

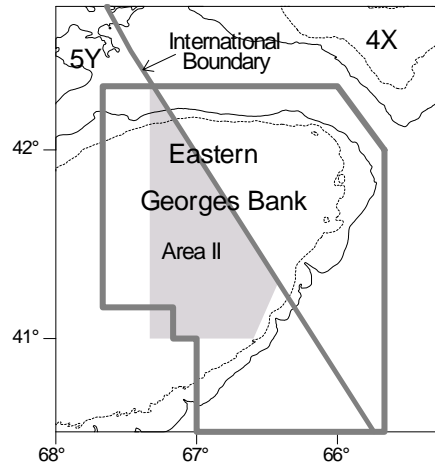


Transboundary Resource Assessment Committee

Status Report 2004/02

**EASTERN  
GEORGES BANK  
HADDOCK**

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



*Summary*

- Combined Canada and USA catches in 2003 were about 8,400 mt.
- Adult biomass (ages 3+) has increased since 1993 and was about 76,000 mt at the beginning of year 2004.
- The 2003 year class may be comparable to the outstanding 1963 year class. The 2000 year class is estimated to be larger than the strong 1975 and 1978 year classes and the 1998 year class is the third strongest since the 1978.
- Fishing mortality rate has been below  $F_{ref} = 0.26$  since 1995.
- Productivity has increased since the 1980s due to improved production of recruits per spawner and increases in the number of larger and older fish in the population.
- A combined Canada/USA catch of 26,000 mt in 2005 would result in a neutral risk (50%) that the fishing mortality rate in 2005 will exceed  $F_{ref}$ . A catch of 23,000 mt would result in a low risk (25%) that the fishing mortality rate in 2005 will exceed  $F_{ref}$ . Catches by 2006 will increase substantially as the 2003 year class becomes more fully recruited to the fishery.



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

		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Avg <sup>1</sup>	Min <sup>1</sup>	Max <sup>1</sup>
<b>Canada</b>	<b>Quota</b>	2.5	4.5	3.2	3.9	3.9	5.4	7.0	6.7	6.9	9.9			
	<b>Landed</b>	2.1	3.7	2.7	3.4	3.7	5.4	6.8	6.5	6.8		3.8	0.5	10.0
	<b>Discard<sup>2</sup></b>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
<b>USA</b>	<b>Quota</b>										5.1			
	<b>Landed</b>	<0.1	<0.1	<0.1	0.3	0.4	0.2	0.6	0.9	1.6		2.3	<0.1	9.1
	<b>Discard<sup>3</sup></b>	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		1.5	<0.1	7.6
<b>Total</b>	<b>Quota</b>										15.0			
	<b>Catch</b>	2.1	3.8	2.9	3.8	4.1	5.6	7.4	7.4	8.4		6.6	2.1	23.2
	<b>Adult Biomass<sup>5</sup></b>	15.5	22.2	21.2	23.8	26.9	32.4	46.0	41.3	79.9	75.7	40.8 <sup>4</sup>	8.5 <sup>4</sup>	90.9 <sup>4</sup>
	<b>Age 1 Recruits</b>	4.7	6.3	13.1	9.3	27.8	12.9	80.8	3.9	1.9	904.9	38.0 <sup>4</sup>	0.5 <sup>4</sup>	904.9 <sup>4</sup>
	<b>Fishing mortality<sup>6</sup></b>	0.15	0.21	0.13	0.15	0.14	0.19	0.20	0.18	0.16		0.28	0.06	0.58
	<b>Exploitation Rate</b>	12%	17%	11%	13%	12%	16%	16%	15%	14%		22%	5%	40%

<sup>1</sup>1969 - 2003

<sup>2</sup>estimates for discards from Canadian scallop fishery prior to 1996 were not available

<sup>3</sup>discards not estimated in 1999-2003 but assumed negligible

<sup>4</sup>1931 - 1955, 1969 - 2004

<sup>5</sup>ages 3+

<sup>6</sup>ages 4+

***Fishery***

Under restrictive management measures, **combined Canada/USA catches** declined from over 6,400 mt in 1991 to a low of about 2,100 mt in 1995, fluctuated between about 3,000 mt and 4,000 mt until 1999 and has since increased to over 8,000 mt (Figure 1). Greater catches were recorded in the late 1970s and early 1980s, ranging up to about 23,000 mt, but subsequently declined and fluctuated around 5,000 mt during the mid to late 1980s.

The 2003 **Canadian catch** of 6,789 mt was below the Canadian quota of 6,933 mt. Weight of all Canadian landings was monitored at dockside. At-sea observers monitored 9% of the total haddock landed, by weight. Comparison of samples from at sea observations against landings indicated that there was little discarding or highgrading. Discarding and misreporting by the groundfish fishery have been considered negligible since 1992. Since 1996 the Canadian scallop fishery has not been permitted to land haddock. Landings until 1995 include those catches reported by the scallop fishery. Discards of haddock by the Canadian scallop fishery were estimated from scallop effort data and observed catches and ranged between 21 mt and 78 mt from 1996 to 2003. Age composition information of discards was not available for this assessment. The size composition of the catch in the 2003 Canadian fisheries had a mode at 50.5 cm for otter trawlers and at 56.5 cm for longliners. Gill-netters caught few haddock. The percentage of haddock below 43 cm was less than 1% in the groundfish fishery.

**USA catches** for 2003 increased to 1,564 mt and discards again were low because the day and trip possession limits remained high or were removed. The combination of area closures, effort restrictions, and trip limits has precluded most operators from making long trips to eastern Georges Bank, with the result that USA catches from there have been low since 1993. The size composition of the catch in the 2003 USA fisheries was 42%

large, with a modal value of 62 cm and 58% scrod, with a modal value of 55 cm. The scrod market category size composition samples did not contain any fish below 43 cm.

For the **combined Canada/USA fishery catch in 2003**, the 2000 year class (age 3) and the 1998 year class (age 5) dominated. In comparison to the age composition of the catch during periods when year classes were quickly fished down, the older age groups (ages 9+) continued to contribute significantly to the 2003 catch. The percentage of age 2 fish in 2003 was well below historical averages. The low percentage of younger ages in the recent catches has been due in part to the type of gear used and to avoidance of areas with small fish.

### ***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,  $F_{ref} = 0.26$ . 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 1969 to 2003. The VPA was calibrated to trends in abundance from three bottom trawl research surveys, NMFS spring, NMFS fall and DFO. Data to approximate the age composition of the catch were also available for the period between 1931 and 1955 in order to reconstruct an illustrative population analysis of eastern Georges Bank suitable for comparison of productivity. Retrospective analysis is used to detect a pattern of inconsistencies, where updates of previously estimated fishing mortality, biomass, and recruitment show a tendency to be predominantly higher or predominantly lower. This stock assessment does not display a retrospective pattern.

**Population biomass** (ages 3+) during the late 1970s and early 1980s was about 40,000 mt, due to recruitment of the strong 1975 and 1978 year classes whose abundances were estimated at about 50 million each (Figure 2). However, biomass declined rapidly in the early 1980s as subsequent recruitment was poor and these two year classes were fished intensely at a young age. The biomass has steadily increased from near an historical low of about 9,000 mt in 1993 to about 76,000 mt (80% Confidence Interval: 69,500 mt – 112,000 mt) at the beginning of 2004. The recent increase has been due to generally improved recruitment and was enhanced by lower exploitation and by reduced capture of small fish in the fisheries. Biomass has been increasing and is the highest it has been in about 30 years. It is now well within the range of the 1931-1955 biomass.

**Recruitment** improved in the 1990s and the 2003 year class, estimated at 905 million at age 1 may be comparable to the outstanding 1963 year class (Figure 3). The 2000 year class (81 million at age 1) is estimated to be larger than the strong 1975 and 1978 year

classes. The 1998 year class (28 million at age 1) is the second strongest since that of 1978. The 1996 and 1999 year classes were estimated to be about 13 million, comparable to the 1983, 1985 and 1987 year classes, which were the strongest 3 year classes over about a 20 year time span. Two recent year classes, 2001 and 2002, are weak, at about 4 and 2 million fish, respectively.

**Fishing mortality** for fully recruited ages 4+ fluctuated between 0.2 and 0.4 during the 1980s and showed a marked increase between 1989 and 1993 to about 0.6, the highest observed, before declining to below the fishing mortality reference,  $F_{ref} = 0.26$ , where it has remained since 1995 ( $F_{2003} = 0.16$ ; 80% Confidence Interval: 0.13 – 0.19) (Figure 1).

### ***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 was generally low during the 1980s. Except for the 2001 and 2002 year classes, which are lower, and the 2003, which is higher, the present recruits per adult biomass ratio appears comparable to that of the 1931 to 1955 period, suggesting that higher recruitment might occur when the biomass is above 40,000 t. In both absolute numbers and percent composition, the **population age structure** displays a broad representation of age groups, reflecting improving recruitment and 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. However, consistent with the pattern observed for previous large year classes, the exceptional 2003 year class at age 0 was distributed more widely throughout the survey area. Observed DFO survey average weights at length, used to reflect **condition**, show a slight decrease in recent years for larger haddock (68-73 cm) although no trend is apparent for smaller haddock (50-53 cm). Productivity has increased since the 1980s due to improved production of recruits per spawner and increases in the number of larger and older fish in the population.

### ***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  $F_{ref} = 0.26$ .

Assuming that the TAC of 15,000 mt is caught in 2004, a combined Canada/USA catch of 26,000 mt in 2005 would result in a neutral risk (50%) that the fishing mortality rate in 2005 will exceed  $F_{ref}$ . A catch of 23,000 mt would result in a low risk (25%) that the fishing mortality rate in 2005 will exceed  $F_{ref}$ .

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 adequately represent stock dynamics. 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 0.26 and assuming 10 year average recruitment of 20 million (excluding the 2003 year class) or 40 million, the average recruitment which occurred during the period 1931 – 1955, when the stock was at a more productive level, indicated that catches and biomass would increase substantially.

**Biomass, Yield (thousands mt)**

	20 Million Recruits			40 Million Recruits		
	Total Biomass	Adult Biomass	Yield	Total Biomass	Adult Biomass	Yield
2004	127	72	15	127	72	15
2005	292	61	26	293	61	26
2006	519	514	96	525	514	96
2007	551	546	175	565	555	177
2008	408	403	127	432	421	132
2009	318	313		348	338	

***Special Considerations***

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

The outstanding 2003 year class will dominate the catch in 2006 and continue to dominate it to 2008, the last year that was forecast. It will increase the  $F_{ref}$  catch by an order of magnitude starting in about 2006. The estimate of the 2003 year class had high uncertainty. Alternative analyses confirmed that this year class is exceptional but its magnitude may be somewhat smaller than the VPA estimate. This note of caution should be considered when evaluating the projection risk analysis. Measures should be taken to avoid wastage of this year class due to discarding.

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***

Van Eeckhaute, L, and J. Brodziak. 2004. Assessment of haddock on Eastern Georges Bank. TRAC Reference Document 2004/02.

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

***Correct Citation:***

TRAC, 2004. Eastern Georges Bank haddock. TRAC Status Report 2004/02.

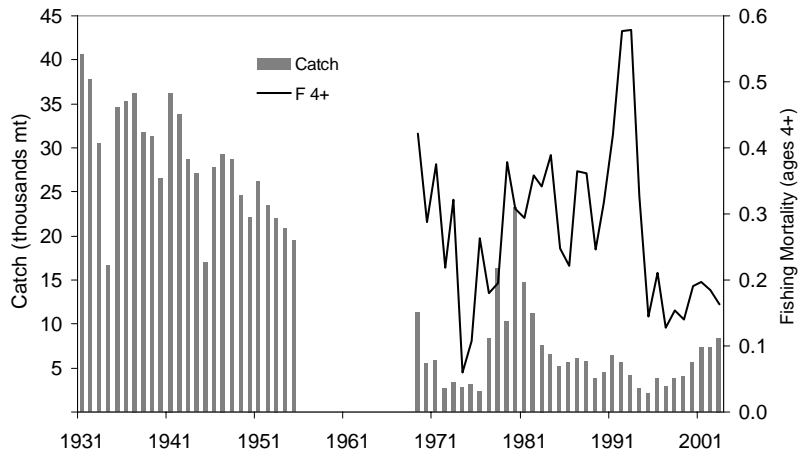


Figure 1. Catches and fishing mortality.

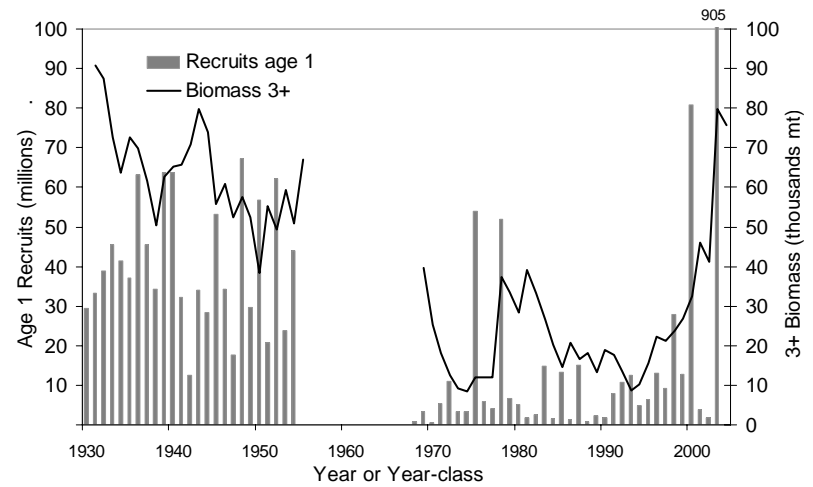


Figure 2. Biomass and recruitment.

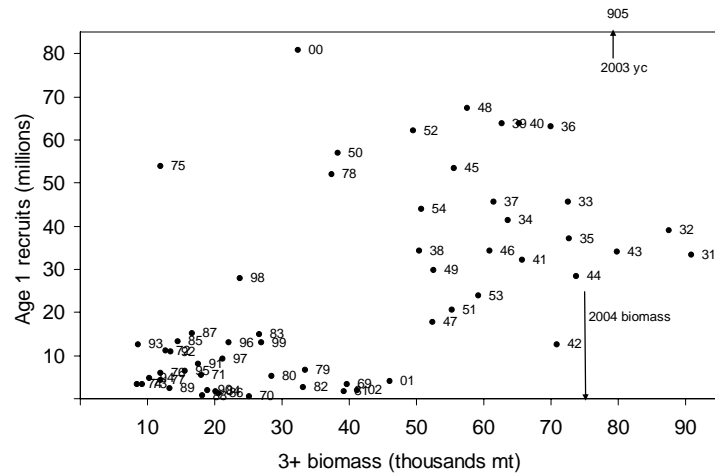


Figure 3. Stock recruitment patterns.

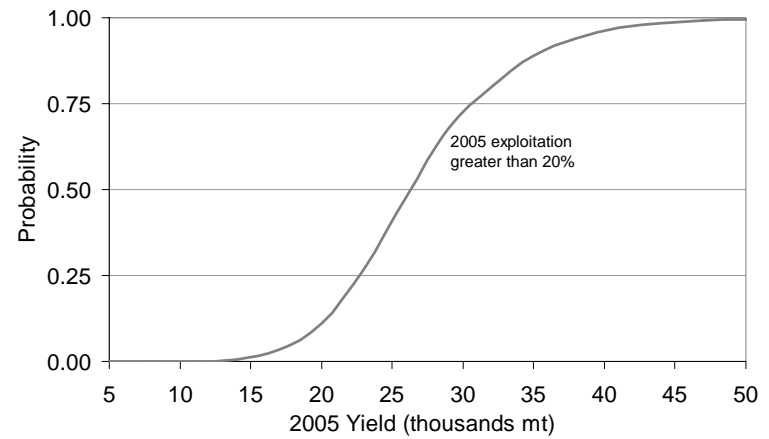


Figure 4. Projection risks.