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Quebec Region

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Science Advisory Report 2005/019

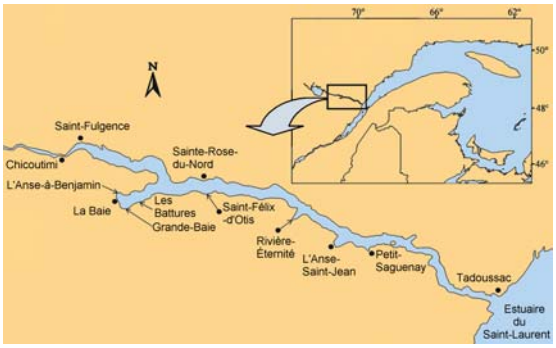

Figure 1. Main fishing sites in the Saguenay Fjord.

The Saguenay Fjord Winter Sport Fishery in 2004

Background

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

Winter fishermen generally come from cities and towns near fishing sites. However, in recent years, the activity has sparked interest among North American and even European tourists, who use 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 fishermen's 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 comanages the Saguenay–St. Lawrence Marine Park; and the Department of Fisheries and Oceans (DFO), which oversees scientific research and the protection of the resource.

Summary

- The ice fishing season usually opens in January and closes by mid-March. Fishing site frequentation is currently estimated at 60,000 fishermen-days approximately. The marine species sought by fishermen are Atlantic cod, redfish and Greenland halibut.
- The catch rate index for cod, which includes Atlantic cod (*Gadus morhua*) and Greenland cod (*Gadus ogac*), showed an upward trend from 1996 to 2001, reaching a high of almost 29,000 individuals. It is difficult to determine the reason for this increase given fishermen's difficulty to differentiate Atlantic cod from Greenland cod. Up until 2000, the abundance of Atlantic cod was overestimated because both species were accounted for as *Gadus morhua*. Concretely, since 1995, Atlantic cod captures would have been low, but relatively steady, while Greenland cod captures would have been larger.
- The catch rate index for Atlantic cod has been relatively the same since 2001. The size structure for Atlantic cod suggests that individuals are being recruited to the fishery.
- Redfish captures are the highest among marine species. From 1996 to 1999, an increase was observed in the redfish

catch rate index, which exceeded 139,000 individuals in 1999. Then, it dropped by over 50% in 2000, and remained low until 2003. In 2004, small increases in the number of redfish caught combined with the presence of smaller individuals, whose proportions are difficult to assess, would suggest that individuals are being recruited to the fishery.

- The catch rate index for Greenland halibut has declined almost steadily since 1995, from nearly 5,000 individuals to fewer than 500 in 2003. In 2004, a sizeable catch increase was observed, totalling nearly 1,800 individuals. Size structures indicate the presence of a few young individuals, but their abundance remains unknown due to insufficient data.
- In order to validate data collected during the winter sport fishery, research surveys have been conducted in the Fjord over the last five years. The gillnet catch rates for all three species were up significantly between 2002 and 2003, compared with 2000 and 2001. The 2004 rates were above the recorded levels between 2000 and 2002.
- The overall status of marine resources harvested in the Saguenay River is obviously precarious. It appears initially that this fishery supports a very significant fishing effort, and that an increase in the number of fishermen would be worrisome.
- The 2003 daily catch limit established at 5 fish obviously did not achieve the expected results of having a further reduction in the number of fish caught in 2004. It is therefore essential that the 2005 winter daily catch limit remain at 5 groundfish and that effective control measures be used to reduce fishing effort.

The fishery

The winter sport fishery is practised 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 L'Anse-St-Jean, Rivière-Éternité, St-Félix-d'Otis, Ste-Rose-du-Nord, St-Fulgence and La Baie, with the latter encompassing L'Anse-à-Benjamin, Grande-Baie and Les Battures (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. 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" area is further off shore, where fishermen 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 by mid-March with the arrival of icebreakers in the Fjord's small bays. Most fishing activity is conducted over some 50 days.

Fishermen use two main types of gear to fish: the tip-up, a fishing line mounted on a mechanical signalling 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. 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. 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 fisherman-days. This number ranged from 43,000 to more than 63,000 fisher-days between 1995 and 2004 for the Fjord as a whole (Figure 2). There are generally fewer pelagic species fishermen than groundfish fishermen, and they generally fish upstream from the Fjord, with St-Fulgence 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 captures are made almost exclusively (≥ 98.8%) in "groundfish" areas.

Resource Status

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

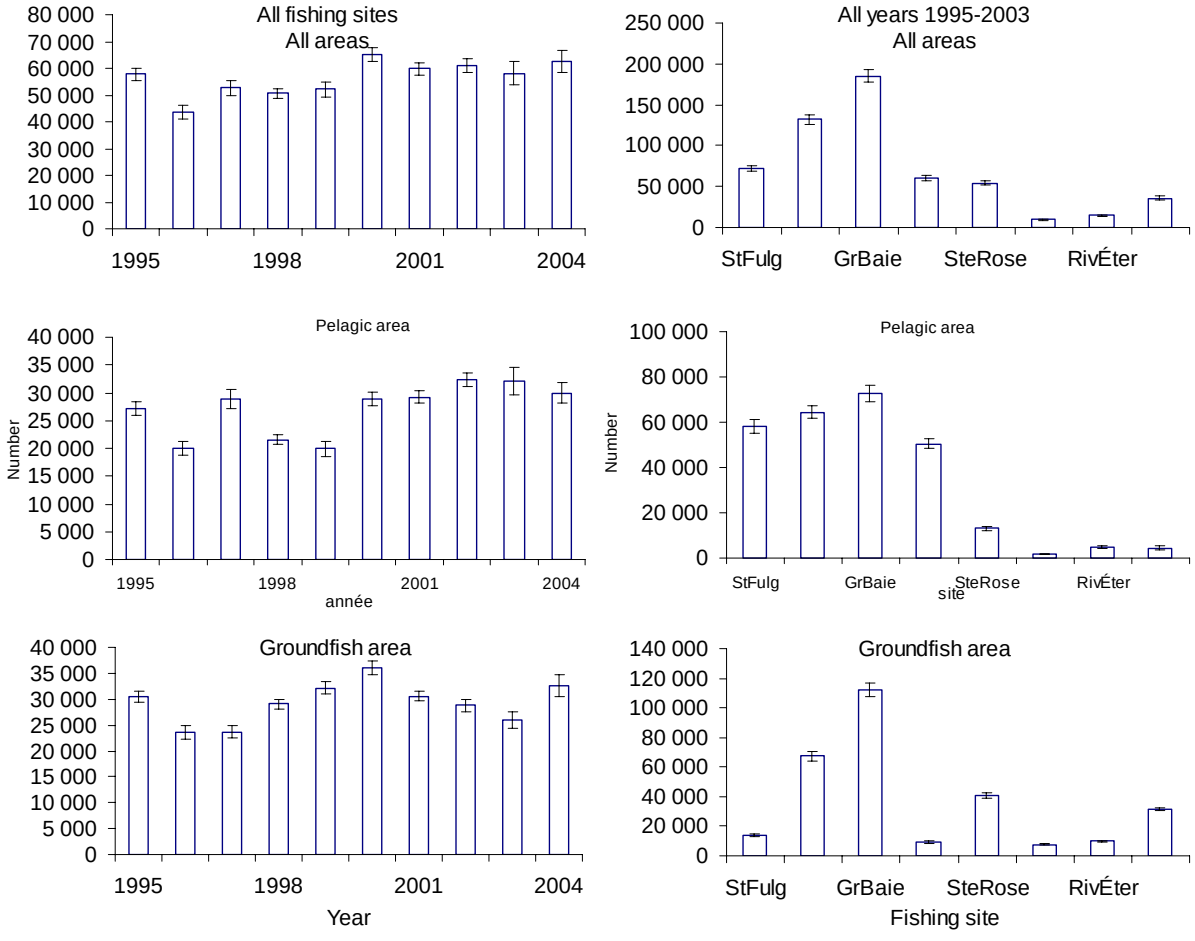

Figure 2. Fishermen-days index (± standard error) per area, year and fishing site.

caught, based on sampling protocols.

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 River. Fishing effort unit is first defined in terms of 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 fisherman. 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 catches have been increasing significantly since 1996, totalling almost 29,000 individuals in 2001 (Figure 3), which corresponds to approximately 40 tonnes. 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 able to report the occurrence of Greenland cod unofficially. After asking fishermen 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). However, the number of cod caught in 2004 appears to have stabilized, totalling 10,133 individuals.

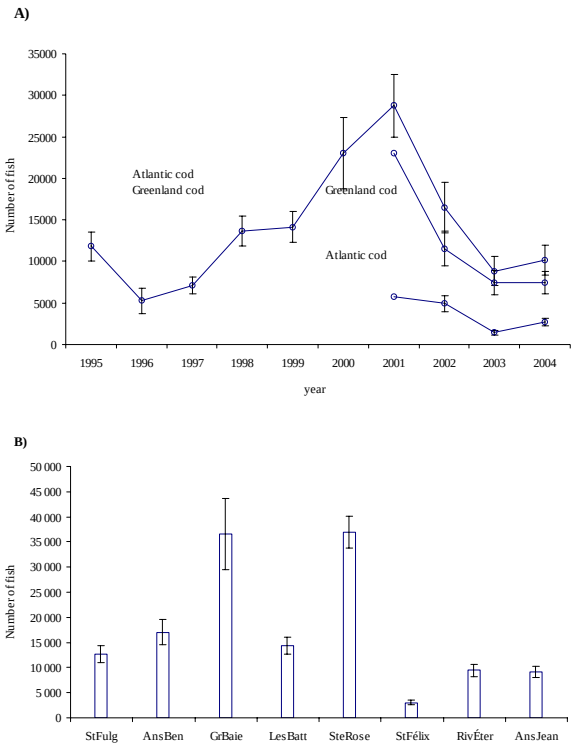

*Figure 3. Cod catch rate index (± standard error) by **A)** year and **B)** fishing site.*

Cod fishing is especially good in Grande-Baie and Ste-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 River are approximately three times higher than those estimated in this study for 2004.

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 2000 is hazardous 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 for the species. In 2003, smaller individuals were observed, which are now in the 2004

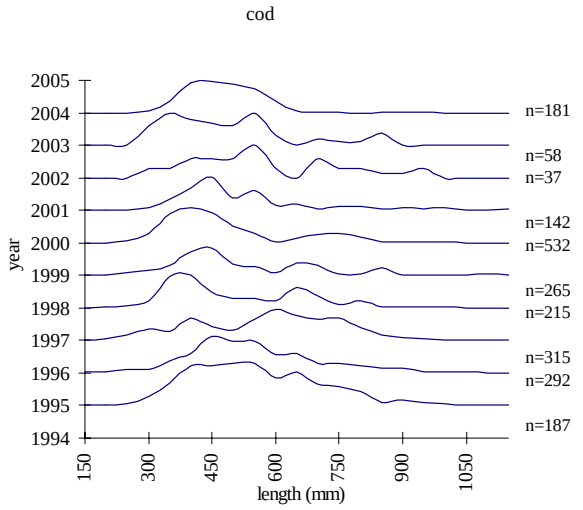

Figure 4. Cod size frequency distribution for all fishing sites. Data for 1995-2000 represents a mix of Atlantic and Greenland cod; data for 2001- 2004 represents Atlantic cod only.

distribution, suggesting recruitment to 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 account for the decline in abundance in recent years.

Redfish

Redfish captures are the highest among marine species in the Saguenay Fjord. Between 1996 and 1999, captures increased from 71,500 to more than 139,000 individuals (Figure 5), but sharply dropped 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. However, in this case also, 2004 catches stabilized at over 78,000 individuals.

The spatial distribution of captures indicates that Grande-Baie, which is the most popular groundfish fishing site, has the highest indices. Landings estimated at other sites

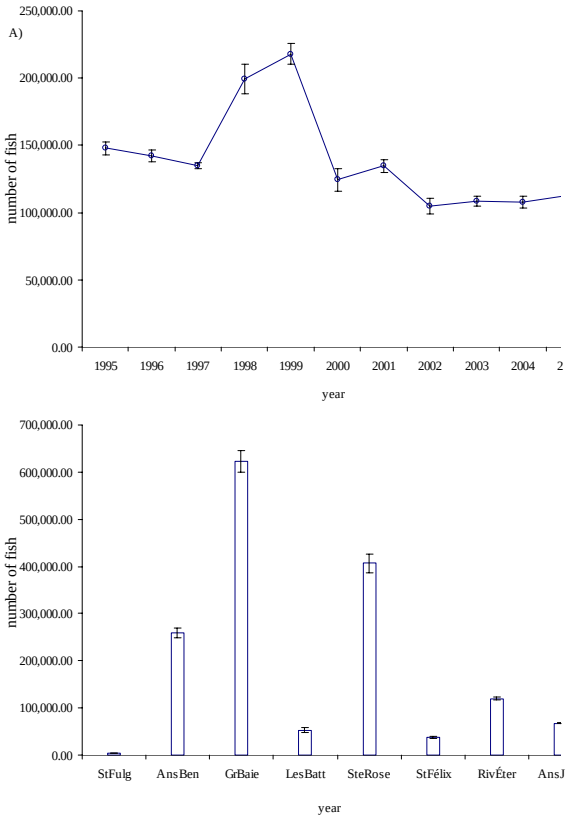

*Figure 5. Redfish catch rate index (± standard error) by **A)** year and **B)** fishing site*

are significantly lower. Very few redfish were caught in St-Fulgence as a result of the limited number of fishermen in the groundfish fishing area.

The modal size of redfish exceeded 320 mm in 2004 (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.

The condition index for redfish generally varied between 1.2 and 1.8 from 1995 to 2004. Strong condition index values were recorded for the species in the Saguenay in winter.

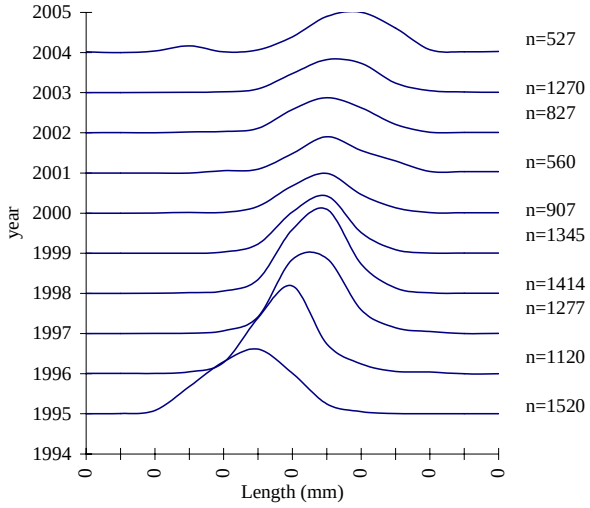

Figure 6. Redfish size frequency distribution for all fishing sites, 1995–2003.

Greenland halibut

The number of Greenland halibut caught in the Fjord as a whole has been decreasing almost steadily between 1995 and 2003 (Figure 7). In 2004, the situation appears to have stabilized and the number of individuals caught totals 1,800. The decrease in catches is worrisome. However, it may be attributable to the fact that fishermen do not tend to report their catches because the species has little value. The situation will need to be monitored closely during the 2005 fishing season follow-up.

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

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 2004 (Figure 8). Furthermore, over the course of this past year, individuals with modal sizes of approximately 350 mm were observed. This could signify the arrival of a new cohort

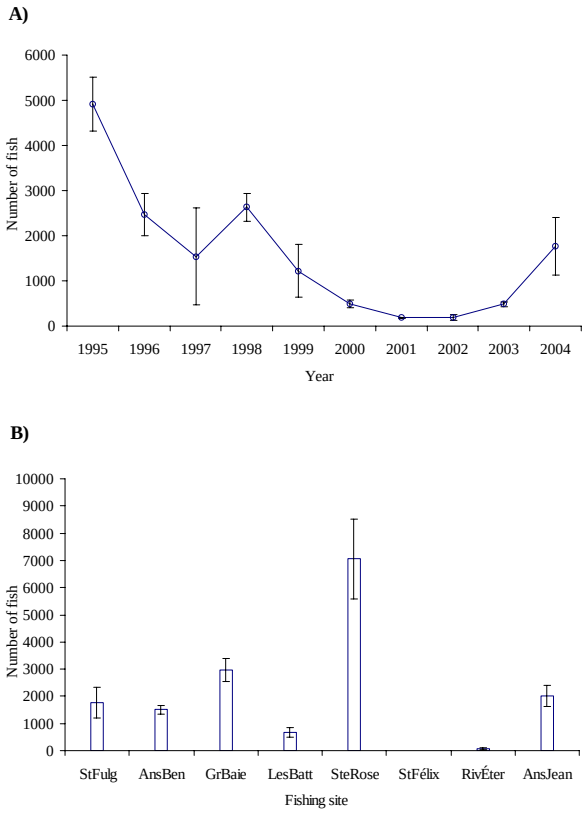

Figure 7. Greenland halibut catch rate index (± standard error) by A) year and B) fishing site.

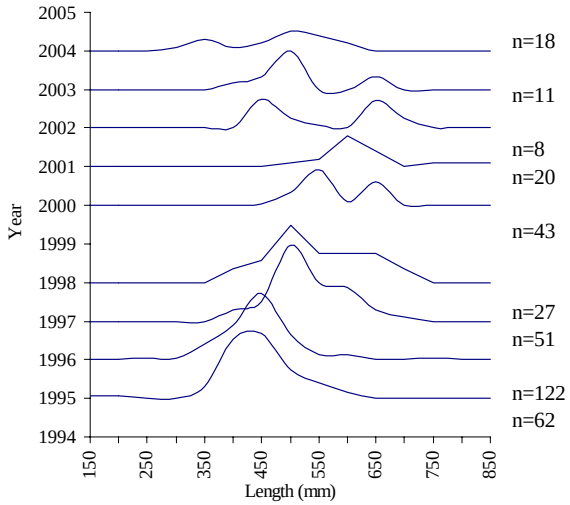

Figure 8. Greenland halibut size frequency distribution for all fishing sites, 1995–2003.

in the fishery. However, the samples were insufficient to guarantee the sustainability of the Greenland halibut population in the Saguenay River.

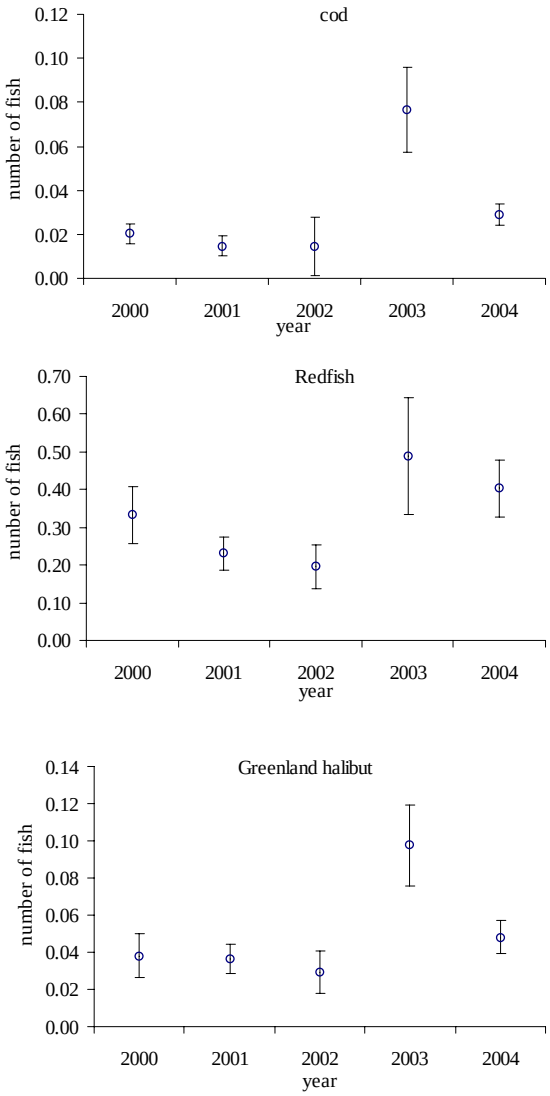

Figure 9. Catch rate per species and per year. Saguenay survey 2000-2004.

The condition index for Greenland halibut shows greater variability, but generally ranged from 0.8 to 1.3 for the 1995-2004 period.

Research survey

In order to validate data gathered during the winter fishery, research surveys have been conducted in the 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 show that inter-annual variations between species are similar. The rates were down from 2000 to 2002, followed by an increase in 2003 and another drop in 2004. The latter are nonetheless higher that those of 2000-2002. It should be mentioned that the research vessel used in 2003 was different than the one used in previous years. It is therefore possible that even if fixed gear was used, the catch potential of both vessels may have been different; e.g. the way the nets are cast.

Other than in 2003, it appears that catch rates have increased slightly from 2000 to 2004. Globally, this situation resembles the winter sport fishery.

Outlook

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 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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