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. Studies conducted in the early 1990s showed that the Gulf halibut was a distinct population and could therefore be managed as a separate stock. Parasite 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 below 2 000 t in both cases. In more recent years, the fishery has been characterized by low yields and catches with a preponderance of small, immature fish. Since 1995, conservation measures (reduction in fishing effort, increase in mesh size, small fish protocol) have been implemented to address these problems.

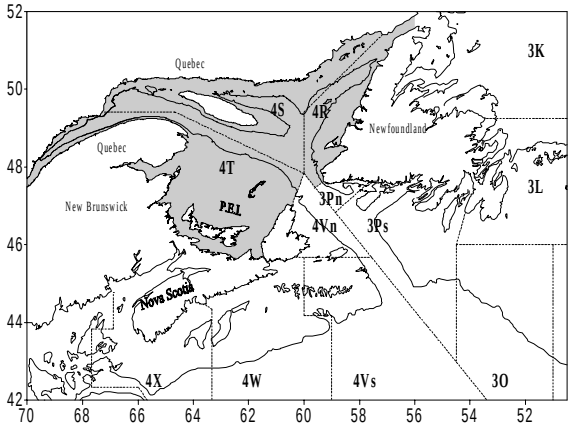

Figure 1. Map of Gulf of St. Lawrence and adjacent areas, showing NAFO Divisions 4RST.

Summary

- The catches per unit of effort (CPUEs) of Quebec gillnet fishers increased in 1998 and the summer fishing season was short. In Division 4R, however, the limited information available on catch rates indicates a drop in CPUEs and a slightly longer summer fishing season.
- The biomass index from the DFO's research survey has shown an upward trend since 1990. The highest estimates were recorded in the last three years. The biomass indices of the sentinel fishery surveys conducted in July and October have been rising since 1995.
- The juvenile abundance indices from the research surveys show that the 1995 and 1997 year-classes are the largest since 1990.
- Because of the rapid growth of the 1995 year-class, the average size of these fish will fall slightly below the minimum size limit (44 cm) and may well lead to large catches of fish under 44 cm in 1999.

Introduction

Greenland halibut (commonly called turbot) is a flatfish found at depths of up to 1500 m (830 fathoms) in the North Atlantic. In the Gulf of St. Lawrence, the halibut are generally found at shallower depths of between 130 and 500 m (70–280 fathoms).

In the summer, the main concentrations of Greenland halibut are found in the St. Lawrence estuary, west of Anticosti Island and, to a lesser extent, north of Anticosti and near the west coast of Newfoundland, in the Esquiman Channel. In winter, major concentrations of the species are found in Cabot Strait, which suggests that Gulf halibut, like a number of other species, migrate toward Cabot Strait at this time of the year.

The Fishery

Landings (thousands of tonnes)

Year	'77–'93 avg.	1994	1995	1996	1997	1998[1]
TAC	—	4	4	2	3	4
Fixed gear	3.2	3.5	2.3	1.9	2.6	3.9
Mobile gear	1.4	0	0	0	0	0.1
Total	4.6	3.6	2.3	1.9	2.6	4.0

[1] *Preliminary figures*

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 mobile gear because of the moratorium on cod fishing and because use of the Nordmore grate has been made mandatory for shrimpers. Furthermore, trawlers are not allowed to target Greenland halibut.

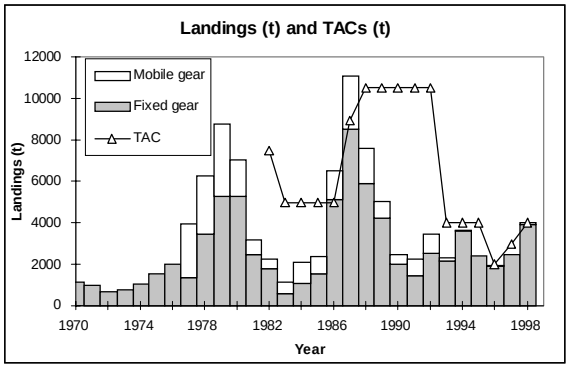

Figure 2. Greenland halibut landings and total allowable catch (TAC) since 1970.

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 1998 put landings at 3,989 t. The total allowable catch (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. Landings in 1998 were therefore more or less equal to the TAC. This change can be explained by the fact that most of the allocations assigned to mobile gear have temporarily been transferred to fixed gear.

In 1998, 59% of the catch came from Division 4T, 24% from 4S and 17% from 4R. The length of the fishing season has decreased sharply since 1994 (going from six months to less than two months) because allocations have been caught in shorter and shorter time spans. The summer fishing season in Quebec was cut from seven to five weeks between 1996 and 1998, despite increases in the TAC. For Newfoundland fishers, in contrast, the trend has been different, since their shortest summer fishing season was in 1997.

Fishery Management

Further to the Fisheries Resource Conservation Council's (FRCC) 1994

recommendations to reduce fishing effort and the number of immature fish taken, major conservation measures 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 in 1997 and 1998) 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 nets).

In 1998, Area 4Tp (west part of the St. Lawrence estuary) had to be closed in the middle of the summer fishing season because too many undersize (less than 44 cm) fish were caught. In the sector northeast of Anticosti Island, new fishers obtained temporary permission to use nets with a smaller mesh (140 mm) because of the late season (fall) and the fact that no 152 mm (6 in) nets were available. In 1999, these new fishers are going to use the same mesh as the others, i.e. 152 mm. Lastly, an area north of Anticosti Island had to be closed to the shrimp fishery for the remainder of the season because shrimpers had caught too many small Greenland halibut there.

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 average length of catches to decline again. In 1995, most Greenland halibut caught by gillnet were 40–45 cm long, with a mode of 42 cm consisting primarily of fish born in 1989 and 1990. After the mesh size was raised to 152 mm (6 in), the dominant length of fish caught increased from 42 to 48 cm. This mode went up to 49 cm in 1997 before falling back to 47 cm in 1998. The drop can be explained by catches of smaller fish in some areas (upper St. Lawrence estuary [4Tp] and northeast of Anticosti Island [4Sv]).

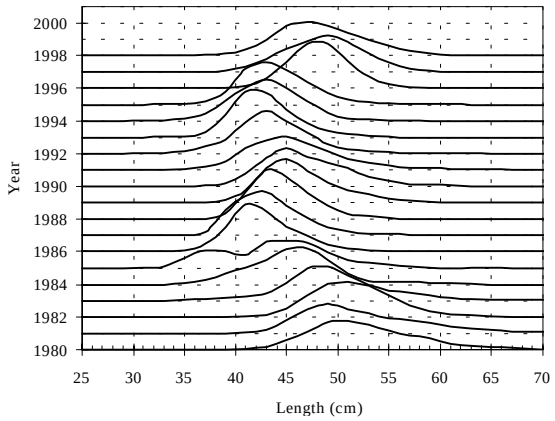

Figure 3. Size structure of Greenland halibut caught with gillnets, 1980 to 1998.

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. As predicted in last year's report, the proportion fell to 65% in 1998 because the males in the 1989–1991 year-classes are now fully recruited to the fishery.

Catch Per Unit of Effort (CPUE)

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 a standardized catch rate for each of the two periods (1991–1995 and 1996–1998) — one prior to the change in mesh size in 1996 and the other after it.

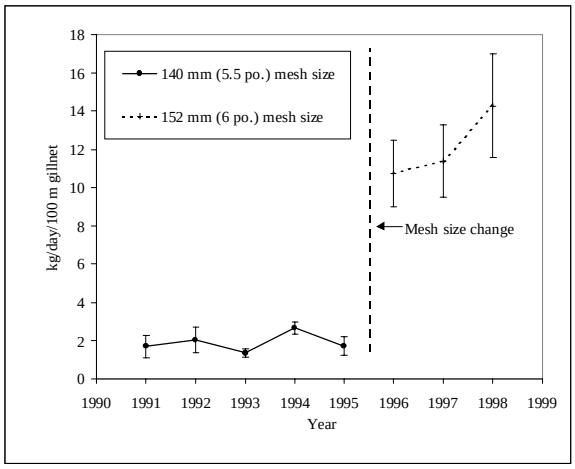

Figure 4. Standardized catches per unit of effort (CPUE) of gillnet fishers.

The CPUEs of gillnet fishers were generally much higher from 1996 to 1998 than from 1991 to 1995 despite the increase in mesh size (Figure 4). Standardized CPUEs rose by 25% in 1998. However, an examination of CPUEs by division shows that the catch rates of Index Fishers (three fishers in 1998) from Newfoundland in Division 4R fell in 1998 compared with 1997.

Shrimper Bycatch

The Greenland halibut bycatch of shrimpers from Divisions 4RST has been monitored by a team of observers in the last few years. This catch was larger in 1998 and a monthly examination of length frequencies indicates that most of the fish are under 20 cm and belong to the 1997 year-class. In April, the mode was 12–13 cm, and growth of close to 5 cm was observed in September.

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 areas west and north of Anticosti Island (Figure 5). Another, weaker concentration has been observed in the Esquiman Channel, near the west coast of Newfoundland. Since 1995, the stock's range has been expanding south and north of Anticosti Island.

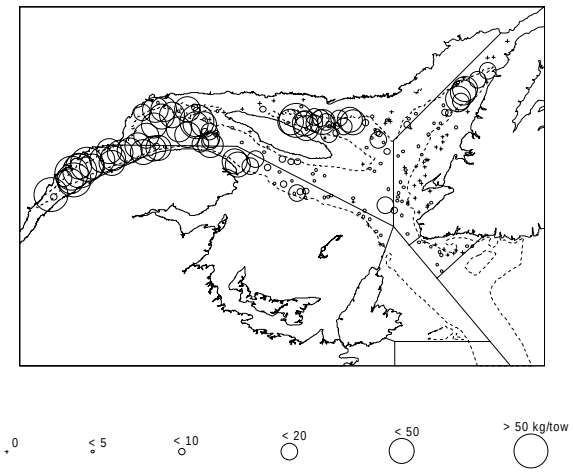

Figure 5. Summer distribution of Greenland halibut, according to the 1998 DFO research survey.

The biomass index derived from the survey has shown an upward trend since 1990, but has risen more sharply since 1996 (Figure 6). The highest values in the series were observed in the last three years. The highest average weights were recorded in Divisions 4S and 4T. The average proportions of the biomass by division since 1990 are 8% for 4R, 50% for 4S and 42% for 4T.

The size structure of the summer survey catches shows two strong recruitment pulses (Figure 7): the first in 1990–92, for the 1989–91 year-classes, and the second in 1996–98, for the 1995 and 1997 year-classes (the peaks of these year-classes are between 15 and 20 cm). Between the two pulses, the year-classes are less abundant (1992–1994 year-classes). The last year-class (1997) is the largest in the series and should be recruited to the fishery in 2002–2003.

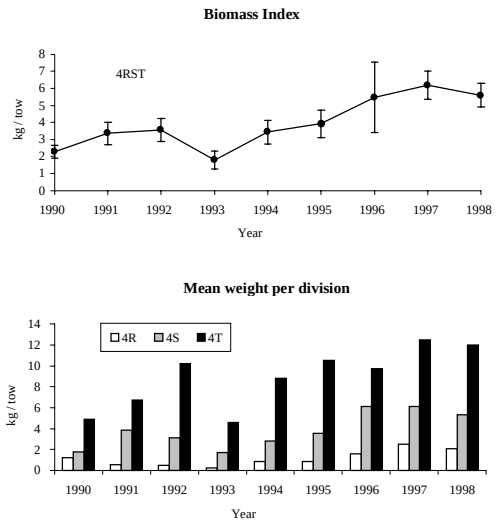

Figure 6. Average weight (kg/tow) of Greenland halibut for Divisions 4RST, and by division, according to DFO summer survey.

An examination of the length frequencies from the summer survey shows that recent year-classes have a much higher rate of growth than those in the early 1990s. Furthermore, a comparison of these data with the shrimper bycatch data indicates that the fish in year-classes observed for the first time on the *Alfred Needler* are one year old.

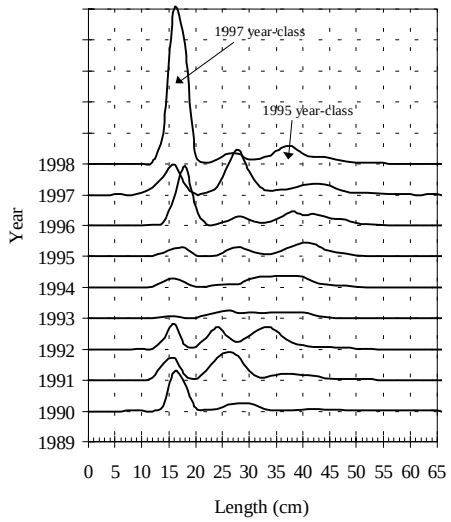

Figure 7. Age structure of Greenland halibut caught since 1990, according to DFO summer research survey.

Size at Maturity Based on DFO Research Survey

Following the FRCC recommendation to reduce catches of immature fish, a minimum size limit was introduced by management as a conservation measure. The size of females at maturity has been monitored since 1995 and provides a benchmark for establishing the limit. The size at which 50% of females reach maturity was estimated to be 50 cm in 1998. This estimate, based on visual criteria, was made during the summer survey in August, in other words, several months before spawning begins in January. A microscopic analysis of ovaries revealed evidence of maturity that could not be seen with the naked eye. On the basis of these histological criteria, the size at which 50% of females reach maturity was estimated to be 46 cm in 1998. This latter estimate is considered to be more accurate than the one made visually. Applying these maturity patterns to the length frequencies of females caught by gillnet in 1998 shows that approximately 30% of them were immature according to the histological criteria (L50 at 46 cm) as opposed to approximately 60% of them according to the visual criteria (L50 at 50 cm).

Sentinel Surveys for Cod

Eight surveys under the sentinel fisheries program for cod have been conducted in Divisions 4RST3Pn by nine otter trawlers since 1995. Four of the surveys were done in the summer (July-August 1995 and July 1996–98) and four in the fall (November 1995 and October 1996–98). 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 have been increasing since 1995, especially the one for October (Figure 8). For both the summer and fall surveys, the highest values were recorded in 1998.

The length frequencies from the July and October sentinel surveys are similar. The 1995 year-class seems heavily represented (Figure 9). The 1997 year-class is also well represented in catches.

The abundance of fish measuring 44 cm and over (minimum size limit for the fishery in 1997 and 1998) was similar in the sentinel surveys of 1997 and 1998, but declined in 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.

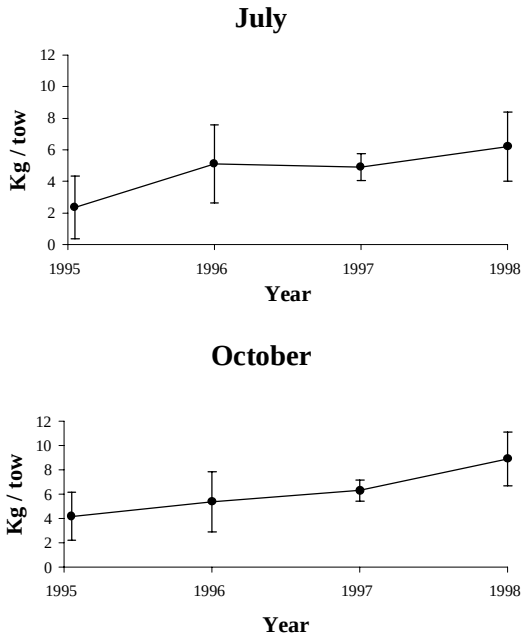

Figure 8. Biomass indices (kg/tow) of Greenland halibut, according to sentinel surveys in the Gulf of St. Lawrence.

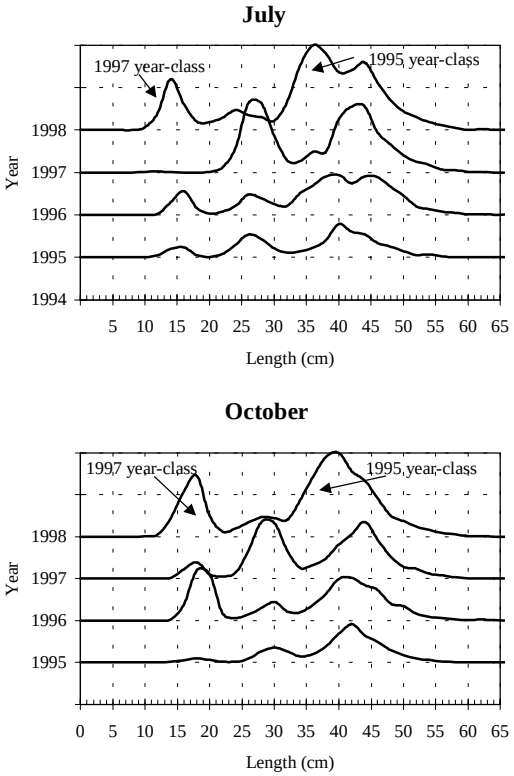

Figure 9. Size structure of Greenland halibut catches, according to sentinel surveys since 1990.

Industry Point of View

All Greenland halibut fishers in Quebec report that the stock is in good condition.

The major reduction in fishing effort since the early 1990s and the mandatory use of the Nordmore grate by shrimpers are perceived by fishers as contributing factors in the recovery of the stock. However, the fact that more females than males are still being caught is a concern to fishers, despite the drop in this proportion in 1998.

Outlook

The CPUEs of gillnet fishers in Quebec increased in 1998 and the summer fishing season was short, indicating that the resource can be harvested without too much trouble. In Division 4R, however, the

limited catch rate data available show a drop in CPUEs and a slightly longer summer fishing season.

The biomass index derived from the DFO research survey has been on the increase since 1990, but has risen more sharply since 1996. The highest values in the series were observed in the last three years. The biomass indices from the July and October sentinel surveys have been increasing since 1995, chiefly in Divisions 4T (St. Lawrence estuary not covered) and 4S. In Division 4R, the indices are stable. Comparison of landings on the basis of biomass distribution seems to indicate that harvesting is more intense in Division 4R (Esquiman Channel) than west of Anticosti Island (4ST). It is hard to assess the significance of this observation, however, since little is known about the movements of Greenland halibut between the main areas of its summer range.

The juvenile abundance indices from the research surveys show that the 1995 and 1997 year-classes are much more heavily represented than the preceding year-classes (1992–94). 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 to the fishery in 2002–2003. Because of the rapid growth of the 1995 year-class, the average size of these fish will be slightly below the minimum size limit (44 cm). Large catches of fish 44 cm or less in length can therefore be expected in 1999.

For more information:

Morin, B and B. Bernier. 1999 Assessment and biology of Greenland Halibut (*Reinhardtius hippoglossoides)* in the Gulf of St. Lawrence (4RST) in 1998. Res. Doc. DFO Atlantic Fisheries 99/ (In prep.).

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