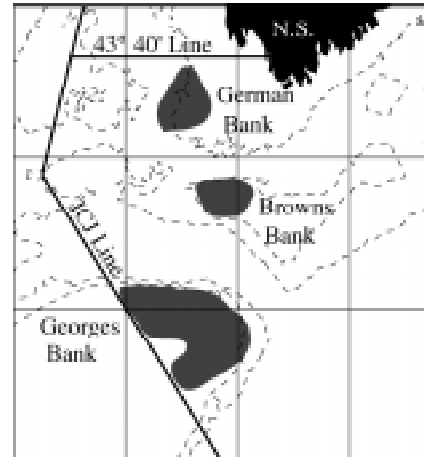


Georges Bank Scallop



Background

The sea scallop, *Placopecten magellanicus*, is found only in the Northwest Atlantic, from Cape Hatteras to Labrador. Scallops are aggregated in patches and harvestable concentrations are called beds. Major areas of offshore fishing activity are Georges Bank, the Scotian Shelf (Middle Grounds, Sable Island Bank, Western Bank, Browns Bank, and German Bank), and St. Pierre Bank. Scallops prefer a sandy, gravel bottom and occur in depths of 35 to 120 m.

Scallops have separate sexes. They mature at age 2. The female gonad is red in colour and the male gonad colour is creamy white. The major spawning period is August to October. The fertilized eggs develop in the water column until settlement on the bottom within 30 to 60 days.

Growth is estimated from the position of annual rings on the shell. The growth rate varies from one area to another and is influenced by season, depth, and temperature.

Offshore scallop vessels range from 27 to 46 m length overall. The offshore fleet uses a New Bedford offshore scallop rake or drag, 4 to 4.9 m in width. Two drags are fished simultaneously, one on each side of the vessel.

Summary

- Overall exploitation rate has been around 20% since 1994.
- The 1992 year class comprised 50% of the catch in 1997.
- Although stock biomass is the highest observed in the past 5 years, survey data do not indicate strong recruitment after the 1992 year class.
- The 1992 and 1993 year classes will continue to dominate the fishery.
- At an exploitation rate of 20% the TAC for 1998 would be 3,650 t. At an exploitation rate of 32% the TAC would be 5,300 t.
- There was a high incidence of clappers on the northeast part of the bank, a loss of about 20% of biomass in this area and a 5% loss for the Canadian side of Georges Bank. It was unlikely that the mortality was due to fishing.

The Fishery

Landings (thousands of tonnes)

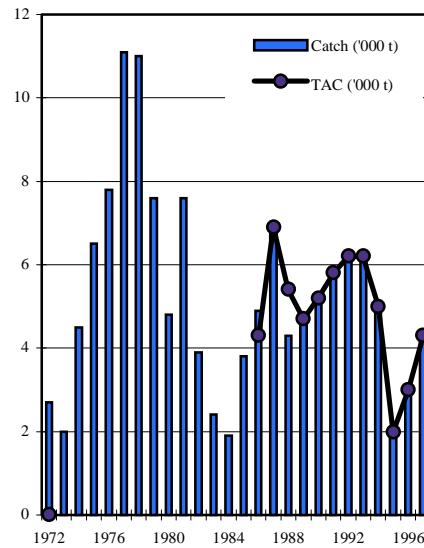
Year	70-79 Avg.	80-89 Avg.	90-93 Avg.	1994	1995	1996	1997
TAC	-	-	5.9	5.0	2.0	3.0	4.3
Catch	5.9	5.1	5.8	5.0	2.0	3.0	4.3

There are currently 23 vessels in the offshore scallop fishery. The fishery directs primarily for ages 4 to 7 scallops.

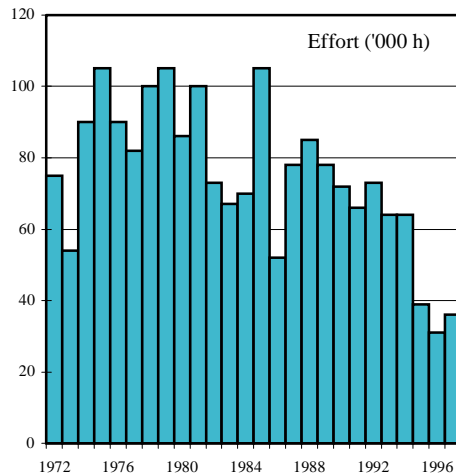
The **average meat weight** in the catch increased from 1993 to 1995. The average meat weight decreased in 1996 because the fishery directed for the strong 1992 year class. Meat weights are in the high range again in 1997 because the fishery kept directing for the 1992 year class. The 1992 year class made up 50% by numbers of the 1997 catch.

In 1995, an industry monitoring program to discourage the presence of small meats in the catch (50+ meats per 500 g) was implemented. A low tolerance level (10% by number of meats 10 g or less) adds more restriction to the regulatory 33 meat count (33 meats per 500 g).

The TAC had been set at 4,250 tonnes for 1997 based on an exploitation rate of 30% on the directed age groups (4 - 7). The 1997 TAC was up 40% from the previous year.



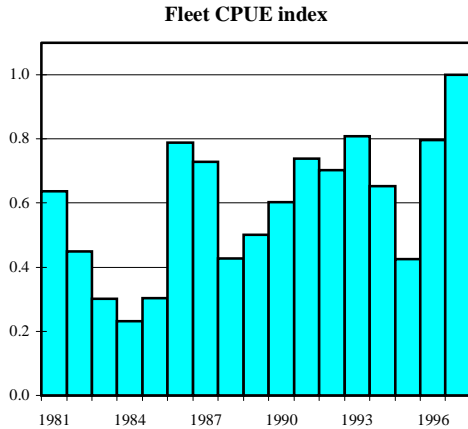
Effort was high prior to 1986 then started to decline. Effort rose 17% from 1996 to 1997. Effort was applied to the south side of Georges Bank in addition to the northern Edge. This suggests a local come-back of scallop beds on the south side.



Resource Status

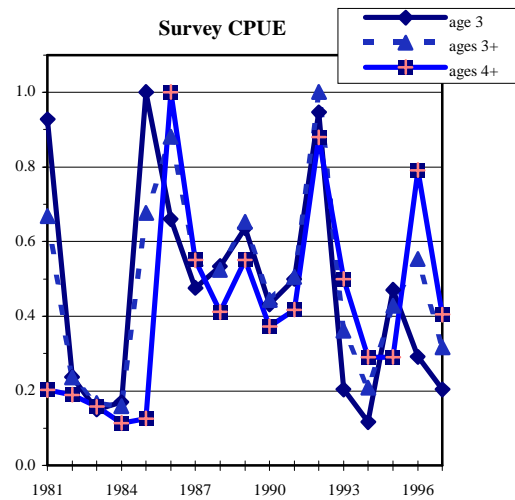
Logbooks provide catch and effort data from which catch-rate (CPUE) is estimated. Landings are monitored at dockside. Catch in numbers at age are derived from port samples. Relative biomass indices are derived from

research surveys. Estimates of population abundance are based on commercial CPUE, research survey biomass indices, and age composition in the stock.

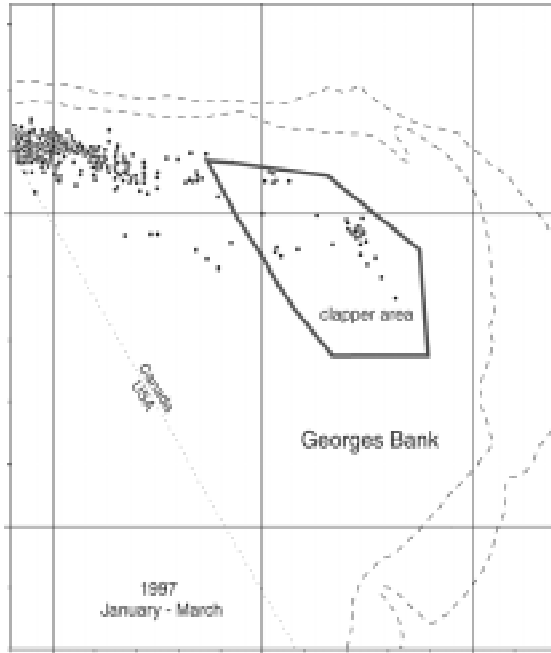


Standardised **commercial catch-rates** varied considerably in the 1990's. Catch-rates for 1997 increased 20%. The annual catch-rate estimate was the highest encountered since the late 1970's due to very high catch-rates during the first quarter of the year.

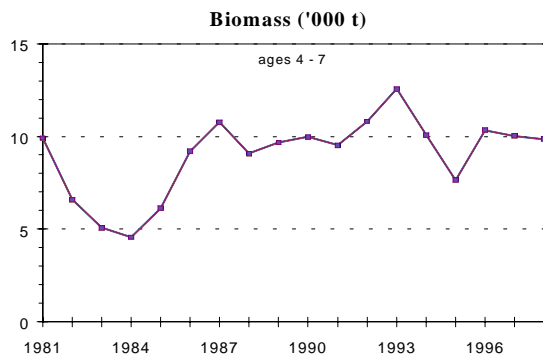
Survey catch-rates for older age groups (age 6+) are quite stable over the last 4 years. Survey abundance index for age 5 is good. This year class was fished intensively at age 4. Research survey estimates for young recruits (age 4) suggest a considerable degree of patchiness in its distribution. The 1997 survey did not cover a marginal habitat on the Peak of the bank where the 1993 year class settled heavily. The strength of the 1993 year class is probably underestimated. Estimates for prerecruits are low overall with an extremely patchy distribution.



Survey results also established that scallop beds on the Peak of Georges Bank experienced heavy die-offs (see outlined clapper area in the map which follows) during the winter of 1996 - 1997. Most of the die-offs were from the 1993 year class. The marginal status of this area meant that the loss of biomass for the stock was about 5%. Fishing activities are sometimes perceived to be the cause for clappers (empty shells still attached together at the hinge). Most of the winter fishing (90%) did not take place in the clapper area. Locations fished (dots) are plotted on a daily basis on the map. Fishing activities covered a very small portion of the 900 km² affected by the die-off.

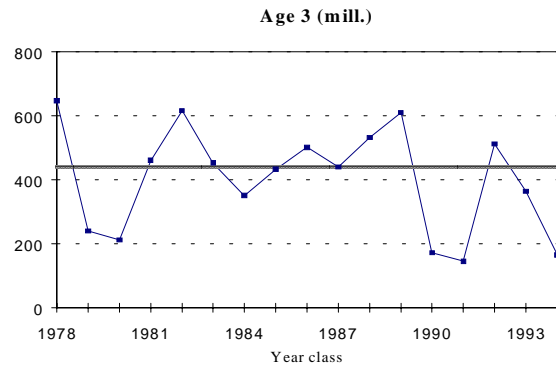


It would appear that the **total biomass** (ages 3+) has been increasing after a low in 1995. The biomass estimate for 1997 is the highest encountered over the last 5 years. However, the directed biomass (ages 4 - 7) experienced a small drop from 1996 to 1997. The incoming age 4 biomass is not large enough to replace the outgoing age 7 biomass.

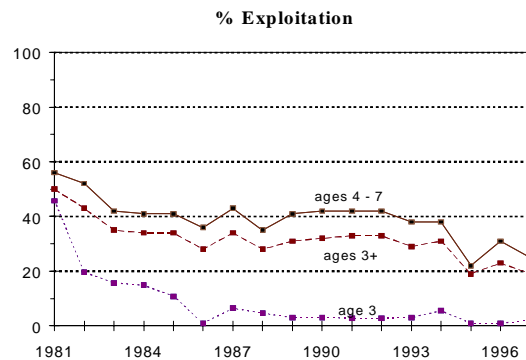


In terms of **recruitment** the early 1990's had seen the passage of the 1988 and 1989 year classes each with 500 million scallops at age 3, followed by the two poorest year classes (1990 and 1991) since 1981. Recruitment has improved with the 1992 year class strength

close to the long term average (horizontal line in graph below). The size of the 1994 year class (age 3 in 1997) is poorly estimated.



The overall **exploitation rate** (ages 3+) varied little from 1988 to 1994 and was considerably lower than before the implementation of TAC's in 1986. The overall rate and the exploitation rate on the directed age group decreased significantly from 1994 to 1995 and has remained at these lower levels until now. The exploitation rate on age 3 has stayed low since 1986 when the 33 meat count forced the fishery to direct for older scallops. Exploitation of age 3 scallops has been reduced to almost nil with the monitoring of small meats in the catch starting in 1995.



Outlook

Fishing at $F_{0.1}$ (3,650 t) in 1998 produces a directed biomass slightly over 9,000 t; this corresponds to an exploitation rate of 20% on the directed age group. A fishing scenario with a 1998 catch equal to the TAC for 1997

(4,250 t) gives a directed biomass estimate of 8,600 t at the end of 1998; this TAC level has an exploitation rate of 24%. The F_{\max} scenario (5,300 t) reduces the directed biomass to about 7,700 t with an exploitation rate greater than 30%.

TAC(t)	Exploitation rate	Directed Biomass (t)
3,650	20%	9,100
4,250	24%	8,600
5,300	32%	7,700

The 1997 TAC was up 40% from the previous year. The 1992 year class, at age 5, made up 50% by numbers of the 1997 catch. The strong dependence on the 1992 year class resulted from the very low densities of the 1990 and 1991 year classes. The dependence on a single year class leads to significant year to year variability in catches and more risk to stock replacement.

The stock biomass is the highest observed over the last 5 years but is concentrated in the 1993 and 1992 year classes at ages 4 and 5. Once ages 4 and 5 scallops are depleted, the incoming 1994 year class does not have the strength to take their place without a reduction in catch-rates and harvesting levels.

Research survey estimates for young recruits (1994 year class) and prerecruits (1995 year class) suggest a high degree of patchiness in their distribution. Establishing the status of year classes as early as possible is essential to forecasting but a challenge to interpreting the information properly, especially for prerecruits.

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Robert, G., M.A.E. Butler, and S.J. Smith. 1998. Georges Bank scallop stock assessment - 1997. DFO Can. Stock Assess. Sec. Res. Doc. 98/69.

This report is available from the:

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