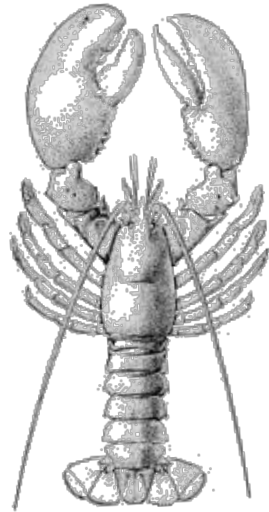




AMERICAN LOBSTER (*HOMARUS AMERICANUS*) STOCK ASSESSMENT IN THE MAGDALEN ISLANDS (LFA 22), QUEBEC, IN 2022



Lobster (*Homarus americanus*)

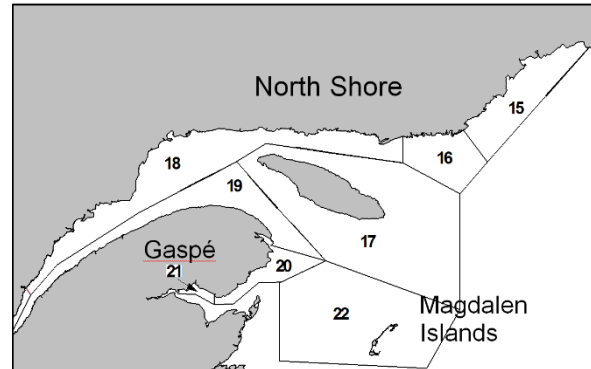


Figure 1. Map showing lobster fishing areas (LFAs) in Quebec (LFAs 15 to 18: North Shore and Anticosti, LFAs 19 to 21: Gaspé and LFA 22: Magdalen Islands).

Context:

Lobster fishing in the Magdalen Islands (LFA 22, Figure 1) is practiced by 325 enterprises (a skipper-owner and one or more fishers' helpers). About two-thirds of the fleet is on the south side (Old Harry to Havre-Aubert) and one-third is on the north side (Grosse-Île to Millerand) (Figure 2). The fishery is managed by controlling the fishing effort (number of licences, number and size of traps, fishing season and daily schedule, organization of trap lines) and by escapement measures (escape vents, release of berried females and minimum legal size). Management and conservation measures introduced over the past 28 years follow the recommendations of the Fisheries Resource Conservation Council (FRCC). In 2012, a precautionary approach was suggested for LFA 22. The status of the resource is assessed every three years. This report describes the situation in 2022 and changes observed since the last stock status assessment in 2018.

SUMMARY

- Landings reached an all-time high of 6,715 t in 2022, which is 124.3% above the average of the past 25 years (2,994 t, 1997–2021), along with an increase in fishing effort since 2020. The increase in landings between 2018 and 2022 was greater in the north (69.8%) than in the south (26.5%).

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- In 2022, for the Islands as a whole, the catch per unit effort (CPUE) by weight of the commercial sample (1.26 kg/trap) was 29.2% higher than in 2018 and 139.4% (south: 120.1%, north: 197.1%) higher than the 1985–2021 average.
- The density of commercial lobsters in the trawl survey increased significantly from 2014 to 2019 (19.6 lobsters/1,000 m²). Since then, the density has decreased to 14.4 lobsters/1,000 m² in 2022, which remains 37.1% higher than in 2018 and 80% higher than the 1995–2021 average (8.0 lobsters/1,000 m²).
- With respect to demographic indicators, the average size of commercial lobsters sampled was 92.3 mm in 2022 and has been stable since 2017. In the trawl survey, the value for 2022 is higher than that for 2018, and close to the peak observed in 2013.
- Fishing pressure indicators show a slight decrease in exploitation rates since 2005. The rates for 2021 (south: 59%, north: 60.3%) were comparable to those in 2017 and 2018. In 2021, the exploitation rate in the north was equal to the 1985–2021 average, while the rate in the south was 6.4% below the average for the same period.
- Productivity indicators remained high. For the Islands as a whole, theoretical egg production in 2022 was 1.7 times higher than in 2018 and 6.8 times higher than in 1994–1996. However, a decrease in individual mating success has been observed since 2004.
- Pre-recruitment indices in 2022 (Pr1=12.4 lobsters/1,000 m²) were 14.1% higher than in 2018 and 132.8% higher than the 1995–2021 average. The benthic recruitment index has been stable at high levels since 2018.
- The number of degree-days for the 2018 and 2019 fishing seasons is below the average for the past 25 years, while that for 2020 is above the average.
- Small rock crab is a key prey source for lobster. The size structures of the trawl survey in subareas A and B suggest very low abundance of crabs under the legal size. In addition, rock crab CPUE in the commercial fishery has been declining since 2020, and is below the 1998–2021 average in 2022.
- With abundance and productivity remaining high and growing, it can be concluded that the Magdalen Islands lobster stock is in good condition relative to current exploitation rates. However, since 2021, a discrepancy has been observed between fishing yield trends in the north and south of this area, skewed towards the north. According to the precautionary approach, the Islands' lobster stock is currently in the healthy zone.
- Indicators of the health status of the rock crab population in the Magdalen Islands were examined using an ecosystem approach. The population status of this key prey source of lobster is of great concern.
- In an effort to ensure the sustainability of the lobster stock and that of its preferred prey, while maintaining their trophic link, all exceptional measures should be considered to minimize rock crab mortality.

INTRODUCTION

Biology

American Lobster (*Homarus americanus*) is found along the West Atlantic coast, from Labrador to Cape Hatteras. Adult lobsters prefer rocky bottoms 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. In the Magdalen Islands, females reach sexual maturity at around 79 mm (cephalothorax length, CL) on the south side and around 84 mm CL on the north side. In general, 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 (primiparous) can produce nearly 8,000 eggs while large females (≥ 127 mm CL or jumbo) 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 hatch the following summer. Differences exist between primiparous and multiparous females. In addition to being more fertile, some jumbo females could spawn two years in a row 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 spawned) 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 surface waters to settle on the sea floor, initiating the benthic phase. The survival of lobsters from their larval stage to their initial benthic stages is impacted by predation as well as hydrodynamic factors that determine the advection or retention of the larvae near areas that are favourable for benthic settlement. During the first few years of their 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. Lobsters are estimated to reach the minimum legal size (MLS) (83 mm CL) 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.

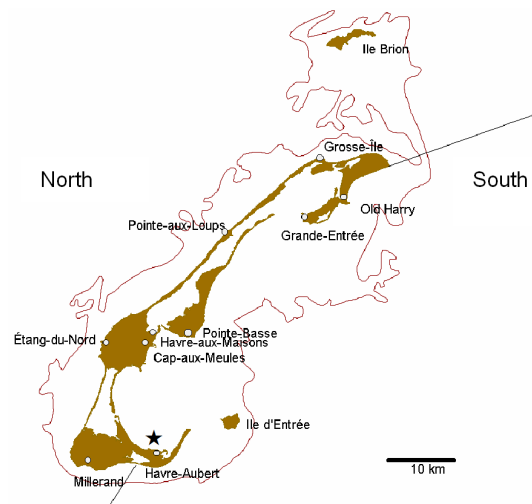


Figure 2. Map of the Magdalen Islands showing the boundaries of the southern and northern areas and the Les Demoiselles site (indicated by a star).

Description of the fishery

The lobster fishery is managed by controlling fishing effort that restricts the number of licences, the number and size of traps, and the duration of the fishing season. Traps cannot be hauled on Sundays. Since 2015, the authorized number of traps per licence is 273 (Table 1); traps are normally hauled once a day from Monday to Saturday and the immersion time is at most 72 hours.

**Assessment of Lobster in the Magdalen
Islands, Quebec, in 2022**

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Table 1. Management rules for the lobster fishery in LFA 22 in 2020-2022. MLS = Minimal legal size.

LFA	Duration (week)	MLS (mm)	No. traps	Trap size (cm) (Length x Width x Height)	Escape vents	No. licences
22	9	83	273	82 x 61 x 50 (round traps) 82 x 61 x 42 (square traps)	2 circulars (65 mm) or 1 rectangle (127 x 47 mm)	325

The minimum number of traps per line was set at seven, with a maximum distance of eight fathoms between traps. The length of the trap lines from the first to the last trap was limited to 56 fathoms. In addition, fishing hours (5:00 a.m. to 9:30 p.m.) were implemented in 2007, in keeping with the ban on making more than one trap haul per day. These measures will allow the effective effort to be controlled or even reduced. The presence of escape vents for juvenile lobsters has been mandatory since 1994. From 2011 to 2022, the number of active fishers in the southern area of the Magdalen Islands has decreased (222 to 209 fishers) in favour of the northern area (103 to 116 fishers).

The minimum legal size (MLS) was increased by 1 mm per year, from 76 mm in 1996 to 83 mm CL in 2003. The objective of the increase in MLS was to double egg production per recruit from the 1994–1996 level. At the same time as the MLS was increased, the size of the vertical opening in trap escape vents was increased from 43 mm in 1996 to 47 mm in 2003. Berried females must be released regardless of their size.

ASSESSMENT

Source of data

Lobster

The stock status assessment is based on indicators of abundance, demography, fishing pressure and stock productivity. Abundance indicators include landings recorded on processing plant purchase slips and catch rates of commercial-size lobsters obtained from at sea sampling. The demographic indicators are taken from the lobster size structures and include mean size and weight, jumbo (≥ 127 mm) abundance, and sex ratios based on the abundance of commercial lobsters (male/non-berried females). The fishing pressure index (exploitation rate) is derived from a measurement of the ratio between the number of individuals (males) from the first moult class recruited to the fishery in a given year and that of the second moult class recruited to the fishery one year later (tracking cohort strength). Productivity indicators are based on abundance of berried females and on egg production (reproduction), abundance of pre-recruits (one year before entering the fishery), and cohort strength at the time of benthic settlement (recruitment).

The indicators are compiled mainly from two sources of data: at-sea sampling (0.14% of fishing activities), which has been conducted on board fishing vessels since 1985 and covers the south and north sides of the Islands; and a trawl survey, which has been conducted on the south side of the Islands since 1995. The latter is a source of fishery-independent data. Trawl survey data were standardized using a correction factor by size class to account for the impact of the

change of research vessel in 2013 (*CCGS Calanus II* to *CCGS Leim*). In addition, divers have studied the benthic settlement of lobster in the Les Demoiselles area (Baie de Plaisance) since 1995.

For each indicator, data from the three previous years are examined and the 2022 data are compared to the averages from the existing data series (from before 2022). When the data are more variable, the average for the current assessment period (2019-2022) is compared to the average for the previous period (2016-2018).

Rock crab

This advisory report represents an initial attempt to incorporate ecosystem elements into the lobster stock assessment. In this context, water temperature and the availability of a key prey source for lobster, i.e. rock crab, are covered in the “Ecosystem” section.

The rock crab stock status assessment is based on indicators of abundance and demographics. Abundance indicators include landings recorded on processing plant purchase slips, catch rates for commercial-size rock crab obtained from dockside sampling and density from trawl surveys carried out in the south of the archipelago. The demographic indicators are taken from the analyses of size structure from dockside sampling and the trawl survey.

Abundance indicators

Landings

Lobster landings recorded for the Magdalen Islands reached a historic record of 6,715 t in 2022 (preliminary data; Figure 3), 124.3% higher than the past 25 years average (2,994 t, 1997–2021). Between 2018 and 2022, the increase in landings was greater in the north (69.8%) than in the south (26.5%). This resulted in the relative contribution of the north side of the Islands to the archipelago’s total landings reaching an all-time high of 40.8%, compared with 59.2% for the south side. In 2022, lobster landings from the Magdalen Islands accounted for 56% of the total landings in Quebec (11,984 t).

Commercial lobster catch rate (≥ 83 mm CL)

Catch rates correspond to catches per unit effort (CPUE) expressed in number or weight of commercial lobster (≥ 83 mm) per trap. In 2022, for the Islands as a whole, the CPUE was 1.98 lobsters per trap (no./trap), which corresponds to 1.26 kg of lobster per trap (kg/trap) (Figures 4A and 4B). The CPUE in number for 2022 was 33.7% higher than in 2018 and 123% higher than the series average (1985 to 2021), which stood at 0.89 lobster/trap. The CPUE in weight was 29.2% higher than in 2018 and 139.4% higher than the historical series’ average, which was 0.53 kg/trap. However, a divergence between trends in fishing yields from the north and south of this area has been observed since 2021 in favor of the north (Figures 4C and D). Logbook data follow a similar upward trend to that of commercial sampling.

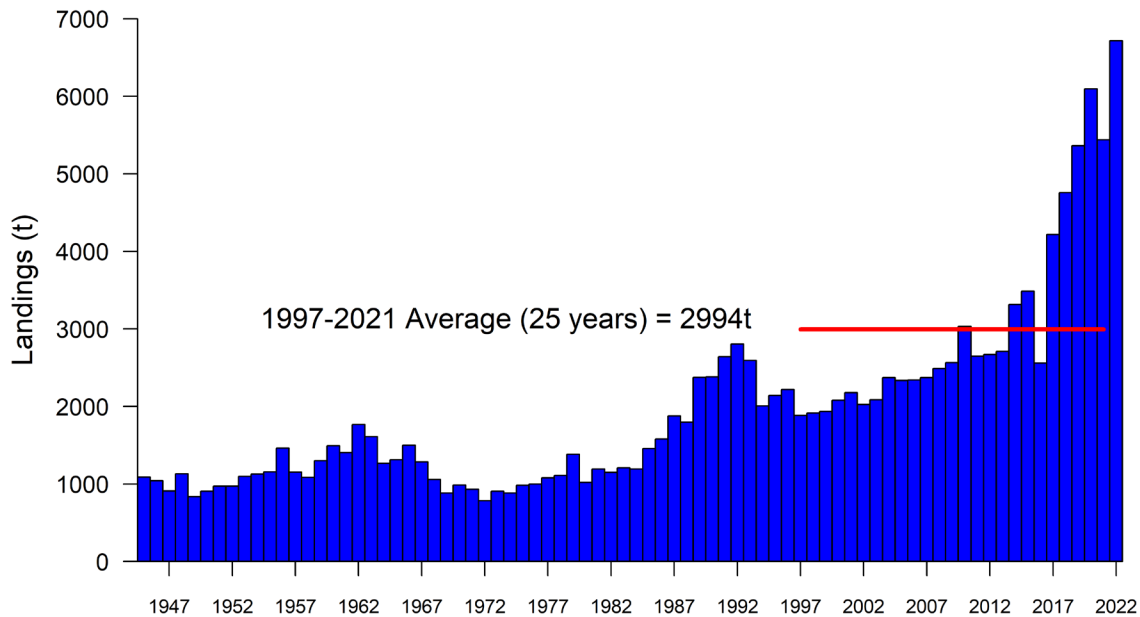


Figure 3. Lobster landings in the Magdalen Islands from 1945 to 2022.

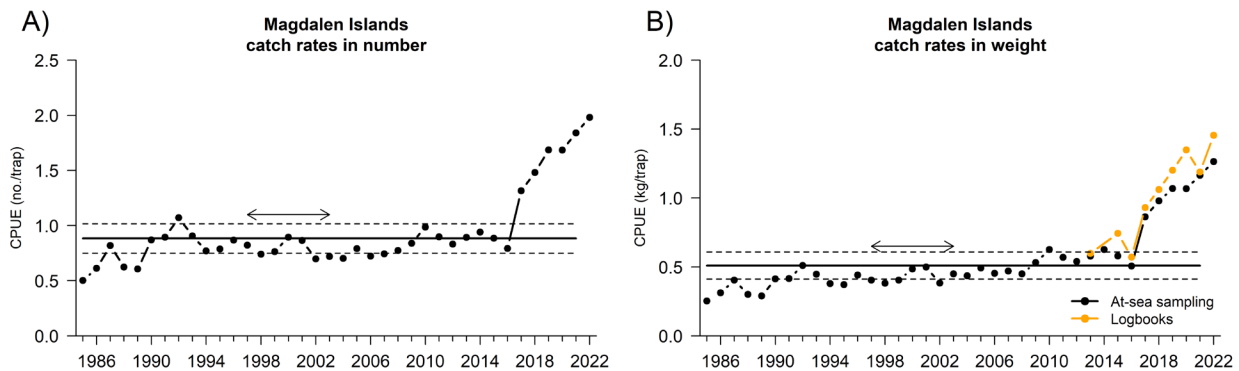


Figure 4. Catch rates (CPUE) of commercial-size lobsters for the Magdalen Islands from 1985 to 2022 in A) number and B) in kg per trap. 1985–2021 mean (solid line) \pm 0.5 standard deviation (dotted lines). The horizontal arrow indicates the period (1997 to 2003) when the MLS was increased from 76 to 83 mm.

Number and biomass of commercial lobsters (trawl)

The trawl survey south of the islands is used to calculate the average density (no./1000 m²) and biomass (kg/1000 m²) of commercial-sized lobsters on the seabed in this region. Since this survey takes place in the fall, after the commercial fishery, it theoretically provides estimate of the lobster biomass that will be available to the fishery in the spring of the following year. Commercial lobster density and biomass reached an all-time high in 2019. The commercial lobster density observed in the 2021 trawl survey was 15.9 lobsters per 1,000 m² (Figure 5A). The corresponding biomass was 11.1 kg of lobster per 1,000 m² (Figure 5B). The density and biomass values observed in 2021 were respectively 27.2% and 30.5% higher than those observed in the 2017 survey and respectively 99.0% and 112.4% higher than the series average (1995 to 2021). During the 2022 survey, the density (14.4 lobsters per 1,000 m²) and biomass (9.88 kg per 1,000 m²) values were slightly lower than in 2021, but remained high compared to the historical series.

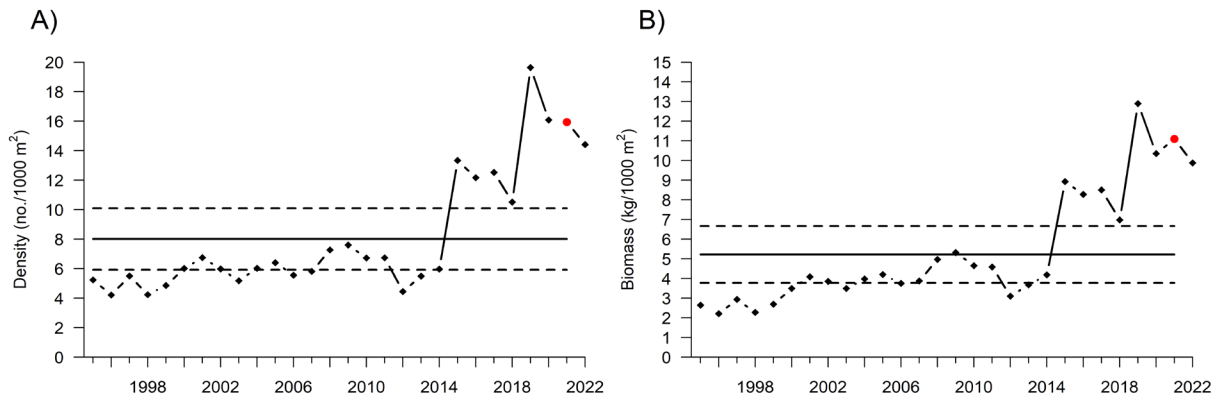


Figure 5. Commercial-size lobster density A) in number and biomass B) in kg per 1,000 m² observed during the September trawl survey conducted on the south side of the Magdalen Islands between 1995 and 2021. 1995–2020 mean (solid line) \pm 0.5 standard deviation (dotted lines). The red dot for 2021 denotes a higher level of uncertainty on the value due to the lower number of transects carried out.

Demographic indicators and fishing pressure

Since the end of the MLS increase in 2003, size structures appear truncated and are dominated by a moult class (83–95 mm for males and 83–93 mm for females) reflecting the year’s recruits. Female size distributions are more truncated toward small sizes than male size distributions, reflecting slowed growth among females upon sexual maturity.

South of the Magdalen Islands, average sizes (cephalothorax lengths [CL]) in commercial sampling increased gradually after 2003, when the MLS increase had ended, up until 2015. Between 2019 and 2022, the average CL remained stable, ranging from 93.8 to 94.8 mm for males and from 89.0 to 89.6 mm for females. North of the archipelago, average sizes in commercial sampling also increased during the period after the MLS increase had ended in 2003 until 2014. These sizes then decreased to values similar to those in 2003 over the course of two years, between 2014 and 2016, and have not shown any clear trend since. Between 2019 and 2022, the average CL varied from 92.4 to 93.7 mm for males and 90.1 to 90.5 mm for females. The average size of commercial lobster in the trawl survey continued to increase slowly between the end of the period in which the MLS was increased in 2003 and 2013. From 2013 to 2021, the trend reversed, with values dropping from 94.1 to 91.5 mm, and then rising rapidly to 93.5 mm in 2022, which is almost the same value as in 2013.

The proportion of jumbo lobsters (≥ 127 mm) observed during at-sea sampling is generally less than 1%. In 2022, it was 0.60% for the south side of the islands, compared to 0.52% in 2018, and for the north side of the islands, it was 0.22% in 2022, compared to 0.35% in 2018. In the trawl survey conducted on the south side, the proportion of jumbos was 0.84% in the fall of 2021, compared to 0.32% in the fall of 2017. These upward trends reflects changes in males, with the percentage of jumbo females remaining below 0.2% since 2014.

Truncated size structures for the current year’s fishing recruitment size classes are an indication of high exploitation rates (Figure 6). On average, during the 2000s, exploitation rates in the south of the Islands remained slightly above the historical average (1985–2021). In the north, rates were well above the historical average for the same period. From 2010 onwards, rates were below average in the south and around the average in the north. In 2021, the exploitation rate in the north was equal to the historical average at 60.3%, while it remained below average in the south at 59%. The greater decrease in the exploitation rate in the south occurred in part

because of the reduction in the number of active licences on the south side to the benefit of the north side.

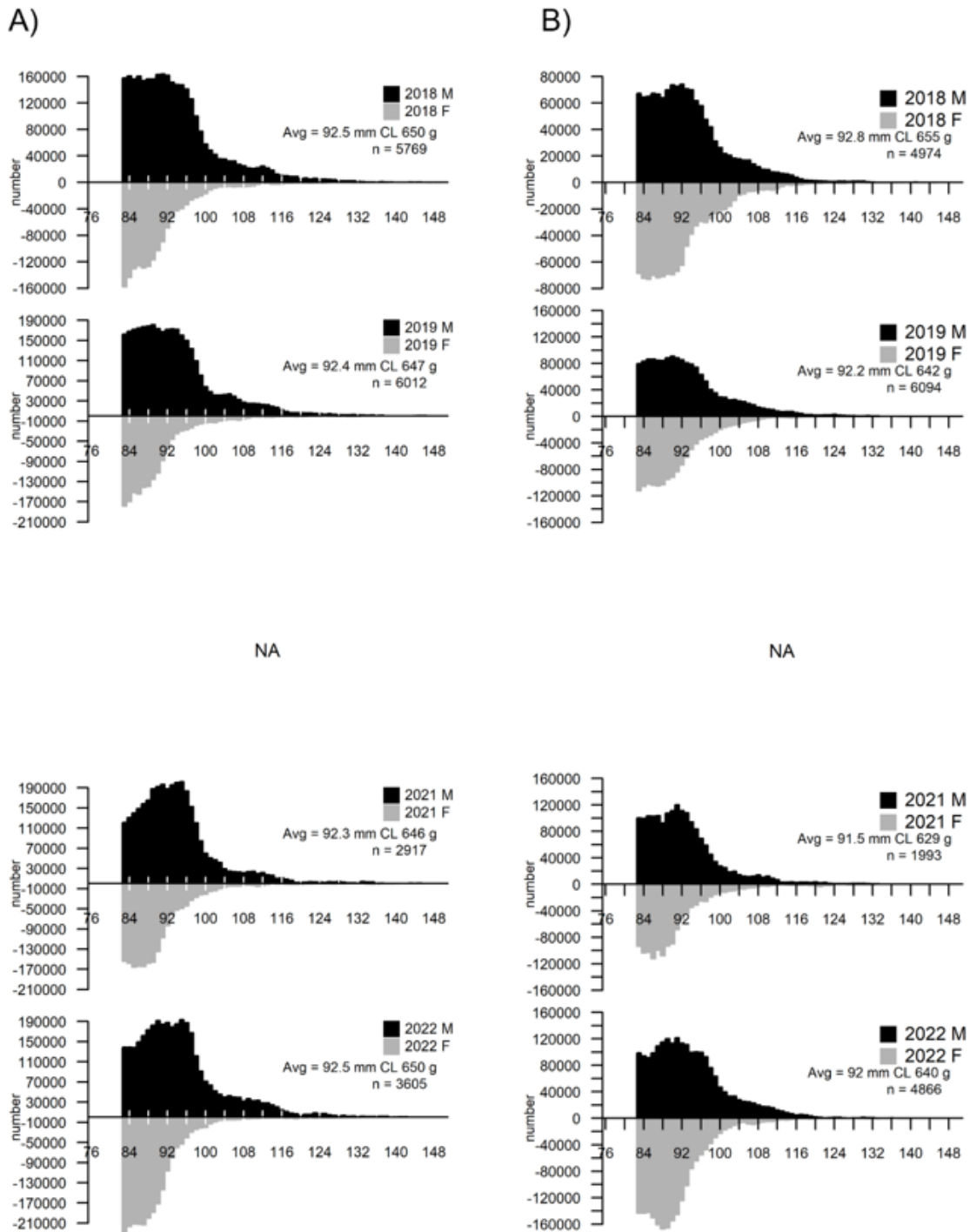


Figure 6. Size frequency distribution of commercial male (black) and female lobsters (grey) within the fishery (at-sea sampling) from 2018 to 2022 for A) the south side and B) the north side of the Magdalen Islands. Frequencies are in numbers weighted by landings. The average size and weight (Avg) and the number of lobsters measured (n) are indicated. In 2020, no at sea sampling was carried out due to the Covid 19 pandemic.

Overall, female mortality due to fishing is not as high because they are protected when berried. As a result, the sex ratio for lobsters left on the sea floor could shift towards females, which is more likely when exploitation rates are high. Until 2011, sex ratios (number of males / non-berried females) were close to 1, both for trawl surveys and at-sea sampling, a condition deemed suitable for mating (≥ 1). From 2012 to 2017, the sex ratio for at-sea sampling increased significantly for males south of the Islands, to just over a value of 2 in 2017. The proportion of males in this area (south) then decreased from 2018 to 2022, but remained above parity. These variations are not observed in trawl sampling, where sex ratios remained slightly below the equilibrium point over the same period.

Productivity indicators

Berried females and egg production

The CPUE of berried females from at-sea sampling for the Islands as a whole reached an all-time high of 0.47 lobster/trap in 2019, only to decrease slightly to 0.42 lobster/trap in 2022, which nevertheless remains the second-highest value in the series, and up 61.5% from 2018 (0.26 lobster/trap). The average CPUE since the end of the increase period (2003–2010) of the MLS to 83 mm, was 0.18 lobster/trap compared to 0.09 lobster/trap for 1985 to 1996 when the MLS was 76 mm (Figure 7). The abundance index of females ≥ 79 mm CL (presumed mature), calculated from trawl survey data, also shows an increase in productivity. The abundance index for females ≥ 79 mm CL (assumed to be mature) calculated from trawl survey data also shows an increase in productivity. The density of mature females was less than 3.0 per 1,000 m² before 1997, had reached an average of 3.5 per 1,000 m² from 2012 to 2014 and then made two major leaps, one to 7.5 on average for the 2015–2018 period and another to 11.4 per 1,000 m² for the 2019–2022 period.

The examination of the size structure of berried females (primiparous and multiparous) from the 2022 at-sea sampling shows a strong mode under the MLS on the south and north sides (Figures 8A and 8B). On the south side, 53% of berried females are under the MLS whereas on the north side, 37% are below it. Before the MLS was increased, most of these females between 76 and 83 mm CL did not contribute to egg production. In 2022, the average size of berried females was 83.4 mm in the south and 86.8 mm in the north. As the trawl survey is carried out on the south side of the islands, the berried female size structures from this survey are similar to those from at-sea sampling on the south side of the Islands. The larger size of berried females on the north side is mainly explained by a larger size at sexual maturity. In 2022, multiparous females represented 31% of berried females in the south and the north, respectively, compared to 29% and 120% in 2018.

An egg production index was calculated by multiplying the abundance index of berried females for each 1-mm size class by the size-specific fecundity. In 2022, the egg production index for the Magdalen Islands was 6.7 times higher than that calculated for 1994 to 1996, before the MLS began to be increased. In 2022, multiparous females contributed to 31% of total egg production.

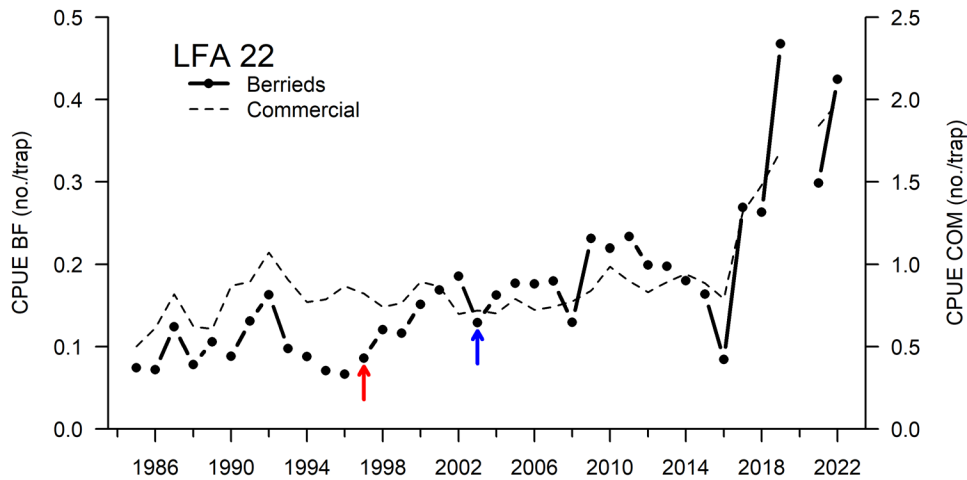


Figure 7. Catch rates (CPUE) of berried females (BF) for the Magdalen Islands from 1985 to 2022. The red arrow indicates the start of the increases in MLS and the blue arrow indicates the year when the height of the escape vents was increased from 43 mm to 47 mm. The dotted line indicates CPUEs of commercial-size lobsters (COM) during the same period.

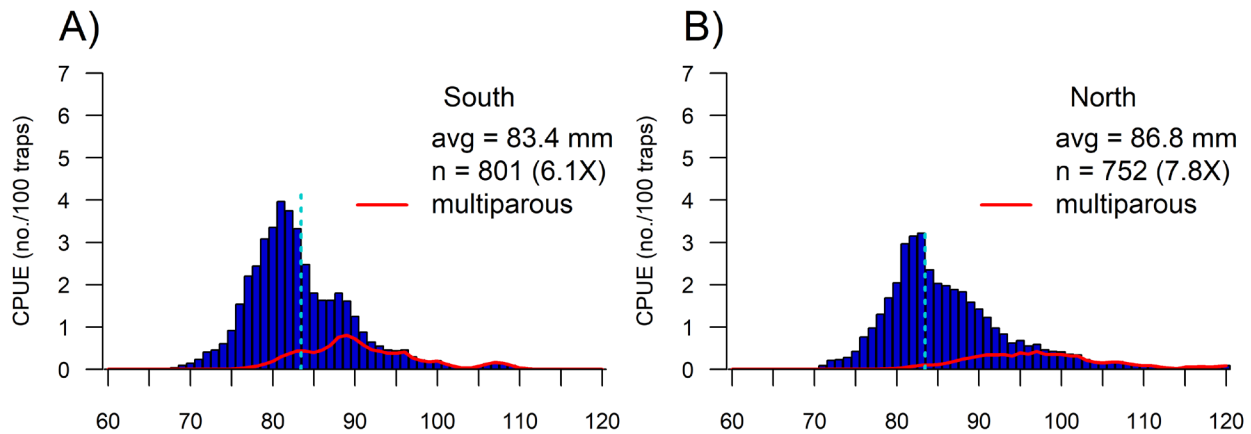


Figure 8. Size distribution frequencies of berried females on A) the south side and B) the north side of the Magdalen Islands in the commercial sampling in 2022. The red line represents the proportion of multiparous females. Distributions are weighted by abundance indices (annual CPUE). The average size (means), the total number of berried females (n) and the rate of increase in egg production compared to the 1994–1996 average (in parentheses) are indicated.

Since 2004, at the time of the trawl survey, females ≥ 80 mm in recent postmoult have been examined to see if they have a sperm plug in the entrance of the seminal receptacle. The presence of a sperm plug indicates that the female has mated and that there is sperm in the seminal receptacle. The purpose of this type of observation is to detect any anomalies in mating success that could be a result of, for example, excessive fishing pressure on males and a sex ratio imbalance. From 2020 to 2022, an average of 56% of females wore a sperm plug. This is lower than the average of 66% in 2016–2018 and the historical high of 82% reached in 2015.

Recruitment

Commercial-size lobster biomass estimated during the trawl survey in a given year gives a fairly good prediction of total landings in the Islands for the following year (Figure 9). This suggests, for the 2023 season, landings greater (5,020 t) than the historic series (1995–2019), and comparable to 2021, if catchability remains similar.

The benthic settlement at the Les Demoiselles site (see map, Figure 2) has been higher on average since 2002 compared to the 1995 to 2001 period (Figure 10). The generally high values since 2002 coincide with the increase in egg production. From 2010 to 2016, the density of young aged 1+ has decreased from 2.62 to 0.31 lobster/m². Since 2017, the density of both age classes (0+ and 1+) has remained high and since 2018, the density of 0+ is higher than the average for 1+ during the 2002–2009 period (0.61 lobsters/m²), which had been rated as excellent. The low values between 2014 and 2016 could suggest a decrease or slowdown in the growth of biomass available to the fishery seven to eight years later. However, after benthic settlement, the survival rate of juvenile lobsters to commercial size remains uncertain. In addition to egg production, the strength and direction of winds, as well as growth rate and larval survival, are all factors influencing recruitment in any given year.

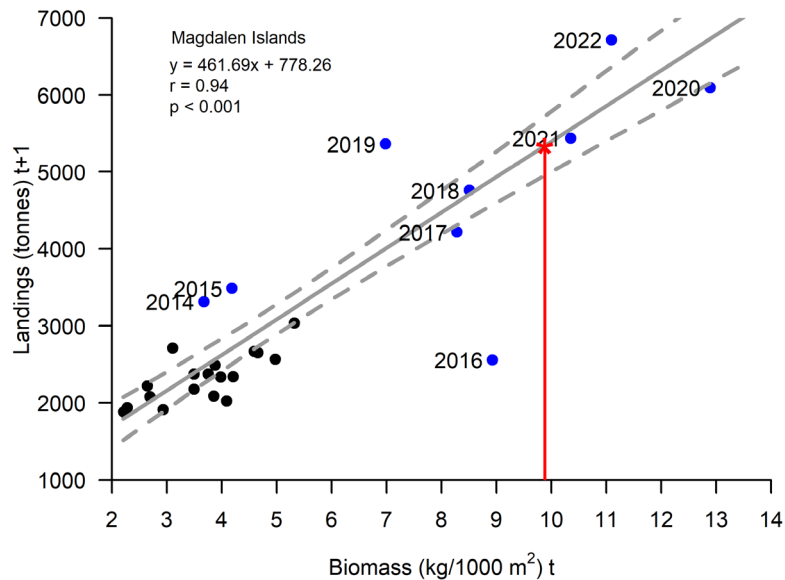


Figure 9. Relationship between the commercial-size lobster biomass index from the trawl survey in a given year (t) and the total lobster landings in the Magdalen Islands one year later ($t+1$). The dotted lines show a confidence interval of 95% around the regression line (2016 excluded). The blue points show recent biomass values observed in the survey in 2013–2021 (at time t) and landings for 2014–2022 (at time $t+1$). The years shown in the figure correspond to the years at time $t+1$. The red line indicates the 2022 biomass value and the red asterisk indicates the prediction of 2023 landings.

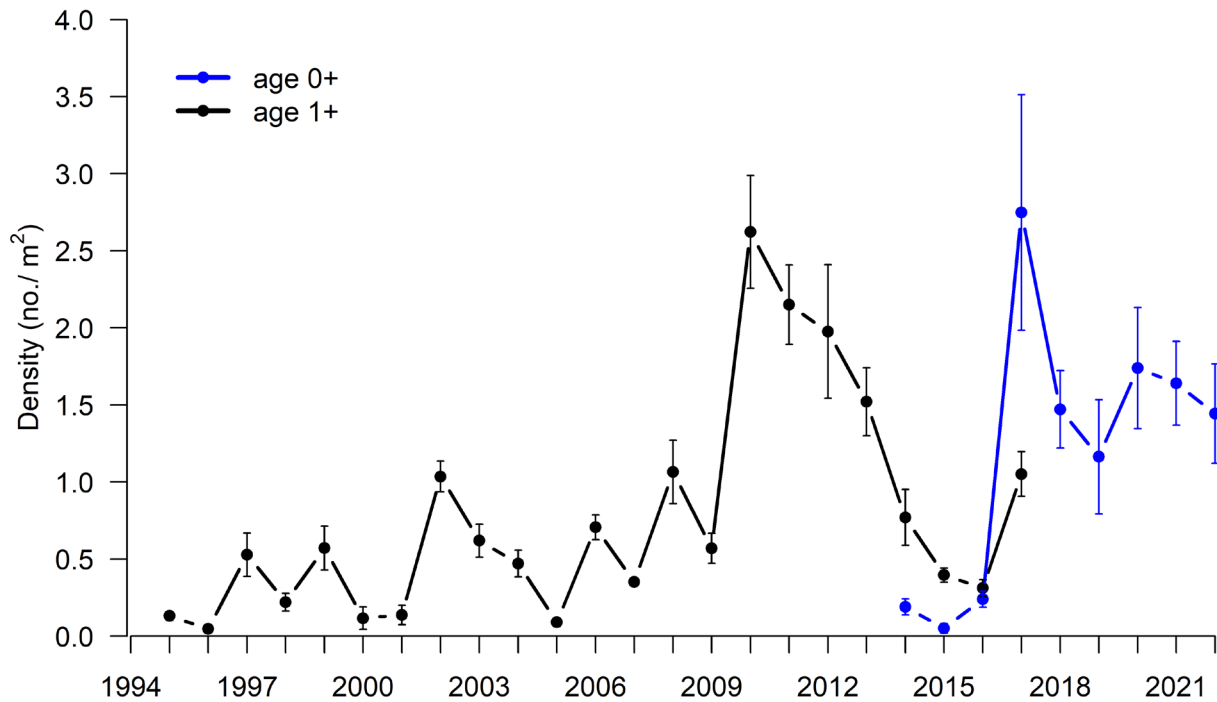


Figure 10. Density of juvenile lobsters from 1995 to 2022. The densities of lobsters aged 1+ are shown in year $t-1$ in order to be compared with the densities of those aged 0+.

Ecosystem

Temperature

In 2021, the water temperature at 10 m was above average at the start and end of the fishing season (Figure 11). In 2022, only early season data are available and show values around the average. The number of degree-days for the 2018 and 2019 fishing seasons are below the average for the past 25 years, while the number for the 2020 season is above the average.

Prey availability

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

Since 2018, and in the three subareas, the size structures of crabs in dockside sampling (Figure 12) show a near absence of small classes, close to the minimum catch size of 102 mm. The absence of these small size classes is typically associated with low recruitment in subsequent years. Despite this forecast of low recruitment, the CPUE increased steadily between 2016 and 2020 in all three subareas (Figure 13). Although CPUE dropped below the historical average (1998–2021) in 2022, the expected low recruitment does not seem to have materialized. Additional data incorporating the non-commercial aspect of the stock (size classes below 102 mm) would be required to better understand the rock crab population in the Magdalen Islands with respect to structure, abundance and recruitment.

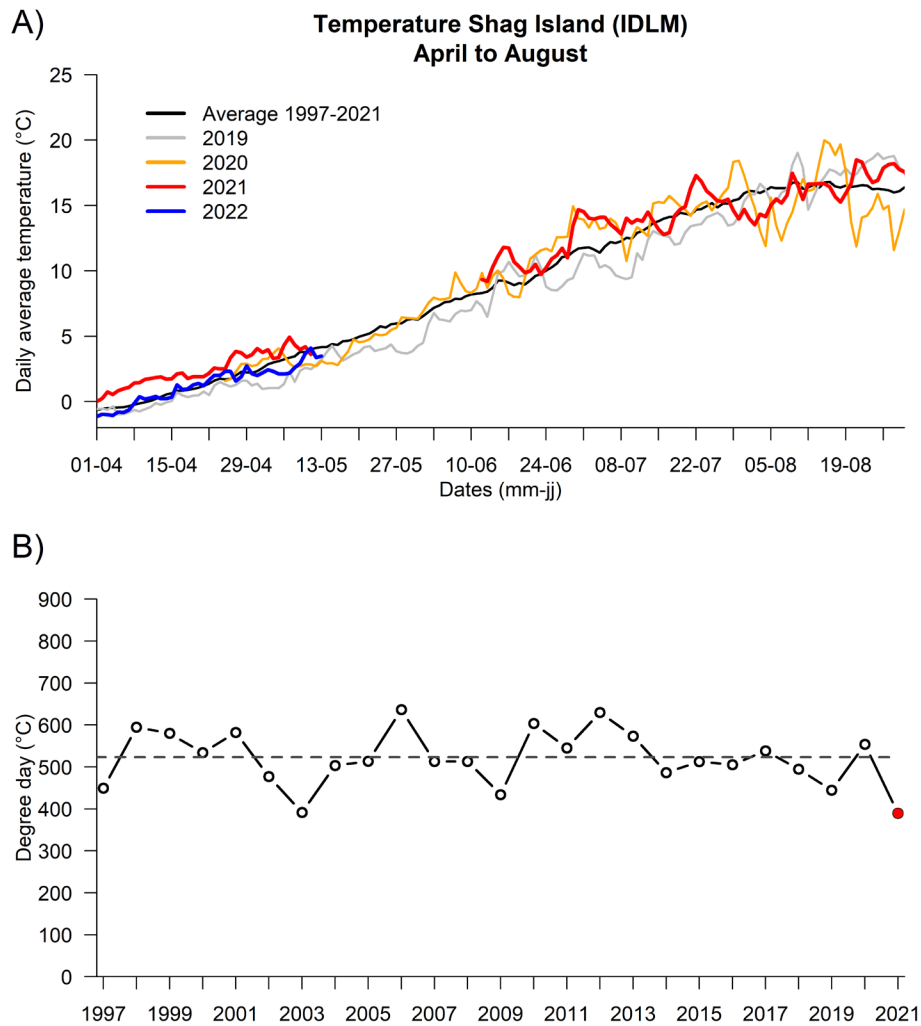


Figure 11. Water temperatures at a depth of 10 m at Shag Island, Magdalen Islands A) for the period of April to August since 2019, B) in degree-days for the same period of the year since 1997. Data are incomplete for 2021 (red line) and 2022 (blue line). In A, the average from 1997 to 2022 is indicated by the black line.

Precautionary approach

A precautionary approach (PA) based on an empirical method was suggested and adopted for the lobster fishery in the Magdalen Islands. The Limit Reference Point (LRP) and the Upper Reference Point (URP), as well as the stock status zones (healthy, cautious and critical) were defined using a stock biomass indicator (landings), in accordance with the DFO operational policy framework. According to the definition in framework, reference points are defined in relation to the maximum sustainable yield (B_{MSY}). The mean value of landings from 1985 to 2009 was used as an approximation of B_{MSY} . These 25 years correspond to a productive period for lobsters and during which at least two large cohorts of lobster were produced. Average landings from 1985 to 2009 were 2,188 t. The LRP (40% x average) was 875 t and the URP (80% x average) was 1,750 t (Figure 14). Based on 6,715 t of landings in 2022, the stock is considered to be in the healthy zone (Figure 14).

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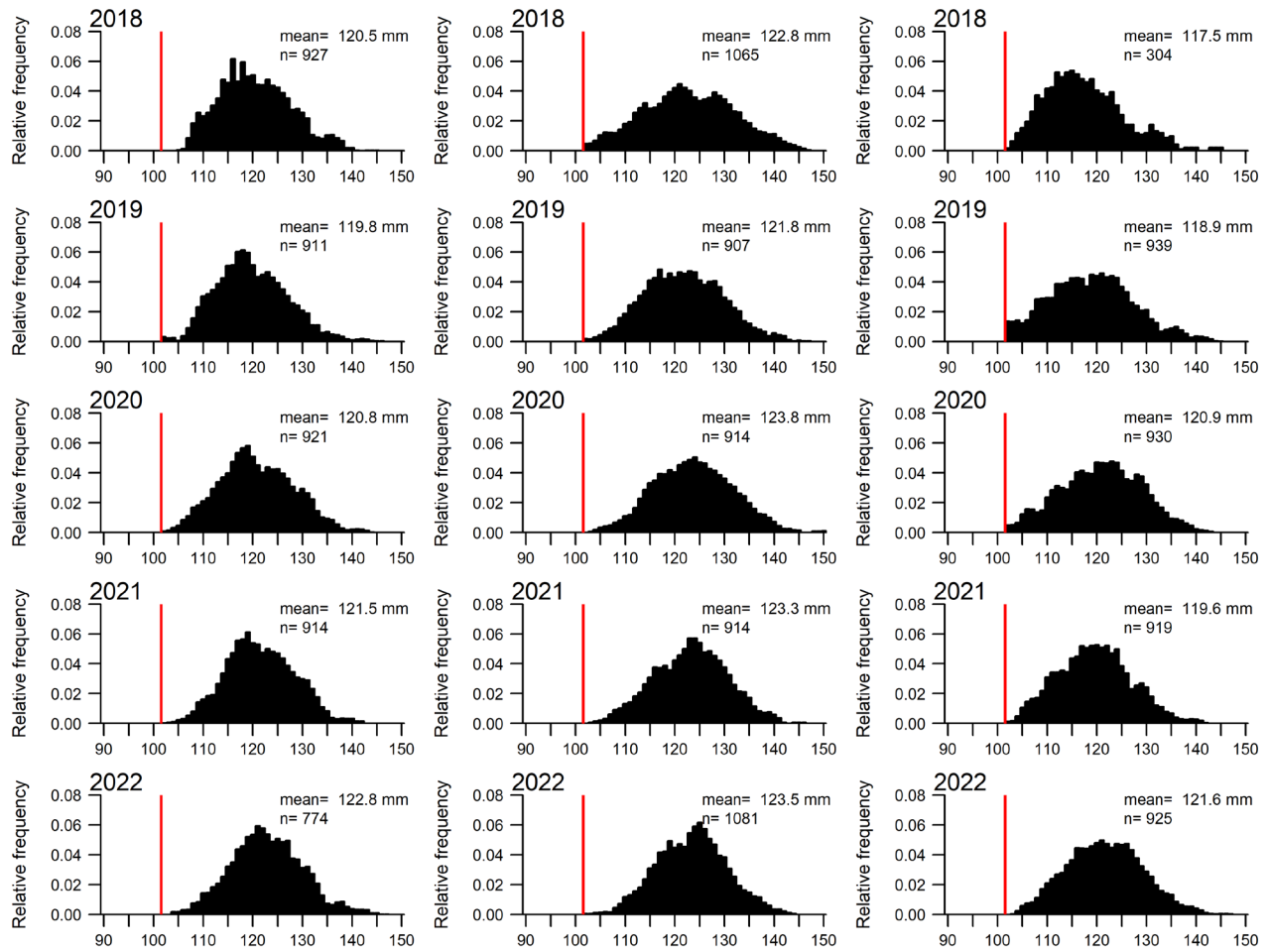


Figure 12. Size structure of rock crabs in dockside sampling for the three rock crab fishing areas from 2018 to 2022. The minimum catch size of 102 mm carapace width is indicated by the red line.

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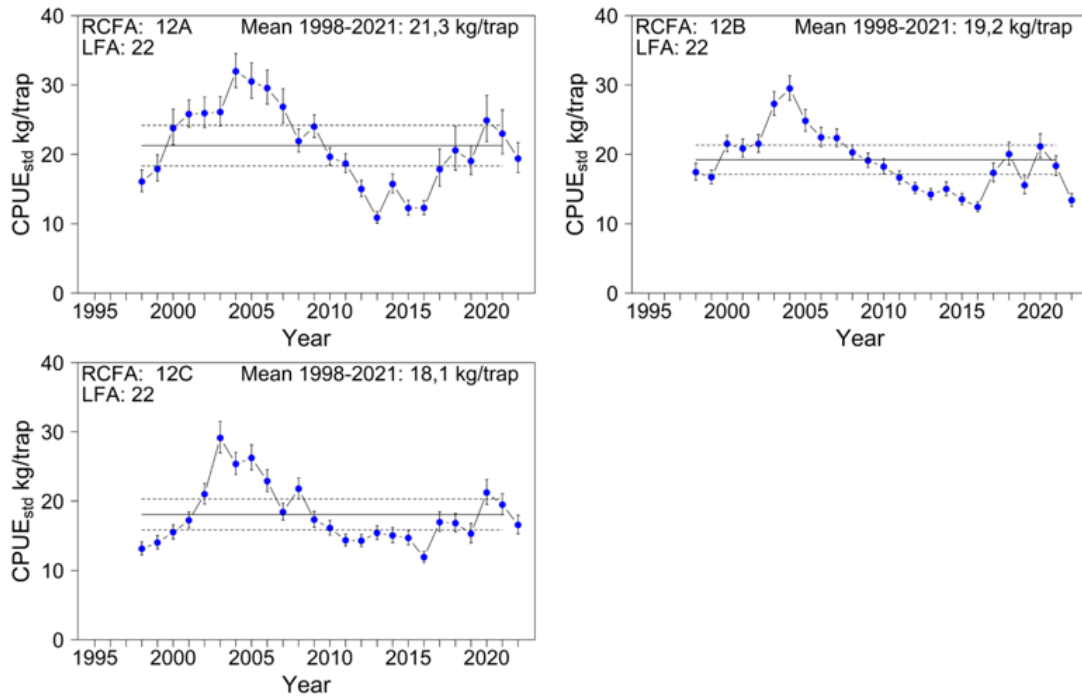


Figure 13. Standardized rock crab CPUE between the two trap types (3 and 4 ft), with standard error, across the three rock crab fishing areas. The solid line and dotted lines indicate the 1998–2021 average and the confidence interval of the average, respectively.

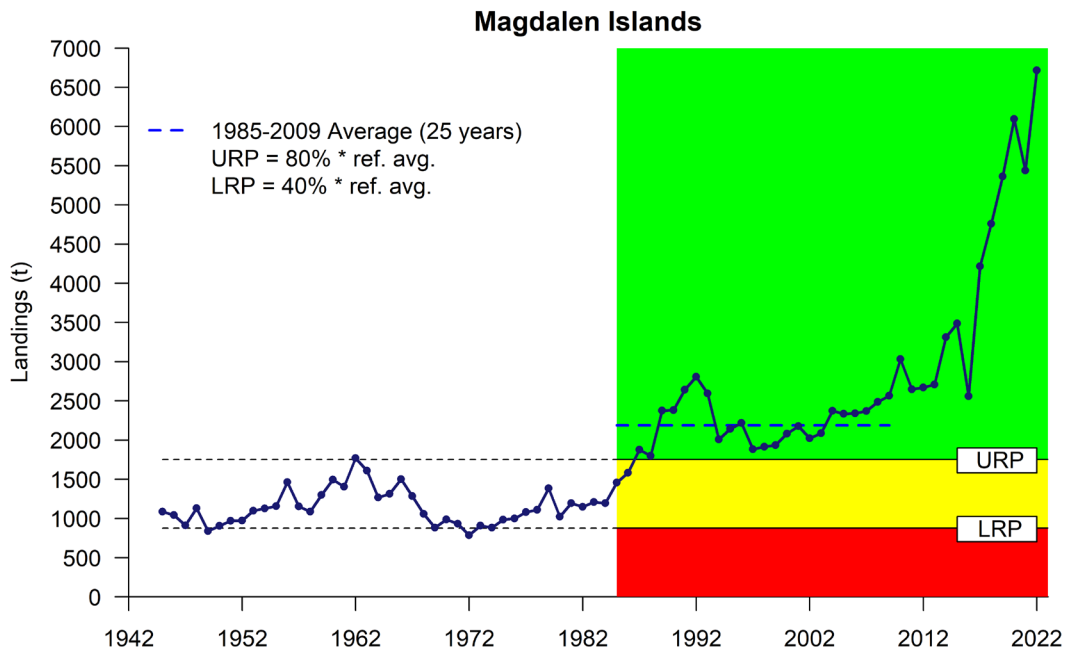


Figure 14. Lobster landings in the Magdalen Islands from 1945 to 2022. Healthy zone is green. Cautious zone is yellow, and the Critical zone is red. The dotted line from 1985 to 2009 corresponds to the average value that approximates the B_{MSY} .

Sources of Uncertainty

The climate (long term) and weather conditions (short term) have significant impacts on all stages of lobster development. The climate determines periods of migration, moulting, reproduction, larval release and benthic settlement. It also conditions feeding and growth rates and periods. Weather conditions (temperature and wind) can affect lobster catchability. For example, when the water temperature is slow to increase in the spring or if it falls rapidly due to cold water upwelling, lobster catchability will be lower. Interannual or seasonal variability in climate and weather conditions can therefore have impacts on several demographic assessment indicators, including trawl and commercial fishery catch rates, which are considered to be abundance indicators and which are used in calculating indexes of exploitation rates.

At-sea sampling coverage is low (0.14% of fishing trips), which may bring about uncertainties in the representativeness of the CPUE estimates in relation to the population being exploited. Spatial fishing patterns can affect the abundance index of berried females if, for example, fishers avoid areas where these females can gather. Work is underway to attempt to predict the biomass available to the fishery based on benthic settlement data and the abundance of pre-recruit in the trawl survey. There is also uncertainty as to the representativeness of small-scale observations for the entire population.

There is uncertainty about the value of dockside rock crab sampling as a means of monitoring stock abundance and demographics. Other methods, such as at-sea sampling, could help confirm the results obtained with current sampling methods.

CONCLUSION

With abundance and productivity remaining high and growing, it can be concluded that the Magdalen Islands lobster stock is in good condition relative to current exploitation levels. However, since 2021, a discrepancy has been observed between fishing yield trends in the north and south of this area, skewed towards the north. According to the precautionary approach, the Islands' lobster stock is currently in the healthy zone.

Indicators of the health status of the rock crab population in the Magdalen Islands were examined in the context of an ecosystemic approach. The population status of this key prey source of lobster is of great concern.

In an effort to ensure the sustainability of the lobster stock and that of its preferred prey, while maintaining their trophic link, all exceptional measures should be considered to minimize rock crab mortality.

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Tamdrari, Hacène	DFO Science	X	X	X	X

SOURCES OF INFORMATION

This Science Advisory Report is from the February 28-March 3, 2023 regional peer review on the Assessment of 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.

DFO. 2009. [A fishery decision-making framework incorporating the precautionary approach](#). (assessed on February 20, 2016)

DFO. 2019. [Assessment of lobster \(*Homarus americanus*\) in the Magdalen Islands \(LFA 22\), Quebec, in 2018](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2019/061.

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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