Gulf of St. Lawrence (4RST) Greenland Halibut

Background

Greenland halibut, or turbot, of the Gulf of St. Lawrence is considered to be a small stock isolated from the main Northwest Atlantic population found to the east and north of the Newfoundland Grand Banks. Parasite studies conducted in the early 1990s showed that the Gulf halibut was a distinct population and could therefore continue to be managed as a separate stock. The research has made it possible to distinguish clearly between Greenland halibut of the Gulf, the Laurentian Channel and adjacent areas, and those of Labrador and the northern part of the Grand Banks. These findings have led to the conclusion that Greenland halibut complete their entire life cycle within the Gulf.

Catches of Greenland halibut have fluctuated widely since the directed fishery began in the mid-1970s. Two periods of high landings (1979 and 1987) were followed by sharp declines to less than 2,000 t in both cases. In the early 1990s, the fishery was characterized by low yields and by a preponderance of small, immature fish in the catches. Since 1995, conservation measures (reduction in fishing effort, increase in mesh size, small fish protocol) have been implemented to address these problems.

In 1999, the fishing plan period was extended until May 14, 2000. This extension of the 1999 season means that a portion of the TAC will still be available to the fishery in April-May 2000. The next fishing plan will cover the period from May 15, 2000 to May 14, 2001.

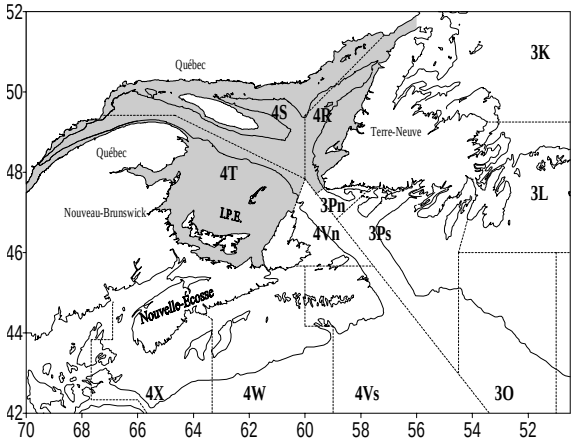

Figure 1. Map of the Gulf of St. Lawrence and adjacent areas, showing NAFO Divisions 4RST.

Summary

- Between 1996 and 1998, the exploitation rate increased for all sizes of fish harvested, but particularly for fish measuring 50 cm and over. However, it decreased in 1999 since part of the TAC was not harvested and is still available for the spring 2000 fishery.
- The catches per unit of effort (CPUEs) of Quebec and Newfoundland traditional gillnet fishers decreased slightly in 1999 compared with the values for 1996 to 1998.
- The biomass index from DFO's research survey has shown an upward trend since 1993. The highest estimate was recorded in 1999. The biomass indices from the sentinel fishery surveys conducted in July and October have also been rising since 1995.
- The juvenile and prerecruit abundance indices from the research surveys show that the 1995 and 1997 year-classes are the largest since 1990. These year-classes should make up a substantial proportion of catches beginning in 2000 and 2002 respectively.

Biology of the Species

Greenland halibut (commonly called turbot) is a flatfish found at depths of up to 1,500 m (830 fathoms) in the North Atlantic. In the Gulf of St. Lawrence, these halibut are generally found at shallower depths of between 130 and 500 m (70-280 fathoms). In summer, the main concentrations of Greenland halibut are found in the St. Lawrence estuary, the areas west and northeast of Anticosti Island and near the west coast of Newfoundland, in the Esquiman Channel. In winter, major concentrations of the species have been observed in Cabot Strait, which suggests that Greenland halibut, like a number of other species, migrates towards the entrance of the Gulf of St. Lawrence at this time of the year.

Further to the Fisheries Resource Conservation Council's recommendation to reduce the number of immature fish taken, a minimum size limit was introduced as a conservation measure. Since 1995, the size of females at sexual maturity has been monitored using visual criteria in order to obtain more accurate annual estimates; this value serves as a benchmark for establishing the minimum legal size. In addition, a microscopic analysis has been carried out since 1997 to detect evidence of maturity that cannot be seen with the naked eye. In 1999, the size at which 50% of females reach maturity was estimated to be 48.5 cm on the basis of visual criteria. This is lower than the values derived in previous years (around 50 cm). On the basis of histological criteria, it was estimated that the size at which 50% of females reach maturity was between 45.5 and 47 cm in 1997-1999. In April, when spawning is almost complete, size at maturity was estimated to be 47 cm in 1997. The latter value is probably the most accurate since it is easier to determine ovary maturity stages in April than in summer, several months after spawning.

The Fishery

Landings (thousands of tonnes)

Year	*77-94 avg.*	*1995*	*1996*	*1997*	*1998*	*1999*[1]
TAC	*-*	*4*	*2*	*3*	*4*	*4.5*[2]
Fixed Gear	*3.2*	*2.4*	*1.9*	*2.6*	*3.8*	*3.3*
Mobile Gear	*1.4*	*0*	*0*	*0*	*0.1*	*0.1*
Total	*4.6*	*2.4*	*1.9*	*2.6*	*3.9*	*3.4*

[1] *Preliminary figures*
[2] *TAC until May 14, 2000*

Until the mid-1970s, Greenland halibut landings in 4RST consisted primarily of bycatches of other fisheries. Later, a directed fishery using gillnets and bottom trawls developed. This fishery is now heavily dominated by vessels using gillnets whose home ports are in Quebec and on the west coast of Newfoundland. Since 1993, virtually no catches have been made using bottom trawls because of the moratorium on cod fishing with this gear type and because use of the Nordmore grate has been made mandatory for shrimpers. Furthermore, trawlers have not been allowed to target Greenland halibut since that date.

The bar chart of annual landings shows two peaks: the first in 1979 (8,800 t) and the second in 1987 (11,000 t) (Figure 2). In 1988, catches began a steep downturn, falling as low as 2,306 t in 1991, and since then have remained between 2,000 and 4,000 t. Preliminary figures for 1999 put landings at 3,393 t compared with 3,945 t in 1998. This decrease from 1998, despite the higher total allowable catch (TAC) in 1999, can be explained by the decision of Quebec fishers to save some of the fish for spring 2000. The TAC was set at 4,000 t from 1993 to 1995. In 1996, it was cut to 2,000 t, but was raised to 3,000 t in 1997 and to 4,000 t in 1998. The 1999 TAC was increased to

4,500 t, and remains effective until May 14, 2000.

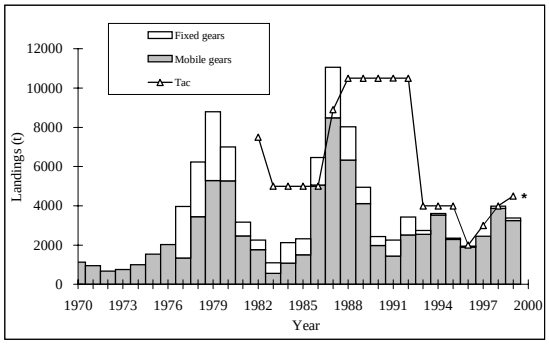

Figure 2. Annual Greenland halibut landings and total allowable catch (TAC) since 1970.

The individual quota pilot project introduced in 1999 for traditional fishers in Quebec had a major impact on the length of the fishing season. Between 1996 and 1998, most landings were concentrated in a five- to seven-week period, while in 1999, the season went from June until late November. Although Newfoundland fishers remained in a competitive fishery, their season was lengthened from three to seven months.

Fishery Management

Following the FRCC's 1994 recommendations to reduce fishing effort and the quantity of immature fish taken, major conservation efforts have been implemented since 1995, including: 1) increase in mesh size from 140 mm (5½ in.) to 152 mm (6 in.); 2) adoption of a fishing net configuration that is more selective; 3) introduction of a minimum size limit (42 cm in 1996 and 44 cm since 1997), along with the application of a small fish protocol; 4) establishment of a dockside monitoring program; and 5) voluntary reduction in the number of nets used by Quebec fishers (from 120 to 80 filets).

Since 1998, new fishers in the Gaspé and along the Lower North Shore targeting Greenland halibut with gillnets have participated in the Quebec fishery. They were granted an allocation as part of a competitive fishery. An individual quota pilot project was introduced in 1999 for traditional fishers in Quebec to allow them to extend their fishing season.

Size Structure of Catches

The average size of fish caught with gillnets fell sharply from 1980 to 1985 (Figure 3). In 1986, the large 1979-80 year-classes began to be harvested, and so the average length of fish caught rose gradually as these cohorts grew. By 1990, these cohorts had been completely harvested, and the fishery began to affect new, less abundant year-classes, causing the main mode of the catches at length to decline again. In 1995, most of the Greenland halibut caught in gillnets were 40-45 cm long, with a mode of 42 cm. After the mesh size was raised from 140 mm (5.5 in.) to 152 mm (6 in.) in 1996, the dominant length of fish caught increased from 42 to 48 cm. This value rose to 49 cm in 1997 before falling back to 47 cm in 1998 and 46 cm in 1999. Most catches in the past few years have consisted of fish from the 1989-1991 year-classes. However, in 1999, the 1995 year-class began to be harvested as small fish (43-45 cm), which explains the drop in the mode of catches.

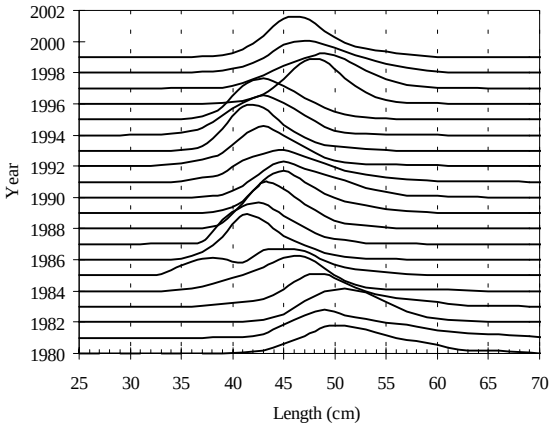

Figure 3. Size structure of Greenland halibut caught with gillnets, 1980 to 1999.

The proportion of females in catches fluctuated between 40% and 70% until 1995, and then rose in 1996 and 1997 (85% and 75%) because of the increase in mesh size and the faster growth of females in the stronger year-classes. The percentage of females fell to 65% in 1998 because the males in the 1989-1991 year-classes were now fully recruited to the fishery. In 1999, the proportion of females increased to 76%, primarily because females from the 1995 year-class (43-45 cm) were appearing.

Gillnet Catches Per Unit of Effort (CPUEs)

The CPUEs of gillnet fishers were calculated using two sets of data: Index Fisher data since 1991 and logbook data from vessels over 45 feet since 1996. The two sets of data were combined to calculate an annual standardized catch rate for 1996-1999, when the mesh size used was 152 mm (6.0 in.). A study of the soak time for these four years showed that fishers hauled their nets less frequently in 1999 (most common period: 3 days) than in 1998 (most common period: 1 day). This change probably resulted from the implementation of individual quotas and the harsh weather conditions observed in 1999, especially in the fall. Standardized CPUEs rose steadily from 1996 to 1998, but fell by 19% in 1999 (Figure 4).

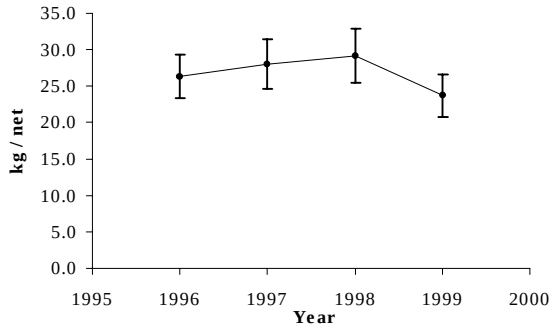

Figure 4. Standardized catches per unit of effort (CPUEs) of gillnet fishers, 1996 to 1999.

Resource Status

DFO Research Survey

A groundfish trawl survey has been conducted by the DFO vessel *Alfred Needler* in the northern Gulf and the St. Lawrence estuary every August since 1990. The catch distribution indicates that the highest densities are found in the St. Lawrence estuary, the areas west and northeast of Anticosti Island and near the west coast of Newfoundland, in the Esquiman Channel (Figure 5). Since 1995, the stock's range has been expanding especially south of Anticosti Island.

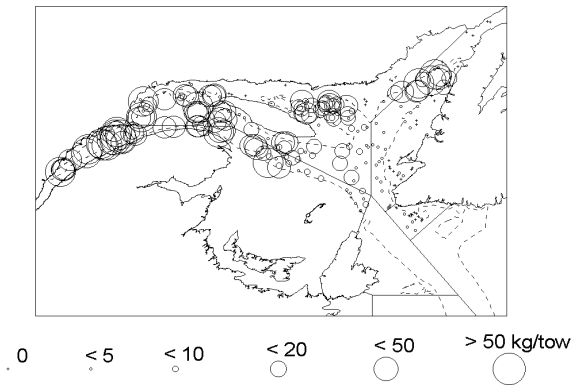

Figure 5. Summer distribution of Greenland halibut, according to DFO 1999 summer research survey.

The biomass index (in kg/tow) derived from the survey has shown an upward trend since 1993 (Figure 6). The highest value in the series was observed in 1999. The highest catch rates (kg/tow) were recorded in Divisions 4S and 4T. The average proportions of the biomass by division since 1990 are 9% for 4R, 50% for 4S and 41% for 4T.

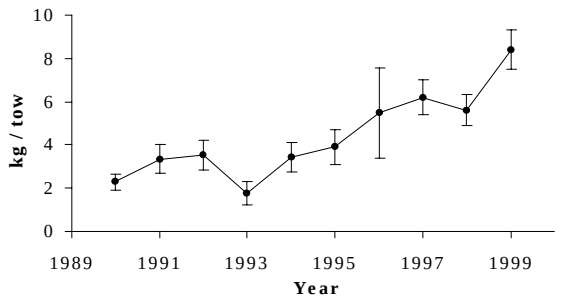

Figure 6. Biomass index (in kg/tow) of Greenland halibut for Divisions 4RST, estimated for the DFO research survey.

The size structure of the DFO research survey catches shows two strong recruitment pulses (Figure 7): the first in 1990-92, for the 1989-91 year-classes, and the second in 1996-99, for the 1995 and 1997 year-classes (the peaks of these classes are between 15 and 20 cm in Figure 7). The 1992-1994 year-classes occurring between the two pulses were smaller. The 1997 year-class is the largest in the series and should start to appear in the fishery in 2001 as the average size of these fish will be just under the minimum size limit (44 cm). It is expected that catches in 2001 will have an abundance of fish measuring 44 cm and under, which will make it more difficult to comply with the small fish protocol. The abundance of the last year-class (1998) appears to be close to average, but another year of sampling is needed to determine its size more accurately.

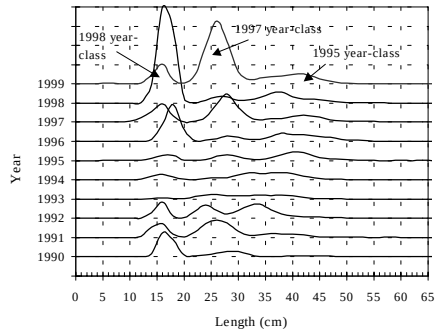

Figure 7. Size structure of Greenland halibut catches, according to DFO research surveys.

Sentinel Surveys for Cod

Since 1995, ten sentinel surveys for cod have been conducted in Divisions 4RST3Pn by nine otter trawlers. Five of the surveys were done in the summer (July-August 1995 and July 1996-1999) and five in the fall (November 1995 and October 1996-1999). These surveys did not cover the St. Lawrence estuary, where 20% of the biomass is found according to the DFO research survey.

The biomass indices (kg/tow) have been increasing since 1995 (Figure 8), but the index decreased in 1999 for the October survey. However, the confidence interval for this estimate is very high and two strata in Division 4T that normally contain Greenland halibut were not covered.

The length frequencies derived from the July and October sentinel surveys are similar and indicate the presence of a large number of juveniles and prerecruits as in the DFO survey (Figure 9). The 1995 and 1997 year-classes are also heavily represented in catches.

The abundance of fish measuring 44 cm and over (minimum size limit for the fishery since 1997) was stable in the 1996-1999 sentinel surveys, but declined in 1997 and 1998 according to the DFO summer research survey. This difference may be due either to a real drop in abundance, or to the *Alfred Needler's* decreasing ability to catch fish as they grow in size. There was an increase in fish measuring 44 cm and over in 1999; this increase was largely due to the arrival of females in the 1995 year-class.

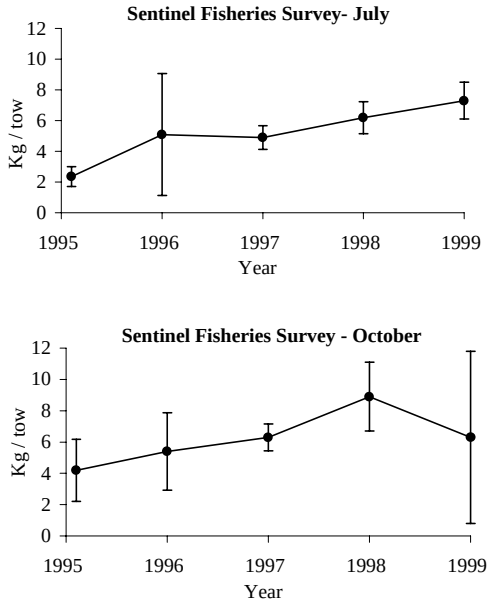

Figure 8. Biomass indices (kg/tow) of Greenland halibut from sentinel surveys in the Gulf of St. Lawrence. The St. Lawrence estuary is not covered by these surveys.

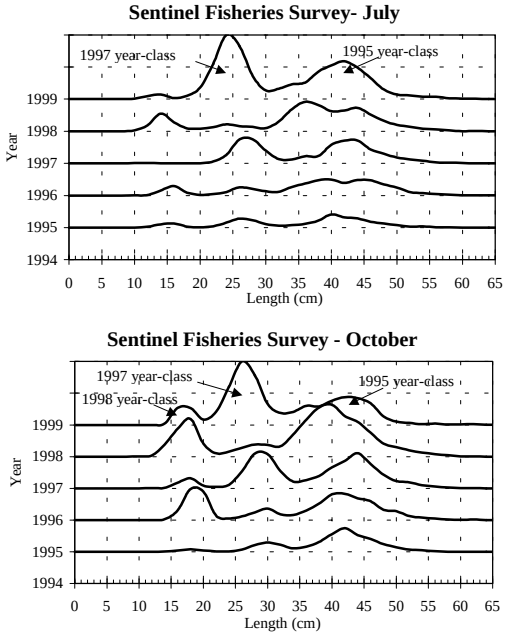

Figure 9. Size structure of Greenland halibut catches, according to sentinel surveys since 1995.

Exploitation Rates

Estimates of the Greenland halibut exploitation rate were calculated using numbers at length from the commercial fishery and from DFO survey catches. These rates were at their lowest level in 1995-1996 and then rose for all sizes harvested, with a particularly pronounced increase for fish measuring 50 cm and over, as a result of the introduction of the 152-mm mesh size (Figure 10). These increases can be explained by the increased TAC and the entry of smaller year-classes (1992 to 1994) in the fishery. Exploitation rates dropped in 1999 since part of the TAC was not fished and is still available for spring 2000. The arrival of a new year-class (1995) also played a part in decreasing exploitation rates for fish measuring close to the minimum size (between 43 and 45 cm).

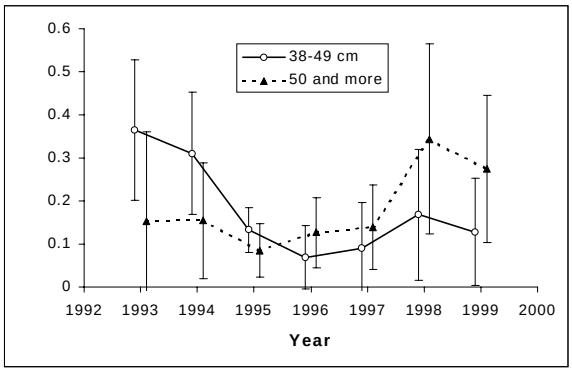

Figure 10. Mean estimated exploitation rates based on fishery catches and the DFO survey.

Industry Point of View

For many fishers, the introduction of individual quotas for traditional fishers had an impact on the fishing season: a smaller effort at the beginning of the season and a longer fishing season. Furthermore, some fishers said that their yields were lower in 1999 than in 1998 and that there were fewer large fish in their catches. Finally, the fact that more females than males are being caught remains a concern to a number of fishers.

Outlook

Catches per unit of effort (CPUEs) in 1999 seem to indicate a decrease in the exploitable component of the stock. As mentioned in last year's assessment, recruitment was low between 1992 and 1994, which would explain the drop in CPUEs. This decrease, along with the larger TAC over the past few years, led to an increase in the exploitation rate between 1996 and 1998 for all sizes harvested, but with a particularly pronounced increase for fish measuring 50 cm and over as a result of the introduction of the 152-mm mesh size. The exploitation rate dropped in 1999 since part of the TAC has not been harvested and is still available for spring 2000. The arrival of a new year-class (1995) has also helped to accentuate this decrease for fish measuring close to the minimum size (between 43 and 45 cm).

The biomass index derived from the DFO research survey has been on the increase since 1993, with the highest value recorded in 1999. The biomass indices from the July and October sentinel surveys have also been increasing since 1995.

The juvenile and prerecruit abundance indices from the research surveys show that the 1995 and 1997 year-classes are more heavily represented than the preceding year-classes (1992-1994). Beginning in 2000, the 1995 year-class should make a substantial contribution to the catches of the commercial fishery. If the natural mortality rate is not too high for the 1997 year-class, it should become accessible and contribute significantly to the fishery as of 2002. Accordingly, the outlook for this stock is good for the next few years.

References

DFO, 1999. Gulf of St. Lawrence (4RST) Greenland Halibut. DFO-Science, Stock Status Report A4-03 (1999).

Morin, B and B. Bernier. 2000 Assessment and Biology of Greenland Halibut (*Reinhardtius hippoglossoides*) in the Gulf of St. Lawrence (4RST) in 1999. Res. Doc. DFO Atlantic Fisheries 00/ (In prep.).

For more information:

Bernard Morin
Maurice Lamontagne Institute
850 Route de la Mer
Mont Joli, Quebec
G5H 3Z4
Tel.: (418)775-0695
Fax: (418)775-0740
E-mail: morinb@dfo-mpo.gc.ca

Correct citation for this publication:

DFO, 2000. Gulf of St. Lawrence (4RST) Greenland Halibut. DFO–Science, Stock Assessment Report A4-03 (2000).

This report is available from the:

Regional Stock Assessment Office,
Department of Fisheries and Oceans,
Maurice-Lamontagne Institute,
P.O. Box. 1000, Mont-Joli,
Quebec, Canada
G5H 3Z4

Email: Stocksrl@dfo-mpo.gc.ca

ISSN 1480-4913

La version française est disponible à l'adresse ci-dessus.

Pêches et Océans Canada | Fisheries and Oceans Canada
Sciences | Science