

Figure 1. Main fishing sites in the Saguenay Fjord.

The Saguenay Fjord Winter Sport Fishery in 2003

Background

The Saguenay Fjord winter sport fishery is unique in Quebec by its size and the variety of fish that are caught in the area. Fishers practise their sport by taking shelter in rustic fishing huts.

Ice fishers are generally from cities and towns near fishing sites. However, in recent years, the activity has sparked interest among North American and even European tourists, who call upon the services of outfitters. Economic spinoffs are estimated at more than \$3 million, making the winter sport fishery a driving force in 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 implemented in 1995 under a research agreement involving Saguenay Fjord fishers' associations and committees; the Société touristique du Fjord; Alcan Smelters and Chemicals Ltd.; the Société des établissements de plein air du Québec; the Société de la faune et des parcs du Québec; the Department of Canadian Heritage (Parks Canada), which co-manages the Saguenay–St. Lawrence Marine Park; and the Department of Fisheries and Oceans, which oversees scientific research.

Summary

- The ice fishing season usually opens in January and closes in mid-March. The number of fisher-days is currently estimated at more than 50,000 and keeps increasing. The marine species sought by fishers are Atlantic cod, redfish and Greenland halibut.
- The catch rate index for cod, which includes Atlantic cod (*Gadus morhua*) and Greenland cod (*Gadus ogac*), rose from 1996 to 2001, to a record 28,740 individuals. As a result of fishers' trouble differentiating between Atlantic and Greenland cod, it is difficult to determine the reason for the increase. Up until 2000, the abundance of Atlantic cod was overestimated because both species were accounted for as *Gadus morhua*. Since 1995, Atlantic cod landings have been low, but relatively steady, while Greenland cod landings have been larger. The catch rate index for Atlantic cod nevertheless dropped between 2001 and 2003. The size structure values for Atlantic cod suggest that individuals are being recruited into the fishery.
- Redfish landings are the highest among marine species in the Saguenay Fjord. From 1996 to 1999, an increase was recorded in the redfish catch rate index, which exceeded 139,000 individuals in

1999. It then plummeted by more than 50% in 2000 and has remained low ever since. The situation is even more alarming given that size structure values indicate that only one age-class is being harvested; no recruitment is forecast for the coming years.

- The catch rate index for Greenland halibut has declined almost steadily since 1995, from 5,000 individuals to fewer than 500 in 2003. Size structure values indicate the presence of a few young individuals, but their abundance remains unknown as a result of insufficient data.
- In order to validate data gathered during the winter sport fishery, research surveys have been conducted in the Fjord over the last four years. The gillnet catch rates for all three species were up significantly between 2002 and 2003, compared with 2000 and 2001. However, this data series is limited, and the recent increase in catch rates needs to be confirmed by upcoming inventories.
- The overall status of marine resources harvested in the Saguenay is very worrisome. Cod, redfish and Greenland halibut landings have decreased considerably and have been very low in recent years. In addition, recruitment is uncertain for Greenland halibut and cod; no recruitment is forecast for redfish.
- Considering the precarious state of marine resources harvested by the fishery, it is essential that the number of fish harvested be reduced. This can be done by reducing fishing effort (e.g. reducing the number of fishing days or lines used) and by further lowering the possession limit. The catch limit was 25 fish in 2002 and 15 fish in 2003. Evidently, these measures have not achieved the expected results and a further reduction of catch limits is therefore needed. The daily catch limit should be set at five groundfish, regardless of species.

The fishery

The winter sport fishery covers 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 L'Anse-St-Jean, Rivière-Éternité, St-Félix-d'Otis, St-Rose-du-Nord, St-Fulgence and La Baie, with the latter encompassing L'Anse-à-Benjamin, Grande-Baie and Les Battures (Figure 1). Fishing sites generally have two fishing areas; fishers target different species depending on the area and on the type of gear, bait and fishing technique used. The main species sought are rainbow smelt (*Osmerus mordax*), Atlantic cod (*Gadus morhua*), redfish (*Sebastes* sp.) and Greenland halibut (*Reinhardtius hippoglossoides*). Thus, each fishing site has a pelagic fish area, where mainly smelt is caught and where fishing huts are located rather close to shore. The groundfish fishing area is further off shore, where fishers take shelter in huts to fish mainly marine species.

The ice fishing season generally opens in January, when ice is 30 cm thick, and closes in mid-March with the arrival of ice breakers in the Fjord's small bays. Most fishing activity is conducted over some 50 days.

Fishers use three main types of gear to fish: the tip-up, a fishing line mounted on a mechanical signalling device that alerts the fisher when a fish takes the bait; the short fishing rod for jigging; and rods for light-line fishing.

There are three approaches to ice fishing. The first consists in being on site continuously and requires perseverance and attentiveness. When a fish takes the bait, the fisher reels it in, removes it from the line, baits the hook and lowers it back into the water. The second approach is more social in nature. Tip-ups are baited and lowered into the water, but fishers are less attentive. A fish that takes the bait could be on the line for a number of hours before being reeled in, making it impossible to catch other fish during that time. The third

approach consists in baiting and lowering tip-ups in the evening and checking the lines only the next day, before or after work.

The number of people visiting fishing sites is measured in fisher-days. This number ranged from 43,000 to more than 63,000 fisher-days between 1995 and 2003 for the Fjord as a whole (Figure 2). There are generally fewer pelagic species fishers than groundfish fishers and they generally fish upstream from the Fjord, with St-Fulgence and Grande-Baie being the most popular locations. Fishing effort with respect to groundfish is mainly concentrated in Anse-à-Benjamin, Grande-Baie, St-Rose-du-Nord and Anse-St-Jean. Cod, redfish and Greenland halibut landings are made almost exclusively ($\geq 98.8\%$) in groundfish fishing areas.

State of the resource

Since 1995, DFO has been monitoring the winter sport fishery in the entire Saguenay region, targeting mainly cod, redfish and Greenland halibut. The program is two-fold and requires the participation of 32 volunteer fishers from the eight main fishing sites. The first part of the program involves a team of eight samplers, who gather data on catches and fishing effort 20 times over the fishing season. Samplers visit each fisher 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 the program involves the gathering of biological data. Twenty-four samplers record the species, size, weight and condition of individuals caught, based on sampling protocols.

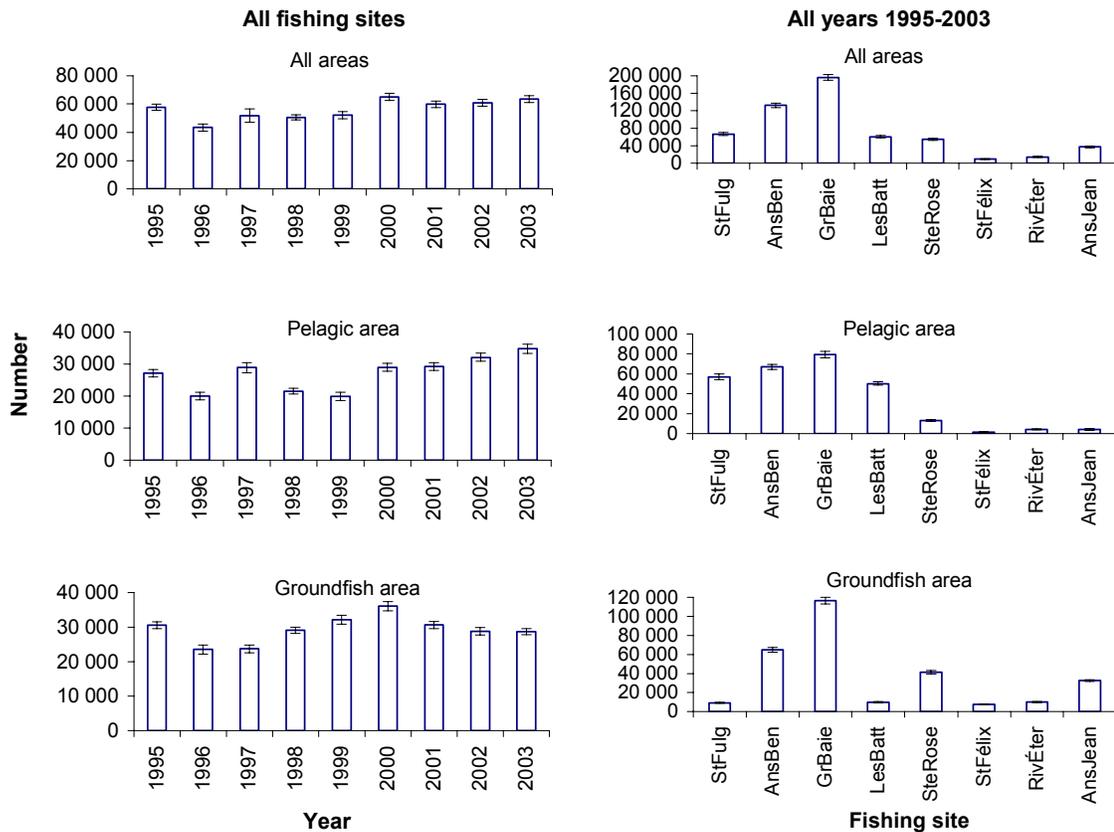


Figure 2. Fisher-days index (\pm standard error) per area, year and fishing site.

The data gathered are used to estimate annual harvesting levels and track trends over a number of years for each species caught. These levels are commonly used as abundance indices for populations. Accordingly, traditional calculation methods were adjusted to better reflect the situation of the winter sport fishery in the Saguenay. First, fishing effort units need to be defined in hook-hours. Then, yield is calculated (i.e. the number of fish caught per hook per hour) using the effort unit data and the number of fish caught per fisher. 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. The 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

Cod landings have been increasing significantly since 1996, totalling 28,740 individuals in 2001 (Figure 3), which corresponds to approximately 40 tonnes. The increase is related to the greater number of Greenland cod (*Gadus ogac*) found in catches since 1996. Although fishers had trouble differentiating between Greenland and Atlantic cod (*Gadus morhua*), they were able to report the occurrence of Greenland cod unofficially. After asking fishers to be more vigilant in correctly identifying species, it was found that Greenland cod accounted for 80% of cod catches in 2001. This situation is rather alarming, as it would mean that only 5,748 Atlantic cod were caught that year. Total landings of the two cod species dropped in 2002 (16,494 individuals) and again in 2003 (8,863 individuals).

Cod fishing is especially good in Grande-Baie and St-Rose-du-Nord, with lower indices being recorded at other fishing sites. Indices estimated by Talbot (1992) over the course of the 1990–1991 fishing season for the entire Saguenay region are

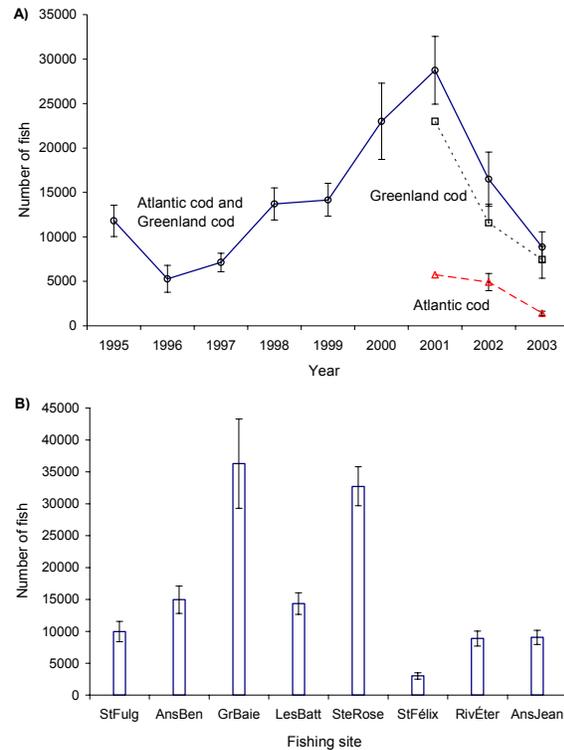


Figure 3. Cod catch rate index (\pm standard error) by **A)** year and **B)** fishing site.

approximately three times higher than those estimated in this study.

The size frequencies of cod caught vary, indicating that individuals of different ages were harvested (Figure 4). The findings of cohort monitoring conducted between 1995 and 2000 are inaccurate, owing to the fact that no difference was made 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. In 2003, smaller individuals were observed, suggesting recruitment into the fishery.

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

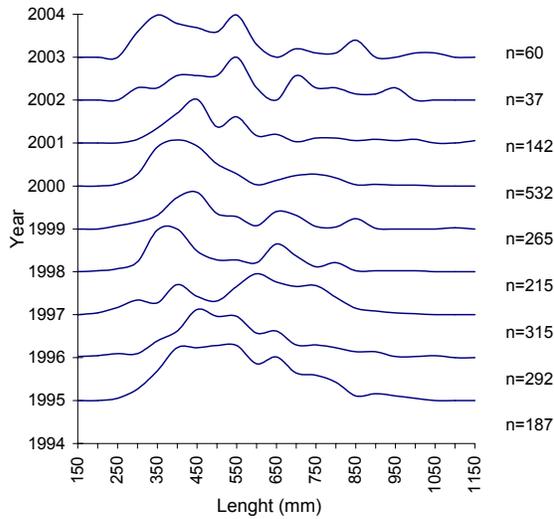


Figure 4. Size frequency distribution for cod for all fishing sites. The data presented for 1995–2000 represent a mix of Atlantic and Greenland cod; data presented for 2001–2003 represent Atlantic cod only.

account for the decline in abundance in recent years.

Redfish

Redfish landings are the highest among marine species in the Saguenay Fjord. Between 1996 and 1999, landings increased from 71,500 to more than 139,000 individuals (Figure 5), but plummeted to 71,800 in 2000 and have remained low ever since. Like for Atlantic cod, the situation of redfish is alarming: catch indices dropped by more than 50% between 1999 and 2003.

The spatial distribution of landings indicates that Grande-Baie, which is the most popular groundfish fishing area, has the highest indices. Landings estimated at other sites are significantly lower. Very few redfish were landed in St-Fulgence as a result of the limited number of fishers in the groundfish fishing area.

The modal size of redfish exceeded 300 mm in 2003 (Figure 6). Unimodal curves suggest that the fishery focuses solely on fish in the same age group. There are no signs of recruitment into the fishery. Given

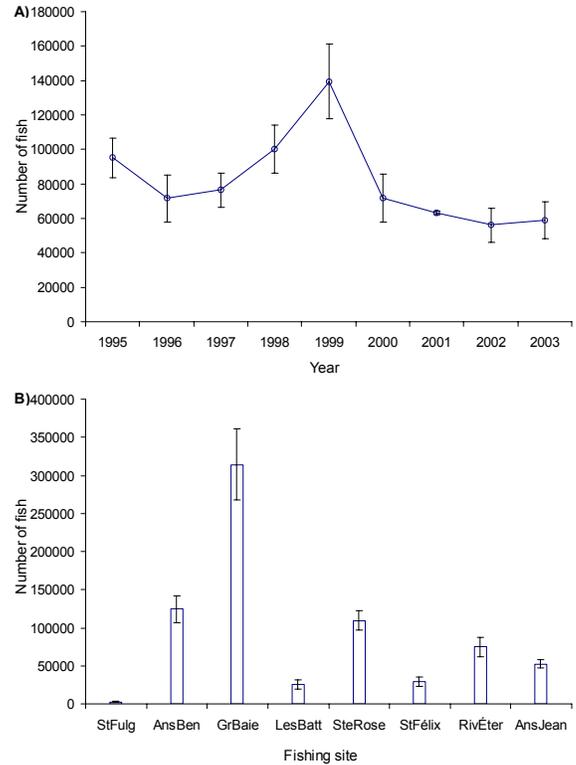


Figure 5. Redfish catch rate index (\pm standard error) by A) year and B) fishing site.

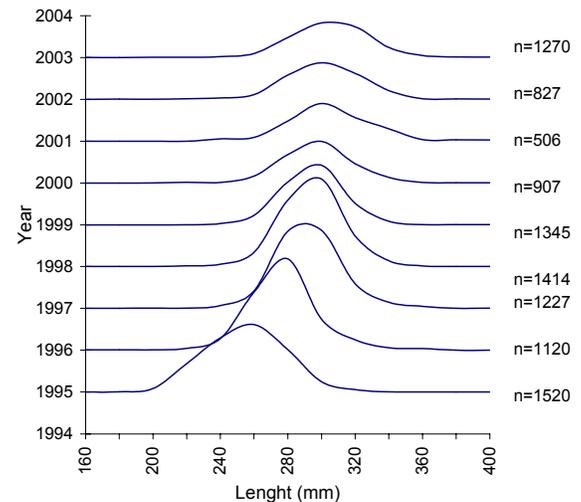


Figure 6. Size frequency distribution for redfish for all fishing sites, 1995–2003.

the lack of contributions by new cohorts, the population’s sustainability could be at risk.

The condition index for redfish generally varied between 1.2 and 1.8 from 1995 to

2003. Strong condition index values were recorded for the species in winter.

Greenland halibut

The number of Greenland halibut caught in the Fjord as a whole has been decreasing almost steadily since 1995, when 4,921 individuals were landed (Figure 7). The 2003 catch rate index totalled 480 individuals. Although the decrease in landings is worrisome, it may be attributable to the fact that fishers do not tend to report their catches because the species has little value. The situation needs to be monitored closely over the coming fishing seasons.

St-Rose-du-Nord is deemed to be the most important site, as fishers catch more than half of the Saguenay’s Greenland halibut there in winter. Fishing sites like St-Fulgence, Grande-Baie and L’Anse-St-Jean are also important.

The size frequency distribution of Greenland halibut indicate that a mode grew from 400 mm to close to 700 mm between 1995 and 2003; a second mode consisting of smaller individuals in 2002 and 2003 (Figure 8) was also observed. However, only 8 and 11 individuals were measured in 2002 and 2003, respectively, which is insufficient to guarantee the sustainability of the Greenland halibut population in the Saguenay.

The condition index for Greenland halibut has varied little, ranging from 0.8 to 1.3 over the years (1995 to 2003).

Research survey

In order to validate data gathered during the winter fishery, research surveys have been conducted in the Fjord over the last four years. One survey was conducted per year between 2000 and 2002, while three surveys were conducted in 2003, in April, June and September. Gillnet catch rates for the four species (i.e. Atlantic cod, Greenland cod, redfish and Greenland halibut) were up significantly from 2002 to 2003. However, this data series is limited

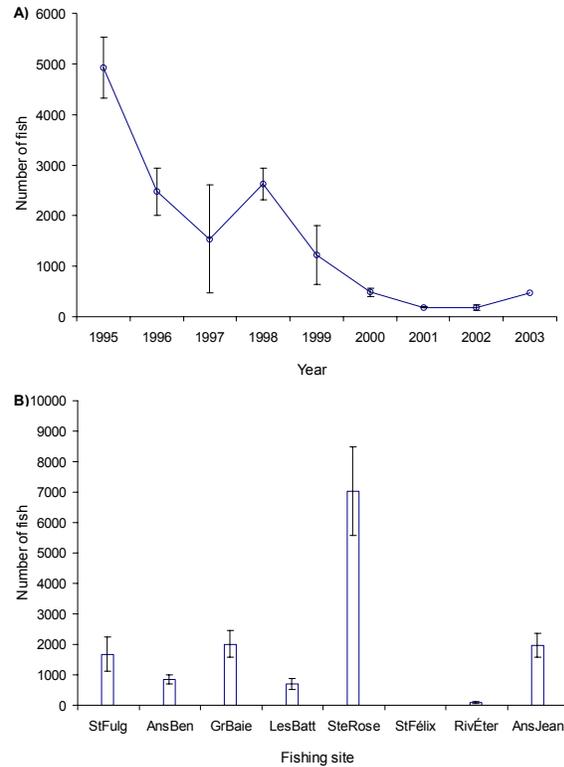


Figure 7. Greenland halibut catch rate index (\pm standard error) by **A)** year and **B)** fishing site.

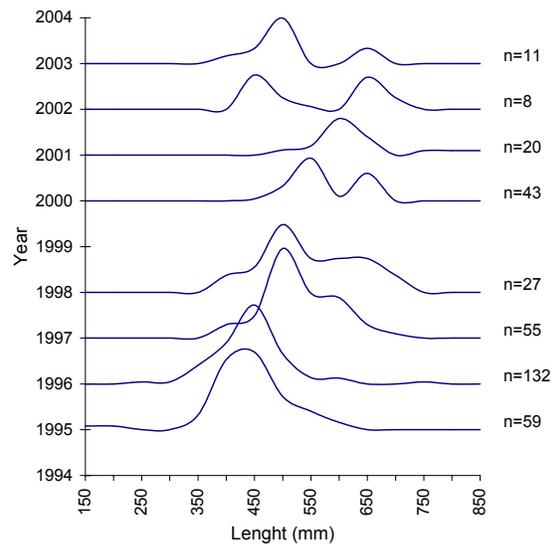


Figure 8. Size frequency distribution for Greenland halibut for all fishing sites, 1995–2003.

and the recent increase in catch rates needs to be confirmed by upcoming inventories.

Outlook

The interest in ice fishing in the Saguenay 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 is very worrisome. Cod, redfish and Greenland halibut landings have dropped considerably over the years and have been low for a number of years now. Recruitment is uncertain and does not look promising. The populations' sustainability is at stake. In light of these observations, we recommend that fishing effort be reduced. The long-term monitoring of Fjord populations will provide more information on species' status and will allow for better management in terms of resource conservation.

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