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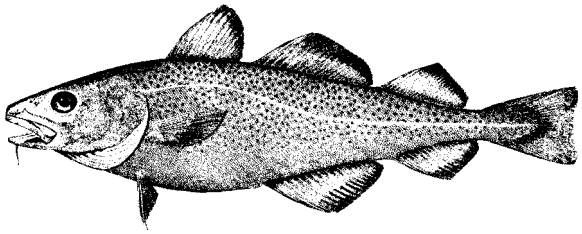
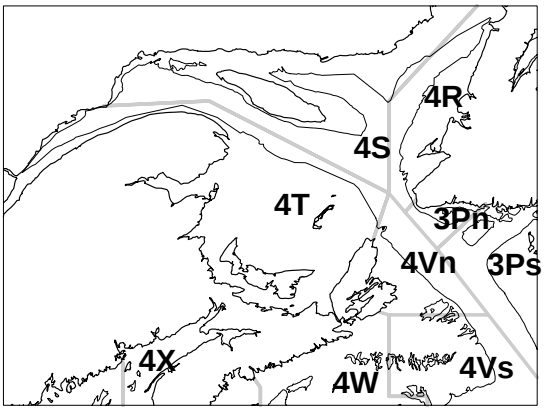
Gulf Region **Stock Status Report 2004/003**



Cod in the Southern Gulf of St. Lawrence



Background

Southern Gulf of St. Lawrence cod are relatively long lived, attaining ages of 20 or more when mortality is low. They begin to reach commercial size at age 4 and are fully available to the commercial fishery by age 8. They mature sexually at a size slightly below the commercial size of 41 cm (ages 4-5).

Southern Gulf cod are highly migratory. Spawning occurs in the Shediac Valley and around the Magdalen Islands from late April to early July. During the summer, the cod are widely distributed while they feed heavily on krill, shrimp, and small fish, primarily herring, Am. plaice and capelin. The fall migration out of the southern Gulf begins in late October and cod concentrate off western Cape Breton in November as they move into 4Vn. The stock overwinters in 4Vn and northern 4Vs, along the edge of the Laurentian Channel. The return migration usually begins in mid-April, although this can be delayed by late breakup of the winter ice. The management unit for this stock includes all of 4T and catches in 4Vn during November-April. In some years, catches in 4Vs in January-April are attributed to this stock

Southern Gulf cod have been exploited commercially since at least the 16th century. Landings varied between 20,000 and 40,000 t annually between 1917-1940, and then began to increase to a peak of over 100,000 t in 1958. The fishery was primarily prosecuted with hook and line until the late 1940s, when a ban on otter trawling was lifted. Landings remained relatively high in the 1960s and early 1970s at about 60,000 t. TACs were first imposed in 1974, and these became restrictive as the stock declined in the mid-1970s. The stock recovered somewhat and landings returned to about 60,000 t during the 1980s. During the 1980s, the fixed gear fishery declined drastically, and the fishery was mainly prosecuted by mobile gear until it was closed in September 1993, due to low abundance. A 3,000 t index fishery was allowed in 1998 and a TAC of 6,000 t was established in 1999. The fishery was open at that level from 1999 to 2002. Larger mesh sizes were in use in the mobile gear fishery during the re-opening. The directed fishery was closed again in 2003 due to a lack of recovery. The management year for the fishery now runs from May 15 of the current year to May 14 of the following year.

The most recent full assessment of the status of this stock was conducted in February 2003 (Chouinard et al. 2003; SSR 2003/016). This report updates fishery and survey data on this stock up to 2003.

Summary

- In 2003-2004, the directed fishery was closed. As of December 31, 2003, 291 t had been landed.
- The research vessel (RV) survey abundance index has been near the lowest levels in the series for over a decade (1992-2002).
- The index of stock status from the research vessel survey cannot be updated in 2003. The regular survey vessel, the CCGS *Alfred Needler*, was disabled shortly before the September survey and was replaced by the CCGS *Wilfred Templeman*. The relative fishing efficiency of the two vessels is unknown and portions of the survey area were either unsampled or under-sampled in 2003.
- Changes to the mobile sentinel surveys were implemented in 2003. The first synoptic mobile gear sentinel survey was conducted in August 2003. As such, catch rates in the survey cannot be compared to those of the program in previous years. During the survey, cod were found in most areas except for the central area of the southern Gulf.

- The sentinel longline index in 2003 is near the lowest level in the time series starting in 1995.
- Data from 2003 do not indicate that stock status has improved. Spawning stock biomass and recruitment are considered to be near lowest levels and no recovery is apparent.

The Fishery

The directed fishery was closed in 2003. Cod were caught in sentinel surveys and as by-catch in fisheries directed at some other species (mainly flatfish). Fishery management measures were expanded to limit the by-catch of cod in other groundfish fisheries. For example, a cap of 75 t was placed on the catch of cod in the Altantic halibut fishery. By-catch of cod in other fisheries was restricted to between 2 and 25% depending on the target species and observer coverage was increased. In addition, the recreational fishery was prohibited.

Landings (thousands of tonnes)

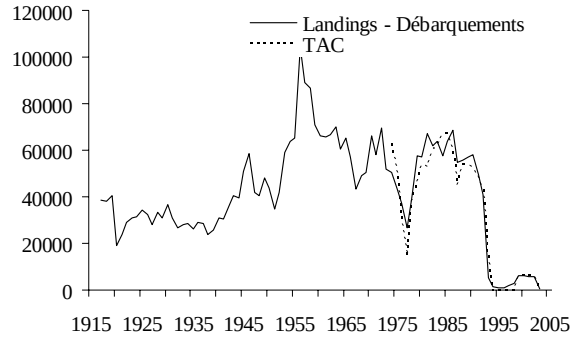
Year	1981-1990 Avg.	1991-1995 Avg.	1996-2000 Avg.	2001	2002	2003
Landings	61	20	4	6	6	0.3
TAC	59	21	3[1]	6[2]	6[2]	0[2]

1. An allowance of 3000 t for an index fishery in 1998.
2. TAC for May 15 to May 14 of the following year.

The total reported **landings** were 291 t in 2003, the lowest landings recorded for this stock unit in the period starting in 1917. Landings in the sentinel surveys used to obtain additional indices of abundance of the stock were 149 t, lower than in previous years.

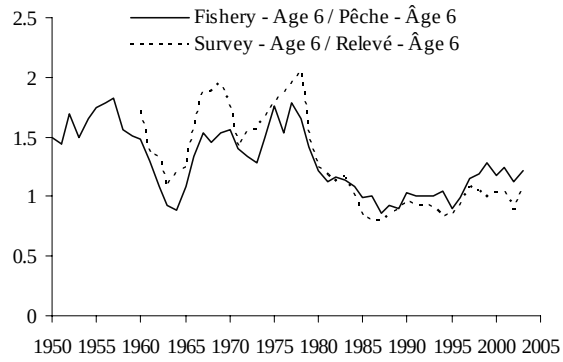
The reduction in sentinel catches was largely caused by a reduction in effort and other changes to the program. Catches of cod in other fisheries amounted to 142 t. Catch reporting in the commercial groundfish fishery is considered reliable. However, there were reports of unquantified catches in other fisheries.

Landings and TAC (t)



Ages seven to nine were the most important in the 2003 landings. Overall, the **average weights at age** of cod in the annual research vessel survey increased over 2002 but remain low relative to the period before 1980. Weights at age in the 2003 landings were generally higher than in 2002 but in the range of values observed in recent years.

Average weight (kg)



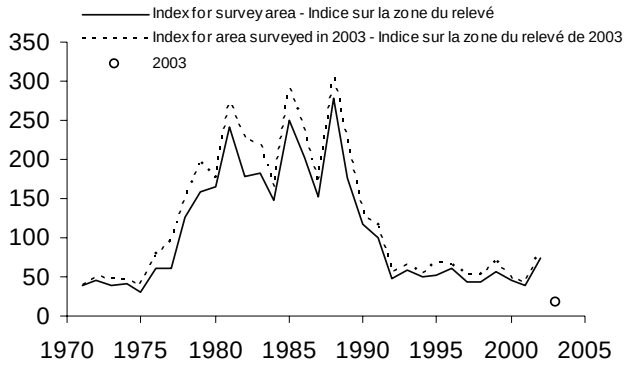
Resource Status

The **annual research vessel (RV) survey** has been conducted in September since 1971. The survey index indicates that the abundance of cod was low in the early to mid-1970s then increased to the early 1980s. Abundance was high until the late 1980s but declined rapidly to low levels by 1992. With the closure of the fishery in

1993, the decline was arrested but the abundance index has remained low.

In 2003, the survey vessel, the *CCGS Alfred Needler* was disabled shortly before the survey and was replaced by the *CCGS Wilfred Templeman*. The relative fishing efficiency of the two vessels is unknown. In addition, some areas were unsampled (the area east of the Magdalen Islands near the Laurentian Channel - strata 438 and 439) and others were under-sampled in 2003. In past years, catches in the area missed in the 2003 survey were lower than in the rest of the survey area.

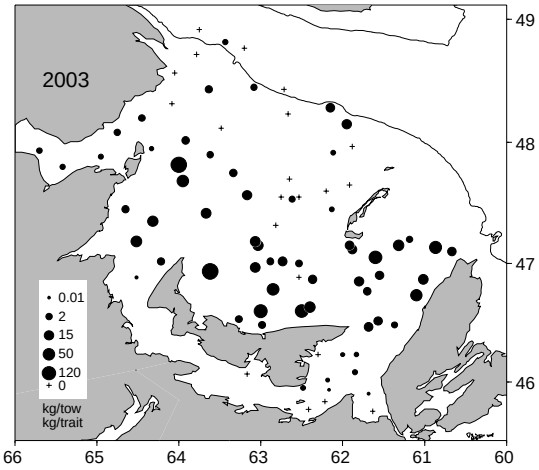
September research survey indices (Age 3+ numbers)



For the area surveyed, the average number of cod caught per tow in 2003 was 23.3. It is not known to what extent this low value may be caused by a difference in fishing efficiency between *CCGS Wilfred Templeman* used in 2003 and the *CCGS Alfred Needler* used in previous years. As a result, it is impossible to update the research vessel abundance index for the stock for 2003. Data from the September survey are used here primarily to examine the geographic distribution of cod in 2003.

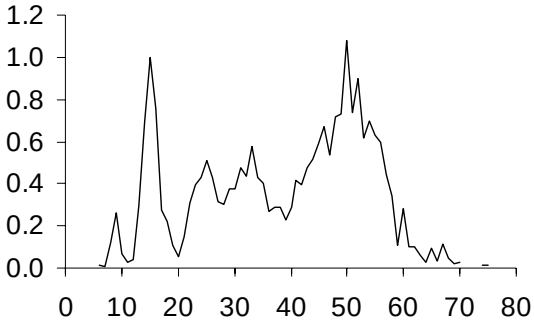
In recent years, areas of highest concentrations in the survey were found in the Shediac Valley, the north coast of PEI and in the area between the Magdalen Islands and Cape Breton. A similar pattern was observed in 2003.

Distribution of cod (kg) in the September 2003 research survey



The first four modes in the research survey **length frequency** represent cod of 0, 1, 2 and 3 years of age. The mode at about 50 cm represents a mixture of age-groups from about 6 to 8 years of age. Few cod larger than 70 cm (ages 13 to 15) were caught in the survey.

Length (cm) frequency of cod in the September 2003 research survey (numbers per tow)



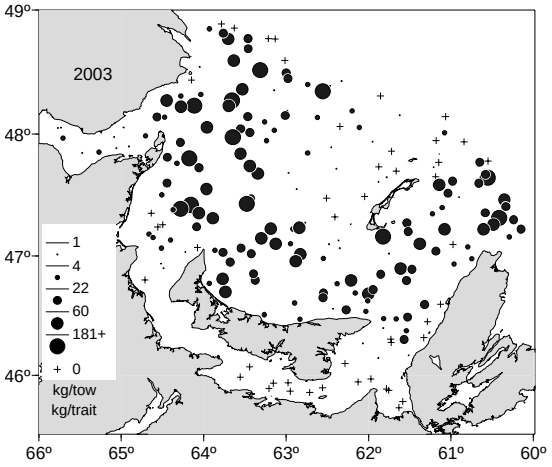
Because the efficiency of the vessel used in the 2003 survey is unknown, the relative abundance of the various age-groups is currently undetermined. In the last assessment of the stock, the 2000 year-class (age 3 – about 31 cm in 2003) was considered to be one of the lowest on record.

Following a review of the **sentinel survey** program, there were important modifications in 2003. The mobile gear sentinel survey of traditional fishing areas was discontinued

and replaced with a synoptic survey conducted in August by four commercial fishing vessels. This survey followed methods similar to the research survey conducted in September. In the fixed gear program, the gillnet index was discontinued but the longline program was retained with about the same amount of effort as in previous years. In total, 22 vessels were used to monitor cod abundance.

The four sentinel mobile gear vessels (trawlers) conducted the survey between August 4 and August 23, 2003. Each vessel used a standard trawl (300 Star Balloon) fitted with a 40 mm liner in the codend and lengthening piece. A total of 221 valid fishing sets were done.

Distribution of cod (kg) in the August 2003 otter trawl sentinel survey

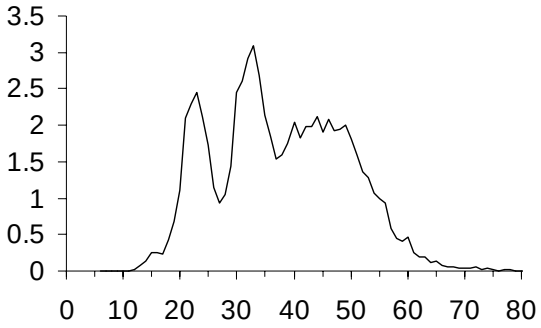


Analyses to examine relative fishing efficiency of the four trawlers at catching cod did not indicate significant differences between vessels. Since 2003 was the first year in which the mobile gear survey adopted a synoptic survey design, abundance cannot be compared to previous years. However, catches in 2003 provide an image of cod distribution in August.

The geographic distribution was mostly similar to that observed in the September research survey with areas of highest concentration in the Shediac Valley, the north coast of PEI and in the area between the Magdalen Islands and Cape Breton. However, concentrations were also found near the Gaspé Peninsula.

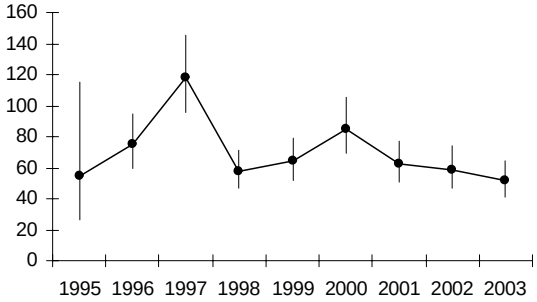
The first three modes in the length frequency at 15, 22 and 31 cm represent cod of 1, 2 and 3 years of age. The mode at about 40 to 50 cm represents a mixture of age-groups from about 5 to 7 years of age. As it is the first year of this survey, the relative abundance of these age-groups is currently undetermined. As in the September research survey, few cod larger than 70 cm were caught in the August survey.

Length (cm) frequency of cod in the August 2003 otter trawl sentinel survey (numbers per tow)



The **sentinel longline** survey was continued in 2003 and resulted in a catch of 138 t. Eighteen vessels fished at 42 reference sites. Standardized catch rates were slightly lower but not significantly different than in the previous 2 years.

Longline sentinel catch rate index



These are amongst the lowest in the time-series starting in 1995. Overall, the longline index does not suggest a significant trend in cod biomass over the time-series. The catch

rate of cod of three years of age in 2003 was the lowest in the time-series.

Sources of Uncertainty

The absence of the September research survey abundance index in 2003 is a major source of uncertainty.

The relative abundance of the 2000 year-class (age 3 in 2003) is uncertain. The first estimate of the 2000 year-class in the last assessment was low. The sentinel longline catch rate at age 3 was the lowest in the series in 2003; however, this gear does not catch a high proportion of this age-group. There is no reliable estimate of the relative abundance of the 2001 year-class (age 3 in 2004).

The estimate of natural mortality for this stock, which was considered to be high in recent years, continues to be a source of uncertainty for this stock. The changes in natural mortality of cod are consistent with changes in the abundance of grey seals in the area. In 2001, one analysis suggested that cod consumption by grey and harp seals in the southern Gulf of St. Lawrence may have been between 19,000 t and 39,000 t.

Fishers reported that un-quantified catches of cod in other fisheries occurred in 2003.

Outlook

The sentinel longline is the only available index of abundance and it suggests that the status of the stock is not significantly different than that described in the last assessment of the resource.

Although little interpretation of the results can be made from the September 2003 survey, the distribution pattern appears to be consistent with periods of low abundance. An increase in stock status could only be demonstrated if there was quite a large difference in fishing efficiency between the *CCGS Wilfred Templeman* and the *CCGS Alfred Needler*.

The 2003 mobile sentinel survey was the first survey conducted under the new sampling scheme and, as such, it does not provide an indication of abundance trends. However, the distribution was mostly similar to that of the September survey.

In the most recent assessment of the stock, spawning stock biomass was estimated to be near the lowest level observed and recruitment was estimated to be poor. The mid-term outlook (5 years) suggested that declines in spawning stock biomass were likely un-avoidable in the short-term, and rebuilding was unlikely even with no fishery. It was concluded that the strength of recent year-classes and the level of natural mortality would affect this conclusion but that a significant change in these parameters would be required to change this outlook. The data collected during 2003 do not indicate that stock status has improved.

For more Information

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References

Chouinard, G.A., and A. Fréchet. 1994. Fluctuations in the cod stocks of the Gulf of St. Lawrence. ICES mar. Sci. Symp. 198: 121-139.

Chouinard, G.A., D.P. Swain, L. Currie, G.A. Poirier, A. Rondeau, H. Benoit, T. Hurlbut, and D. Daigle. 2003. Assessment of the southern Gulf of St. Lawrence cod stock, February 2003/ Évaluation du stock de morue du sud du Golfe du St-Laurent, février 2003. DFO Can. Sci. Adv. Sec. Res. Doc. 2003/015.

DFO, 2003. Cod in the southern Gulf of St. Lawrence. DFO Science Stock Status Report 2003/016.

Hammill, M.O., and G.B. Stenson. 2002. Estimated consumption of Atlantic cod (*Gadus morhua*) and some other prey by grey seals (*Halichoerus grypus*) and harp seals (*Phoca groenlandica*), in the southern Gulf of St. Lawrence (NAFO Division 4T). DFO Can. Sci. Adv. Sec. Res. Doc. 2002/054.

Poirier, G.A., and L. Currie. 2004. Results from the August 2003 sentinel mobile survey of the southern Gulf of St. Lawrence. DFO Can. Sci. Adv. Sec. Res. Doc. 2004/014.

Poirier, G. A., T. Hurlbut, D.P. Swain, G.A. Chouinard, H.P. Benoit, C. LeBlanc, and L. Currie. Preliminary results from the September 2003 bottom-trawl survey of the southern Gulf of St. Lawrence / Résultats préliminaires du relevé au chalut de fond de septembre 2003 dans le sud du golfe du Saint-Laurent . DFO Can. Sci. Adv. Sec. Res. Doc. 2003/112.

Sinclair, A.F. 2001. Natural mortality of cod (*Gadus morhua*) in the southern Gulf of St. Lawrence. ICES J. Mar. Sci. 58: 1-10.

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