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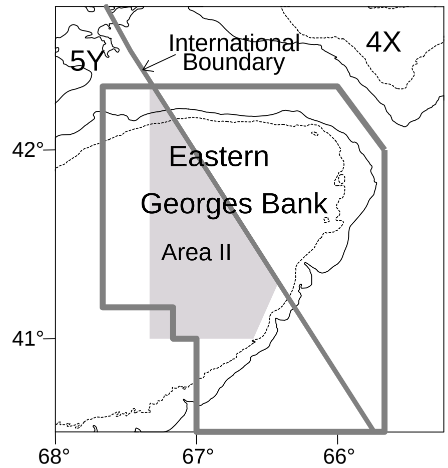
NOAA FISHERIES NATIONAL MARINE FISHERIES SERVICE

Transboundary Resources Assessment Committee

Status Report 2010/04 (Revised)

EASTERN GEORGES BANK HADDOCK

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



Summary

- Combined Canada and USA catches in 2009 were 19,707 mt.

- Adult biomass (ages 3+) decreased to 58,600 mt in 2005 and subsequently increased to 157,300 mt in 2009. In 2010 the adult biomass decreased to 125,100 mt.

- The exceptional 2003 year-class, currently estimated at 293 million fish at age 1, is the largest in the assessment time series. Except for the strong 2000 year-class and the exceptional 2003 year-class, recruitment has fluctuated without trend about an average of 9 million since 1990. The 2005 year-class is near the time series average of 26.5 million. The preliminary estimate for the 2009 year-class is below-average at 5 million fish at age 1.

- Fishing mortality was below $F_{ref} = 0.26$ during 1995 to 2003, fluctuated around F_{ref} during 2004 to 2006, but has been below F_{ref} since 2007 and was 0.13 in 2009.

- The stock exhibits an expanding age structure, improvements in size at age for the younger ages and broad spatial distribution, but, the stock is expected to decrease in the near future.

- Assuming a 2010 catch equal to the 29,600 mt total quota, a combined Canada/USA catch of 22,000 mt in 2011 results in a neutral risk (50%) that the 2011 fishing mortality rate would exceed $F_{ref} = 0.26$. The 2003 year-class is expected to constitute 75% of the 2011 catch biomass. A catch of 19,000 mt in 2011 results in a low risk (25%) that the 2011 fishing mortality rate will exceed F_{ref}. A catch of 25,150 mt in 2011 results in a high risk (75%) that the 2011 fishing mortality rate will exceed F_{ref}.

Canada

July 2010
Revised: March 2012

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

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Avg[1*]	Min[1*]	Max[1*]
Canada	**Quota**	7.0	6.7	6.9	9.9	15.4	14.5	12.7	15.0	18.9	17.6			
	Landed	6.8	6.5	6.8	9.7	14.5	12.0	11.9	14.8	17.6		5.2	0.5	17.6
	Discard	<0.1	<0.1	0.1	0.1	<0.1	0.1	0.1	<0.1	0.1		0.1	<0.1	0.2
USA	**Quota**[2]				5.1	7.6	7.5	6.3	8.1	11.1	12.0			
	Catch[2]				1.1	0.6	0.7	0.3	1.6	1.6				
	Landed	0.8	1.1	1.7	1.8	0.6	0.3	0.2	1.1	2.0		2.1	<0.1	9.1
	Discard	<0.1	<0.1	0.1	0.2	0.1	0.3	0.3	<0.1	<0.1		0.6	0	7.6
Total	**Quota**[3]				15.0	23.0	22.0	19.0	23.0	30.0	29.6			
	Catch[3,4]				10.9	15.1	12.7	12.3	17.1	17.6				
	Catch	7.6	7.6	8.6	11.9	15.3	12.6	12.5	16.0	19.7		7.9	2.1	23.3
Adult Biomass[5]		50.2	43.1	82.4	77.3	58.6	118.5	144.2	147.5	157.3	125.1	48.1[6]	4.9[6]	157.3[6]
Age 1 Recruits		82.5	4.0	2.9	292.7	6.3	24.3	6.8	10.3	5.6	5.0	26.5[6]	0.2[6]	292.7[6]
Fishing mortality[7]		0.17	0.17	0.19	0.27	0.25	0.25	0.12	0.09	0.13		0.29	0.09	0.58
Exploitation Rate[7]		14%	14%	16%	22%	20%	20%	11%	8%	11%		22%	8%	40%

[1] 1969 - 2009
[2] for fishing year from May 1st – April 30th
[3] for Canadian calendar year and USA fishing year May 1st – April 30th
[4] sum of Canadian Landed, Canadian discard, and USA Catch (includes discards)
[5] January 1st ages 3+
[6] 1931 - 1955, 1969 – 2010
[7] ages 4+ for 1969 - 2002; ages 5+ for 2003 - 2009

Fishery

Under restrictive management measures, **combined Canada/USA catches** declined from 6,504 mt in 1991 to a low of 2,150 mt in 1995, varied between about 3,000 mt and 4,000 mt until 1999, and increased to 15,256 mt in 2005 (Figure 1). Combined catches then decreased to 12,488 mt in 2007 but increased to 19,707 mt in 2009.

The **Canadian catch** in 2009 increased to 17,648 mt from 14,814 mt in 2008. The weight of all Canadian landings was monitored at dockside. At-sea observers monitored 20% of the total haddock landed, by weight, in 2009. Discarding and misreporting by the groundfish fishery have been negligible since 1992. Discards of haddock by the Canadian sea scallop fishery ranged between 29 and 186 mt since 1969 and were 54 mt in 2009.

USA catches in 2009 increased to 2,058 mt from 1,181 mt in 2008. Landings were 2,011 mt and discards were estimated to be 47 mt, primarily from the otter trawl fishery, but discards also occurred in the longline fleet.

For the **combined Canada/USA fishery catch in 2009**, the 2003 year-class (age 6) dominated by numbers and weight. Discards at age from the USA groundfish fishery (1989-1994, 2001-2009) and the Canadian sea scallop fishery (1969-2009) were included in the assessment when identified.

[*] Superscript 1 added.

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 reference, $F_{ref} = 0.26$. When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.

State of Resource

Evaluation of the state of the resource was based on results from an age structured analytical assessment (Virtual Population Analysis, VPA) that used fishery catch statistics and sampling for size and age composition of the catch for 1969 to 2009 (including discards). The VPA was calibrated to trends in abundance from three bottom trawl survey series; NMFS spring, NMFS fall and DFO. Data to approximate the age composition of the catch during 1931 to 1955 were used to reconstruct a population analysis of eastern Georges Bank haddock suitable for comparison of productivity to recent years. Retrospective analyses were conducted to detect any tendency to consistently overestimate or underestimate fishing mortality, biomass and recruitment relative to the terminal year estimates. The current stock assessment does not display a retrospective pattern.

Improved **recruitment** since 1990, lower exploitation, and reduced capture of small fish in the fisheries allowed the **adult population biomass** (ages 3+) to increase from near an historical low of 10,300 mt in 1993 to 82,400 mt in 2003 (Figure 2). Adult biomass decreased to 58,600 mt in 2005 and subsequently increased to 157,300 mt in 2009, higher than the 1931-1955 maximum biomass of about 90,000 mt. In 2010 the adult biomass decreased to 125,100 mt (80% confidence interval: 101,500 mt – 153,300 mt). The tripling of the biomass after 2005 was due to the exceptional 2003 year-class, currently estimated at 293 million age 1 fish (largest in the assessment time series: 1931-1955 and 1969-2009). Except for the strong 2000 year-class and the exceptional 2003 year-class, recruitment has fluctuated without trend about an average of 9 million since 1990. The 2005 year-class is near the time series average of 26.5 million. The preliminary estimate for the 2009 year-class is below-average at 5 million fish at age 1.

Fishing mortality (N weighted for ages 4+) fluctuated between 0.2 and 0.4 during the 1980s, and markedly increased in 1992 and 1993 to about 0.5, the highest observed. From 2003 to the present, the age at full recruitment to the fishery has been at age 5 (rather than age 4, previously) due to a decline in size at age of haddock. Fishing mortality (N weighted for ages 4+ prior to 2003 and ages 5+ for 2003-2009) was below $F_{ref} = 0.26$ during 1995 to 2003, fluctuated around F_{ref} during 2004 to 2006, but declined since then and was 0.13 in 2009 (80% confidence interval: 0.11 – 0.17, Figure 1).

Productivity

Recruitment, as well as age structure, spatial distribution and fish growth reflect changes in the productive potential. Recruitment, while highly variable, has generally been higher when adult biomass has been between 40,000 and 100,000 mt (Figure 3). The **population age structure** displays a broad representation of age groups, reflecting improving recruitment and lower exploitation since 1995. The **spatial distribution** patterns observed during the most recent bottom trawl surveys were similar to the average patterns over the previous ten years, except for the 2009 NMFS fall survey which showed an unusual distribution of several large tows in the center and west of the center of the 5Zjm area. The decline in weights at age observed in previous years appears to have halted or reversed for most ages. The size at age for the 2003 year-class is smaller than previous year-classes, but its rate of growth at length is similar to previous year-classes. DFO survey average weights at length, used to reflect fish **condition,** exhibit a declining trend since the late 1990s and declined in 2010 to below each lengths average. This stock exhibits some positive features such as an expanding age structure, improvements in size at age for the younger ages and broad spatial distribution.

Outlook

This outlook is provided in terms of consequences with respect to the harvest reference points for alternative catch quotas in 2010. Uncertainty about current biomass generates uncertainty in forecast results, which is expressed here as the risk of exceeding F_{ref}=0.26. The risk calculations assist in evaluating the consequences of alternative catch quotas by providing a general measure of the uncertainties. However, they are dependent on the data and model assumptions and 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 stock dynamics closely enough.

For projections, the 2010 survey and 2009 fishery weights at age were used for inputs, except for age 6 in 2010 which used the 2007 to 2009 Canadian average fishery weight to avoid using the slower growing 2003 year-class weight for that value. Fishery partial recruitment was based on the most recent five years. Inputs for the 2003 and 2005 year-classes were derived by accounting for recent trends in reduced growth rate. Assuming a 2010 catch equal to the 29,600 mt total quota, a combined Canada/USA catch of 22,000 mt in 2011 results in a neutral risk (50%) that the 2011 fishing mortality rate would exceed $F_{ref} = 0.26$ (Figure 4). The 2003 year-class is expected to constitute 75% of the 2011 catch biomass. A catch of 19,000 mt in 2011 results in a low risk (25%) that the 2011 fishing mortality rate will exceed F_{ref}. A catch of 25,150 mt in 2011 results in a high risk (75%) that the 2011 fishing mortality rate will exceed F_{ref}. Adult biomass is projected to be 67,800 mt at the beginning of 2012, a decline from 96,300 mt in 2011 as expected with the passing of the 2003 year-class through the population.

Probability of exceeding F_{ref}	**25%**	**50%**	**75%**
2011 quota	19,000 mt	22,000 mt	25,150 mt

Special Considerations

The 2003 year-class has reached maximum biomass. As a consequence, 3+ stock biomass has declined from a peak of 157,000 mt in 2009 and is expected to be 68,000 mt in 2012 based on fishing at F_{ref}. Catches in 2010 and 2011 will continue to be dependent on the 2003 year-class, but its contribution could decrease quickly if the partial recruitment on ages 9+ remains low.

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.

Surveys conducted by the FSV Henry B. Bigelow in the spring and fall of 2009 and spring of 2010, calibrated to the RV Albatross IV units, were included in this assessment.

Source Documents

O'Brien L, Worcester T, editors. 2010. Proceedings of the Transboundary Resources Assessment Committee (TRAC): Eastern Georges Bank Cod and Haddock, and Georges Bank Yellowtail Flounder: Report of Meeting held 20-23 July 2010. TRAC Proceedings 2010/02.

Van Eeckhaute L, Brooks E. 2010. Assessment of Haddock on Eastern Georges Bank for 2010. TRAC Reference Document 2010/05.

Correct Citation

TRAC. 2010. Eastern Georges Bank Haddock. TRAC Status Report 2010/04 (Revised).

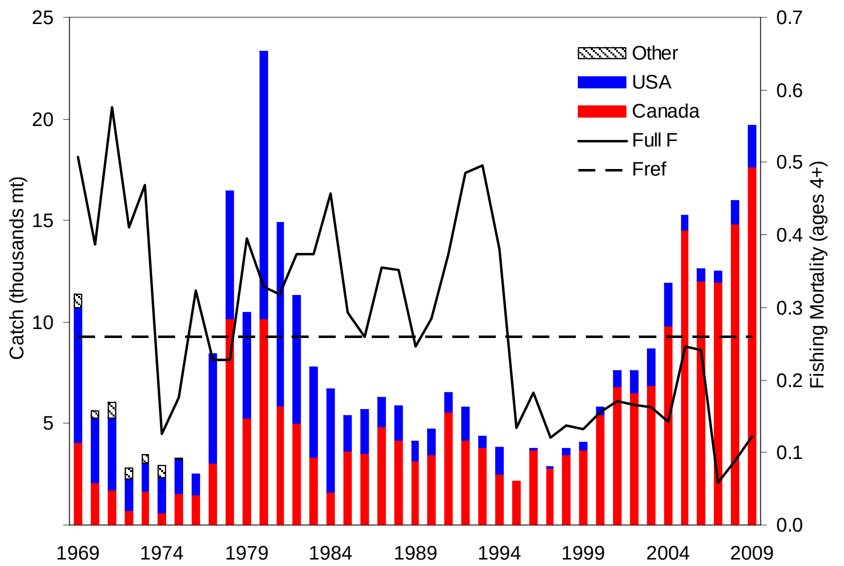


Figure 1. Catches (bars) and fishing mortality (line); (Full F=4+ for 1969-2002 and 5+ for 2003-2009).

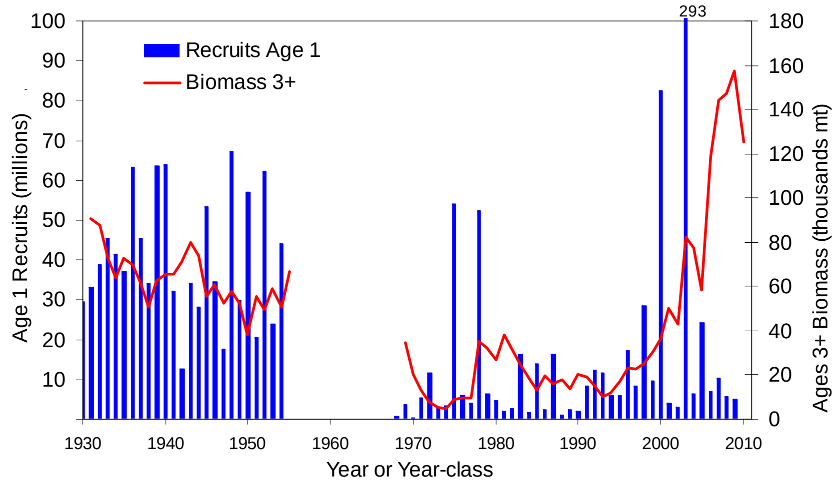


Figure 2. Biomass (line) and recruitment (bars).

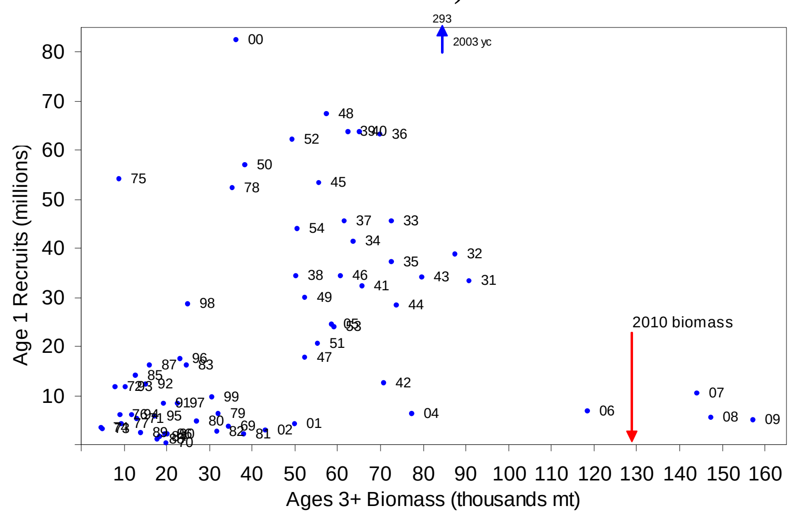


Figure 3. Stock recruitment patterns.

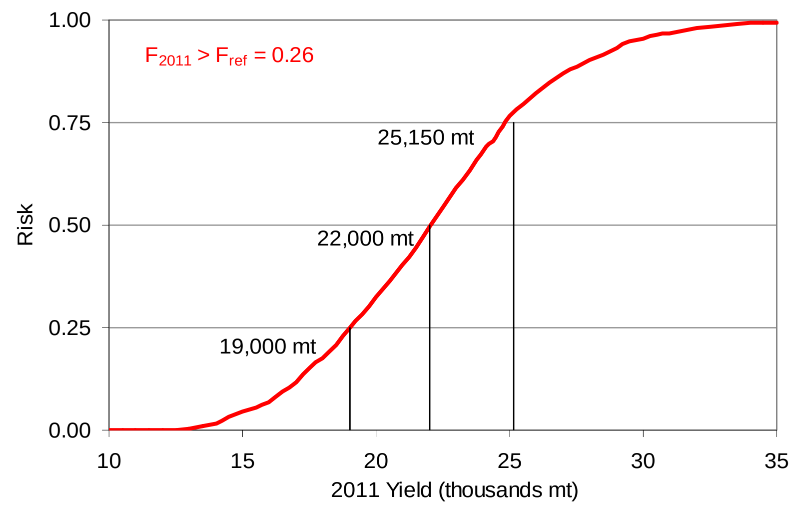


Figure 4. Projection risks.