Fisheries and Oceans Canada | Pêches et Océans Canada
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Canadian Science Advisory Secretariat
Quebec Region **Science Advisory Report 2019/005**

THE SAGUENAY FJORD WINTER RECREATIONAL GROUNDFISH FISHERY, 2017-2018

Photo : J. Gauthier, DFO

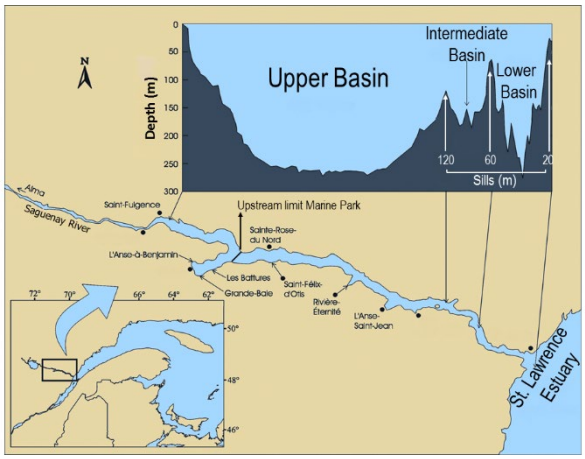

Figure 1. Main winter recreational fishing sites in the Saguenay Fjord.

Context:

The winter recreational fishery in the Saguenay Fjord took off in the early 1980s. It is unique in Quebec because of its size and the variety of species caught in the area. As a result of the growing interest in this recreational and tourism activity in the mid-1990s, several stakeholders are now concerned about resource conservation and sustainable development of this fishery. In this context, a monitoring program was launched in 1995, coordinated by Fisheries and Oceans Canada (DFO) and involving various parties including: Société des établissements de plein air du Québec and the Parks Canada Agency, which co-manage the Saguenay–St. Lawrence Marine Park as well as Promotion Saguenay and the Saguenay Fjord fishermen associations and committees.

The main groundfish species caught in this winter recreational fishery are, in order of importance, Redfish, Atlantic Cod, Greenland Cod and Greenland Halibut. Scientific studies have found that marine fish in the Saguenay Fjord, and more specifically cod and redfish, are sink populations whose recruitment depends on the arrival of juveniles from the St. Lawrence Estuary.

A resource assessment is performed every two years, and the indicators are based on winter recreational fishery data and abundance indices from a DFO research survey. An individual logbook initiative set up in 2015 provides new indicators for resource monitoring.

This assessment was prepared in response to a request by Fisheries Management regarding the status of the winter recreational groundfish fishery in the Saguenay Fjord. This fishery is currently managed by way of a fishing season and daily catch limits. This Science Advisory Report is from the November 21, 2018 meeting onThe Saguenay Fjord Winter Recreational Groundfish Fishery. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SUMMARY

- Winter recreational fishing in the Saguenay is still very popular. In the 2017 and 2018 fishing seasons, an average of 1,376 cabins were set up on the pack ice between Saint-Fulgence and L'Anse-Saint-Jean. This represents a decrease of nearly 100 cabins when compared to the average for the period 1998–2016.
- Fishing effort, estimated in number of fisher-days, has decreased over the last three years at the La Baie sites and increased in the Saguenay–St. Lawrence Marine Park (SSLMP), more specifically in the village of L'Anse-Saint-Jean. In 2017–2018, the estimate of the number of fisher-days for the entire Saguenay region is below the average for the 1996–2016 time series.
- During the winter recreational fishery in 2017 and 2018, redfish, Atlantic Cod, Greenland Cod and Greenland Halibut (turbot) accounted for 76%, 14%, 2% and 8% of groundfish catches, respectively.
- The recreational fishery catch rate for redfish shows a significant decrease from 1996 to 2007, and the DFO scientific survey shows a similar trend from 2003 to 2007. Since 2008, these catch rates have been low and stable and remain below the averages for their respective time series.
- Catch rates for Atlantic Cod, Greenland Cod and Greenland Halibut in the recreational fishery and the scientific survey are generally low. However, since 2013, there has been an increase in recreational fishery catch rates for Atlantic Cod and Greenland Halibut, with values above the averages for the time series.
- A new initiative involving the use of individual logbooks indicates that recreational fishery catch rates for the four groundfish species remained stable between 2015 and 2018.
- The recruitment of several groundfish species present in the Saguenay Fjord depends on the arrival of juveniles from the St. Lawrence Estuary. Strong year-classes of redfish (*Sebastes mentella*) (2011, 2012 and 2013) were noted in the Estuary, and their abundance was at the highest level seen in the last 30 years. Their presence in the Saguenay Fjord has been observed since 2013.
- Recent redfish cohorts are slowly beginning to recruit to the recreational fishery. In the winter of 2018, they had a modal size of 20 cm and accounted for nearly 10% of catches.
- Since groundfish in the Saguenay are part of a unique ecosystem, their populations must be protected in accordance with the precautionary principle. The outlook for the winter recreational redfish fishery in the Saguenay Fjord is encouraging. However, since the new redfish cohorts have not yet fully recruited to the fishery, maintaining a level of effort similar to that of recent years would be appropriate for the 2019 and 2020 fishing seasons.

BACKGROUND

Circulation and renewal of Saguenay Fjord waters

Three recent studies have increased our knowledge of water renewals and renewal times in the Saguenay Fjord (Bourgault *et al*. 2012; Belzile *et al*. 2016; Galbraith *et al*. 2018). The first two studies revealed the existence of three water renewal regimes which depend on the salinity (and thus the density) of the St. Lawrence maritime estuary waters present at the first sill of the Saguenay (Figure 2), specifically, deep renewal in winter, subsurface renewal in late winter and

intermediate renewal in summer (Figure 2). The third study, as well as recent research, indicates that the three types of renewal are not season-specific and can be observed at any time of the year. This study also showed that the variations in salinity at the first sill (20 m deep) are critical in determining the type of renewal that occurs. At low tide, the waters at this sill consist of waters from the St. Lawrence maritime estuary at the same depth, while at high tide, the waters that pass over the sill are estuarine waters that come from the cold intermediate layer at depths of 80 to 100 m. The same temperature and salinity ranges are found at depths of 20 to 70 m about 100 km farther east at the Rimouski station. The temporal variations observed at both locations are synchronous. This suggests that a simultaneous vertical movement of the waters throughout the Estuary has a decisive influence on the type of water renewal and renewal times in the Saguenay Fjord.

The renewal time of the Saguenay Fjord upper basin waters (Figure 1) could vary from 1 to 6 months. Indeed, samplings made at a five-week interval in July and August 2017 demonstrated an almost complete renewal of the fjord's waters during this period.

Saguenay Fjord groundfish

The main groundfish species caught in the Saguenay Fjord winter recreational fishery are, in order of importance, Deepwater Redfish *(Sebastes mentella*), Atlantic Cod (*Gadus morhua*), Greenland Cod (*Gadus ogac*) and Greenland Halibut (*Reinhardtius hippoglossoides*), also called Turbot.

Studies published in the late 2000s suggested that marine fish populations in the Saguenay Fjord, and more specifically cod and redfish, are “sink” populations whose recruitment depends on the arrival of juveniles from the St. Lawrence Estuary. Once these fish settle in the Saguenay, they spend most of their life there. The status of Saguenay marine fish populations would therefore be closely tied to the status of populations in the Estuary and Gulf of St. Lawrence.

Some St. Lawrence fish stocks are in a precarious situation and have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). As a result, southern Gulf Atlantic Cod and White Hake have all been designated as endangered species by COSEWIC. In addition, the commercial cod fishery in the southern Gulf of St. Lawrence has been under a moratorium since 2009, and the findings of the latest Science Advisory Report are not optimistic. They indicate it is highly unlikely that this stock will recover, even in the absence of fishing (DFO 2016).

The latest Redfish data are more encouraging (DFO 2018a). High abundances of juvenile Redfish have been identified in the Estuary from 2013 to 2016. Genetic analyses have confirmed that these new cohorts are composed nearly entirely of Deepwater Redfish (*S. mentella*) from the Gulf of St. Lawrence population, a species found in the Saguenay. These new Redfish cohorts have been observed in the Saguenay Fjord since 2013 by recreational anglers and since 2014 by the DFO scientific survey. Since 2014, it has also been noted that small Redfish have been caught at shallow depths in the Smelt fishery. The proportion of smelt fishers catching small Redfish increased from 10% to 18% between 2016 and 2018. The average size of these Redfish increased from 8.3 cm to 13.7 cm over the same period. Genetic studies confirm that these Redfish come from the strong cohorts observed in the Estuary since 2013.

The conclusions of the most recent Greenland Halibut stock assessment in the Gulf of St. Lawrence are mixed (DFO 2018b). The short-term outlook for this stock is worrisome, given

ecosystem changes, low recruitment, the decreases in abundance and biomass indices for fish over 40 cm, and the fishery's lower performance index.

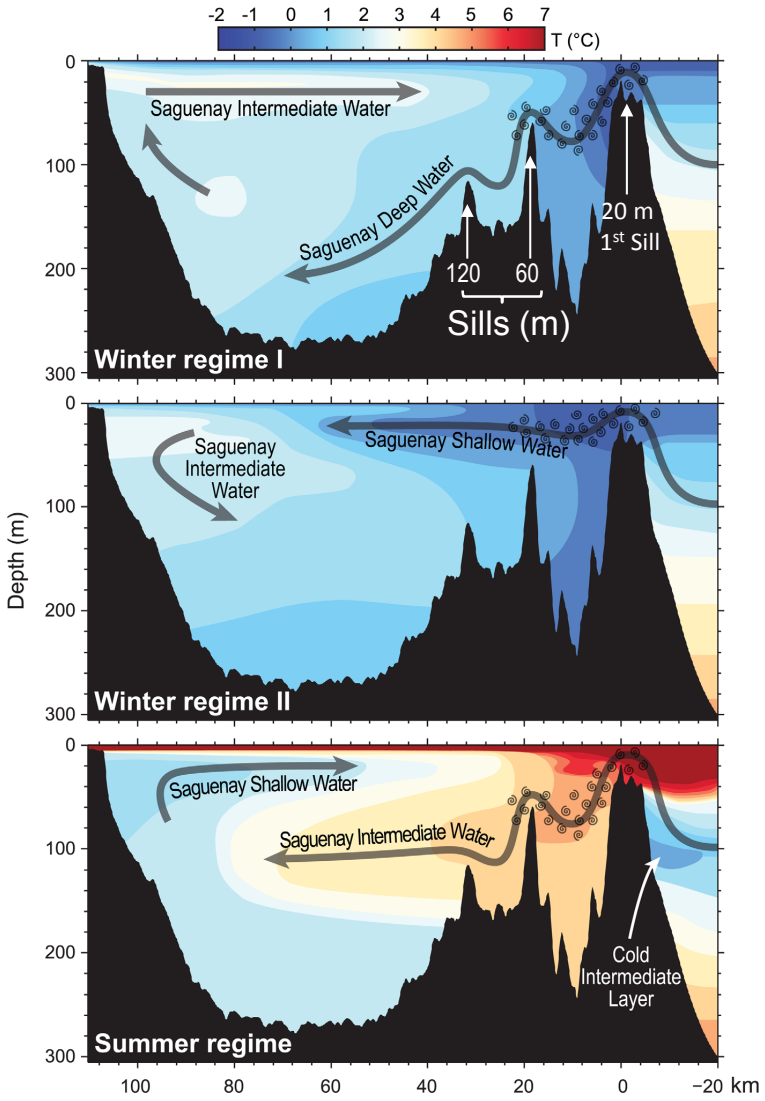

Figure 2. Illustration of the three types of renewal regimes in the Saguenay Fjord. Top panel; deep renewal when the density of the waters in the Estuary is high. Middle panel; subsurface renewals. Bottom panel; intermediate water renewals regime. Adapted from Belzile et al. 2016.

Description of the fishery and conservation measures

The winter recreational groundfish fishery in the Saguenay Fjord took off in the early 1980s. It has been monitored by DFO since 1995. The main collaborators of the program are Société des établissements de plein air du Québec (SÉPAQ) and the Parks Canada Agency, which co-manage the Saguenay–St. Lawrence Marine Park as well as Promotion Saguenay and the Saguenay Fjord fishermen associations and committees.

The fishery extends throughout the entire upper basin of the Saguenay Fjord, between Saint-Fulgence and L'Anse-Saint-Jean (Figure 1). The borough of La Baie includes the villages of

L'Anse-à-Benjamin, Grande-Baie and Les Battures. The other villages are associated with the municipalities of Saint-Fulgence, L'Anse-Saint-Jean, Rivière-Éternité, Saint-Félix-d'Otis and Sainte-Rose-du-Nord. The last four sites are located within the boundaries of the SSLMP. For several years, portable shelters have been popular with the more adventurous fishing enthusiasts because they can move beyond the fishing villages.

Winter recreational fishing in the Saguenay is very popular. In the 2017 and 2018 fishing seasons, an average of 1,376 cabins were set up on the pack ice between Saint-Fulgence and L'Anse-Saint-Jean. This represents a decrease of nearly 100 cabins when compared to the average for the period 1998–2016 (Guy Girard, Promotion Saguenay, pers. comm.). Over 80% of the cabins are in the three fishing villages in La Baie. It should be noted that the village of Les Battures located in La Baie has been closed since 2013.

Fishing sites generally include two areas: a pelagic fish area near shore where smelt is the main catch, and a groundfish area further out on the ice where the species discussed in this report are caught. The second area is located in deeper waters where 65% of all cabins are set up, all sites included.

This fishery does not require a licence and is done exclusively with a line. Fishermen use two main types of gear: a conventional or short fishing rod and a roller. The roller consists of a line mounted on a pulley and is used on the pack ice outside the cabins. Hand lines are primarily used inside the cabins. There is no limit on the number of lines and hooks a single angler may use, but fishing gear may not be left unattended for more than 72 consecutive hours. The regulations include the mandatory release of crustaceans, mollusks, Atlantic Halibut (*Hippoglossus hippoglossus*), Spotted Wolffish (*Anarhichas minor*), Atlantic Wolffish (*Anarhichas lupus*), Northern Wolffish (*Anarhichas denticulatus*), sharks and skates. It is also prohibited to sell, trade or waste fish.

Conservation measures put in place for this recreational fishery since the beginning of the monitoring program focus mainly on two aspects: 1) the length of the fishing season and 2) the groundfish daily catch limit. The first management measures were put in place in 1995 and combined a daily limit of 25 groundfish and a season length of more than 100 days. The daily limit was decreased from 25 to 15 groundfish in 2003, and then to five in 2004. The fishing season was reduced twice in 2005 and 2011 from an average of 59 days to 45 days.

Ice fishing is characterized by three main types of behaviour. The first is characteristic of fishermen paying close attention to the gear. When the fish takes the hook, the fisherman removes the line, unhooks the fish, and baits and sets the line again. The second behaviour involves social activities. The gear is baited and lowered into the water, but the fishermen do not watch the gear as attentively. As a result, a fish that takes the bait can be hooked to the line for a number of hours before being pulled out. This means there is virtually no chance that another fish will be caught with the gear during this time. The third approach involves baiting and lowering the gear in the evening, for example, and checking the lines at the beginning or end of the next day. Rollers are used more often with this approach. The prevalence of these three behaviours varies between sites.

The average frequentation for the period 1996–2018 (Figure 3) was approximately 38,000 fisher-days. Variations in frequentation reflect, among other things, adverse weather conditions in some years, reduction in the length of the fishing season and the adoption of more stringent municipal bylaws to ensure safety on the ice, resulting in reduced frequentation in some villages. Fishing effort, estimated in number of fisher-days, has decreased over the last three years at the La Baie sites and increased in the SSLMP, more specifically in the village of

L'Anse-Saint-Jean. In 2017–2018, the estimate of the number of fisher-days for the entire Saguenay region is below the average for the 1996–2016 time series.

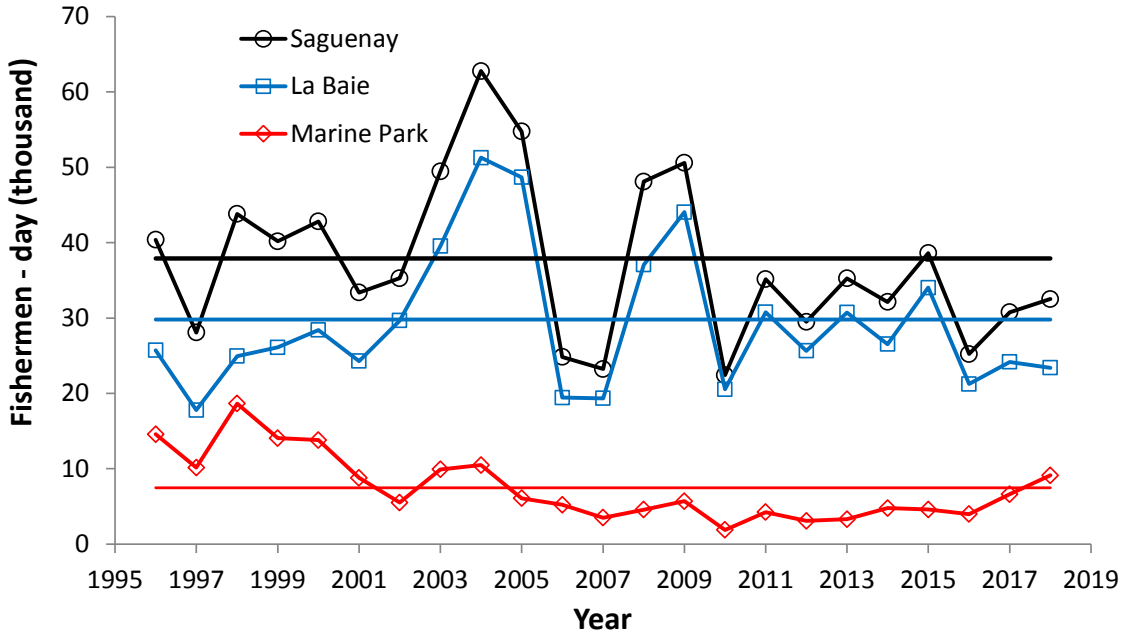

Figure 3. Annual fishermen-day index. The horizontal lines represent the three series averages for the period 1996–2016. The Saguenay combines data from all sampled sites. La Baie includes data from L'Anse-à-Benjamin, Les Battures and Grande-Baie. The marine park includes Sainte-Rose-du-Nord, L'Anse-St-Jean, Rivière-Éternité and Saint-Félix-d'Otis sites.

ASSESSMENT

Data source

The main indicators for this assessment are from recreational fishery monitoring (1995-2018), from individual logbooks (2015-2018) and abundance indices from a DFO research survey (2000-2018).

Monitoring program of the recreational fishery

DFO has been monitoring the recreational fishery and marine fish populations in the Saguenay Fjord since 1995, focusing on the main species harvested, namely Redfish, Atlantic and Greenland Cod, and Greenland Halibut. This program has two components and involves the participation of fishermen recruited from the main fishing villages and several stakeholders who collaborate closely: Parks Canada, SEPAQ and Promotion Saguenay. They all contribute significantly to monitoring marine fish populations harvested in the Saguenay Fjord.

The first component of the monitoring program involves interviewing recreational fishermen. The aim for each fishing season is to visit each site 20 times and interview 15 fishermen each time. The visits are conducted on weekdays and weekends throughout the fishing season. Data are gathered on catches (species, number), fishing effort (number of line, hooks and hours fished) and number of active fishermen at the time of the visit. The main purpose is to identify trends in catches per unit effort (NUE). It is considered that the catch rate of a species is proportional to its abundance. Depth sounder use has also been tracked since 2010.

The second component of recreational fisheries monitoring involves collecting biological data on the main species caught (fishing site, date, species, size and weight of fish caught).

Individual logbooks

In 2015, an individual logbook initiative was implemented to collect additional data on fishing activities. Logbooks are distributed to recreational fishers who fish with rods on a regular basis. Since 2015, an annual average of 16 logbooks have been completed for an average of nearly 300 fishing activities.

Gillnet research survey

Since 2000, DFO's Regional Science Branch has been using a Coast Guard research vessel to conduct a research survey in the Saguenay Fjord. This gillnet survey, conducted annually from 2000 to 2010 and now every two years, takes place in early spring. Gillnets with a mesh size of 5.5 inches are used. Since 2014, smaller mesh sizes have also been employed during surveys. Sampling stations are grouped together at eight sites in the La Baie des Ha! Ha! and Bras du Nord areas, upstream from the Saguenay-St. Lawrence Marine Park boundary. Annual fishing effort has increased from about 30 sets during the first few years of the survey to an average of 74 between 2010 and 2018.

Several factors account for the sometimes divergent trends in the winter recreational fishery and research survey indices:

1) The activities do not take place at the same time of year. The fishery takes place in the winter from January to early March, while the survey is conducted in April–May. The fish may move for feeding or breeding purposes.
2) The activities do not occur in the same geographical area. The survey focuses on eight sites located in Baie des Ha! Ha! and Bras du nord. It does not cover fishing village sites in the marine park (Sainte-Rose-du-Nord, Anse-St-Jean, Rivière Éternité and St-Félix-d'Otis).
3) The gear is selective. Recreational fishing hooks and the 5.5-inch gillnets used in the DFO survey do not target the same sizes of fish.

Resource status

Fishing success

The information collected in the individual logbook initiative indicates that participants' fishing success is increasing. The percentage of activities where fishers caught their daily limit of five groundfish increased from 12% to 28% between 2016 and 2018 (Figure 4).

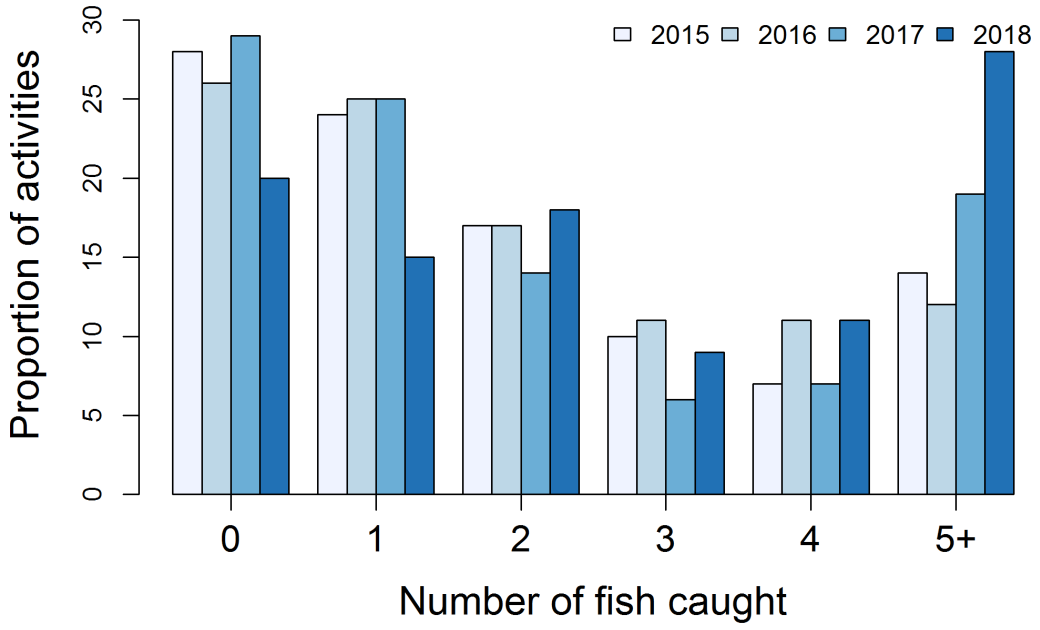

Figure 4. Fishing success, assessed against the daily catch limit of 5 fish based on information from individual logbooks.

Redfish

Redfish is the most widely harvested species during the recreational fishery accounting for 78% of catches in 2017 and 2018.

For the Saguenay as a whole, the recreational fishery catch rate index showed a continuous downward trend from 1996 to 2006, followed by stabilization at low values (Figure 5A). The 2017 and 2018 values were low and below the series average.

This general downward trend is also evident in the research survey abundance index, which decreased significantly between 2000 and 2008, and then stabilized at low values and below the series average since 2006 (Figure 5B).

Fishing gear, hook and lines in the recreational fishery and gillnets in the DFO research survey, have different selectivity. Hook and lines are less selective and catch a wider range of fish sizes than gillnets (Figures 6A and 6B). Redfish less than 20 cm are occasionally caught in the recreational fishery, indicating the sporadic presence of young individuals. However, the gradual increase in median size from 28 cm to 32 cm between 1996 and 2015 suggests that the recreational fishery has not experienced a major inflow of recruits and that the fishery focuses on a small number of cohorts. Since 2016, there has been catch of more Redfish less than 23 cm, which accounts for nearly 10% of catches in 2018. The total modal length of these fish is 20 cm. The DFO survey cannot assess recruitment due to the restricted selectivity of 5.5-inch mesh gillnets, and the size range of Redfish remains fairly similar year after year. However, since 2016, the deployment of small mesh gillnets (1.5 to 4 inches) has allowed the capture of small Redfish. In 2018, the size of these Redfish varied from 12 to 21 cm.

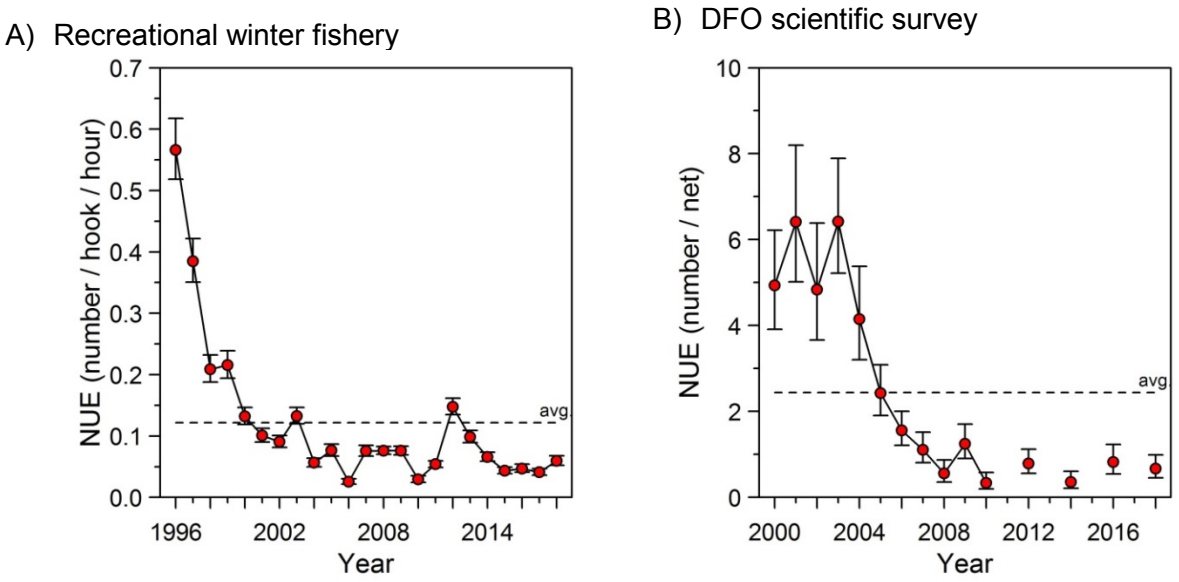

Figure 5. Annual Redfish catch rate in numbers per unit effort (NUE) in the recreational fishery (A) and the research survey (B). The vertical lines represent a 95% confidence interval. The solid horizontal lines indicate the series average.

The estimated total Redfish catch (Figure 7) in the winter recreational fishery has been on a general downward trend between 1998 and 2018, with significant annual variations. These estimates are largely influenced by the annual sampling of fishing activities. In 2006, the significant decline in the estimated catch was largely due to the lack of sampling at the Anse-à-Benjamin site, which on average accounts for 20% of the total annual fishing effort.

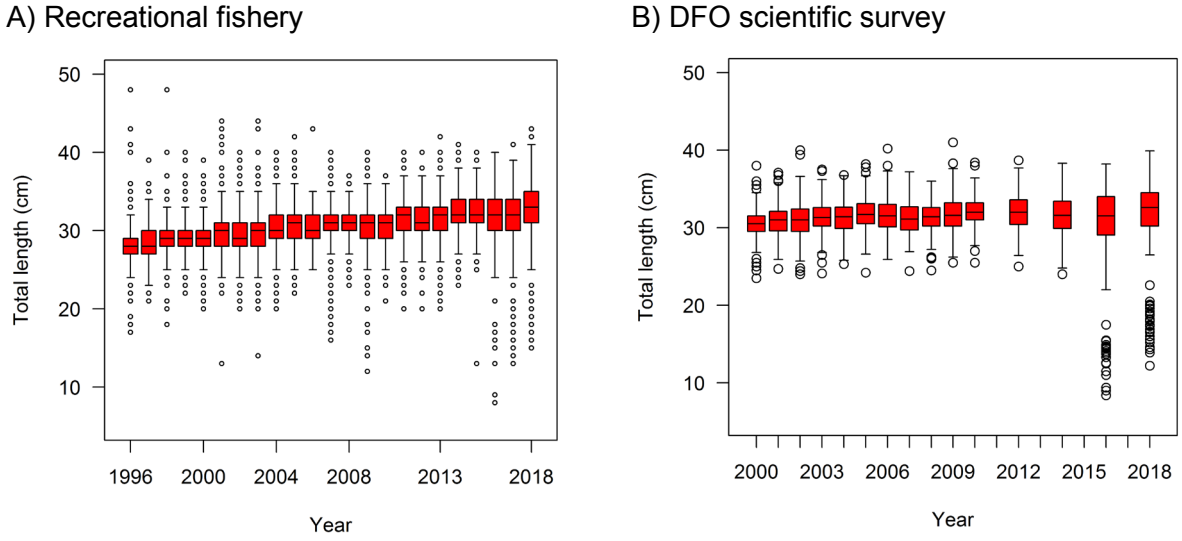

Figure 6. Annual distribution of Redfish size frequencies in the recreational fishery (A) and the 5.5-inch gillnet survey since 2014 (B). Box-and-whisker plot: the median is shown by the line in the middle of the box. The box ranges from the 25th to the 75th percentile. The whiskers (vertical lines on each side of the box) range from the 5th to the 95th percentile and circle represents outliers.

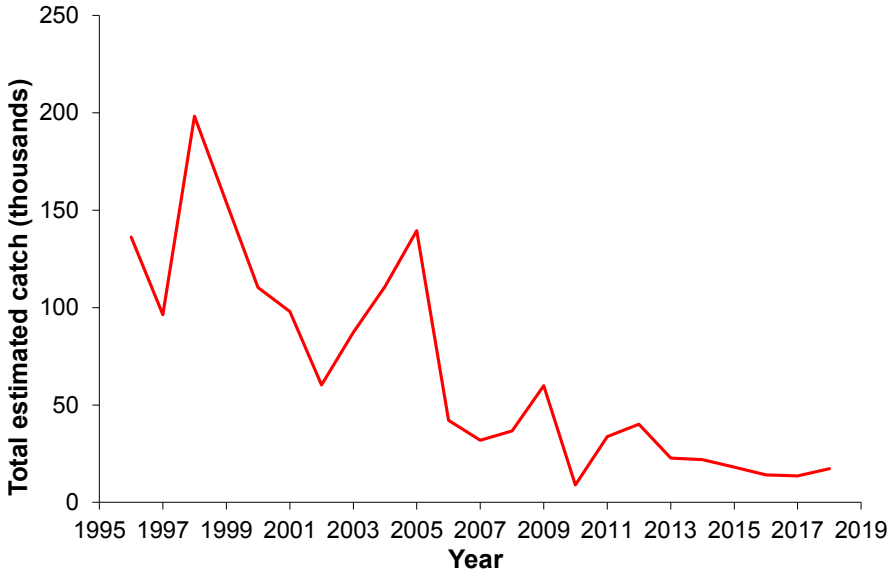

Figure 7. Estimated total landings of Redfish in the recreational fishery.

Atlantic Cod

Recreational fishery abundance indices began in 2000, when cod species started to be distinguished. Generally, Atlantic Cod catch rates are low. The recreational fishery abundance index (Figure 8A) decreased between 2000 and 2007 for the Saguenay as a whole. The index surged in 2008 and continued to increase until 2010 when the value was close to initial values in the series. It then declined until 2013 and has been rising since then. The 2018 index was above the average of the series.

Atlantic Cod catches were also very low in the DFO research survey (Figure 8B). Between 2 and 66 cod have been caught per survey since the beginning of the series, and 3 Atlantic Cod were caught in the 2018 survey. The catch rate index fluctuated without any clear trend between 2000 and 2005. The index then increased until 2010 with a value above the series average. The index has been decreasing since then and was below the series average in 2018 at the lowest value observed for this survey.

The increased catch rates (NUE) of Atlantic Cod in the recreational fishery are attributable to fishing activities in the sites located in the Saguenay–St. Lawrence Marine Park. DFO's scientific survey does not include a station in the Saguenay–St. Lawrence Marine Park.

The wide range of sizes in cod catches (20 cm–100 cm) and the presence of fish less than 30 cm every year in the recreational fishery (Figures 9A and 9B) indicate a regular inflow of new individuals into the Saguenay population.

The estimated total Atlantic Cod landings (Figure 10) in the recreational fishery fluctuate significantly, peaking in 2004 and hitting bottom in 2007. There is an increase in the total number of Atlantic Cod caught between 2013 and 2018, for an annual average of just over 1800 cod.

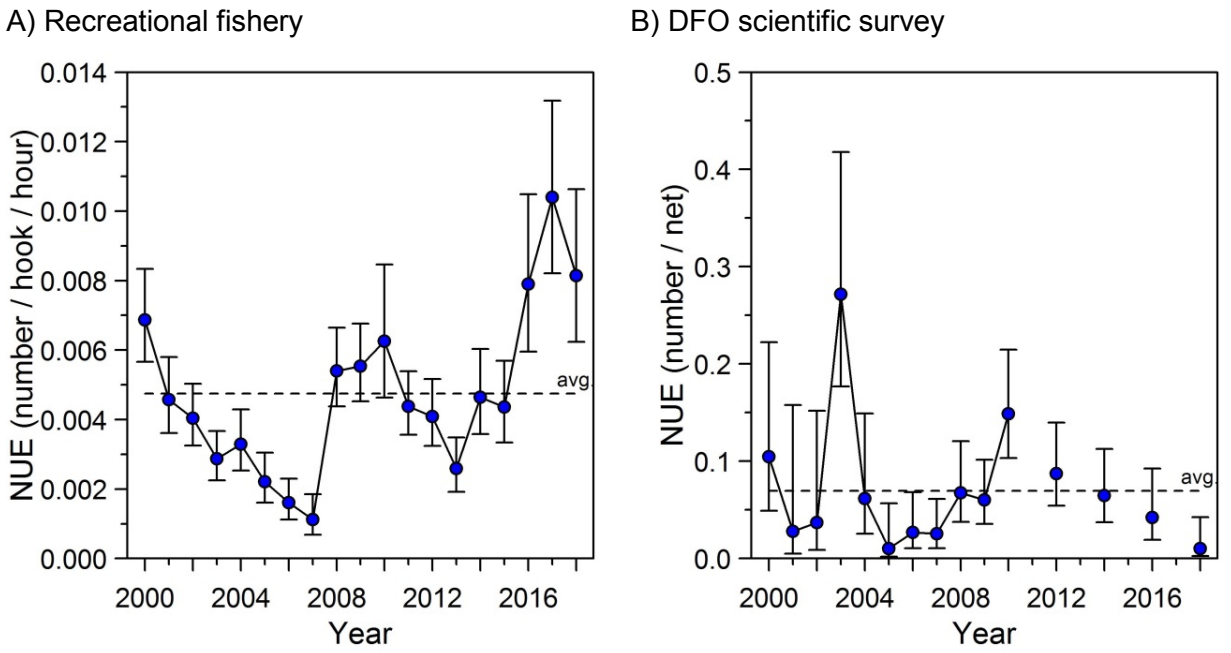

Figure 8. Annual Atlantic Cod catch rate in numbers per unit effort (NPUE) in the recreational fishery (A) and the research survey (B). The vertical lines represent a 95% confidence interval. The solid horizontal lines indicate the series average.

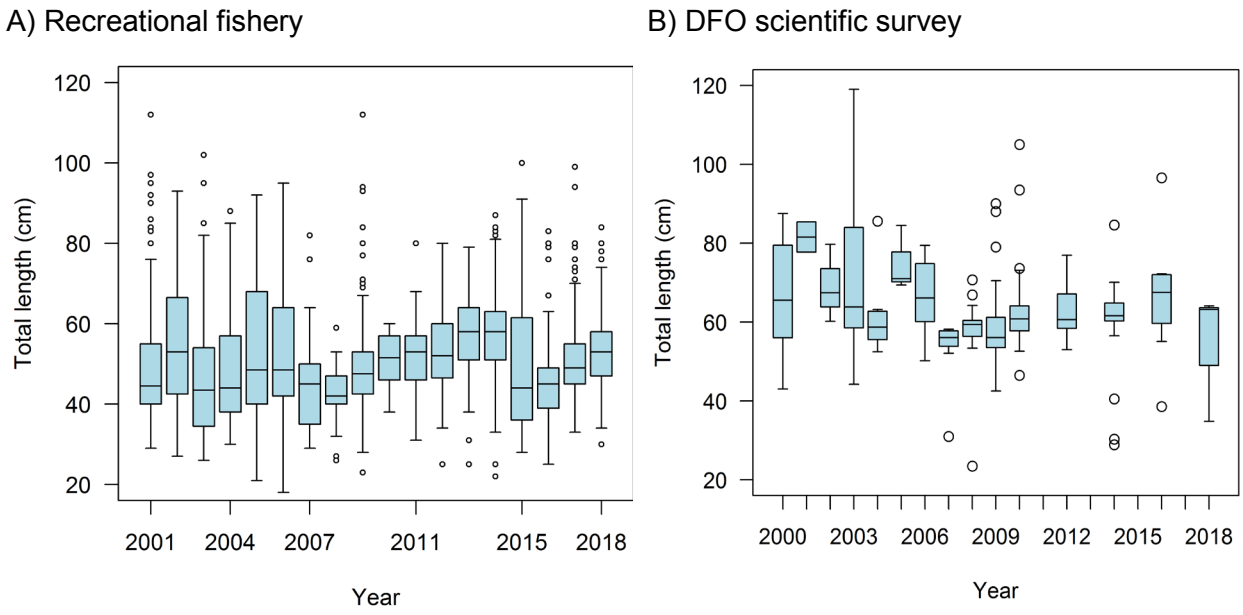

Figure 9. Annual Atlantic Cod size frequency distribution from the recreational fishery (A) and the research survey (B) Box-and-whisker plot: the median is shown by the line in the middle of the box. The box ranges from the 25th to the 75th percentile. The whiskers (vertical lines on each side of the box) range from the 5th to the 95th percentile and circle represents outliers.

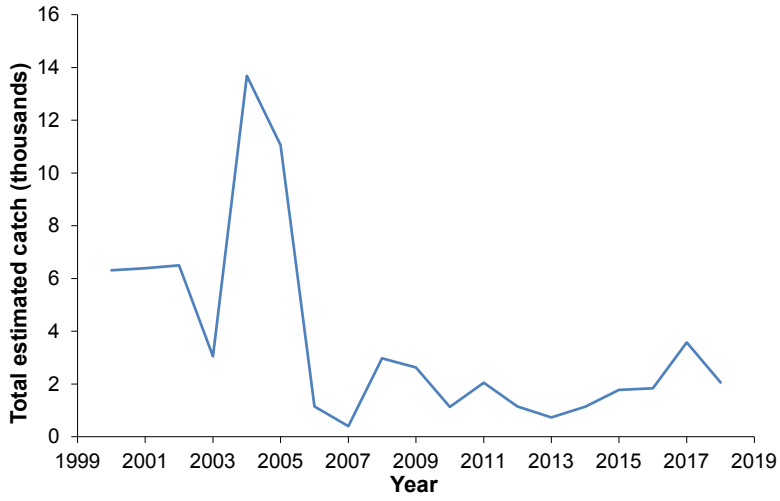

Figure 10. Estimated total landings of Atlantic Cod in the recreational fishery.

Greenland Cod

Greenland Cod catch rates are low. Throughout the Saguenay, the abundance index of Greenland Cod in the recreational fishery decreased (Figure 11A) between 2000 and 2007, and with the exception of 2014, values have been below the series average since 2006.

Greenland Cod is also an occasional catch in the research survey, making data interpretation somewhat uncertain. Greenland Cod catches have ranged from 1 to 23 fish per survey. Nevertheless, this abundance index seems to have decrease between 2000 and 2008, and then stabilized at a low level below the series average since 2006 (Figure 11B).

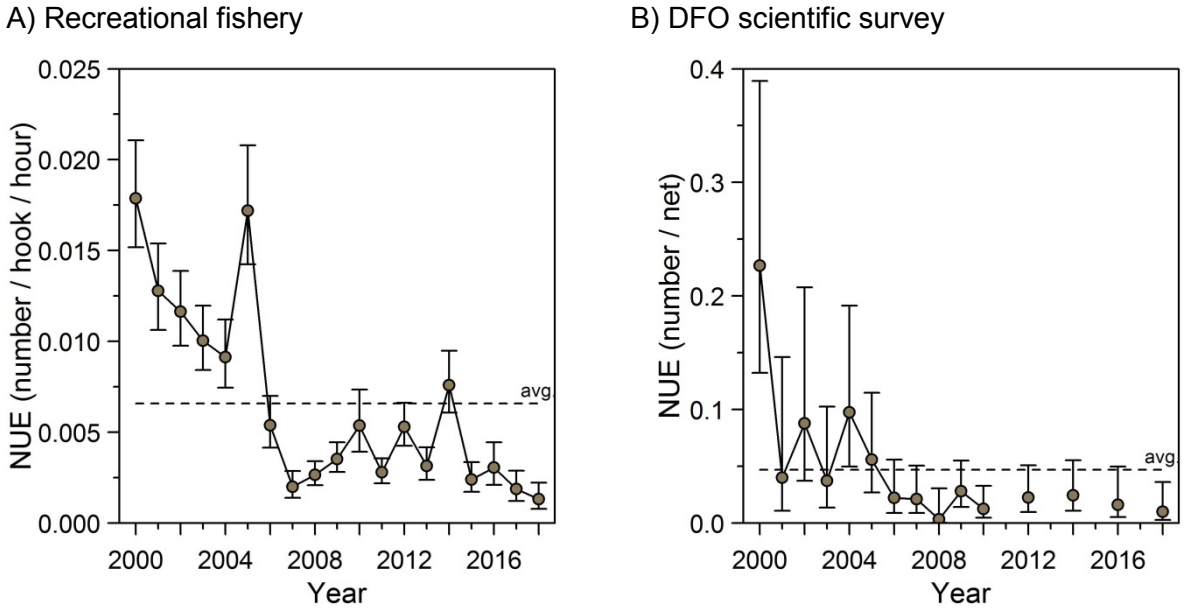

Figure 11. Annual Greenland Cod catch rate in numbers per unit effort (NUE) in the recreational fishery (A) and the research survey (B). The vertical lines represent a 95% confidence interval. The solid horizontal lines indicate the series average.

There is a wide range of Greenland Cod size and the regular presence of individuals less than 35 cm in the recreational fishery, suggesting constant recruitment (Figure 12).

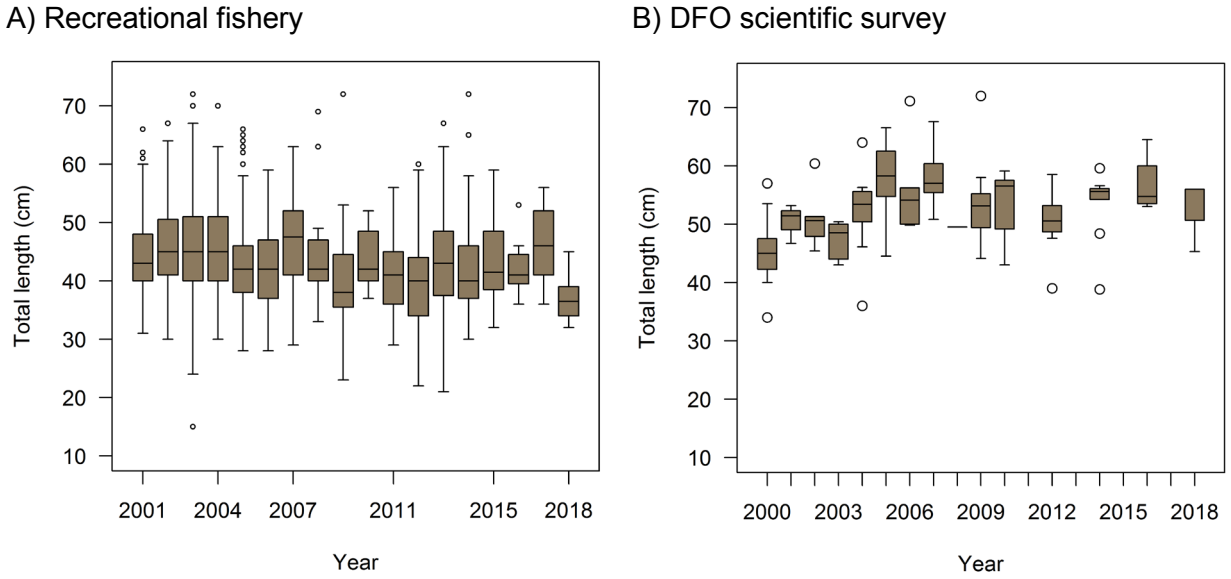

Figure 12. Greenland Cod size frequency distribution from the recreational fishery (A) and the research survey (B). Box-and-whisker plot: the median is shown by the line in the middle of the box. The box ranges from the 25th to the 75th percentile. The whiskers (vertical lines on each side of the box) range from the 5th to the 95th percentile and circle represents outliers.

The estimated total landings of Greenland Cod (Figure 13) in the recreational fishery decreased significantly between 2000 and 2007 and then stabilized at an average annual value of just over 1,000 individuals

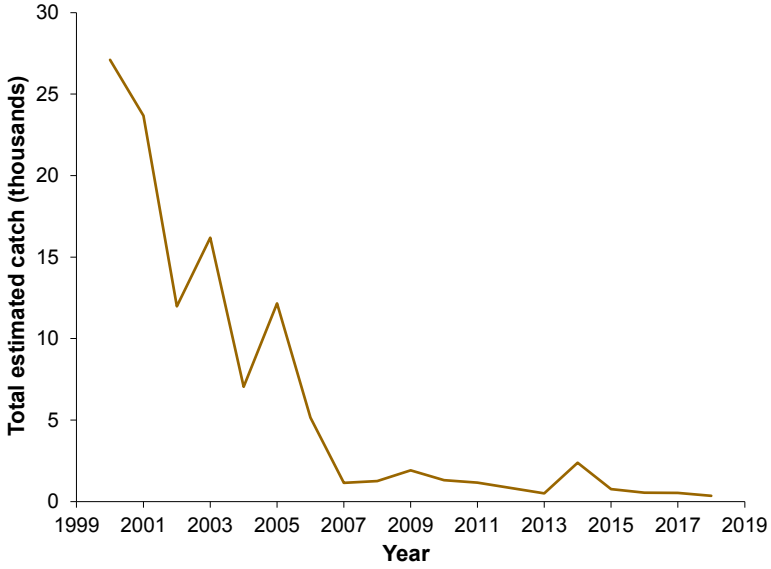

Figure 13. Estimated total landings of Greenland Cod in the recreational fishery.

Greenland Halibut

Greenland Halibut are seldom caught in the Saguenay recreational fishery (Figure 14A). Nevertheless, a steady increase was noted since 2009 to reach the highest value of the series in 2018. Greenland Halibut catches are high in the research survey. This abundance indicator shows higher catch rates between 2005 and 2012 than in the period 2000–2004 (Figure 14B). Since 2014, the index has shown a significant decrease with values that are below the series average at values comparable to those at the beginning of the series.

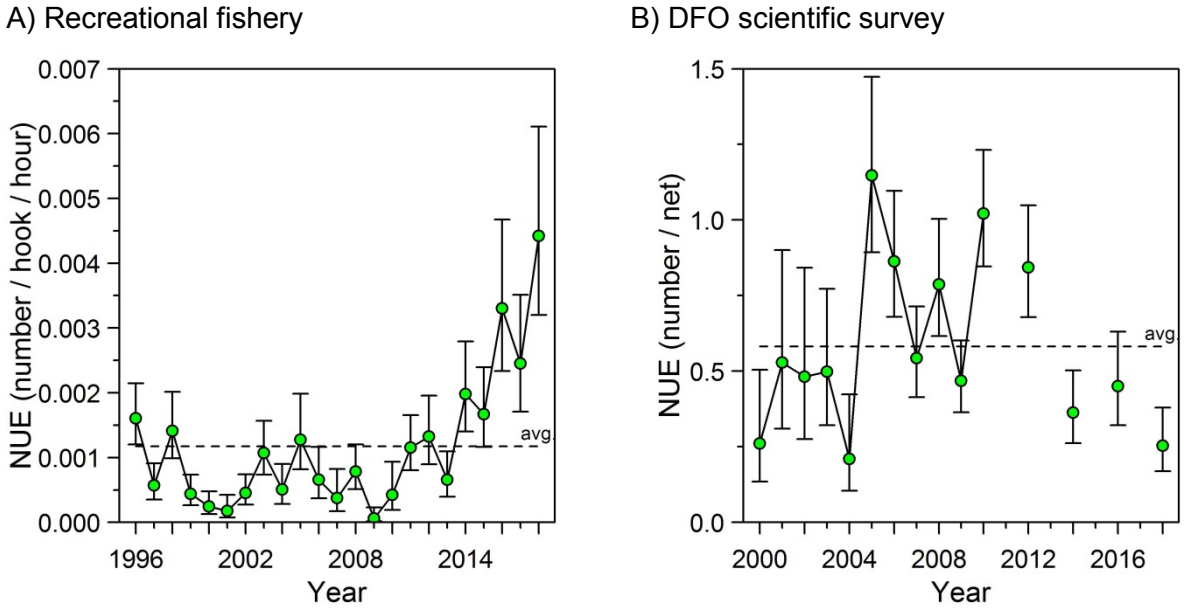

Figure 14. Annual Greenland Halibut catch rate in numbers per unit effort (NPUE) in the recreational fishery (A) and the research survey (B). The vertical lines represent a 95% confidence interval. The solid horizontal lines indicate the series average.

Greenland Halibut size structures in the recreational fishery and the research survey indicate the presence of several cohorts in the Saguenay and indicate a regular recruitment of Greenland Halibut from the St. Lawrence Estuary (Figure 15).

Estimated total catches in the recreational fishery are generally low and strongly influenced by sampling (Figure 16). Since catches at a site are multiplied by the effort at that site, a few extra fish at a very busy site will produce a large variation. The estimated average annual catch since 2010 is close to 800 individuals.

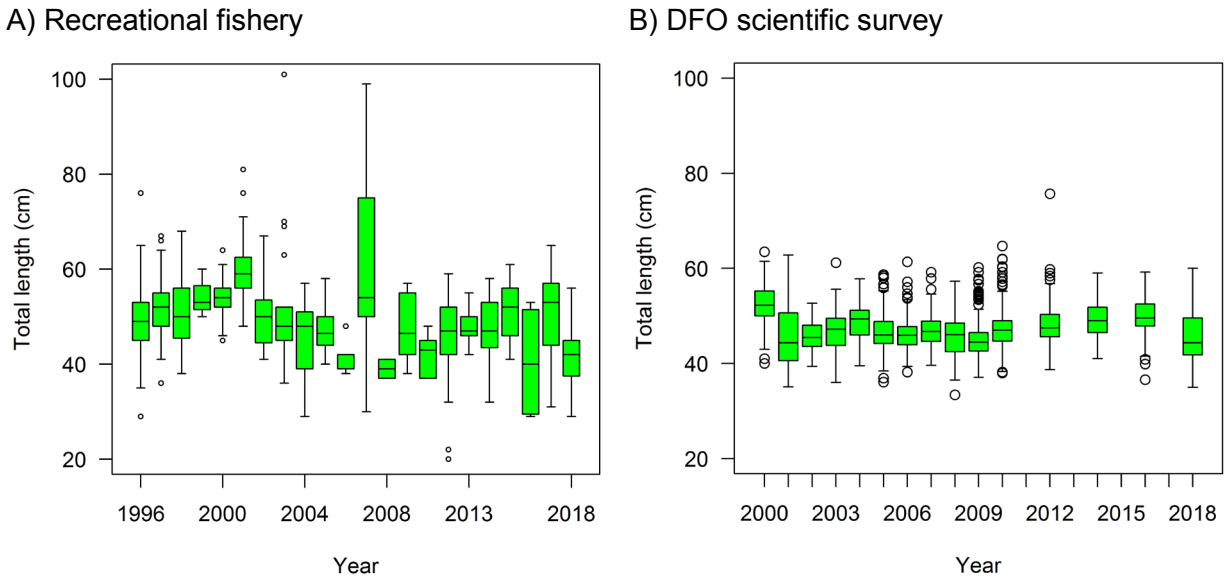

Figure 15. Greenland Halibut size frequency distribution from the recreational fishery (A) and the research survey (B). Box-and-whisker plot: the median is shown by the line in the middle of the box. The box ranges from the 25th to the 75th percentile. The whiskers (vertical lines on each side of the box) range from the 5th to the 95th percentile and circle represents outliers.

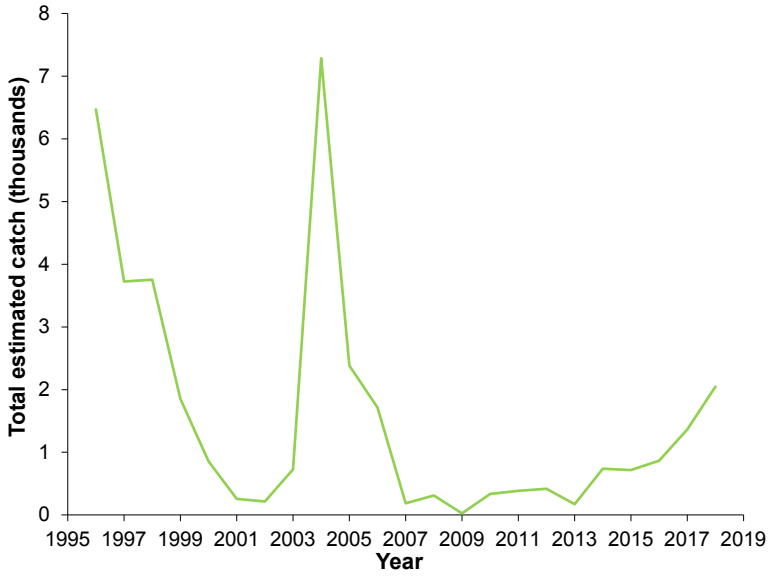

Figure 16. Estimated total landings of Greenland Halibut in the recreational fishery

Individual logbooks

Based on then individual logbook initiative implemented in 2015, recreational fishery catch rates have remained stable for the four groundfish species (Figure 17).

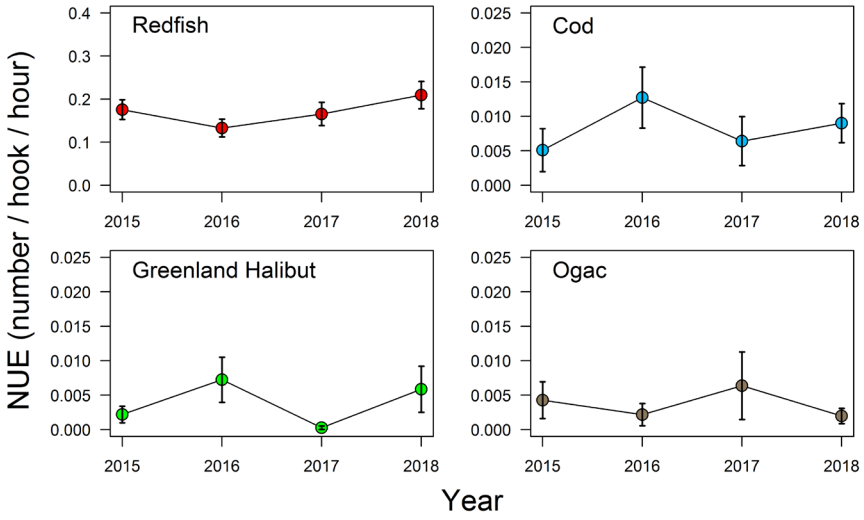

Figure 17. Catch rate in number of fish per unit effort (NUE) according to individual logbook data for Deepwater Redfish, Atlantic Cod, Greenland Halibut and Greenland Cod.

Sources of Uncertainty

Annual effort (Figure 3) and, consequently the total catch (Figures 7, 10, 13 and 16) calculations are based on the length of the fishing season, average number of active fishermen per day and, for the total catch, the average daily effort. The approximation methods used to determine these three variables contain many biases, and the available information is insufficient to quantify their degree of uncertainty associated.

Theoretically, the best abundance indices completely cover a stock in terms of its geographic range and the extent of its year-classes (area sampled and gear selectivity). It is also preferable that sampling be conducted when the fish are dispersed and catchable. For the Saguenay Fjord, we only have partial abundance indices. The recreational fishery takes place in winter in very localized areas in bays of medium depth. Spatial coverage is therefore limited compared to the expected distribution of the target species. The gear used, hook and line, is selective enough to catch a fairly wide range of fish sizes, but is not equally effective for all sizes. The DFO survey is not optimal either. Spatial and temporal coverage is limited and the gear used, gillnets with mesh size of 5.5 inches, has a fairly narrow selectivity that targets certain ranges of adult fish sizes. The survey does not indicate that fish populations are being recruited in the Saguenay. Smaller mesh nets were used since 2014 to develop recruitment indices for Saguenay groundfish populations. This initiative allowed the capture of juvenile Redfish, thus confirming their presence in the Saguenay.

CONCLUSIONS AND ADVICE

Abundance indices based on the recreational fishery and the gillnet survey show a significant decline in Redfish, by far the main species caught in this fishery. However, outlook is encouraging because high abundances of juvenile Redfish were identified in the Estuary and Gulf of St. Lawrence between 2013 and 2016. These high abundances were also observed in the Saguenay. However, in the short term, harvesting should contribute to a lower abundance of

adult Redfish. The recreational fishery monitoring program shows that 10% of Redfish measured in 2018 were less than 23 cm in size with a 20 cm mode.

Redfish are slow growing and long-lived. According to estimates of Redfish growth in the Gulf, nearly 60% of the fish of the 2011 cohort will exceed 23 cm in the summer of 2019. However, our knowledge of Redfish growth in the Saguenay is limited, and a recent study suggested that Redfish growth in the Saguenay is slower than for the same cohort in the Gulf of St. Lawrence.

Catch rates for the winter recreational Atlantic Cod, Greenland Cod and Greenland Halibut fisheries are low. However, since 2013 there has been an increase in the Atlantic Cod and Greenland Halibut fishery indices with values above their respective series averages.

Since groundfish in the Saguenay are part of a unique ecosystem, their populations must be protected in accordance with the Precautionary Principle. The outlook for the winter recreational redfish fishery in the Saguenay Fjord is encouraging. However, since the new redfish cohorts have not yet fully recruited to the fishery, maintaining a level of effort similar to that of recent years would be appropriate for the 2019 and 2020 fishing seasons.

Monitoring process for interim years

Saguenay Fjord marine fish populations targeted by the winter recreational fishery are assessed every two years. It was agreed at the November 21, 2018 assessment that in the interim year, no updated indicators would be made by DFO Science. On the other hand, monitoring programs for this fishery continue with various parties on an annual basis

SOURCES OF INFORMATION

This Science Advisory Report is from the November 21, 2018 meeting on the Saguenay Fjord Winter Recreational Groundfish Fishery. 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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