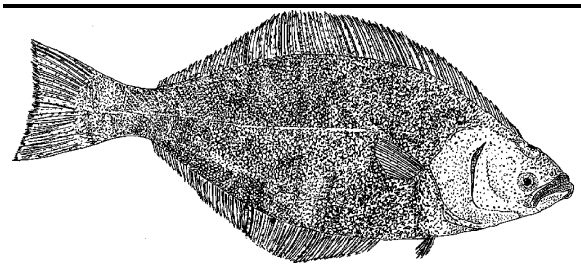

Greenland Halibut in the Gulf of St. Lawrence (4RST)

Background

The Greenland halibut (turbot) of the Gulf of St. Lawrence are considered to form a small stock that is separated from the main Northwest Atlantic population, which inhabits the area to the east and north of the Grand Banks of Newfoundland. Studies conducted in the early 1990s showed that the Gulf halibut constituted a separate population and could therefore be managed as a stock.

Greenland halibut catches have fluctuated widely since the directed fishery began in the mid-1970s. Two years with record high landings (9,000 t in 1979 and 11,000 in 1987) were followed in each case by sharp declines to a catch level below 2,000 t. In more recent years, fishing has been characterized by low yields and catches with a predominance of small immature fish. In 1995, conservation measures (reduction in fishing effort, increase in mesh size, implementation of a small fish protocol) were adopted in order to solve these problems.

Introduction

The Greenland halibut (commonly called turbot) is a flatfish species that lives at depths of up to 1500 m (830 fathoms) in the North Atlantic. In the Gulf of St. Lawrence, these fish are generally found at shallower depths, between 130 and 500 m (70-280 fathoms). The main summer concentrations of Greenland halibut occur in the St. Lawrence estuary, to the west of Anticosti Island and, to a lesser extent, north of this island and near the west coast of Newfoundland in the Esquiman Channel.

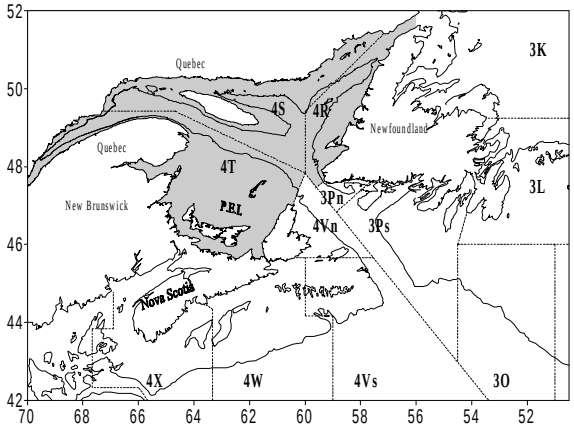

Figure 1. Map of the Gulf of St. Lawrence and nearby regions showing the NAFO 4RST divisions.

Stock structure

The Greenland halibut that inhabit the Gulf of St. Lawrence are isolated from the stocks located to the east and north of the Grand Banks of Newfoundland. Their distribution throughout the Laurentian Channel area can be examined by combining data from the groundfish survey in the Gulf, with those from the Newfoundland Region survey conducted in NAFO divisions 3P4V during the same period using similar gear. The only large concentrations are those found at the heads of channels in the northern and western Gulf of St. Lawrence, whereas extremely small concentrations are found in the area extending to the edge of the continental slope, in divisions 4V, 3P and 3O (figure 2).

Recent research on parasites has helped to complete out the initial studies used to define the stock. All of the Greenland halibut from the Gulf, the Laurentian Channel and the adjacent area can be clearly separated from those of Labrador and the northern part of the Grand Banks. Moreover, in summer

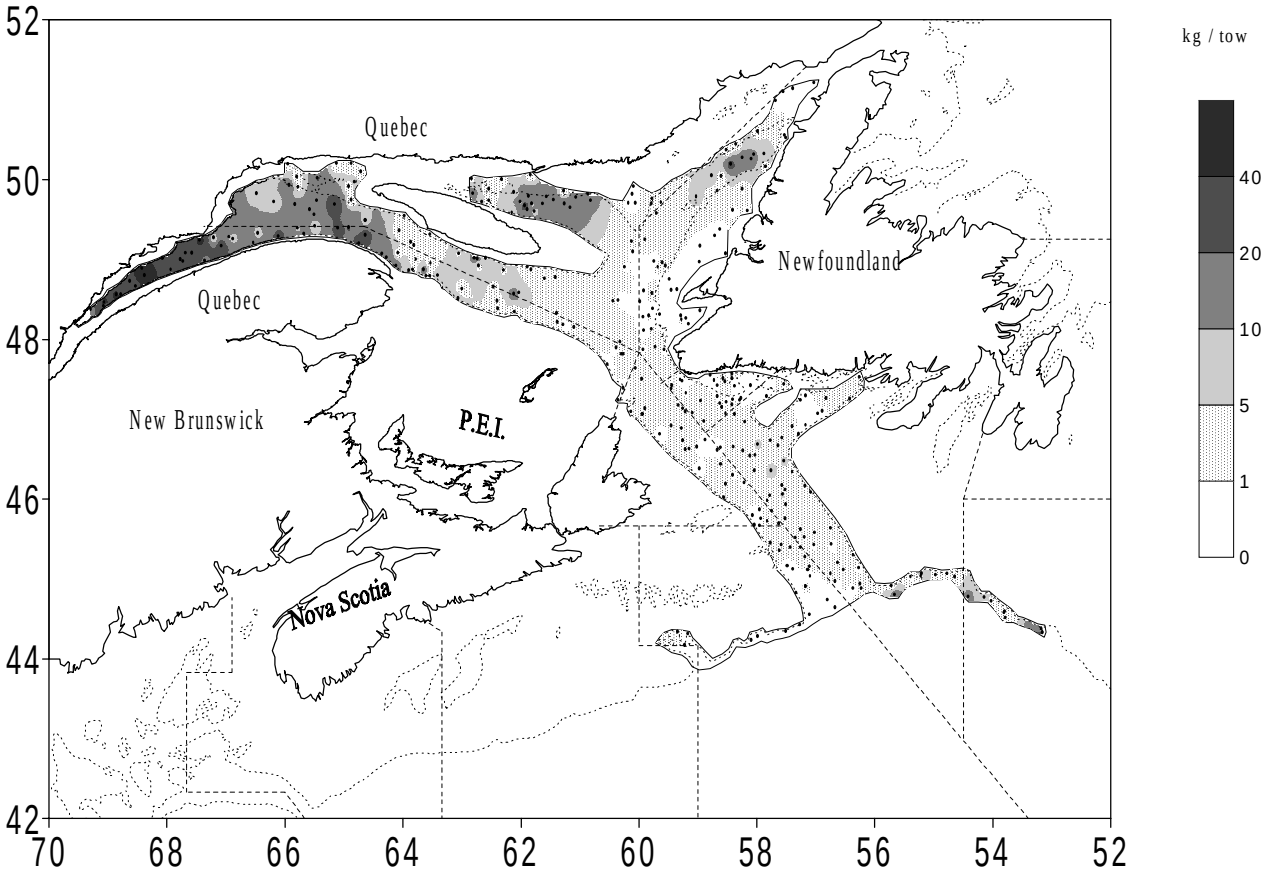

Figure 2. Summer distribution of Greenland halibut determined from summer research surveys in 1997. The data for the region outside the Gulf come from a redfish survey conducted by the Newfoundland Region. Positions of the stations sampled are indicated by a dot.

the halibut coming from the interior of the Gulf can be distinguished from those caught farther east, in divisions 3P and 4V, although the low densities of fish in the eastern part of the study area make this distinction of little relevance. Consequently, it can be concluded that Greenland halibut do not leave the Gulf once they have matured and they complete their entire life cycle inside the Gulf.

In winter, there are large concentrations of Greenland halibut in the Cabot Strait area, which are not present in the summer. Whereas these concentrations cannot be distinguished from those found in the Gulf in summer, they can be differentiated from the eastern concentrations in divisions 3P and 4V. The Gulf turbot therefore appear to migrate during the winter toward the Cabot Strait region, like a number of other species, which means that the landings from this area should be recorded as catches of the Gulf stock.

Growth and reproduction

The estimated growth curves for 1996 indicated that males and females grow at basically the same rate up to age five. At this age (35-40 cm), males reach sexual maturity and begin to grow more slowly than females (figure 3).

Greenland halibut generally spawn between January and April. Accordingly, groups of spawning Greenland halibut are taken in the deep waters of the Laurentian Channel dur-

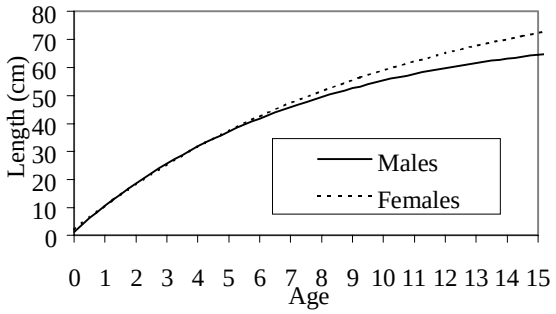

Figure 3. Growth rate of 4RST Greenland halibut in 1996.

ing winter trawl surveys and post-spawning females were caught in April 1997.

In 1995, the FRCC expressed concern about the large quantities of immature Greenland Halibut being caught in this fishery. For this reason, the Council recommended that "measures be implemented to permit young turbot to mature, including implementation of a small fish protocol and increasing the mesh size of gill nets". In order to implement this recommendation, management has put in place a minimum size regulation (42 cm) in 1996, part of a long term plan to eventually increase this size to the length at which 50 % of females reach sexual maturity (L_{50}). In addition, this size will allow the conservation of males since they reach sexual maturity at a smaller length than females. Thus, substantial efforts have been made since 1996 to establish the length at maturity of females with more precision.

The length at which 50% of females reach sexual maturity was estimated at 49-50 cm between 1995 and 1997. These estimates, based on visual criteria, were made during the summer survey, in August, hence several months before spawning begins (January). Preliminary results from microscopic analyses of ovaries have revealed evidence of maturation that cannot be seen with the naked eye. At present, a maturity ogive cannot be computed from those results.

Table 1. Landings (thousands of tonnes)

Year	77-92[2]	1993	1994	1995[1]	1996[1]	1997[1]
TAC	-	4	4	4	2	3
Fixed gear	3.3	2.6	3.5	2.3	1.9	2.5
Mobile gear	1.4	0.2	0	0	0	0
Total	4.7	2.8	3.5	2.3	1.9	2.5

[1] Provisional figures

[2] Average

Description of the fishery

Until the mid-1970s, Greenland halibut landings in 4RST consisted primarily of by-catches of other species. 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, the catches made by the mobile gear fleet have been almost nil because of the moratorium on cod fishing and the mandatory use of the Nordmore grate imposed on shrimpers. In addition, directed fishing by trawlers is banned.

The catch data series shows two peaks: the first in 1979 (8,800 t) and the second in 1987 (11,000 t) (figure 4). In 1988, catches began a steep downturn, falling as low as 2 306 t in 1991, and since then have ranged from 2,000 t to 3,500 t. In 1997, preliminary landings totalled 2,459 t. The total allowable catch (TAC) was set at 4,000 t in 1993 and maintained at that level until 1995. In 1996, the TAC was reduced to 2,000 t; however, in 1997 it was raised to 3 000 t. In 1997 more than 60% of catches came from Division 4T. The length of the fishing season has decreased considerably since 1994 (from 6 months to less than 2) because quotas have been caught ever more quickly.

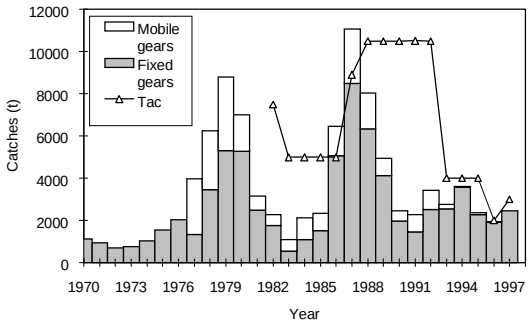

Figure 4. Landings of Greenland halibut and total allowable catch (TAC) since 1970.

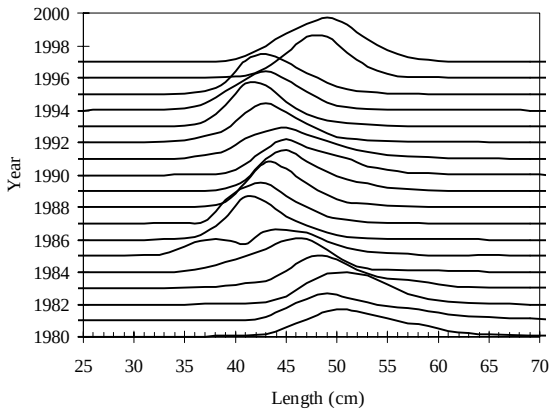

Figure 5. Size structure of Greenland halibut catches made with gillnets between 1980 and 1997.

Fishery management

In response to the FRCC's 1994 recommendations to reduce fishing effort and the quantity of immature fish taken, major conservation initiatives have been implemented since 1995. The main ones are: 1) increase in mesh size from 140 mm (5 ½ inches) to 152 mm (6 inches); 2) adoption of a fishing net configuration that is more selective; 3) establishment of a minimum size limit (42 cm in 1996 and 44 cm in 1997) along with a small fish protocol; 4) establishment of a dockside monitoring program; and 5) voluntary decrease in the number of nets used by Quebec fishers (from 120 to 80 nets).

Description of the catches

The average length of fish caught in gillnets fell sharply between 1980 and 1985 (figure 5). In 1986, the large 1979-80 year-classes began to recruit to the fishery, 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 then began to target new year-classes which were less abundant, causing the average length to again decline. In 1995, the majority of Greenland halibut caught in gillnets were 40-45 cm long, with a mode of 42 cm, and they were mainly from the 1988 and 1989 year-classes. After the mesh size was raised to 152 mm, the dominant length in creased from 42 to 48 cm. This mode increased to 49 cm in 1997.

The proportion of females in catches varied between 40% and 70% until 1995, and then increased in 1996 and 1997 (85% and 77%) due to the larger mesh size and the faster growth of females in the strong year-classes.

Catches per unit of effort (CPUE)

The catches per unit of effort (CPUE) of gillnet fishers were calculated from three sources of information: Index Fishermen data since 1991, the Observer Program since 1994 and logbook data since 1996 from vessels over 45 feet.

In general, the CPUEs of Index Fishermen for 1996 and 1997 were twice as high as those for the period 1991 to 1995 despite the increase in mesh size. The CPUEs in the Observer Program series indicate that there has been a gradual increase since 1994 (figure 6).

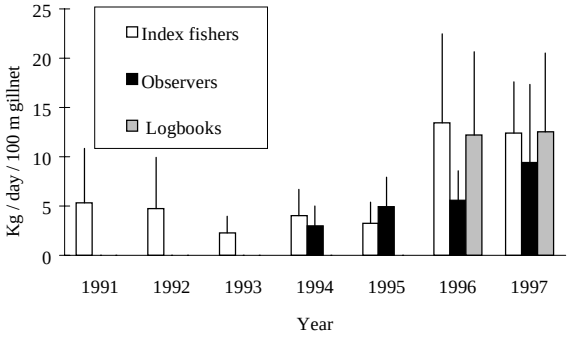

Figure 6. Catches per unit of effort (CPUE) of gillnet fishers.

Status of the resource

Research survey

A groundfish trawl survey has been conducted in summer in the northern Gulf and the St. Lawrence estuary since 1990. The biomass index derived from the survey shows an uptrend since 1990 and has nearly

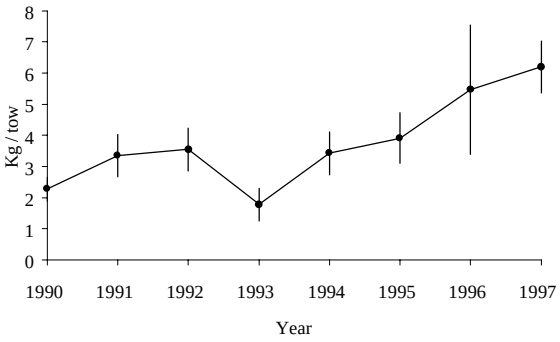

Figure 7. Biomass index (kg/tow) for Greenland halibut from the summer survey conducted in the Gulf of St. Lawrence.

tripled (figure 7).

The size structure of catches based on the summer survey (figure 8) shows two strong recruitment pulses: one in 1990-92, corresponding to the 1988 to 1990 year-classes, and another in 1996-97, representing the 1994 and 1995 year-classes (In the figure, the modes for these year-classes are situated between 15 and 20 cm). Between these two

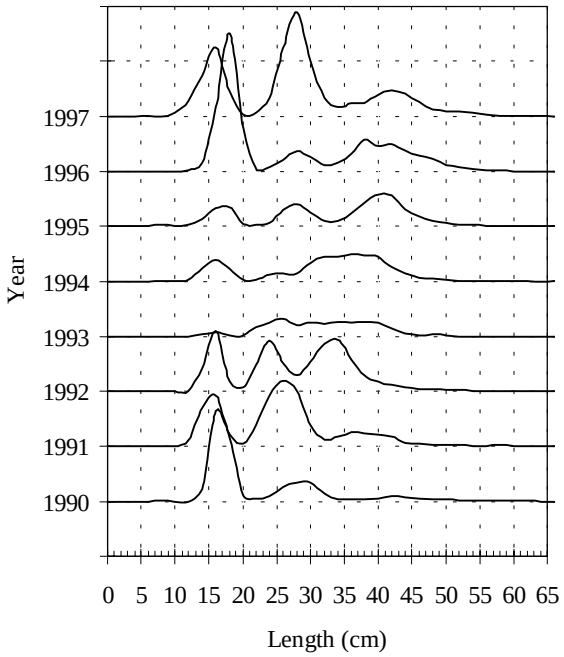

Figure 8. Size structure of Greenland halibut caught during summer research surveys since 1990.

pulses, the year-classes are less abundant (1993-95). Since 1995, there has been a significant increase in commercial size Greenland halibut (over 40 cm) and in the abundance of the spawning stock (figure 9).

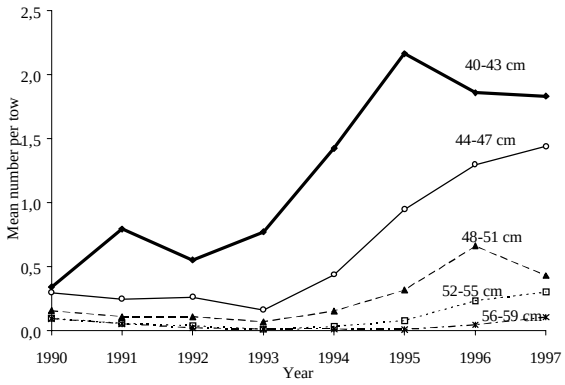

Figure 9. Abundance index (mean number per tow) of commercial size fish (> 40 cm).

Industry point of view

Industry members all agree that resource abundance has increased substantially since

1995. Moreover, some fishers compared the 1996 and 1997 catch rates to those of their best years (1986-88). Some thought that the increase in the size of fish caught and in CPUEs observed in 1996 resulted from the advent of large size fish from unharvested fishing sectors or from outside the Gulf. Finally, fishers are worried about the larger proportion of females caught since 1996.

Outlook

Between 1995 and 1997 there was an appreciable increase in the size of halibut caught in the fishery, and the size structure is now similar to that which existed in the early 1980s, when a mesh size of 152 mm (6 inches) was principally in use. The larger mesh size has led to a reduction in catches of immature halibut in the fishery. The CPUEs of gillnet fishers rose substantially in 1996 and 1997 despite the increase in mesh size.

The biomass index has been on the rise since 1990, but showed a more marked increase in 1996 and 1997. The abundance of juveniles rose considerably in 1996 and 1997 compared to the period 1993 to 1995. The research survey also shows an increase in the abundance of commercial size fish and in the spawning stock.

Recent catches were composed mainly of females from the large 1988 and 1990 year-classes. Given their fast growth rate, these halibut should become less and less vulnerable to the gillnets used by the commercial fishery (152 mm; 6 inches). Males from these year-classes, with their slower growth rate than females, are currently reaching sizes where they will be completely vulnerable to the fishery. They should thus start making up a larger proportion of commercial catches. Subsequent year-classes (1991-1993) are less abundant and should begin having an effect on the fishery in 1998. Finally, there are indications that recent recruitment (halibut born in 1994 and 1995) are abundant, but these fish should not make a noticeable contribution to the fishery before 1999 or 2000.

The Greenland halibut that concentrate in the Cabot Strait region in winter most likely come from the Gulf of St. Lawrence. If a fishery targeting this species is begun in the area, the catches should be recorded as deriving from the 4RST stock.

For more information

Morin, B and B. Bernier. 1997. Assessment and biology of Greenland Halibut (*Reinhardtius hippoglossoides*) in the Gulf of St. Lawrence in 1996 and 1997. Res. Doc. DFO Atlantic Fisheries 97/(In prep.).

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Published by

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G5H 3Z4

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