



THE SAGUENAY FJORD WINTER SPORT FISHERY IN 2007

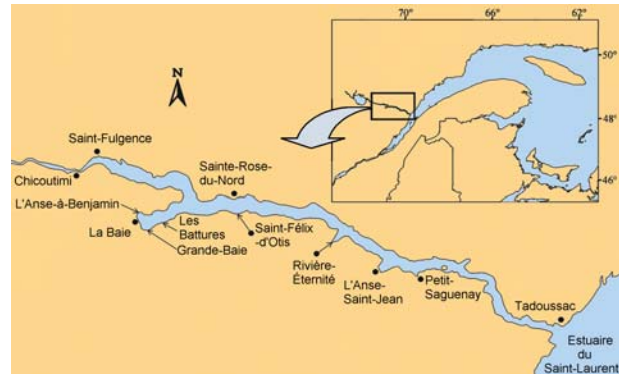


Figure 1: Main fishing sites in the Saguenay Fjord.

Context

The winter sport fishery carried on in the Saguenay Fjord is unique in Quebec by its magnitude and the variety of species that are caught in that area. This fishery is practiced in rustic fishing huts.

The enthusiasts of this winter sport generally come from cities and towns near fishing sites. However, in recent years, this activity has sparked interest among North American and even European tourists, who use the services of outfitters. With economic spin-offs estimated at more than \$4 millions, the winter sport fishery is a driving force for the region's tourism industry.

As a result of the growing interest in this recreational/tourism activity, various stakeholders are now concerned about resource conservation and the sustainable development of the fishery. In this context, a monitoring program was launched in 1995 under a research agreement involving Saguenay Fjord fishermen associations and committees; Promotion Saguenay; the Musée du Fjord; Alcan Smelters and Chemicals Ltd.; the ministère des Ressources naturelles et de la Faune du Québec; the Société des établissements de plein air du Québec and the Department of Canadian Heritage (Parks Canada), which comanage the Saguenay-St. Lawrence Marine Park; and the Department of Fisheries and Oceans (DFO), which is responsible for scientific monitoring and resource protection.

SUMMARY

- In the Saguenay Region, the 2007 winter ice fishing season opened January 15, and was supposed to end March 12, 2007. Following the intervention of the community, the fishing period was extended until March 18, 2007. However, all over this fishing season, several sites across the fjord were temporarily closed due to bad weather. Consequently, the fishermen number index was significantly reduced, as well as fishing effort.

- Estimated captures of smelt, Atlantic cod, Greenland cod, redfish and Greenland halibut decreased significantly in 2007 due to the reduction in fishing effort observed in 2007.
- Catch rates, i.e. the number of fish captured by hook per hour, showed variations between 1995 and 2007, and the values obtained in 2007 are among the weakest observed.
- Catch rate values from the research mission carried out in April 2007 do not differ significantly from those of 2006 for the whole of the species. Globally, they have been stable since the beginning of the survey in 2000. However, catch rates for Greenland halibut are rising.
- Catch rates from fishing and surveys for all groundfish stocks have not made it possible to detect significant differences in the abundance of these species since 2000, except for Greenland halibut. However, the community seems to be concerned about the status of these stocks on the longer term. Given these uncertainties, maintaining the 2007 management measures for the winter of 2008 is recommended.
- The status of the marine resources harvested in the Saguenay River still raises concerns. The 2007 fishing season will have been marked by a reduction in fishing effort, as well as a reduction in the fishing success. Leaving aside 2007, it seems that the daily catch limit established at 5 fish since 2004, along with the reduction in the duration of the fishing season, would have stabilized the catch levels. It is therefore critical that, for the winter of 2008, catch limits remain at 5 groundfish, while limiting the duration of the fishing season as was done in 2004. Moreover, a particular attention will have to be paid to sample catches for each species coveted.

INTRODUCTION

Species biology and background

During the winter sport fishery in the Saguenay Region, the main species sought are rainbow smelt (*Osmerus mordax*), Atlantic cod (*Gadus morhua*), Greenland cod (*Gadus ogac*), redfish (*Sebastes* spp.), and Greenland halibut (*Reinhardtius hippoglossoides*). All these species are groundfish, except for smelt. The presence of groundfish in the fjord remains an enigmatic issue as it is well known that individuals spawn during winter and in spring, whereas recent surveys note the absence of upstream larvae until downstream from the Saguenay River. Thus, the larval drift out of the fjord would be very significant, or the rate of mortality for the young stages would be very high. The St. Lawrence Estuary would then take a critical importance regarding the contribution and presence of groundfish species in the Saguenay fjord.

Fishery description and conservation measures

Winter sport fishery is practiced over the entire upper basin of the Saguenay Fjord, between St-Fulgence and Petit-Saguenay. The six main fishing villages are associated with the municipalities of Anse-St-Jean, Rivière-Éternité, St-Félix-d'Otis, Ste-Rose-du-Nord, St-Fulgence and Baie des Ha! Ha!, with the latter encompassing the Anse-à-Benjamin, Grande-Baie and Les Battures sites (Figure 1). Generally, fishing sites have two fishing areas. Depending on the area and on the type of gear, bait and fishing technique used, fishermen target a given species. Thus, each fishing site has a "pelagic fish" area, where mainly smelt is caught and where fishing

huts are located rather close to the shore. The “groundfish” area is further off shore, where are situated huts in which fishermen take shelter to fish mainly marine species.

Fishermen use two main types of gear to fish: the tip-up, a fishing line mounted on a mechanical signaling device that alerts them when a fish takes the bait, and rods for light-line fishing.

There are three main approaches to ice fishing. The first consists in being on site continuously, paying close attention to the gear. When a fish takes the bait, the fisherman pulls up the line, removes fish from the line, baits the hook and lowers it back into the water. The second approach is of a social nature. Tip-ups are baited and lowered into the water, but fishermen are less attentive. So, a fish that takes the bait could be on the line for a number of hours before being pull up, making it impossible to catch other fish during that time with this gear. The third approach consists in baiting and lowering tip-ups in the evening and checking the lines only the next day, at the beginning or at the end of the day.

In order to ensure the sustainability of Saguenay fish populations, conservation measures were adopted at the beginning of the 2004 winter fishery, reducing the daily limit of catches to 5 individuals of any groundfish species and by delaying the opening of the fishery to mid-January. In 2007, ice conditions delayed the beginning of winter fishery to February 1st. The season ended on March 18 with the arrival of the ice-breaker. In addition, several sites across the fjord were temporarily closed all over this fishing season due to bad weather, which caused sampling problems, among other things. Fishing site frequentation was thus reduced by more than 22 000 fishermen-days (f/d), dropping from more than 48 000 f/d in 2006 to 25 000 f/d in 2007. Generally, values have been around 50,000 f/d since 1995 (Figure 2).

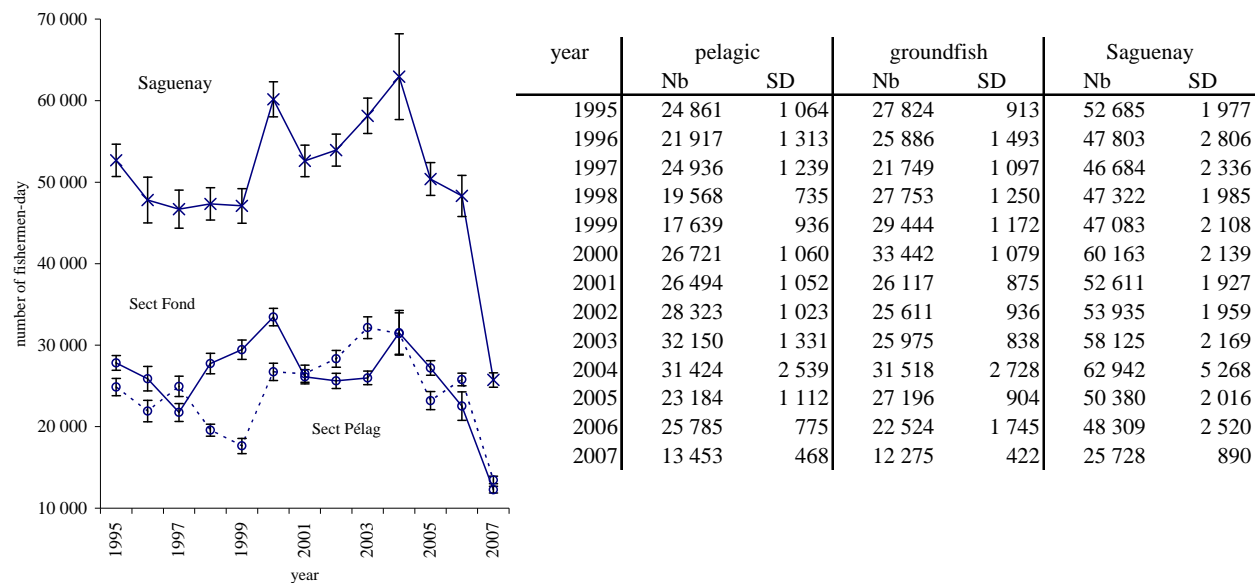


Figure 2. Fishermen-day index (± standard error) by sector, year and fishing site

There are fewer pelagic species fishermen than groundfish fishermen, and they mostly fish upstream from the Fjord, with Anse-à-Benjamin and Grande-Baie sites being the most popular locations. Fishing effort directed at groundfish is mainly concentrated in Anse-à-Benjamin, Grande-Baie, Ste-Rose-du-Nord and Anse-St-Jean. Cod, redfish and Greenland halibut catches are made almost exclusively in “groundfish” areas.

ASSESSMENT

Status of the resource

Since 1995, DFO has been monitoring the winter sport fishery in the Saguenay River, focusing mainly on the main marine species harvested: Atlantic cod, Greenland cod, redfish spp. and Greenland halibut. The program is two-fold and requires the participation of 32 volunteer fishermen from the eight main fishing sites, as well as from the Saguenay Municipality, the Direction de l'aménagement de la faune du Saguenay-Lac-Saint-Jean, the ministère des Ressources naturelles et de la Faune, the SEPAQ and the Saguenay-St. Lawrence Marine Park.

The first part of this program involves a sampler team who collect data on catches and fishing effort 20 times over the fishing season. Volunteers visit each fisherman to find out the number of lines used, the number of hooks per line, the number of fishing hours and related catch. The second part of this program focuses on the collection of biological data. It gathers samplers who, according to sampling protocols, record the species, size, weight and condition of individuals caught.

The data gathered are used to estimate annual harvesting levels and trends over a number of years for each species caught. These levels are commonly used as abundance indices for populations. To do this, traditional calculation methods were adjusted to better reflect the situation of the winter sport fishery in the Saguenay River. Fishing effort unit is first defined in terms of hooks-hours. Then, yield (i.e. the number of fish caught per hook per hour) is calculated using the effort unit data and the number of fish caught per fisherman, per fishing site, per day of the week and of the weekend. These yields are then extrapolated to obtain the total fishing effort to estimate the number of individuals caught per species and per fishing site.

A condition index is calculated for each species sampled. This index is based on the size and weight of individuals. The heavier of two fish of the same size is generally deemed to be in better condition.

Cod

catches have increased significantly between 1996 and 1999, totaling almost 35,000 individuals (Figure 3), which corresponds to approximately 50 tons. This increase is related to the greater number of Greenland cod (*Gadus ogac*) found in catches since 1996. Although fishermen had difficulties differentiating between Greenland and Atlantic cod (*Gadus morhua*), they were nevertheless able to report the occurrence of Greenland cod in an informal way. After asking fishermen to be more vigilant in correctly identifying species, it was found that Greenland cod accounted for 80% of cod catches in 2000. This situation is rather alarming, as it would mean that only 5,000 Atlantic cod were caught in 2000. Total landings of the two cod species dropped until 2004, reaching 9,000 individuals. In 2006, catches are very similar to those observed in 2005 and showed a slight increase before stabilizing to nearly 15,000 individuals. In

2007, a significant drop in catches was recorded. This situation could be the result of the reduction in fishing effort due to bad weather (too high temperature). However, this situation raises concerns as the catch rates are among the weakest observed since 1995.

From 1995 to 2006, cod fishing was especially good at Ste Sainte-Rose-du-Nord. In 2007, however, the best catch rates are distributed between the sites of Saint-Fulgence, Grande-Baie and Sainte-Rose-du-Nord. Indices estimated by Talbot (1992) over the course of the 1990-1991 fishing season for the entire Saguenay River are approximately three times higher than those estimated in this study for 2007.

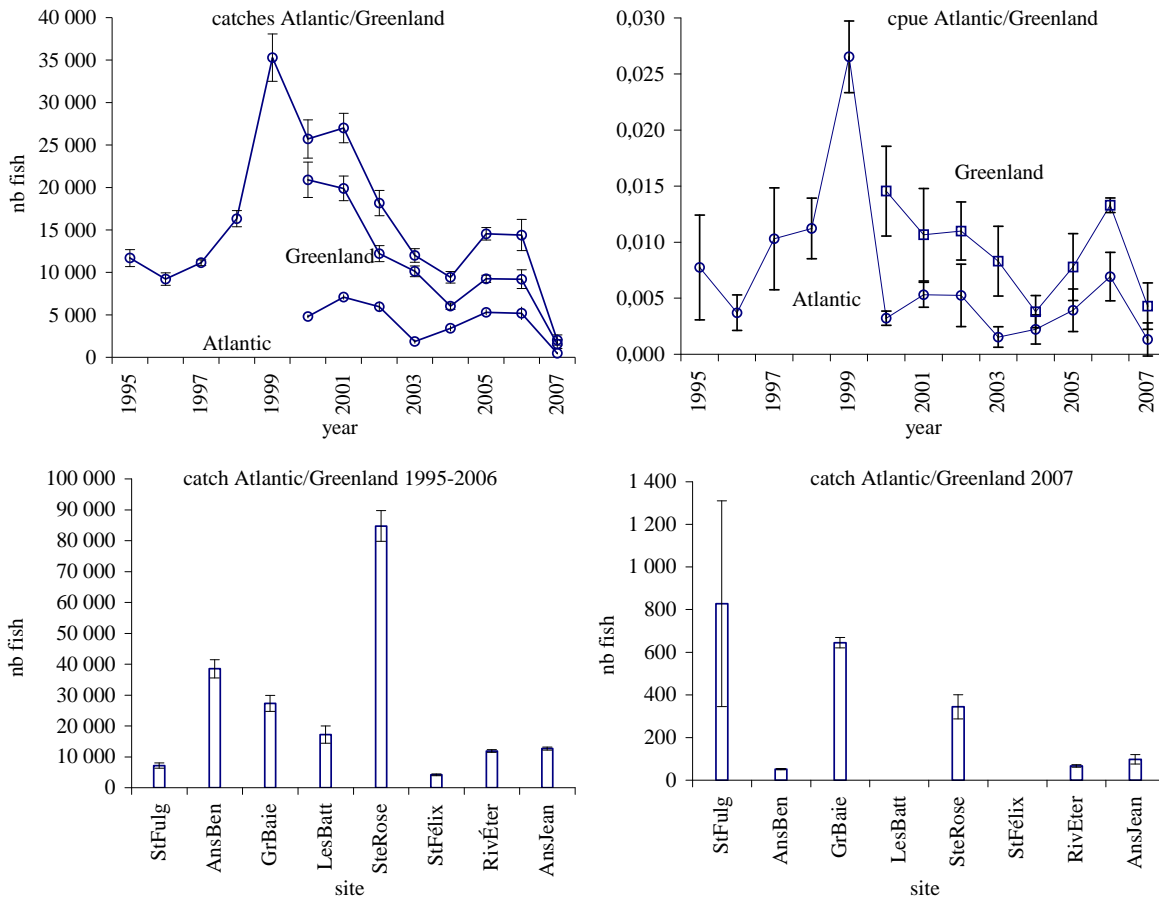


Figure 3. Atlantic and Greenland cod catch rate index (\pm standard error) per year and fishing site

The size frequencies of cod caught vary, indicating that individuals of different ages were harvested (Figure 4). The interpretation of cohort monitoring results from 1995 to 1999 is risky owing to the lack of differentiation between the two species of cod sampled. Despite the small number of Atlantic cod sampled between 2001 and 2003, a mode was found to have grown from 450 mm in 2001 to close to 550 mm in 2002 (8 cm to 10 cm per year at this range of size), representing a normal growth rate for the species. In 2003, smaller individuals were observed, which are now in the 2005 distribution, suggesting recruitment to the fishery. In 2006 and 2007, the curves are multimodal. For Greenland cod, the progression of unimodal curves is constant from 2000 to 2006, indicating individual growth and the absence of recruitment. However, small individuals were observed in 2007.

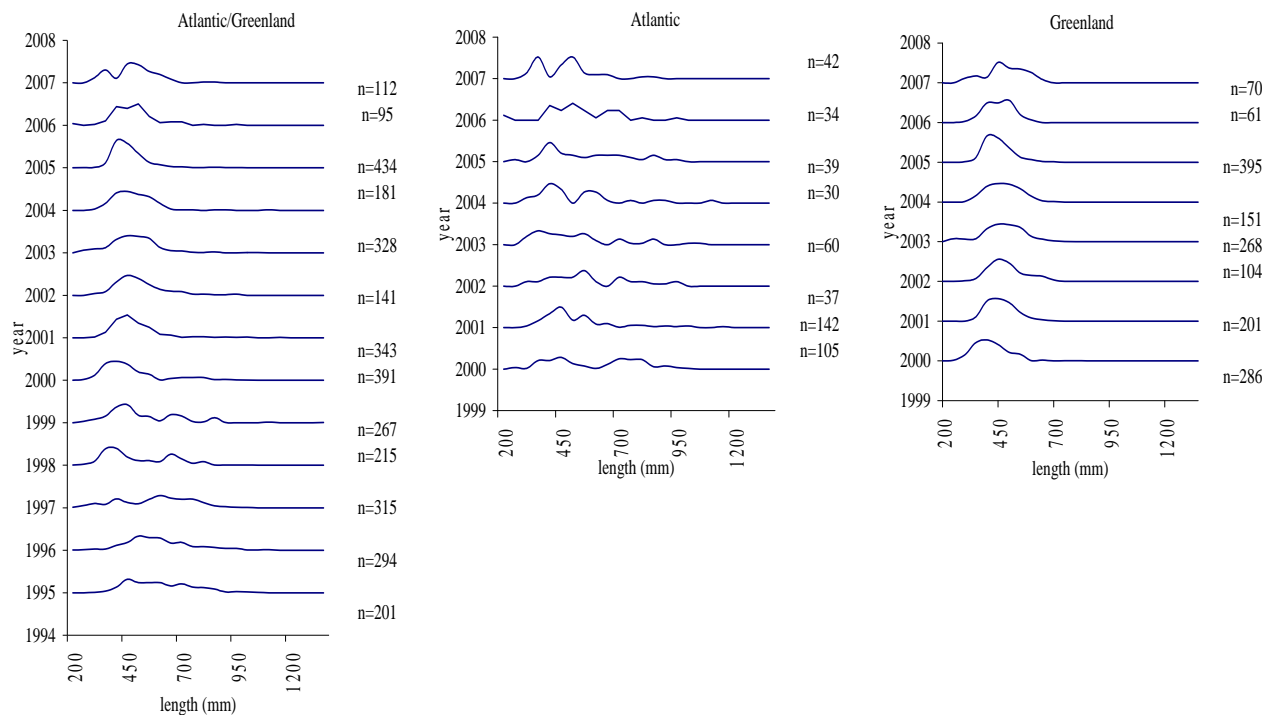


Figure 4. Cod size frequency distribution for all fishing sites. Data for 1995-2000 represents a mix of Atlantic and Greenland cod. Data for the 2 species are shown separately since 2001. N represents the number of fish measured.

The condition index for cod has varied between 1.0 and 1.4 on average over the years in winter in the Saguenay, which is considered high. Generally, the condition of cod sampled is good and the factor cannot account for the decline in abundance in recent years.

Redfish

Redfish catches are the highest among marine species in the Saguenay Fjord. Between 1995 and 1998, catches increased from close to 150,000 to more than 250,000 individuals (Figure 5), but dropped sharply in 2000 and have remained low but relatively steady until 2006. In 2007, the lowest values since 1995 and one of the weakest fishing successes since 1995 were observed.

From 1995 to 2005, the spatial distribution of catches indicates that Grande-Baie, Sainte-Rose-du-Nord, and Anse-à-Benjamin are the most popular groundfish fishing sites; the highest indices are recorded there. Landings estimated at other sites are significantly lower. Finally, very few redfish were caught in St-Fulgence as a result of the limited number of fishermen in the groundfish fishing area. In 2006, the size of cracks in the ice forced Sainte-Rose-du-Nord to stop fishing activities as of mid-February, and the catches reflect this situation. In 2007, the sites of Grande-Baie and Anse-à-Benjamin are indisputably the sites where redfish catches were the highest in the fjord.

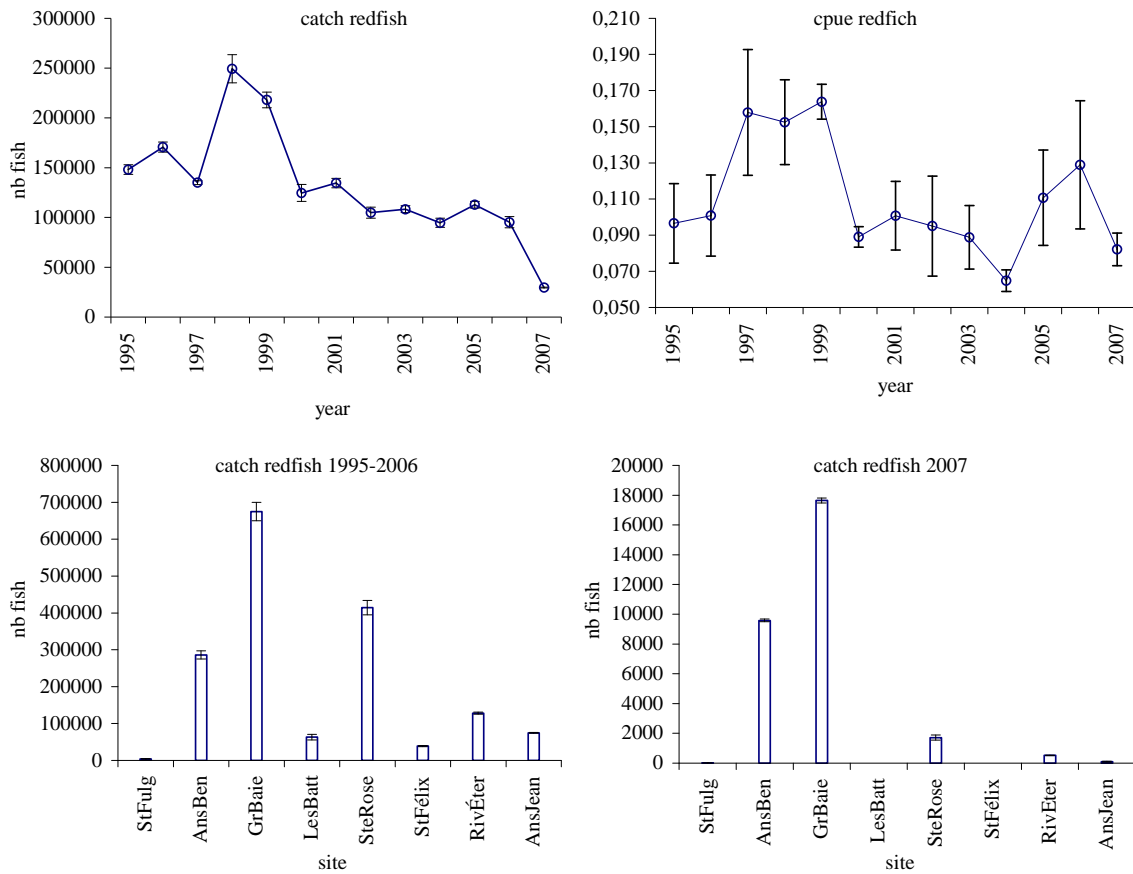


Figure 5. Redfish catch index, CPUEs, (\pm standard error) per year and fishing site

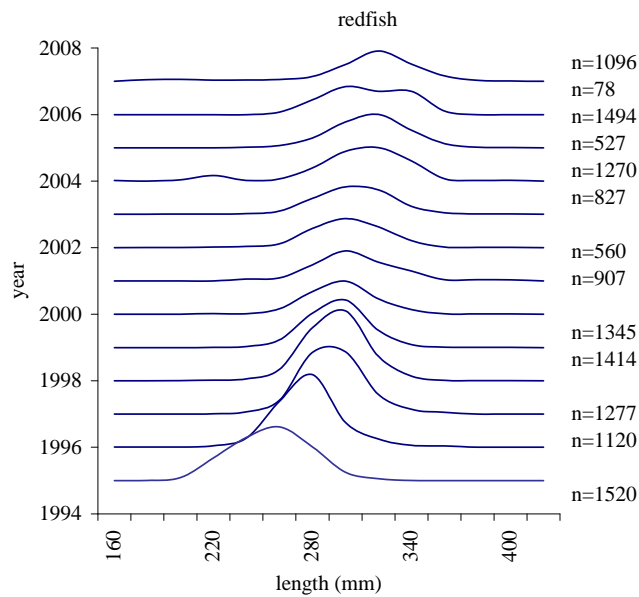


Figure 6. Redfish size frequency distribution for all fishing sites, 1995-2007, where "n" represents the number of fish measured.

The modal size of redfish exceeded 325 mm in 2005 (Figure 6). Since 1995, unimodal curves suggested that the fishery focuses solely on fish in the same age group. These observations indicated that given the lack of contributions by new cohorts, the population's sustainability could be at risk. However, in 2004, smaller individuals were noticed with a modal size of approximately 220 mm, suggesting recruitment to the fishery. However, in 2005, far fewer of these smaller individuals were found. In 2006, the curve is multimodal, indicating a weak presence of small individuals whose sizes range between 220 mm and 260 mm. In 2007, a unimodal curve with mode around 340 mm is observed. Since the beginning of scientific monitoring of winter fishery in 1995, the problem of recruitment has remained an issue for redfish.

The condition index for redfish generally varied between 1.2 and 1.8 from 1995 to 2007. There have not been weak condition index values recorded for the species in the Saguenay in winter.

Greenland Halibut

The number of Greenland halibut caught in the Fjord as a whole has been decreasing almost steadily between 1995 and 2001 (Figure 7). There has been a slight increase since then, and from 2003 to 2004, the increase was even more noticeable. In 2005, catches have continued to increase and have reached nearly 4,000 individuals. In 2006, catches decreased. However, they are higher than those recorded from 1997 to 2003. In 2007, the values dropped significantly and are similar to those observed in 2000-2002. The number of fish captured per hook and per hour shows time patterns similar to those observed for catches.

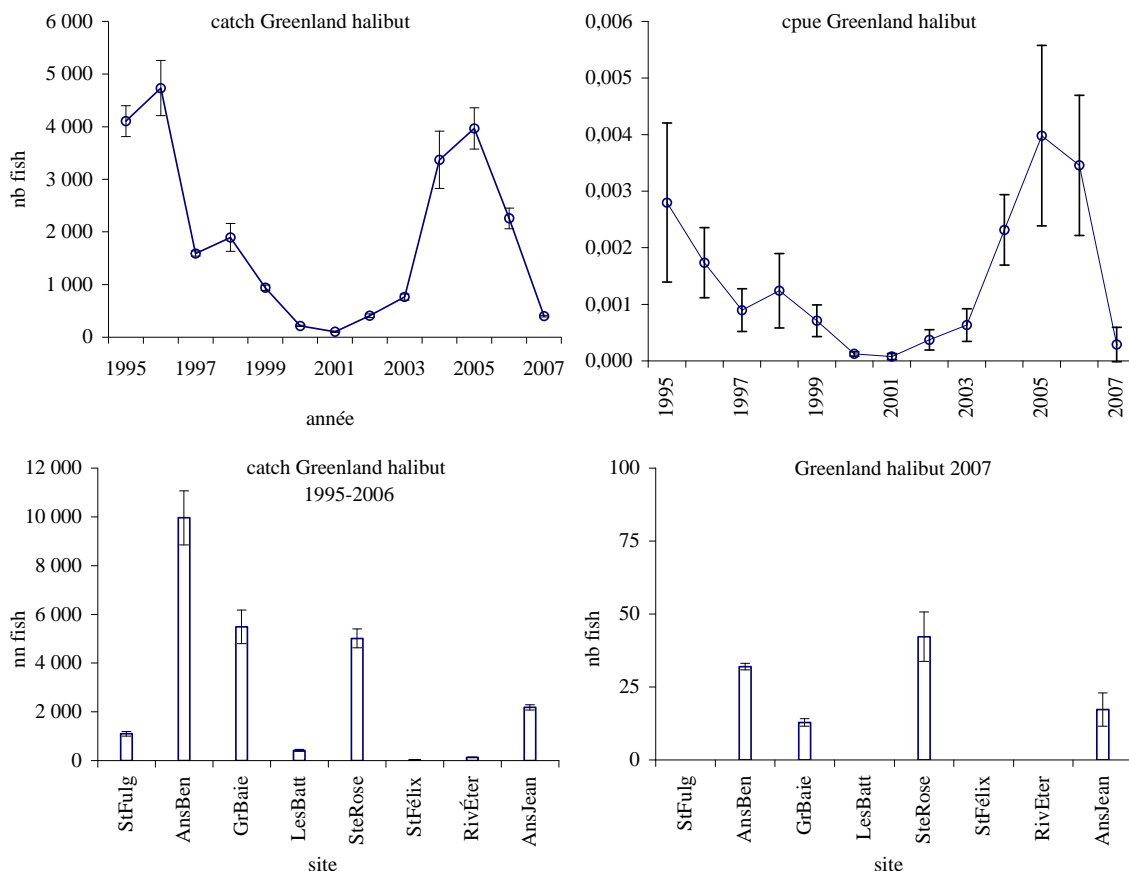


Figure 7 Greenland halibut catch rate index (\pm standard error) per year and fishing site.

Anse-à-Benjamin is considered to be the most important site, as ice fishermen catch more than half of the Saguenay's Greenland halibut harvested there in the winter. Fishing sites such as Sainte-Rose-du-Nord, Grande-Baie and Anse-Saint-Jean are also of some importance in 2007.

The size frequency distribution of Greenland halibut indicates a mode growing from 400 mm to close to 700 mm between 1995 and 2003 and a second mode consisting of smaller individuals in 2002 and 2003, of which growth is noticeable in 2005 (Figure 8). In 2006, the presence of small individuals with a mode around 450 mm is noted. In 2007, a multimodal curve is noted at 300-800 mm size ranges.

The condition index for Greenland halibut shows greater variability, but generally ranged from 0.8 to 1.3 for the 1995-2007 period.

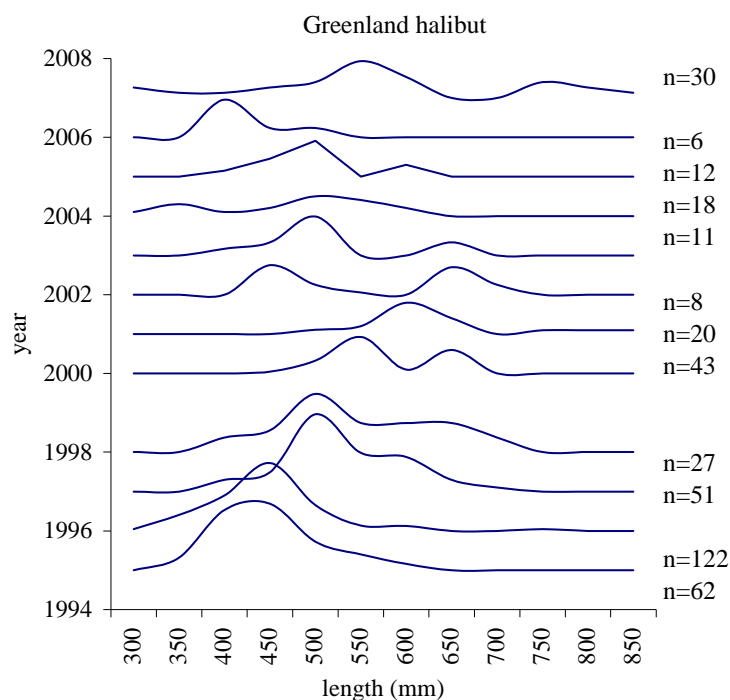


Figure 8. Greenland halibut size frequency distribution for all fishing sites, 1995-2006, where “n” represents the number of fish measured.

Research Survey

In order to validate data gathered during the winter fishery, research surveys have been conducted in the Saguenay Fjord over the last five years. These surveys were conducted as soon as possible following winter sport fishery closure, in April of every year. Gillnet catch rates (Figure 9) show that inter-annual variations between cod and redfish are similar. The rates were down from 2000 to 2002, followed by a significant increase in 2003 and another drop until 2005. The latter are nonetheless similar to those of 2000-2002. It should be mentioned that the boat used in 2003 was different than the one used in previous years. It is therefore possible that even if fixed gear were used, the catch potential of both boats may have been different; e.g. the way the nets are cast. In 2006, catch rates globally increased for the whole of the species sought. For Greenland cod and Greenland halibut, these increases are significant. In 2007, compared with the previous year, the variations are not significant for the whole of the species,

except for the actual values for Greenland cod, where a strong reduction is observed, and which, however, leaving aside 2006, remains in the same order of magnitude as those observed since 2001.

The main fishing sites are generally located in Baie des Ha! Ha!. Moreover, for Greenland cod and Greenland halibut, catch rates are also significant in Saint-Fulgence. The strong presence of these two species would be due to the smelt spawning ground located in the channel of Chicoutimi. Regarding the sector downstream from the fjord, very few catches have been made since 2000. There are certain indications that species such as redfish and Atlantic and Greenland cod have already begun their descent towards the deeper waters of the three basins of the fjord at this time of year.

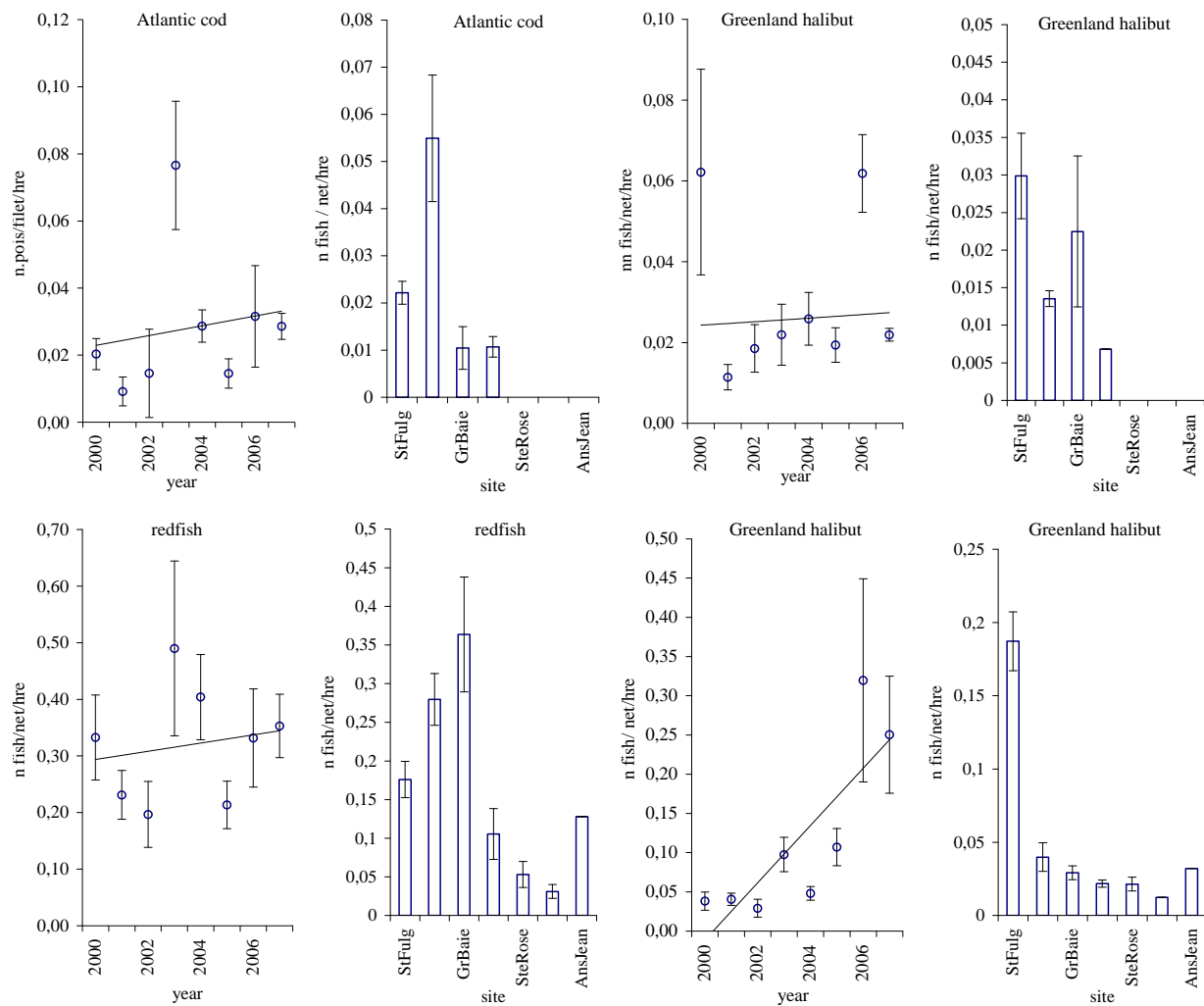


Figure 9. Saguenay Survey 2000-2007. Catch rate (± standard error) per species, year and site for 2000-2007.

CONCLUSIONS AND ADVICE

The interest in ice fishing in the Saguenay River keeps growing and the number of fish caught there is considerable. The data available suggest that the current status of marine resources harvested in the Saguenay River is very worrisome. Cod, redfish and Greenland halibut landings have dropped considerably compared to the 1990s and have been low for a number of years now. Recruitment is uncertain and does not look promising. The populations' sustainability is at stake. However, the daily catch limit of 5 groundfish implemented since 2004 as well as the reduction of the fishing season seem to have contributed to stabilize the catch levels. It is thus critical that for the winter of 2008, the daily catch limit of 5 groundfish as well as the reduction of the fishing season to the time implemented in 2004 be maintained. Moreover, careful attention will have to be paid to improve quality of catch sampling in each species coveted.

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