Transboundary Resources Assessment Committee

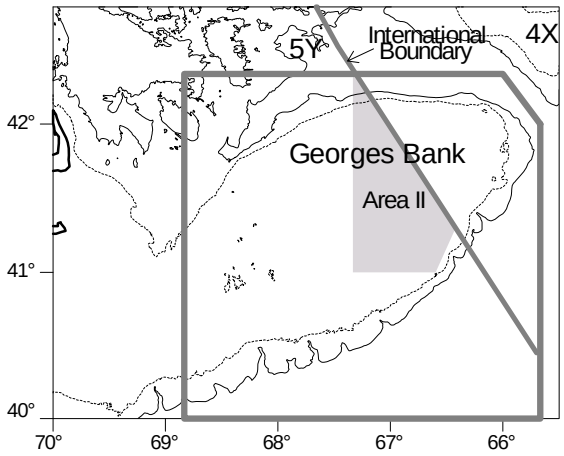
Status Report 2013/01

GEORGES BANK

YELLOWTAIL

FLOUNDER

[5Zhjmn;
522,525,551,552,561,562]



Summary

- Combined Canada and USA catches in 2012 were 722 mt. This is the first time since 1940 that catch has been less than 1,000 mt.

- The Split Series Virtual Population Analysis (VPA), which splits the survey indices between 1994 and 1995, was used for the stock assessment, but a retrospective adjustment (denoted rho adjustment) was applied to the terminal year estimates for both status determination and provision of catch advice. The TRAC acknowledges that the assumptions made about population dynamics in the model do not fully capture the trends in the data. However, the model's conclusion that stock conditions are poor is valid.

- Adult population biomass (age 3+) at the start of 2013 and spawning stock biomass in 2012 are both estimated to be the lowest values in the time series when the rho adjustment is applied.

- Recruitment of the three most recent cohorts is estimated to be the lowest in the time series.

- Fishing mortality for fully recruited ages 4+ is estimated to be above the reference point of $F_{ref} = 0.25$ for the entire assessment time series.

- To achieve a high probability that F in 2014 will be less than F_{ref}, a 2014 quota of less than 200 mt would be required. In order to achieve high probability that adult biomass will increase from 2014 to 2015, a 2014 quota of less than 500 mt would be required. Due to the assumption used for the 2012 year class in the projections, the increase in adult biomass will be optimistic if the 2012 year class is as poor as the recent year classes.

- Catches well below 500 mt are likely needed to achieve the harvest strategy.

Table 1. Catches, Biomass (thousands mt); Recruits (millions)

		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Avg[1]	Min[1]	Max[1]
Canada[9]	**Quota**	1.9	1.7	0.9	0.4	0.6	0.5	0.8[8]	1.2	0.6	0.3			
	Landed	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		0.5	<0.1	2.9
	Discard	0.4	0.2	0.5	0.1	0.1	0.1	0.2	<0.1	<0.1		0.5	<0.1	0.8
USA[9]	**Quota[2]**	6.0	4.3	2.1	0.9	1.9	1.6	1.2[8]	1.5	0.6	0.2			
	Catch[2]	5.9	3.8	1.9	1.0	1.6	1.8	1.1	1.1	0.5				
	Landed	5.8	3.2	1.2	1.1	0.7	1.0	0.7	0.9	0.4		4.3	0.4	15.9
	Discard	0.5	0.4	0.4	0.5	0.4	0.7	0.3	0.2	0.2		0.6	<0.1	3.0
Total[9]	**Quota[3]**	7.9	6.0	3.0	1.3	2.5	2.1	2.0[8]	2.7	1.2	0.5			
	Catch[3]	6.4	4.1	2.5	1.1	1.7	1.9	1.3	1.1	0.6				
	Catch[4]	6.8	3.9	2.1	1.7	1.5	1.8	1.2	1.2	0.7		5.8	0.7	17.2
Split Series VPA (no rho adjustment applied)														
Adult Biomass[5]		8.5	4.0	2.4	2.4	3.1	3.3	2.9	3.1	2.6	2.5	6.6[6]	2.0[6]	26.2[6]
SSB		5.4	3.2	2.3	2.7	3.2	3.2	3.0	3.0	2.6		6.5	2.2	22.2
Age 1 Recruits		6.8	8.5	10.1	6.2	5.4	5.7	2.9	2.3	2.3		18.9	2.3	70.6
Fishing mortality[7]		1.94	1.39	1.54	1.05	0.57	0.83	0.73	0.60	0.32		1.02	0.32	1.94
Exploitation Rate[7]		80%	70%	73%	60%	40%	52%	47%	42%	25%		59%	25%	80%

[1]1973 – 2012
[2]for fishing year May 1 – April 30
[3]for Canadian calendar year and USA fishing year May 1 – April 30
[4]sum of Canadian Landed, Canadian Discard, and USA Catch (includes discards)
[5]Jan-1 age 3+
[6]1973 - 2013
[7]age 4+
[8]quotas not jointly determined; established individually by each country
[9] unless otherwise noted, all values reported are for calendar year

Fishery

Total catches of Georges Bank yellowtail flounder peaked at about 21,000 mt in both 1969 and 1970 (Figure 1). The combined Canada/USA catch increased from 1995 through 2001, averaged 6,300 mt during 2002-2004, but declined to 722 mt in 2012 due to restrictive management measures (Table 1). The 2012 catch was the first time since 1940 that catch has been less than 1,000 mt.

The 2012 **Canadian catch** of 91 mt was well below the Canadian quota of 586 mt, with landings of only 46 mt and estimated discards of 45 mt. The majority of landings were from a total of nine directed yellowtail trips. Discards were due to the sea scallop dredge fishery.

USA catches in 2012 were 631 mt, with landings of 443 mt and discards of 188 mt. The USA landings in 2012 were predominantly from the trawl fishery while discards came from both the trawl and sea scallop dredge fisheries. Preliminary estimates of the USA catches for fishing year 2012 were 94% of the 564 mt quota.

Ages 3-5 accounted for most of the **combined Canada/USA fishery** catch in 2012. Both the Canadian and the USA fisheries were well sampled to determine length composition of the catch.

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, $F_{ref} = 0.25$ (established during the 2005 TRAC benchmark). 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 1973 to 2012. The VPA was calibrated to trends in abundance from three bottom trawl survey series (NMFS spring, NMFS fall and DFO) and a recruitment index from the NMFS summer sea scallop survey (for the years that it covered the whole bank). The VPA formulation down-weights the DFO surveys in 2008 and 2009 to account for the higher uncertainty in these years due to large tows, as recommended by the TRAC previously. 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 Split Series VPA, which splits the survey indices between 1994 and 1995, was used for the stock assessment. The Split Series stock assessment exhibits strong retrospective bias in SSB and F which results in decreases in SSB and increases in F compared to the results of previous assessments. A retrospective adjustment (denoted rho adjustment) based on the observed retrospective bias was applied to the terminal year estimates for both status determination and provision of catch advice.

Adult population biomass (age 3+) at the start of 2013 and spawning stock biomass in 2012 are both estimated to be the lowest values in their time series when the rho adjustment is applied (Table 2, Figure 2).

Recruitment of the three most recent cohorts is estimated to be the lowest in the time series (Figure 3).

Fishing mortality for fully recruited ages 4+ is estimated to be above the reference point of $F_{ref} = 0.25$ for the entire assessment time series (Table 2, Figure 4).

Table 2. Estimated and rho adjusted values for the Split Series VPA. Note the SSB rho value was used to adjust the adult biomass estimate.

	estimate	rho adjusted
2012 F	0.32	0.78
2012 R	2278	1168
2012 SSB	2593	869
2013 Adult B	2467	826

Productivity

Age structure, spatial distribution, and fish growth typically reflect changes in the productive potential. In both absolute numbers and percent composition, the **population age structure** estimated by the VPA displays a truncated pattern with few old fish and poor recent recruitment. **Spatial distribution patterns** from the three groundfish surveys generally follow historical averages. **Growth** has recently been variable without trend and condition (weight at length) has improved from last year, although still below the long term average. Truncated age structure and low recent recruitment indicate current resource productivity is lower than historical levels.

Outlook

This outlook is provided in terms of consequences with respect to the harvest reference points for alternative catch quotas in 2014. Uncertainty about current biomass generates uncertainty in forecast results, which is expressed here as the probability of exceeding $F_{ref} = 0.25$ and change in adult biomass from 2014 to 2015. The risk calculations assist in evaluating the consequences of alternative catch quotas by providing a general measure of the uncertainties. However, the risk calculations 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, the possibility that the model may not reflect stock dynamics closely enough, and/or retrospective bias.

Projections were made using 2010-2012 average fishery partial recruitment and average weights at age from the Split Series VPA as inputs. The abundance of the 2012 year class (age 1 in 2013) was set as the geometric mean of the previous ten years. The three most recent recruitments have been well below this value.

For the past ten years, catches have generally been below the quotas set with the intent to increase the population abundance but survey trends do not indicate that this has occurred. Total mortality rates estimated from the surveys have remained high despite large reductions in quotas and catches. If the 2014 catch quota is set based on model results as done in the past, this pattern of failing to achieve management objectives seems likely to continue given the model's increasing retrospective pattern. TRAC recommends considering the 2014 catch advice provided below as an upper bound instead of a target. In order to meet management objectives ($F<F_{ref}$ and reduce F when stock condition is poor to promote rebuilding) the 2014 quota should be a reduction from the 2013 quota of 500 mt to as low a level as possible. Fishing at F_{ref} results in a 2014 quota of 123 mt from the rho adjusted Split Series model (see Special Considerations).

Under the projections based on rho adjusted Split Series VPA, to achieve high probability that F in 2014 will be less than F_{ref}, a 2014 quota of less than 200 mt would be required (Table 3). In order to achieve high probability that adult biomass will increase from 2014 to 2015, a 2014 quota of less than 500 mt would be required. Due to the assumption used for the 2012 year class in the projections, the increase in adult biomass will be optimistic if the 2012 year class is as poor as the recent year classes.

Table 3. Implications of five 2014 quotas (100-500 mt): P(F>Fref) = probability fishing mortality rate in 2014 will exceed F_{ref}, F2014 = median 2014 F, delta B = relative change in median biomass from 2014 to 2015, P(B inc) = probability median adult Jan-1 biomass will increase or P(B inc 10%) = increase by at least 10%.

	2014 Quota (mt)				
	100	200	300	400	500
Split Series rho adjusted					
P(F>Fref)	0.26	0.97	1.00	1.00	1.00
F2014	0.20	0.43	0.71	1.05	1.48
delta B	60%	44%	27%	11%	-4%
P(B inc)	1.00	1.00	1.00	1.00	0.21
P(B inc 10%)	1.00	1.00	1.00	0.66	0.02

In the USA, there is a requirement to provide rebuilding projections when stocks are overfished. The current rebuilding scenario for Georges Bank yellowtail flounder requires solving for a value of F (F_{reb50}) that, when applied in years 2014 onwards, results in a 50% probability that SSB is greater than SSB_{msy} (43,200 mt) in year 2032. This is so far into the future that no rebuilding projections were considered.

Special Considerations

The TRAC acknowledges that the assumptions made about population dynamics in the model do not fully capture the trends in the data. However, the model's conclusion that stock conditions are poor is valid. This is supported by the fact that survey indices continued to decline when catches decreased from 1,800 mt to 722 mt during 2008 to 2012 due to reduced quotas. When the Split Series VPA is projected without a rho adjustment, fishing at F_{ref} results in 562 mt. This catch quota is certainly too high based on past performance of the Split Series model projections. There is some evidence from the two most recent assessments that the rho adjusted projections perform better than the unadjusted values. Thus, Table 3 results, which include the rho adjustment, are reasonable to consider for guidance on catch advice. Catches well below 500 mt are likely needed to achieve the harvest strategy.

There is a continued need to conduct research to limit the possible causes for the retrospective bias exhibited in this assessment.

In July 2013 there will be a reduction in minimum size from 13 inches to 12 inches for the U.S. fishery which is expected to result in reduced discards and a possible change in partial recruitment for the youngest ages.

Source Documents

Clark, K.J., and L. O'Brien, editors. 2013. Proceedings of the Transboundary Resources Assessment Committee (TRAC): Eastern Georges Bank Cod and Haddock, and Georges Bank Yellowtail Flounder: Report of Meeting held 25-27 June 2013. TRAC Proceedings 2013/02.

Legault, C.M., L. Alade, W.E. Gross, and H.H. Stone. 2013. Stock Assessment of Georges Bank Yellowtail Flounder for 2013. TRAC Reference Document 2013/01.

Correct Citation

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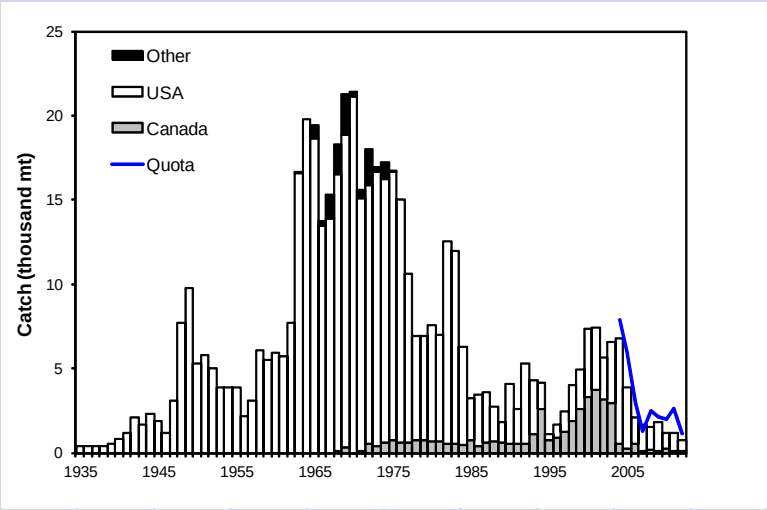

Figure 1. Catches and TMGC quotas.

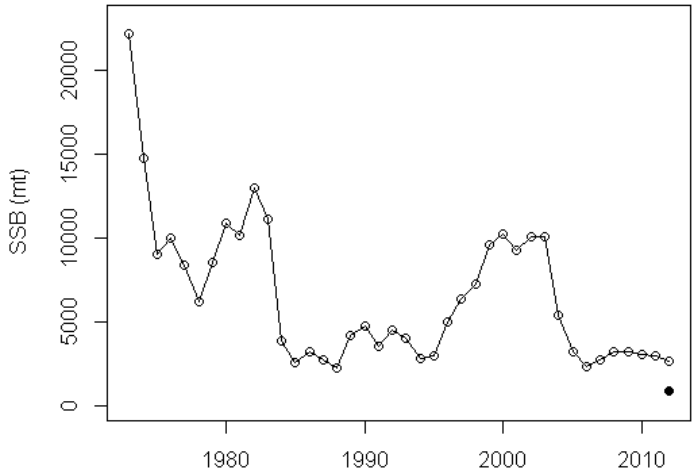

Figure 2. Spawning stock biomasses (with rho adjusted point).

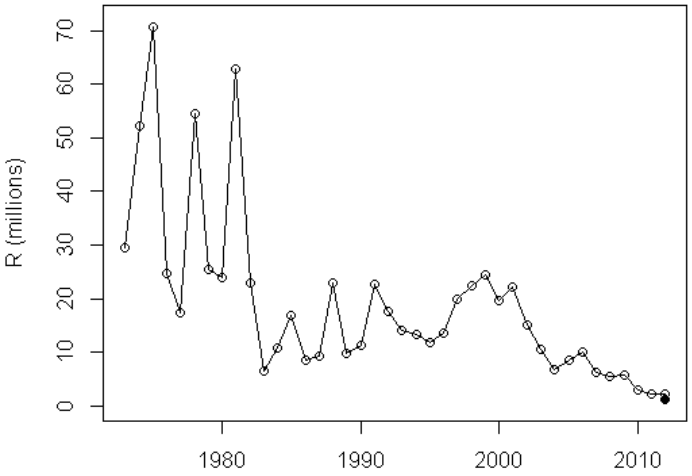

Figure 3. Recruitments (with rho adjusted point).

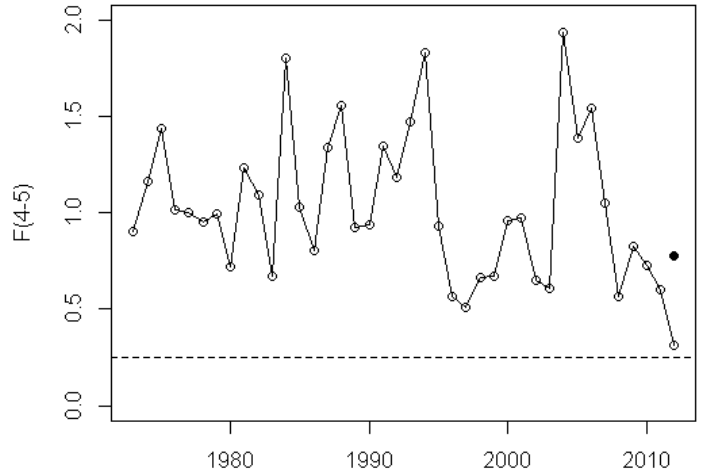

Figure 4: Fishing mortality rates (with rho adjusted point and F_{ref} line).

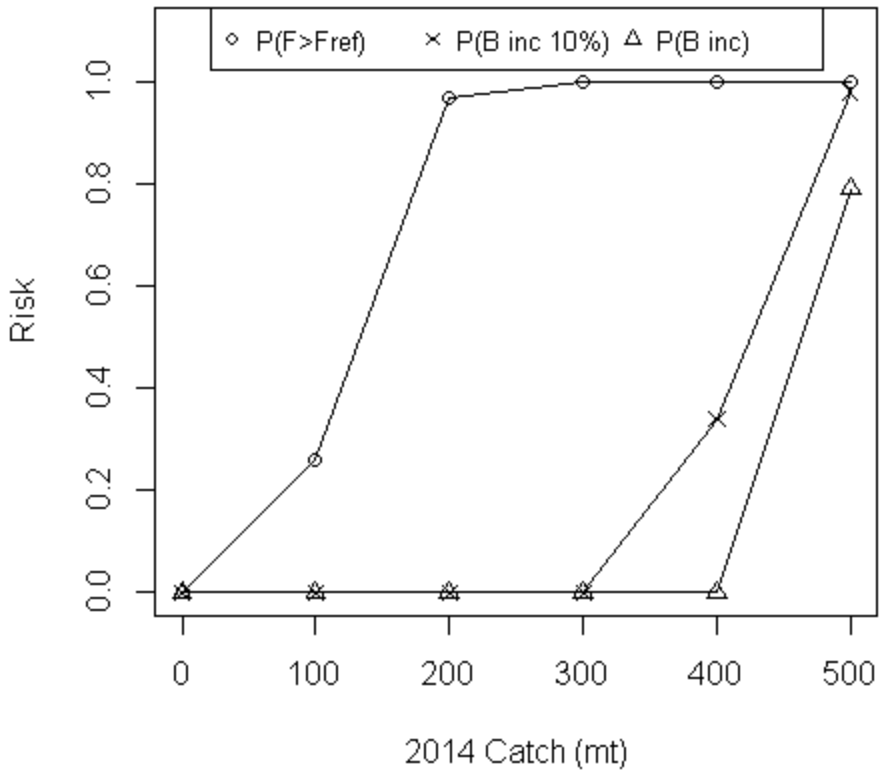

Figure 5. Risk of overfishing, P(F>Fref), biomass will not increase 10%, P(B inc 10%), or biomass will not increase, P(B inc).