

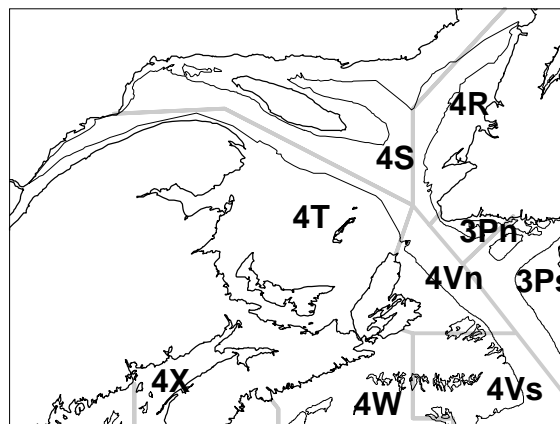
Cod in the Southern Gulf of St. Lawrence

Background

Southern Gulf of St. Lawrence cod are relatively long lived, and may reach ages of 20 or more when fishing mortality is low. They begin to reach commercial size at age 4, and are fully available to the commercial fishery by age 7. They mature sexually at a size slightly below the commercial size of 41 cm.

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 begins in late October and cod become concentrated 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 begins in mid-April, although in some years (1991-92) this was delayed by the late breakup of the winter ice. The management unit for this stock includes all of 4T, catches in 4Vn during November-April, and some catches in 4Vs in January-April.

Southern Gulf cod have been exploited since the 16th century. Landings varied between 20,000 - 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, in the range of 60,000 t. TAC's were first imposed in 1974, and these became restrictive as the stock declined in the mid-1970's. The stock recovered somewhat, and landings returned to the 60,000 t range during the 1980s. During the past decade, 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.



The Fishery

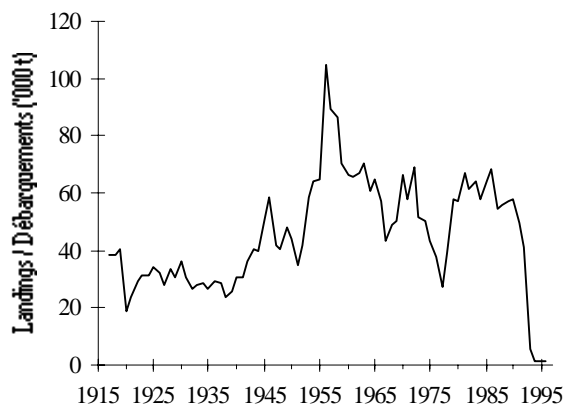
The cod fishery in the southern Gulf continued to be closed in 1996. Cod were caught as by-catch in fisheries directed at other species, mainly American plaice, witch flounder, winter flounder, and dogfish. However, these fisheries were also closed if the catch of cod exceeded 10% by weight. A recreational fishery using hook and line gear was allowed. A sentinel survey, conducted under a scientific protocol designed to obtain additional indices of abundance of the stock, and a mesh selection experiment also yielded significant catches of cod.

The total reported **landings** was 1142 t in 1996. This was slightly higher than landings in 1995 (1036 t) when the lowest landings since 1917 were recorded. Almost all of the 1996 landings came from 4T; there were 2 t reported from 4Vn in November-December. Landings increased for all gear sectors. A 2000 t allowance has been made for by-catch, sentinel surveys, and experimental fisheries in 1997.

Maritimes Region

Landings (thousands of tonnes)

	70-79	80-89	92	93	94	95	96
Landings	50	61	41	5	1	1	1
TAC	48	59	43	13	0	0	0



The **views of fishers** from Gaspé, northeast NB, the Magdalen Islands, and PEI were generally that cod abundance was low and that there was little sign of improvement since the fishery was closed. This view was not shared by fishers from Gulf NS who felt that cod abundance was higher than indicated in recent assessments and increasing.

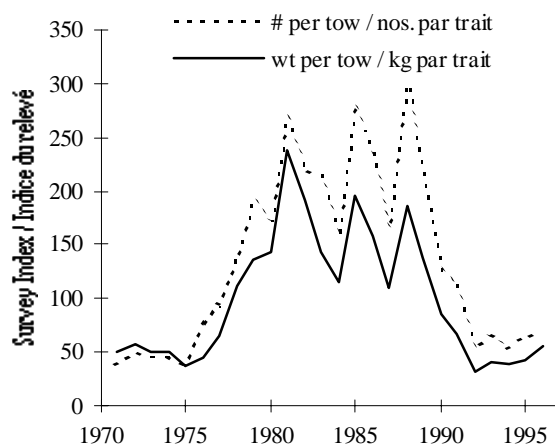
Age 6 was the dominant age in the limited 1996 landings, and ages 4-8 were well represented. Most of the age 4 and 5 landings came from the sentinel fishery where small mesh liners were used in order to collect information on the abundance of recruiting year-classes. The **weights at age** of cod in the commercial fishery and the research vessel survey remained low in 1996, indicating that growth continues to be below average.

Resource Status

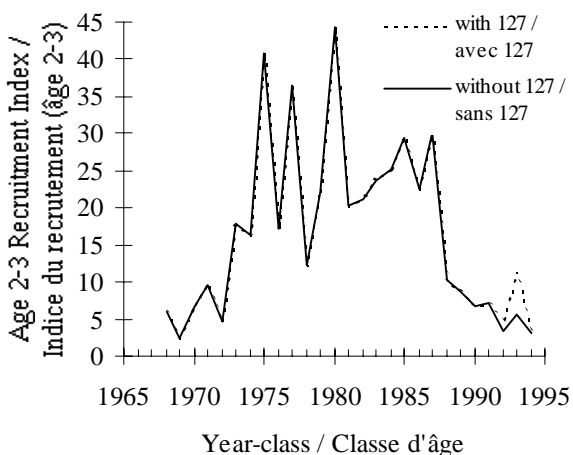
This stock status report presents new information on stock status obtained from research vessel surveys and sentinel surveys.

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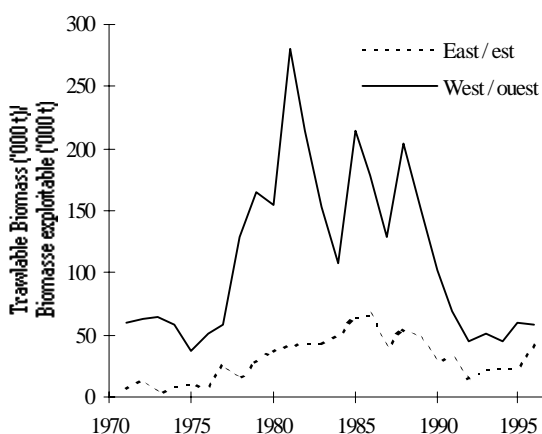
The **annual groundfish survey** has been conducted in September since 1971. The results of the 1996 survey indicate that the stock continues to be at low abundance with little sign of recovery. Stock biomass, as indicated by trends in the survey mean weight per tow, shows a modest increase due mainly to growth of year-classes present when the fishery was closed. The total abundance of cod (mean numbers per tow) was virtually the same in 1996 as in the 1993, 1994, and 1995, close to the lowest values seen.



Where the 1995 survey provided some encouragement in terms of improved **recruitment**, these were not borne out in 1996. The catch of age 0 cod in 1995 was the highest seen in the time series and catches were distributed in several areas. Unfortunately, the catch of age 1 cod in 1996 was about average. There has been no correlation between age 0 or age 1 catches in the survey and subsequent recruitment. There was also one large catch of age 1-3 cod in the Shediac Valley area (Set 127) in 1995. However, catches of these year-classes in 1996 were well below average.



The survey results indicate a change in the relative biomass of cod occurring in the eastern and western portions of the stock area. While there has been little change in biomass in the western area since the fishery closed in 1993, there appears to have been an increase in the east. Where less than 25% of the stock biomass occurred in the eastern portion during the 1970s and 1980s, this has increased to over 40% in 1996. This observation agrees with the comments of fishers obtained in pre-assessment consultations.



The fourth **winter groundfish survey** was conducted in the Cabot Strait area in January, 1997. Coverage was restricted to the northern portion of the survey area by poor weather conditions. Several concentrations of cod were found on both

sides of the Laurentian Channel and cod abundance was lower in the center of the Laurentian Channel than on either side. The overall distribution of cod was similar to that seen in the previous surveys.

The **sentinel survey** program was expanded in 1996 to include more longline and gillnet fishing locations. Mobile gear projects were also added in western PEI and the Magdalen Islands. The main objectives were to obtain an additional index of cod abundance and monitor the timing of cod migration. The 1996 catch rates of adult fish increased in Gaspé, eastern PEI, and NS otter trawl projects and the NS longline project. They remained about the same in the NB seine projects. Catch rates of small cod were about the same in 1996 as 1995. These results indicate a modest increase in biomass of adult cod and an overall distribution similar to the results of the September RV survey. Additional years of sentinel surveys are needed to develop a useful and comprehensive index of abundance.

Cod condition has been monitored seasonally since September 1991. The annual condition index, calculated from data collected in September, indicated average levels. Seasonal condition in 1996 showed a slightly different pattern than in previous years in that the maximum condition was reached in early summer and it remained high throughout the summer and early fall. Condition had already declined substantially in January and February, 1997, to levels not normally attained until the spawning season in May.

Closure of the commercial cod fishery and the existence of a reliable research vessel survey have allowed direct estimation of the **natural mortality** rate (M) of this cod stock. M is an important parameter in stock assessments but it is very difficult to estimate

when fishing is ongoing. Previous estimates were based on information collected prior to the mid-1970s and were based on indirect methods. This earlier work and other estimates of M for cod resulted in a value of 0.2 being used in stock assessments. However, the mortality rate measured by research vessel surveys since the fishery closure, and regressions of total mortality and fishing intensity for the period 1971 - 1996, indicate that M has been closer to 0.4 for adult cod, at least in recent years. It is also possible that M may have increased to this higher value in the late 1970s although the precise time of a change still needs to be resolved. Investigations of the recent dynamics of M are ongoing. The traditional sequential population analysis of the stock was not attempted pending completion of this research. Results of the annual groundfish survey, which provides a snapshot of stock abundance, can be interpreted without knowing M precisely.

Outlook

Adult biomass has increased modestly since the fishery closed in 1993 due mainly to growth. Recruitment of young cod to the stock has been well below average. Stock recovery will require increased recruitment.

For more Information

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This report is available from the:

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