Transboundary Management Guidance Committee

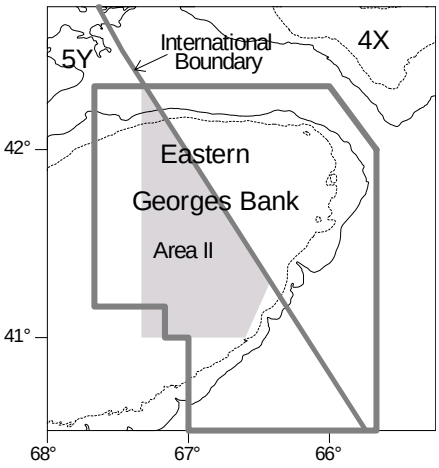
Guidance Document 2007/01

The Transboundary Management Guidance Committee (TMGC), established in 2000, is a government – industry committee comprised of representatives from Canada and the United States. The Committee's purpose is to develop guidance in the form of harvest strategies, resource sharing and management processes for Canadian and US management authorities for the cod, haddock and yellowtail flounder transboundary resources on Georges Bank. This document is a summary of the basis of the TMGC's guidance to both countries for the 2008 fishing year. Pertinent reference documents and consultations used in the TMGC deliberations are listed at the end of this document.

Eastern Georges Bank Cod [5Zjm; 551, 552, 561, 562]

Guidance

The TMGC concluded that the most appropriate combined Canada/USA TAC for Eastern Georges Bank cod for the 2008 fishing year is 2,300 mt. This corresponds to a low risk (less than 25%) of exceeding the F_{ref} of 0.18 in 2008 and that stock biomass will not increase from 2008 to 2009, though that increase is estimated to be nominal. The annual allocation shares between countries for 2008 are based on a combination of historical catches (20% weighting) and resource distribution based on trawl surveys (80% weighting). Combining these factors entitles the USA to 29% and Canada to 71%, resulting in a national quota of 667 mt for the USA and 1,633 mt for Canada.



Harvest Strategy & Reference Points

The strategy is 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.

Fishery Exploitation

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

		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Avg[1]	Min[1]	Max[1]
Canada	**Quota**	1.9	1.8	1.6	2.1	1.2	1.3	1.0	0.7	1.3	1.3(1.4)[6]			
	Landed	1.9	1.8	1.6	2.1	1.3	1.3	1.1	0.6	1.1		6.6	0.6	17.8
	Discard	0.4	0.3	0.1	0.1	0.1	0.2	0.1	0.2	0.4		0.1	0.0	0.5
USA	**Quota[3]**							0.3	0.3	0.4	0.5			
	Landed	0.8	1.2	0.7	1.4	1.4	1.8	1.0	0.1	0.1		4.1	0.1	10.6
	Discard	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.2	0.1		0.1	0.0	0.2
Total	**Quota**							1.3	1.0	1.7	1.9			
	Catch	3.1	3.3	2.3	3.7	2.8	3.4	2.3	1.1	1.6		10.8	1.1	26.5
Adult Biomass[4]		12.1	15.5	16.1	19.6	18.5	16.6	18.5	13.4	17.0	20.2	24.9[2]	8.5[2]	43.8[2]
Age 1 Recruits		1.8	4.4	2.6	2.2	3.0	1.0	7.7	1.0	2.1		6.3	1.0	21.1

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Avg[1]	Min[1]	Max[1]
Fishing mortality[5]	0.33	0.29	0.18	0.31	0.23	0.33	0.19	0.10	0.15		0.46	0.10	1.00
Exploitation Rate	25%	23%	15%	24%	18%	26%	16%	9%	13%		32%	9%	58%

[1]1978 – 2006
[2]1978 – 2007
[3]for fishing year from May 1 – April 30
[4]Jan 1 ages 3+
[5]ages 4-6
[6]quota reduced to adjust for catch overage in preceding fishing year

Combined Canada/USA catches, which averaged 17,500 mt between 1978 and 1992, peaked at 26,460 mt in 1982, declined to 1,804 mt in 1995, fluctuated around 3,000 mt until 2003 and subsequently declined to 1,161 mt in 2005, the lowest since 1978. Catches in 2006 were 1,615 mt, including 441 mt of discards.

Fishing mortality for ages 4-6 increased sharply between 1989 and 1993 from 0.5 to 1.0. In 1995, fishing mortality declined substantially to F=0.19, due to restrictive management measures. Fishing mortality subsequently fluctuated between 0.18 and 0.50 until 2005 when it declined to 0.10, the lowest since 1978, and was 0.15 in 2006, below F_{ref}=0.18.

State of Resource

Adult population biomass (ages 3+) declined substantially from 43,800 mt in 1990 to 8,500 mt in 1995, the lowest since 1978. The biomass subsequently increased to 19,600 mt in 2001, declined to 13,400 mt in 2005 but increased again to 20,200 mt at the beginning of 2007. Much of the increase in the late 1990's was the result of growth and survival of the 1992, 1995 and 1996 year classes. The increases in 2006 and 2007 were due largely to recruitment and growth of the above average 2003 year class. Generally poor recruitment since 1990, apart from the 2003 year class, and lower weights-at-age in recent years have constrained rebuilding.

Productivity

The 2003 year class, estimated at 7.7 million, is the first above average cohort since the 1990 year class. Prior to the 2003 year class, the 1996 and 1998 year classes, at over 4 million, were the strongest since the 1990 year class. The 2002 and 2004 year classes, at about 1 million each, are the lowest on record. The initial estimate of the 2005 year class is below average, at 2.1 million. Resource productivity is currently poor due to low weight at age and generally low recruit per spawner ratio.

2008 Catch Risk Assessment

Risk of exceeding F_{ref}	25% (risk averse)	50% (risk neutral)	75% (risk prone)
2008 Catch (mt)	2,400 mt	2,700 mt	3,100 mt

Risk of biomass decrease	25% (risk averse)	50% (risk neutral)	75% (risk prone)
2008 Catch (mt)	2,400 mt	2,700 mt	3,100 mt

As indicated in the above table a combined Canada/USA catch of about 2,700 mt in 2008 would result in a neutral risk (50%) that the fishing mortality rate in 2008 will exceed F_{ref} and that the 2009 adult biomass will be lower than the 2008 adult biomass. Given the

poor productivity, a 20% biomass increase is unlikely even with no catch, and a catch of 700 mt results in a neutral risk that biomass would not increase by 10%. A combined Canada/USA catch in 2008 of 2,300 mt results in a low risk that the 2008 fishing mortality would exceed F_{ref}=0.18 and that the adult biomass will not increase from 2008 to 2009.

Special Considerations

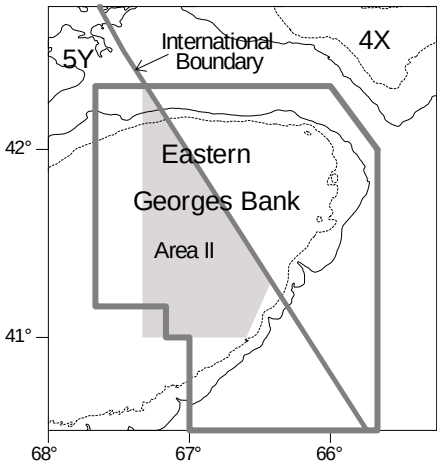
The 2003 year class is projected to contribute over 50% of the fishery catch biomass in 2007 and 2008. With below average 2004 and 2005 year classes, exploitation below F_{ref} should maintain biomass at higher levels in the near future, increasing chances of better recruitment.

Cod and haddock are often caught together in groundfish fisheries, although they are not necessarily caught in proportion to their relative abundance because their catchabilities to the fisheries differ. Due to the higher haddock quota, discarding of cod may occur. To mitigate this concern and to address discarding in all fisheries, modifications to fishing gear and practices with enhanced monitoring should be considered.

Eastern Georges Bank Haddock [5Zjm; 551, 552, 561, 562]

Guidance

The TMGC concluded that the most appropriate combined Canada/USA TAC for Eastern Georges Bank haddock for the 2008 fishing year is 23,000 mt. This represents a low risk (less than 25%) of exceeding the F_{ref} of 0.26. Adult biomass is projected to peak at 159,000 mt in 2008, reflecting the recruitment and growth of the exceptional 2003 year class, and then decline to 146,000 mt in 2009. The annual allocation shares between countries for 2008 are based on a combination of historical catches (20% weighting) and resource distribution based on trawl surveys (80% weighting). Combining these factors entitles the USA to 35% and Canada to 65%, resulting in a national quota of 8,050 mt for the USA and 14,950 mt for Canada.



Harvest Strategy & Reference Points

The strategy is 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.

Fishery Exploitation

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

		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Avg[1]	Min[1]	Max[1]
Canada	**Quota**	3.9	3.9	5.4	7.0	6.7	6.9	9.9	15.4	14.5	12.7			
	Landed	3.4	3.7	5.4	6.8	6.5	6.8	9.7	14.5	12.0		4.5	0.5	14.5
	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**[6]							5.1	7.6	7.5	6.3			
	Landed	0.3	0.4	0.2	0.6	0.9	1.6	1.8	0.5	0.4		2.1	<0.1	9.1
	Discard[2]	<0.1	0	0	<0.1	<0.1	0.1	0.2	0.1	0.1		0.9	<0.1	7.6
Total	**Quota**							15.0	23.0	22.0	19.0			
	Catch	3.8	4.1	5.6	7.5	7.5	8.5	11.8	15.1	12.6		7.2	2.2	23.3
	Adult Biomass[4]	23.7	28.9	33.5	44.8	38.0	69.5	64.2	46.9	114.9	145.3	43.0[3]	6.8[3]	145.3[3]
	Age 1 Recruits	7.2	24.8	9.0	69.3	3.5	2.0	321.7	7.8	30.5	8.7	27.7[7]	0.5[7]	321.7[7]
	Fishing mortality[5]	0.15	0.14	0.17	0.19	0.20	0.20	0.18	0.32	0.36		0.30	0.08	0.59
	Exploitation Rate[5]	13%	12%	14%	16%	16%	16%	15%	25%	27%		23%	7%	41%

[1]1969 - 2006
[2] discards not estimated in 1999-2000 but assumed negligible
[3]1931 - 1955, 1969 – 2007
[4]Jan 1 ages 3+
[5]ages 4+
[6]for fishing year from May 1 – April 30
[7]1931 - 1955, 1969 – 2006

Combined Canada/USA catches declined from 6,522 mt in 1991 to a historical low of 2,181 mt in 1995, fluctuated between about 3,000 mt and 4,000 mt until 1999 and since increased to 15,112 mt in 2005. Greater catches were recorded in the late 1970s and early 1980s, ranging up to about 23,000 mt, but catches subsequently declined and fluctuated around 5,000 mt during the mid to late 1980s. The combined catch in 2006 was 12,642 mt.

Fishing mortality for 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. During 1995-2004, fishing mortality was below the reference, F_{ref}=0.26, but exceeded F_{ref} in 2005 and 2006 (F_{2006}=0.36).

State of Resource

Adult population biomass (ages 3+) increased from near a historical low of 8,500 mt in 1993 to 69,500 mt in 2003, subsequently decreased to 46,900 mt in 2005, but increased to 145,300 mt at the beginning of 2007, the highest in the assessment time series (1931-1955 and 1969-2006), as a result of the exceptional 2003 year class.

Productivity

Recruitment improved in the 1990s and the 2003 year class, estimated at 322 million, is the largest in the assessment time series. In contrast, the 2001, 2002 and 2004 year classes, at less than 8 million, are below the average. The 2005 year class (30.5 million age-1 fish) is above the average. Initial estimates of the 2006 year class suggest that it is below average. With expanded age structure, broad spatial distribution and generally higher recruit per spawner ratio, resource productivity is high, negatively impacted only by recent reductions in fish size at age.

2008 Catch Risk Assessment

Risk of exceeding F_{ref}	25% (risk averse)	50% (risk neutral)	75% (risk prone)
2008 Catch (mt)	23,000 mt	26,700 mt	31,000 mt

A combined Canada/USA catch of 23,000 mt results in a low risk of exceeding F_{ref}=0.26. The risk of biomass decline is not pertinent because biomass is currently the highest in the assessment series.

Special Considerations

The outstanding 2003 year class was expected to contribute 66% of the 2006 catch numbers but accounted for only 28%. The contribution was less than predicted due to lower than anticipated recruitment to the fishery. The failure of this year class to contribute as expected to the fishery resulted in more of the 2000 and older year classes being caught in 2006 than had been projected from the 2005 assessment. This generated a fishing mortality above F_{ref} on the older ages in 2006. Slow growth of the 2003 cohort will continue to impact the fishery. If the TAC in 2007 is caught, fishing mortality will, again, be higher than F_{ref} on the fully recruited ages (F_{5+}=0.33) because the 2007 age 4 fishery partial recruitment is now estimated at 0.2 compared to 0.3 from the 2006 assessment.

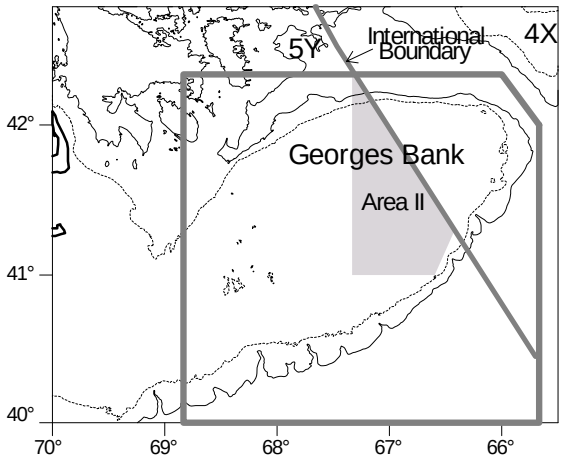
While best judgement was used to determine the fishery partial recruitment for the reduced weight of the 2003 year class, the risk analysis does not capture the extent of uncertainty of the consequences for various catch levels. Using the observed range of partial recruitment at weight during 1995 to 2006, the 2008 projected catch could vary from 17,000 mt to 31,000 mt. If the realized partial recruitment is near the higher end of the observed partial recruitment range, the fishery could forego available yield, if it is lower, the 4+ fishing mortality could be higher than F_{ref}.

Haddock and cod are often caught together in groundfish fisheries, although they are not necessarily caught in proportion to their relative abundance because their catchabilities to the fisheries differ. Due to the higher haddock quota, discarding of cod may occur. To mitigate this concern and to address discarding in all fisheries, modifications to fishing gear and practices with enhanced monitoring should be considered.

Georges Bank Yellowtail Flounder [5Zhjmn; 522,525, 551, 552, 561, 562]

Guidance

The TMGC concluded that the most appropriate combined Canada/USA TAC for the 2008 fishing year is 2,500 mt. This corresponds to an F of 0.17, lower than the F_{ref} of 0.25. With a catch of 2,500 mt in 2008, the age 3+ biomass is expected to increase by 22%. The annual allocation shares between countries for 2008 are based on a combination of historical catches (20% weighting) and resource distribution based on trawl surveys (80% weighting). Combining these factors entitles the USA to 78% and Canada to 22%, resulting in a national quota of 1,950 mt for the USA and 550 mt for Canada.



Harvest Strategy & Reference Points

The strategy is to maintain a low to neutral risk of exceeding the fishing mortality limit reference, F_{ref}=0.25. When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.

Fishery Exploitation

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

		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Avg[1]	Min[1]	Max[1]
Canada	**Quota**	1.2	2.0	3.0	3.4	2.9	2.3	1.9	1.7	0.9	0.4			
	Landed	1.2	2.0	2.9	2.9	2.6	2.1	0.1	<0.1	<0.1		0.6	<0.1	2.9
	Discard	0.7	0.6	0.4	0.8	0.5	0.8	0.4	0.3	0.6		0.5	0.3	0.8
USA	**Quota**[5]							6.0	4.3	2.1	0.9			
	Landed	1.8	2.0	3.7	3.8	2.5	3.3	6.2	3.3	1.2		4.9	0.4	15.9
	Discard	0.1	0.5	0.4	0.3	0.2	0.4	0.5	0.5	0.4		0.6	<0.1	3.0
Total	**Quota**							7.9	6.0	3.0	1.3			
	Catch	3.8	5.0	7.4	7.9	5.9	6.6	7.3	4.1	2.2		6.7	1.2	17.2
Adult Biomass[3]		6.4	7.9	10.3	10.7	9.2	11.4	9.2	4.6	4.4	6.2	7.4[2]	2.0[2]	26.4[2]
SSB		7.0	9.5	10.5	9.5	10.5	10.5	6.0	4.4	5.0		7.6	2.6	21.9
Age 1 Recruits		23.9	25.5	21.0	23.8	16.2	12.2	12.5	14.9	62.9		23.6	6.6	70.6
Fishing mortality[4]		0.78	0.70	0.89	0.95	0.62	0.58	1.88	1.22	0.89		1.05	0.58	1.88
Exploitation Rate[4]		50%	46%	54%	56%	42%	40%	79%	65%	54%		58%	40%	79%

[1]1973 – 2006
[2]1973 - 2007
[3]Jan-1 ages 3+
[4]ages 4+
[5]for fishing year May 1 – April 30

Combined Canada/USA catches of Georges Bank yellowtail flounder peaked at 20,000 mt during the mid 1960s and early 1970s. The catch increased from 1995 through

2001, averaged 6,600 mt per year during 2002-2004, but declined from 7,275 mt in 2004 to 4,088 mt in 2005 and 2,206 mt in 2006.

Fishing mortality for fully recruited ages 4+ was close to or above 1.0 between 1973 and 1994, fluctuated between 0.58 and 0.95 during 1996-2003, increased in 2004 to 1.88, and then declined to 0.89 in 2006. Fishing mortality has been well above F_{ref}=0.25 for the entire time series, in contrast to the perception of being below F_{ref} since 1995 as estimated in pre-2005 assessments.

State of Resource

Two assessment approaches were considered by TRAC. The Base Case VPA continues to display a retrospective pattern, updating population biomass estimates to lower values than previously determined and compromising interpretation of results. The Major Change VPA did not exhibit a retrospective pattern; updates were both above and below previously estimated values. The Major Change VPA better reflects the recent trend observed in all three surveys and is adopted as the basis for management advice for 2008.

Adult population biomass (ages 3+), based on the Major Change VPA results, increased from a low of 2,200 mt in 1995 to 11,400 mt in 2003 and then declined to 4,400 mt in 2005 and increased to 6,200 mt at the beginning of 2007. Spawning stock biomass in 2006 was estimated to be 5,000 mt.

Productivity

Recruitment improved from the mid-1990s, averaging 23.6 million fish at age 1 during 1998-2001, but has since declined, with the exception of the 2005 year class estimated at 62.9 million, which is near the highest value in the time series. Previous assessments indicated the presence of some large recruitment in the late 1990s and early 2000s, but the size of these cohorts is now estimated to be much lower. The 2005 year class was observed at high levels in 2006 at age 1 in the NMFS Fall, NMFS Spring, and NMFS Sea Scallop surveys, and observed at high levels in 2007 at age 2 in the DFO and NMFS Spring surveys. This coherence among surveys gives confidence that this year class is well above average. However, the magnitude of this year class will be better estimated as more observations become available. Truncated age structure in the surveys and changes in distribution indicate current resource productivity may be limited relative to historical levels.

2008 Catch Risk Assessment

It is considered that in this assessment the uncertainties, particularly those associated with the changes in survey catchabilities, are more problematic than in other assessments. As such, the standard risk assessment does not capture the extent of uncertainty of the consequences for various catch levels. A sensitivity analysis illustrates the dependence of the projected 2008 catch on the magnitude of the 2005 year class.

A combined Canada/USA catch of about 3,500 mt in 2008 would result in a neutral risk (~50%) that the fishing mortality rate in 2008 will exceed F_{ref}. Fishing at F_{ref} in 2008 will generate a 16% increase in median age 3+ biomass from 2008 to 2009.

The 2005 year class accounts for 59% of the 2008 catch, 73% of the 2008 age 3+ biomass, and 60% of the 2009 age 3+ biomass. Replacing the 2007 age 2 value (the 2005 year class) by the average during 1997-2006 (14.8 million fish at age 2) generates a combined Canada/USA F_{ref} catch in 2008 of 2,000 mt (44% lower than the default projections). This sensitivity analysis is an extreme example because the average age 2 population abundance during 1997-2006 of 14.8 million fish, is well below the point estimate (52.5 million) and even the lower 80% confidence interval (34.6 million) for the 2005 year class at age 2 in 2007. However, in the past, some year classes that were estimated as strong were later found to be average when the cohort was observed for more years.

A combined Canada/USA catch of 2,500 mt in 2008 corresponds to an F of 0.17, lower than the F_{ref} of 0.25. With a catch of 2,500 mt in 2008, the age 3+ biomass is expected to increase by 22%.

Special Considerations

Although the Major Change VPA is recommended for management decisions, the mechanism for the large changes in survey catchability is not easily explained. These changes in survey catchability are most appropriately thought of as aliasing an unknown mechanism that produces a better fitting model. The inability to plausibly explain these survey catchability changes causes increased uncertainty in this assessment relative to other assessments. However, the Major Change VPA results more closely reflect the recent trend in abundance observed in all three surveys and is the preferred model from which to make management decisions.

The realized fishing mortality rates have been higher than the target F used to set the quotas. In 2005, a catch of 2,100 mt in 2006 was projected to produce a fishing mortality of 0.25. However, the observed catch of 2,200 mt resulted in an F of 0.89. In contrast, when set in 2006, the 2007 TAC of 1,250 mt was expected to result in an F of 0.25. The F in 2007 is now projected to be 0.20 due to the well above average 2005 year class. This highlights the difficulties of assessing this resource because of a strong retrospective pattern of unknown source (for the Base Case model), truncated age structure, and reliance on incoming year classes. The current model, while an improvement over the Base Case model, should be used with these uncertainties in mind.

Source Documents

Gavaris S, O'Brien L and Mayo R. 2007. Update of allocation shares for Canada and the USA of the transboundary resources of Atlantic cod, haddock and yellowtail flounder on Georges Bank through fishing year 2008. TRAC Reference Document 2007/01.

TRAC. 2007. Eastern Georges Bank cod. TRAC Status Report 2007/01.

TRAC. 2007. Eastern Georges Bank haddock. TRAC Status Report 2007/02.

TRAC. 2007. Georges Bank yellowtail flounder. TRAC Status Report 2007/03.

Consultations

Transboundary Resources Assessment Committee (TRAC), St. Andrews, New Brunswick, 12-15 June 2007.

Transboundary Management Guidance Committee public consultation in Canada, Yarmouth, Nova Scotia, 23 August 2007.

New England Fishery Management Council, Groundfish Oversight Committee, Peabody, Massachussets, 1 August 2007.