

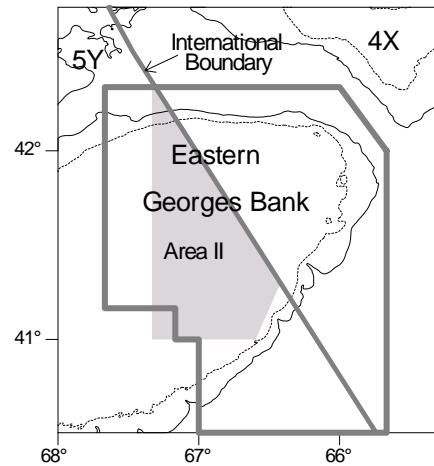


Transboundary Resource Assessment Committee

Status Report 2004/01

EASTERN GEORGES BANK COD

[5Zjm; 551,552,561,562]



Summary

- Combined Canada and USA catches in 2003 were about 3,400 mt, an increase of about 600 mt from 2002, due primarily to increased catches by the USA.
- Adult biomass increased from 8,500 mt in 1995 to about 18,700 mt in 2001 but has since declined to about 13,900 mt at the beginning of 2004. Most of the post-1995 increase has been the result of growth and survival to ages 5+ of the 1992, 1995 and 1996 year classes.
- Recruitment remains at very low levels and the 2002 year class is the lowest on record. Although not estimated in the assessment, early indications from research surveys suggest some improvement with the 2003 year class.
- Fishing mortality for ages 4-6 increased rapidly between 1989 and 1993 to over 0.9, much greater than the fishing mortality reference, $F_{ref} = 0.18$. In 1995, it declined to near F_{ref} due to restrictive management measures. Since 1995, fishing mortalities have been greater than the F_{ref} .
- Age structure continues to expand, but overall productivity for this stock is currently poor, largely due to low recruits per spawner and declines in weight at age.
- A yield of about 1,100 mt in 2005 has about a 50% risk of exceeding F_{ref} and a greater than 50% chance of a decrease in biomass from the beginning of year 2005 to the beginning of year 2006. Even in the absence of a fishery, a 10% increase in biomass is not expected.



Catches, Biomass (thousands mt); Recruits (millions)

		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Avg ¹	Min ¹	Max ¹
Canada	Quota	1	2	3	1.9	1.8	1.6	2.1	1.2	1.3	1.0			
	Landed	1.1	1.9	2.9	1.9	1.9	1.6	2.1	1.4	1.3		7.2	1.1	17.8
	Discard²	<0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2		<0.1	<0.1	0.2
USA	Quota										0.3			
	Landed	0.7	0.8	0.6	0.8	1.2	0.7	1.4	1.4	1.8		4.5	0.6	10.6
	Discard	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
Total	Quota										1.3			
	Catch	1.8	2.8	3.7	2.8	3.1	2.3	3.6	2.8	3.4		11.8	1.7	28.6
	Adult Biomass⁴	8.5	12.3	13.0	11.9	16.5	16.0	18.7	16.7	14.3	13.9	25.1 ³	8.5 ³	45.3 ³
	Age 1 Recruits	1.5	2.7	4.4	1.7	4.1	2.4	1.9	0.7	0.2		6.3	0.2	21.1
	Fishing mortality⁵	0.19	0.25	0.37	0.27	0.26	0.19	0.29	0.23	0.28		0.48	0.18	0.96
	Exploitation Rate⁵	16%	20%	28%	22%	21%	15%	23%	19%	22%		33%	15%	57%

¹1978 – 2003

²estimates for discards from Canadian scallop fishery prior to 1996 were not available

³1978-2004

⁴ages 3+

⁵ages 4-6

Fishery

Combined Canada/USA catches, which averaged about 17,900 mt between 1978 and 1992, peaked at 26,600 mt in 1982 and declined to 1,800 mt in 1995, the lowest observed (Figure 1). Landings since 1999 have been about 3,000 mt. US landings have been increasing since 2000 and were 1,800 mt in 2003. Canada accounts for about 60% of the total landings but this was reduced to about 50% in 2002 and about 39% in 2003.

Canadian catches were about 1,300 mt in 2002 and 2003. Landings from fixed gear components have been dominant in recent years and accounted for about 62% of the 2003 total. In 1995, cod fishing was restricted to bycatch only. Since 1995, with reduction in quotas, the fishery has become more of a mixed species fishery with reduced targeting for cod. Also, since 1995, industry imposed self-regulation to avoid overrunning allocations, including directing for haddock in early June and late fall when cod bycatch was low. The Canadian groundfish fishery on eastern Georges Bank has been closed to all vessels from January to May inclusive, since 1994. About 10% of landed weight was observed and all landings have been subject to 100% dockside monitoring. Landings until 1995 include those catches reported by the scallop fishery. Since 1996 the Canadian scallop fishery has not been permitted to land cod. Discards of cod by the Canadian scallop fishery since 1996 were estimated from scallop effort data and observed catches and ranged between 56 and 170 mt. Age composition of these catches was not available for this assessment. Estimates of cod less than 43 cm taken in the Canadian groundfish fishery have been less than 1% of the total in recent years. CPUE has remained stable in the last four years but is strongly influenced by management measures and fisheries practices to avoid the catch of cod.

USA catches for 1995-98 were <1000 mt but have been increasing since 1998 and were 1,800 mt in 2003. Since December of 1994, a year-round closure of area Area II has been

in effect. Minimum mesh sizes limits were increased in 1994 and again in 1999. Limits on sea days as well as trip limits were also used as additional management measures.

The 1998 year class at age 5 (38%) dominated the **combined Canada/USA 2003 fishery**. The proportional catch at age in 2003 was very similar to that forecast from the yield projection of 2003.

Harvest Strategy and Reference Points

The Transboundary Management Guidance Committee has adopted a strategy to maintain a low to neutral risk of exceeding the fishing mortality limit reference, $F_{ref} = 0.18$. When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.

State of Resource

The state of the resource was based on results from an age structured analytical assessment (VPA) that used fishery catch statistics and sampling for size and age composition of the catch for 1978 to 2003. The VPA was calibrated to trends in abundance from three bottom trawl research surveys, NMFS spring, NMFS fall and DFO. Retrospective analysis is used to detect any pattern of inconsistency with a tendency to over or underestimate fishing mortality, biomass and recruitment relative to the terminal year estimate. The extent of the pattern for this assessment was similar to that seen in the past and was not of concern.

There was a substantial decline in **adult (3+) stock biomass** from about 45,000 mt in 1990 to about 8,500 mt in 1995, the lowest observed (Figure 2). The biomass subsequently increased to 18,700 mt in 2001 but declined to 13,900 mt at the beginning of 2004 (80% Confidence Interval: 11,500 t – 17,400 t). Almost all of the increase in the late 1990's has been the result of growth and survival to ages 5+ of the 1992, 1995 and 1996 year classes. Lower weights-at-age in the population in recent years and the continuing low recruitment have contributed to the recent decline.

Recruitment has been below the 1978-98 average of 7.5 million since 1990. The 1996 and 1998 year classes, at about 4 million, appear to be the strongest since the 1990 year class (Figure 3). Recruitment since the 1998 year class has been less than 2 million and the 2002 year class appears to be the lowest on record. Early indications from research surveys suggest that the 2003 year class may be above the recent average.

The **fishing mortality for ages 4-6** increased rapidly between 1989 and 1993 to over 0.9, much greater than the fishing mortality reference, $F_{ref} = 0.18$ (Figure 1). In 1995, it declined to near F_{ref} due to restrictive management measures. Since 1995, fishing mortalities have been greater than the F_{ref} ($F_{2003}=0.28$; 80% Confidence Interval: 0.25 – 0.41).

Productivity

Attributes like recruits per spawner, age structure and spatial distribution reflect possible fluctuations in the productive potential and can be used to qualify reference points and acceptable risk. The recruits per adult biomass ratio has been generally lower than that seen prior to 1990. In both absolute numbers and percent composition, the **population age structure** displays an increasing representation of age groups, reflecting lower exploitation, particularly at younger ages, since 1995. The **spatial distribution** patterns observed during the most recent bottom trawl surveys were similar to the average patterns over the previous five years. Observed declines in **weight at age** are a factor in limiting improvements to the population biomass. Largely due to low recruits per spawner and declines in weight at age, overall productivity for this stock is currently poor.

Outlook

The outlook is provided in terms of the possible consequences for alternative catch quotas in 2005 with respect to the harvest reference points. Uncertainty about standing stock generates uncertainty in forecast results. This uncertainty is expressed in the outlook as the risk of exceeding $F_{ref} = 0.18$, the risk of not achieving a stable biomass and the risk that the biomass will not increase by 10% or more between 2005 and 2006.

Assuming a 2004 catch equal to the 1,300 mt quota, the projection indicates that a combined Canada/USA yield of about 1,100 mt in 2005 has a neutral risk, about 50%, of exceeding F_{ref} . (Figure 4). At a yield of 1,100 mt in 2005, there is a high risk, greater than 50% chance, of a decrease in biomass from the beginning of year 2005 to the beginning of year 2006. Even in the absence of a fishery, a 10% increase in biomass is not expected. Although not used in the forecast, the potential above average recruitment of the 2003 year class at age 3 in 2006 may result in some rebuilding.

The risk calculations are dependent on the model assumptions and data used in the analyses. Though these assumptions were deemed most suitable, there may be other plausible assumptions. These calculations do not include uncertainty due to variations in weight at age, partial recruitment to the fishery, natural mortality, systematic errors in data reporting or the possibility that the model may not reflect the stock dynamics closely enough. The risk profiles provide a general sense of the associated uncertainties and can assist in assessing the consequences of alternative catch quotas.

Medium term projections assuming that the stock is exploited at a constant fishing mortality rate of 0.18 and assuming 10 year average recruitment of 2.8 million indicated that catches and biomass remained relatively stable.

Biomass, Yield (thousands mt)

	Total Biomass	Adult Biomass	Yield
2004	14.12	13.90	1.30
2005	14.06	12.88	1.12
2006	14.02	12.84	0.99
2007	13.85	12.67	1.14
2008	15.54	14.37	1.42
2009	15.05	13.87	

Special Considerations

Consistent management by Canada and the USA is required to ensure that conservation objectives are not compromised.

Cod and haddock are often caught together in groundfish fisheries, although their catchabilities to the fisheries differ and they are not necessarily caught in proportion to their relative abundance. With current fishing practices and catch ratios, the achievement of rebuilding objectives for cod may constrain the harvesting of haddock. Modifications to fishing gear and practices, with enhanced monitoring, may mitigate these concerns.

Source Documents

Hunt, J.J., B. Hatt, and L. O'Brien. 2004. Population status of eastern Georges Bank cod (unit areas 5Zjm) for 1978-2005. TRAC Reference Document 2004/01.

TRAC, 2004. Proceedings of the Seventh Meeting of the Transboundary Resources Assessment Committee (TRAC); 15–18 June 2004. TRAC Proceedings 2004/01.

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TRAC, 2004. Eastern Georges Bank cod. TRAC Status Report 2004/01.

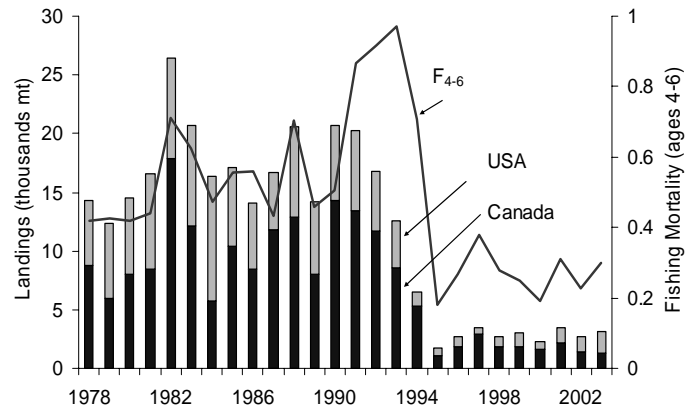


Figure 1. Catches and fishing mortality.

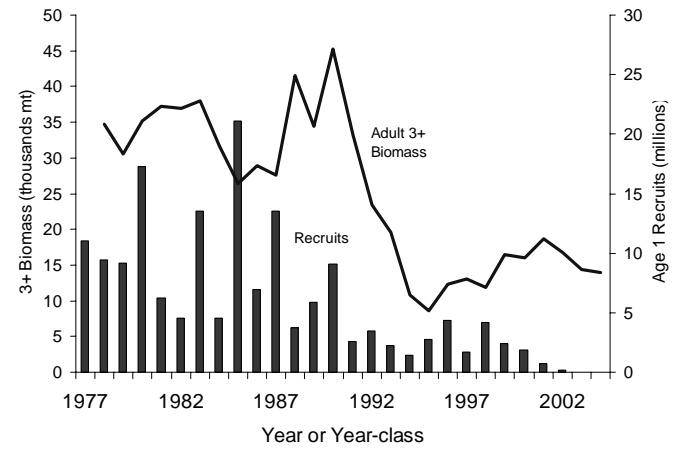


Figure 2. Recruitment and adult biomass.

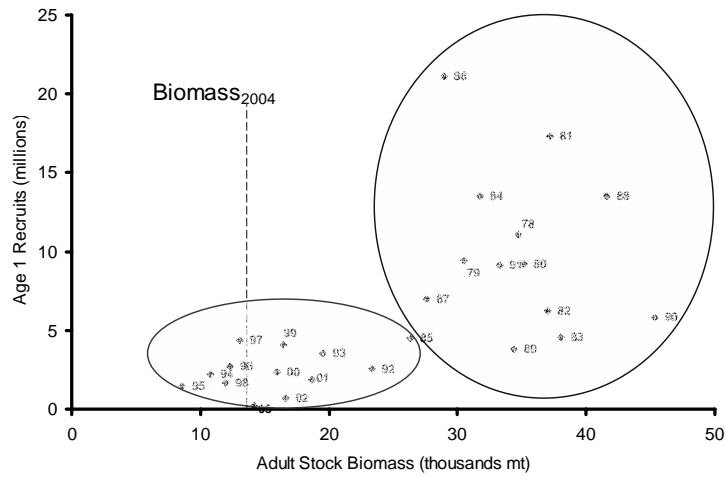


Figure 3. Stock recruitment patterns.

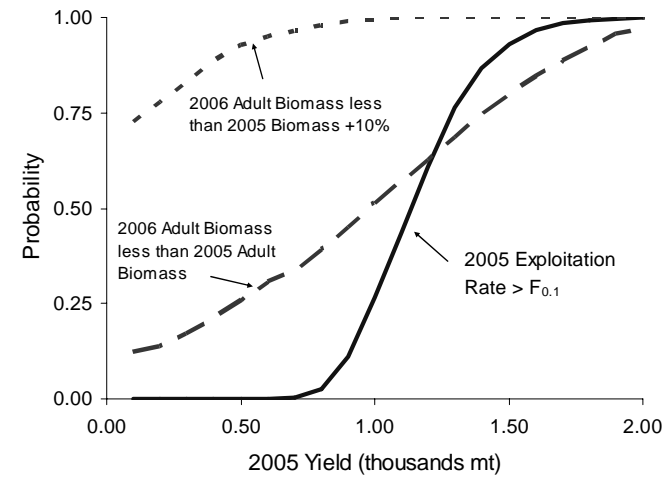


Figure 4. Projection risks.