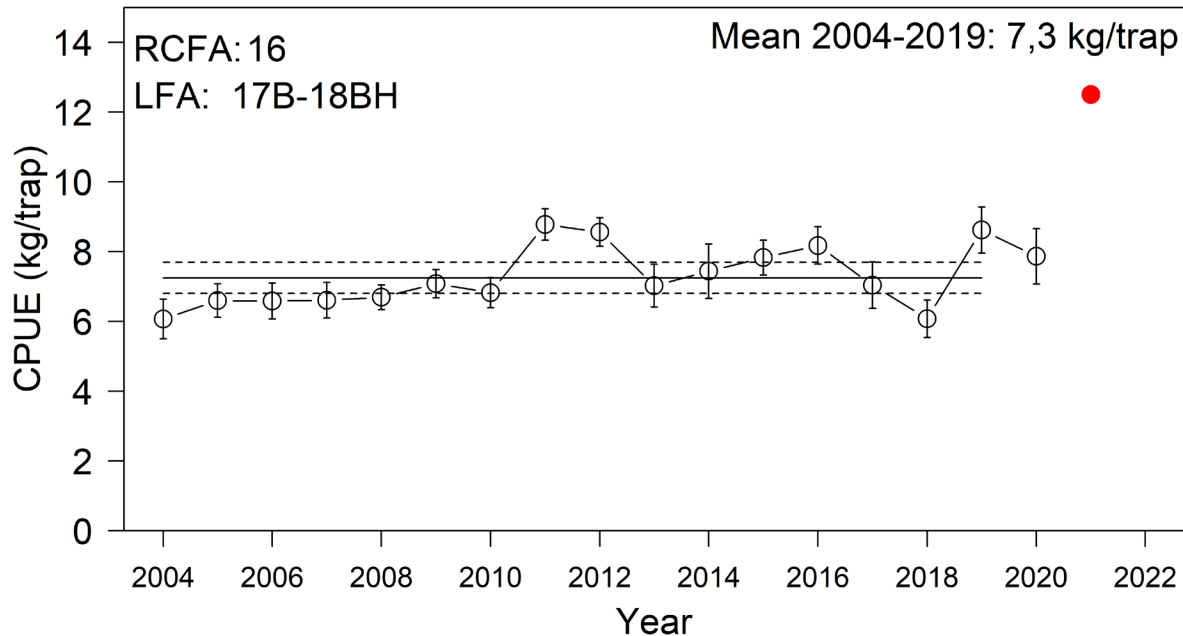


Figure 8. CPUE of rock crab in LFAs 17B and 18BH. The value for 2021 is represented by a separate red dot as a reminder of its higher level of uncertainty than for the rest of the series.

Sources of Uncertainty

In general, there is little data on lobster populations in the North Shore and Anticosti Island. However, the mandatory use of electronic logbooks in recent years will enhance the quality and quantity of data on lobster abundance and distribution in the various areas. However, the sampling of catches is insufficient, especially in LFAs 15 and 16 in order to properly monitor the non-commercial component of the population. There are no indicators of stock productivity (egg production and recruitment) for these stocks.

CONCLUSIONS AND ADVICE

Abundance indicators (landings and CPUE) are up sharply on the North Shore and at Anticosti Island. Lobster populations in these areas appear to be in good condition. Nevertheless, these populations could be vulnerable to overexploitation, given that legal size is smaller than size at sexual maturity and that they are slow-growing. It is not possible to provide comments from an ecosystem approach because of the lack of data and/or their interpretation.

In the context of increasing fishing effort and changes in the environment, it would be important to rapidly develop or update the biological knowledge essential for the sustainable management of these stocks.

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SOURCES OF INFORMATION

This Science Advisory Report is from the February 28-March 3, 2023 regional peer review on the Assessment of the lobster in Quebec's inshore waters in 2022 and advice for the 2023 to 2025 fishing seasons. Additional publications from this meeting will be posted on the [Fisheries and Oceans Canada \(DFO\) Science Advisory Schedule](#) as they become available.

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