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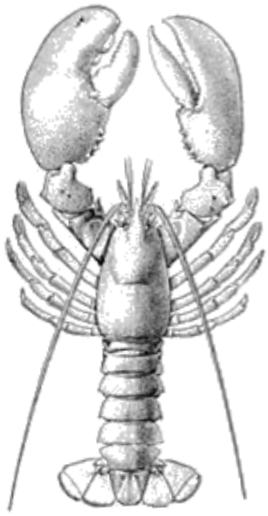
Canadian Science Advisory Secretariat
Quebec Region **Science Advisory Report 2019/059**

ASSESSMENT OF LOBSTER (*HOMARUS AMERICANUS*) ON THE NORTH SHORE (LFAS 15, 16 AND 18) AND AT ANTICOSTI ISLAND (LFA17), QUEBEC, IN 2018



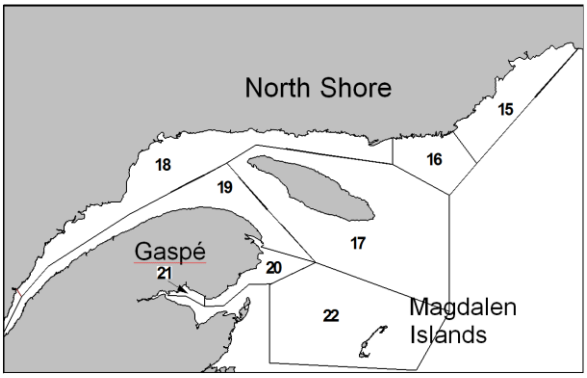


Figure 1. Map showing lobster fishing areas (LFAs) in Quebec (LFAs 15 to 18: North Shore and Anticosti, LFAs 19 to 21: Gaspé Peninsula and LFA 22: Magdalen Islands).

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 (around 50) are in LFA 15, there are 4 to 8 fishers depending on the year in LFA 16, and 3 to 8 fishers in LFA 18, in sub-areas C, D, G, and H (Figure 2). The lobster fishery at Anticosti Island is practiced by 15 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. 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 24 years follow the recommendations of the Fisheries Resource Conservation Council (FRCC). The resource status is assessed every three years. This report describes the situation in 2018 and the changes observed since the last stock status assessment in 2015.

SUMMARY

- Lobster **landings** on the North Shore increased significantly between 2015-2018 (82% in LFA 15, 305% in LFA 16, and 423% in LFA 18). The 2018 values are at historic peaks and two-thirds of the increase would be due to increased fishing effort. On Anticosti Island (17B), landings also reached an all-time peak, rising from 504 t in 2015 to 782 t in 2018.
- In LFAs 15 and 16, **catch per unit effort** (CPUE) by weight from commercial sampling increased by 27% between 2015 and 2018 and by 137% compared to the historical average

(1993-2017), while fishing effort has been increasing since 2015. In LFA 18, the 2018 CPUE by weight was 44% higher than in 2015 and 112% higher than the historical average (2012-2017) for fishing effort that has been increasing since 2014. In LFA 17, the 2018 CPUE by weight from logbooks was 33% higher than in 2015 and 114% higher than the historical average (2006-2017) for an increased fishing effort since 2011.

- Commercial sampling for **demographic indicators** is very limited in this region, especially in LFAs 15, 16 and 18. In LFA 17B, size structures are broad, but the average size is decreasing possibly due to increased recruitment.
- 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, but are characterized by slow growth as well as late sexual maturity and at larger size (90 mm and over). Given that legal size is smaller than size at sexual maturity, these populations may be vulnerable to over-harvesting. In the context of increasing fishing effort in these regions 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.

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 CL. 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.

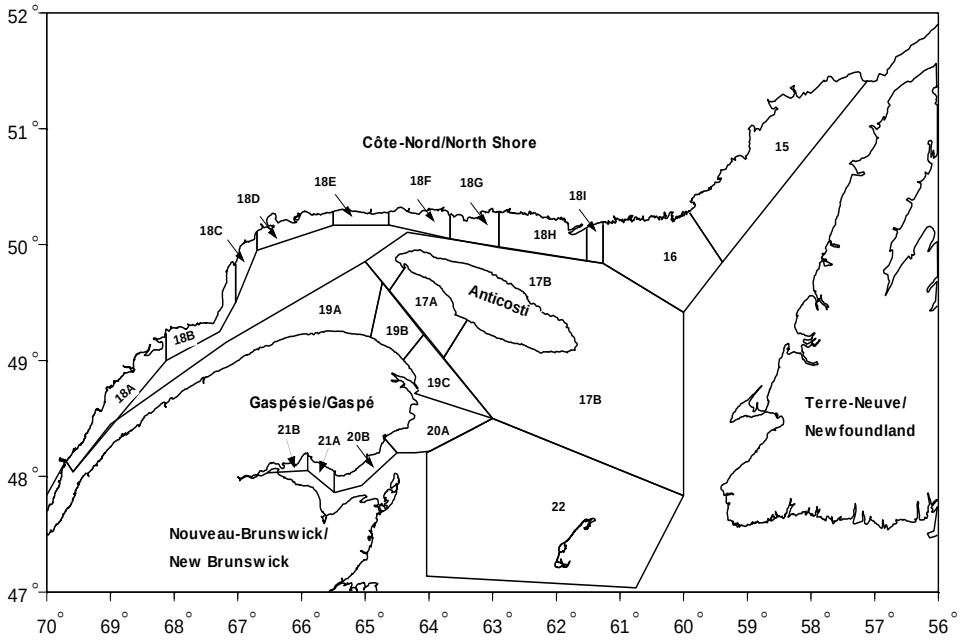


Figure 2. Lobster fishing areas (LFAs) on the Lower North Shore (LFAs 15 and 16), Upper and Middle North Shore (LFA 18, subareas A to I) and at Anticosti Island (LFAs 17, subareas A and B).

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.

STOCK STATUS ASSESSMENT

Source of data

The stock status assessment is conducted for LFAs 15, 16 and 17B only. Due to insufficient data, the stock status in LFA 18 cannot be assessed. 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 2018 data are compared with the averages of the pre-2018 data series. Where data are highly variable, the average for the current evaluation period (2016-2018) is compared to the average for the previous period (2012-2015).

Table 1. Fishing rules in 2016-2018

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)	39–51 (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)	8 (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 cm 92 x 71 x 50 cm	2 circulars (65 mm) or 1 rectangle (127 x 47 mm)	1 (1)

Abundance Indicators

Landings

Lobster landings in LFA 15 were 66 t in 2018, which represents an increase of 82% compared to 2015 (36 t) and 188% over the 1993-2017 average of 23 t (Figure 3A). In the LFA 16, landings in 2018 reached 88 t, an increase of 305% compared to 2015 (22 t) and 492% from the 1993-2017 average (15 t) (Figure 3B). Landings from the North Shore (LFA 15, 16 and 18) account for 3% of Quebec landings (8,127 t). However, information on landings of the North Shore may be incomplete. 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 48 in 2015 to 59 in 2018. Comparing the rate of

increase in landings with that of CPUE, it is estimated that two-thirds of the increase in landings would be due to increased fishing effort, while the remaining one-third would be due to an increase in lobster abundance.

At Anticosti Island, in LFA 17B, landings have been increasing since 2004, reaching a maximum of 782 t in 2018 (Figure 3C), which is a 55% increase from 2015 (504 t) and 250% of the average of the past 25 years (224 t). Landings from LFA 17B account for 10% of Quebec landings. In 2015, the majority (80%) of traps are hauled on a daily basis. However, in 2018, the frequency of daily trap haul decreased to 75% due to less favorable weather conditions during the fishing season.

Data for LFA 18 is fragmentary. From 2001 and 2011, landings where around 1 t and have since grown exponentially to 128 t in 2018, which is a 423 % increase from 2015 (24 t) and 1,083 % of the average of the past 25 years (11 t) (Figure 3D).

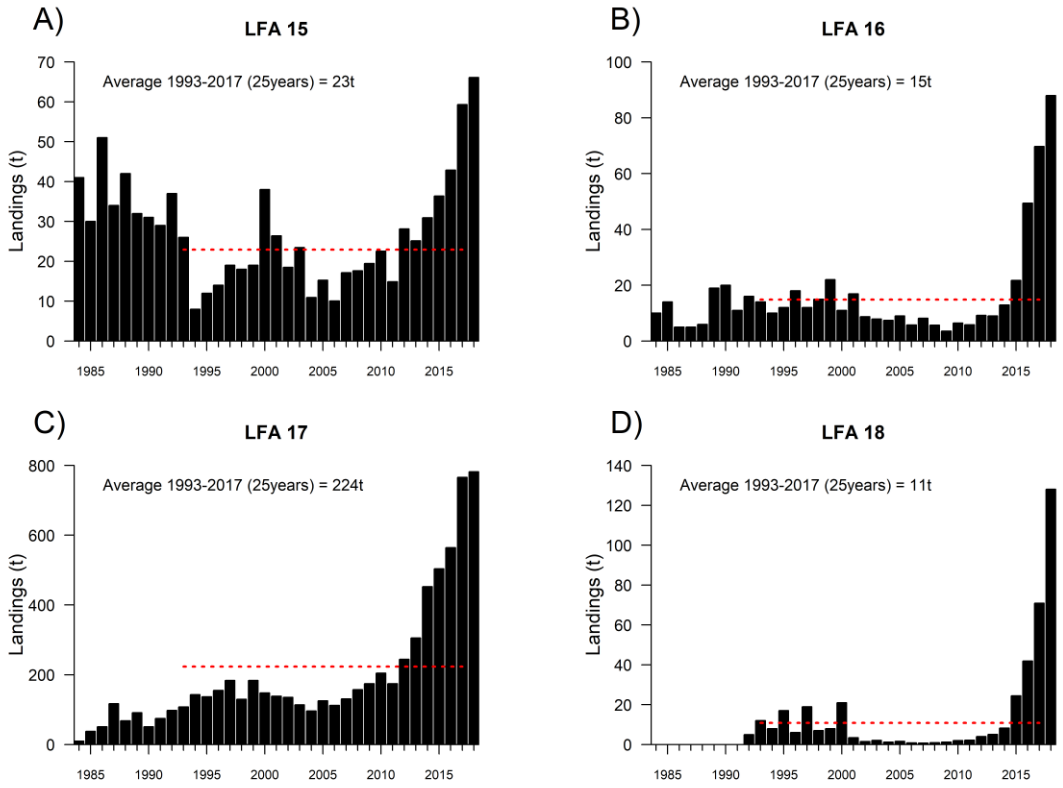


Figure 3. Lobster landings on the North Shore (LFAs 15, 16 and 18) and at Anticosti Island (LFA 17, subarea B) from 1984 to 2018. The dotted lines represent the average value for the past 25 years, excluding 2018.

Catch rates for commercial lobster

Catch rates correspond to the catch per unit effort (CPUE) expressed in weight of lobster per trap. In 2018, CPUEs from logbooks in LFAs 15 and 16 combined were 0.63 kg of lobster per trap (kg/trap) (Figure 4A). This is an increase of 27% from 2015 (0.50 kg/trap) and 137% compared to the 1993-2017 average (0.27 kg/trap). Since 2011, numerical estimates are no longer available due to insufficient data.

In LFA 17B, CPUEs reached 3.41 kg/trap in 2018, their highest value since 2006. The 2018 CPUE represented a 33% increase over the 2015 CPUE (2.57 kg/trap) and 114% over the 2006-2017 average (1.59 kg/trap; Figure 4B).

In sub-area 18D, the CPUE reached 4.20 kg/trap in 2018. The 2018 CPUE was 44% higher than the 2015 CPUE (2.91 kg/trap) and 112% higher than the 2012-2017 average (1.98 kg/trap; Figure 4C).

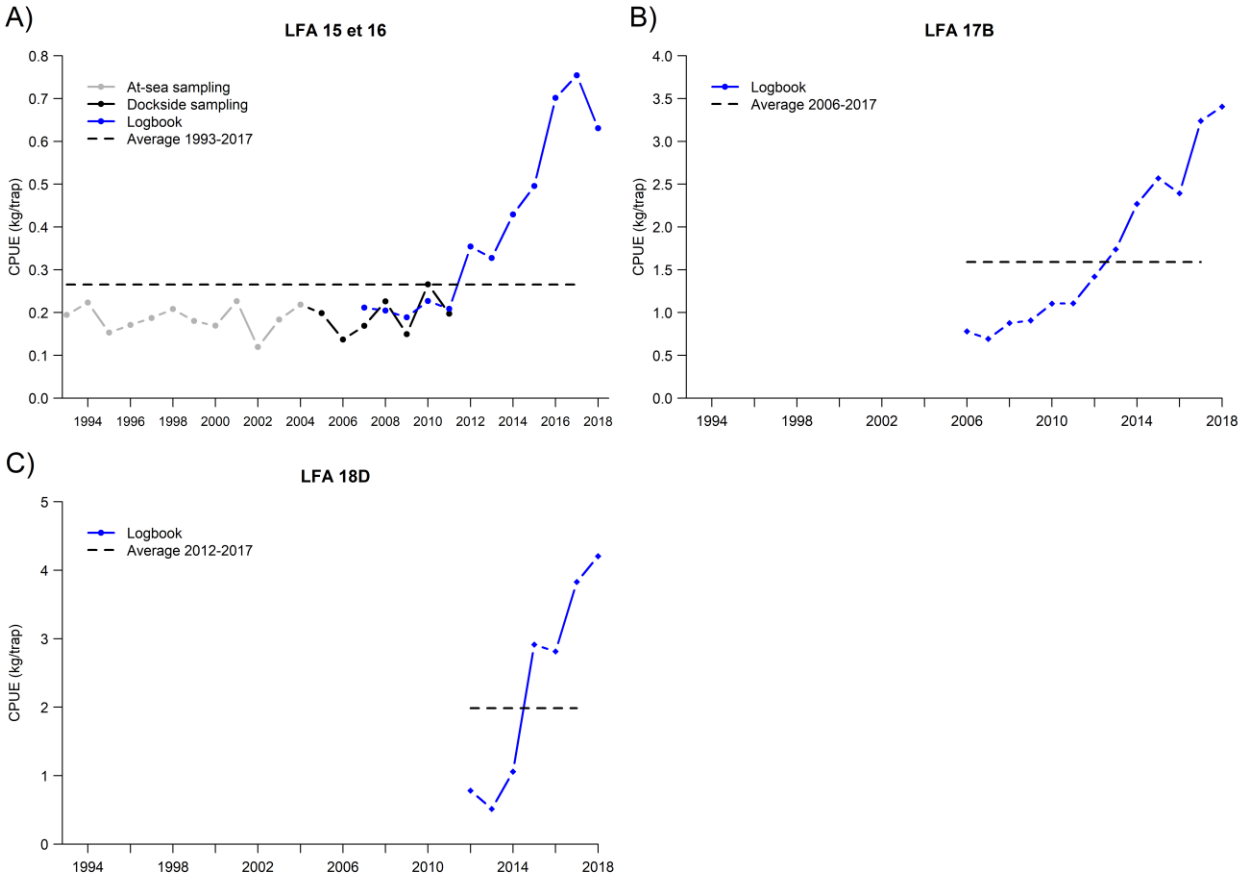


Figure 4. Catch rates (CPUE) of commercial-size lobster in LFAs 15 and 16 (A) on the North Shore from 1993 to 2018 in weight (kg) per trap and for LFA 17, subarea B (B) and LFA 18, subarea D (C). The dotted horizontal line represents the historical average (beginning of the series to 2017).

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. Since 2014, the average size has varied from 92 to 98 mm. It is important to note that prior to the increase of the MLS (1998-2005), average size was around 83–91 mm. Jumbo lobsters would previously show up in samples (0–2%), but from 2014 to 2018, their proportion varied between 1.5 and 6%. 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 for all commercial lobster decreased by 2 mm since 2015, from 95 mm in 2012-2015 to 93 mm in 2016-2018. This decrease can be explained by strong recruitment over the past three years, which is consistent with the recent increase in CPUE. 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 decreased by 4 mm from 103 mm in 2015 to 99 mm in 2018.

Sources of Uncertainty

In general, there is little data on lobster populations in the North Shore and Anticosti Island. The use of electronic logbooks should improve the quality and quantity of data on lobster abundance and distribution. However, the sampling of catches is insufficient, especially in LFAs 15 and 16. 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, but are characterized by slow growth as well as late sexual maturity and at larger size (90 mm and over). Given that legal size is smaller than size at sexual maturity, these populations may be vulnerable to over-harvesting. In the context of increasing fishing effort in these regions 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.

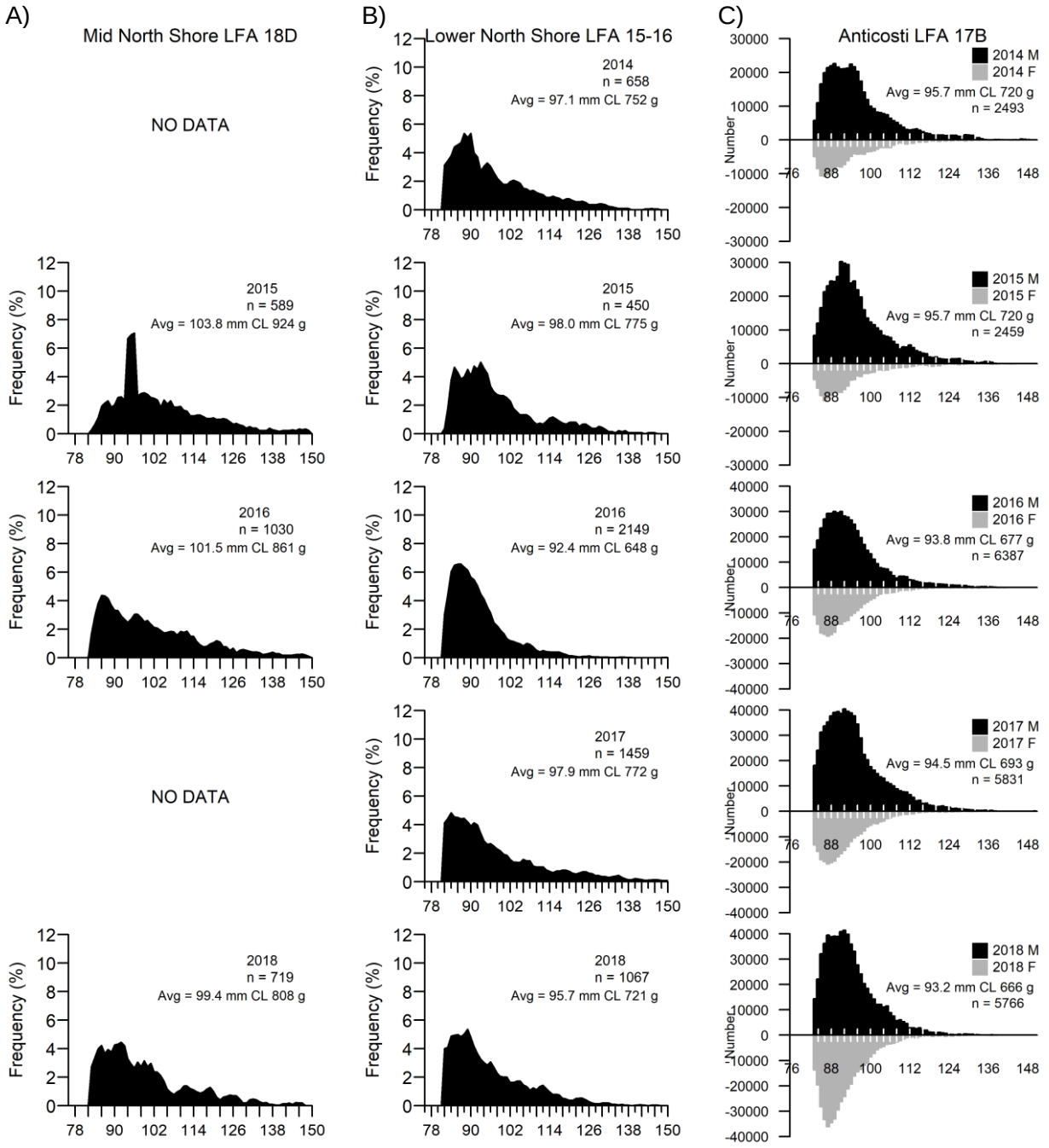


Figure 5. Size frequency distribution for commercial lobster A) LFA 18, subarea D, B) LFAs 15 and 16 and C) LFA 17, subarea B from 2014 to 2018. For A) and B), the combined frequencies for males and females are in percentage; for C), frequencies in numbers weighted by landings are presented for males (black) and females (grey) separately. Note the change in the number scale from 2016 onwards in C). The average size (Avg.) and number of lobsters measured are indicated.

LIST OF MEETING PARTICIPANTS

Name	Affiliation	March 12	March 13	March 14
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Belley, Rénald	DFO – Science	x	x	x
Bernier, Denis	DFO – Science	x	x	x
Bouchard, Danielle	MAPAQ	x	-	-
Bruneau, Benoit	DFO – Science	x	x	x
Coté, Jean	RPPNG	x	x	x
Couillard, Catherine	DFO – Science	-	x	x
Cyr, Charley	DFO – Science	x	x	x
Deraspe, Norman (tel)	Fisher from Iles-de-la-Madeleine	-	x	-
Gauthier, Pierre	DFO – Science	x	-	-
Gilbert, Michel	DFO – Science	x	-	x
Gillis, Carole Anne	Listuguj Fisheries	-	-	x
Hurtubise, Sylvain	DFO – Science	x	x	x
Jérome, Adam	AGHAMM	x	-	x
Juillet, Cédric	DFO – Science	x	x	x
Larochelle, Mia (tel)	DFO – Fisheries management	-	-	x
Lévesque, Isabelle	DFO – Science	x	-	-
Maltais, Domynick	DFO – Science	x	-	x
Monseau, Alexandre	Fisher from Anticosti	-	x	-
Paille, Nathalie	DFO – Science	x	x	x
Parent, Shanie	DFO – Fisheries management	x	x	x
Plourde, Stéphane	DFO – Science	x	x	-
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Sainte-Marie, Bernard	DFO – Science	x	x	x
Sean, Anne-Sara	DFO – Science	x	-	-
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Turbide, Carole	DFO – Science	x	x	x
Two-Axe, Tara	Gesgapegiag	x	-	x

SOURCES OF INFORMATION

This Science Advisory Report is from the March 12-14, 2019 regional peer review meeting on the Assessment of the lobster in Quebec's inshore waters. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

DFO. 2016. 2015 Lobster stock assessment on the North Shore (LFAs 15, 16 and 18) and at Anticosti Island (LFA 17), Quebec area. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/044.

Gendron, L. and Savard, G. 2012. Lobster stock status in the coastal waters of Quebec (LFAs 15 to 22) in 2011 and determination of reference points for the implementation of a precautionary approach in the Magdalen Islands (LFA 22). DFO Can. Sci. Advis. Sec. Res. Doc. 2012/010. xvii+ 143 p.

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Aussi disponible en français :

*MPO. 2019. Évaluation de l'état des stocks de homard (*Homarus americanus*) de la Côte-Nord (ZPH 15, 16 et 18) et de l'île d'Anticosti (ZPH 17), Québec, en 2018. Secr. can. de consult. sci. du MPO, Avis sci. 2019/059.*