Transboundary Resources Assessment Committee

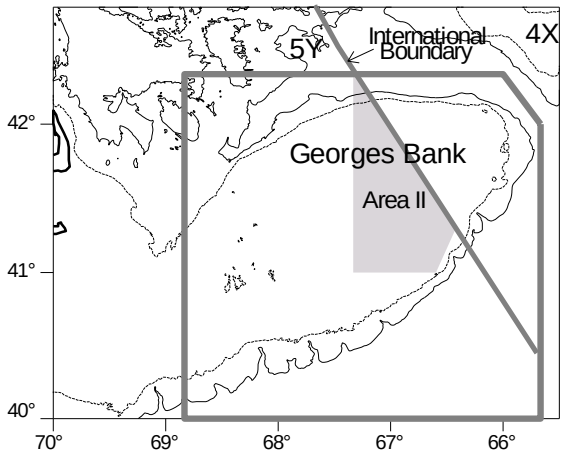
Status Report 2016/03

GEORGES BANK

YELLOWTAIL

FLOUNDER

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



Summary

- Combined Canada and USA catches in 2015 were 118 mt. This is the lowest value in the time series beginning in 1935.
- The declining trend in survey biomass to low levels for the past three years, despite reductions in catch to historical low amounts, indicates a poor state of the resource.
- Recent catch is low relative to the biomass estimated from the surveys but catch curve analyses indicate high total mortality rates (Z>1).
- Stock biomass is low and productivity is poor.
- An empirical approach based on survey catches developed during the 2014 Georges Bank Yellowtail Flounder Diagnostic and Empirical Approach Benchmark was applied to generate catch advice. Using a constant exploitation rate of 2% to 16% results in 2017 catch advice of 31 mt to 245 mt.

Table 1. Catches (thousands mt)

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Avg[1]	Min[1]	Max[1]
Canada[2]	**Quota**	0.4	0.6	0.5	0.8	1.2	0.6	0.3	<0.1	0.1	0.1			
	Landed	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		0.4	<0.1	2.9
	Discard	0.1	0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1		0.4	<0.1	0.8
USA[2]	**Quota[4]**	0.9	1.9	1.6	1.2	1.5	0.6	0.2	0.3	0.2	0.3			
	Catch[4]	1.0	1.6	1.8	1.1	1.1	0.5	0.1	0.1	0.1[5]				
	Landed	1.1	0.7	1.0	0.7	0.9	0.4	0.1	<0.1	<0.1		4.0	<0.1	15.9
	Discard	0.5	0.4	0.7	0.3	0.2	0.2	<0.1	<0.1	<0.1		0.5	<0.1	3
Total[2]	**Quota[6]**	1.3	2.5	2.1	2.0	2.7	1.2	0.5	0.4	0.4	0.4			
	Catch[6]	1.1	1.7	1.9	1.3	1.1	0.6	0.1	0.1	0.1[5]				
	Catch[7]	1.7	1.5	1.8	1.2	1.2	0.7	0.2	0.2	0.1		5.4	0.1	17.2

[1] 1973 – 2015
[2] unless otherwise noted, all values reported are for calendar year
[3] quotas not jointly determined; established individually by each country
[4] for fishing year May 1 – April 30
[5] preliminary estimate
[6] for Canadian calendar year and USA fishing year May 1 – April 30
[7] sum of Canadian landed, Canadian discard, and USA catch (includes discards)

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 118 mt in 2015 (Table 1) due to restrictive management measures. The 2015 value was the lowest catch in the time series beginning in 1935.

The 2015 **Canadian catch** of 14 mt was well below the Canadian quota of 106 mt, with landings of 3 mt and estimated discards of 11 mt from the sea scallop dredge fishery.

USA catches in calendar year 2015 were 104 mt, with landings of 63 mt and discards of 41 mt. The USA landings in calendar year 2015 were predominantly from the trawl fishery, while discards came from both the trawl (4 mt) and sea scallop dredge (37 mt) fisheries. Preliminary estimates of the USA catches (landings plus discards) for fishing year 2015 were 27% of the 248 mt quota.

Harvest Strategy and Reference Points

The Transboundary Management Guidance Committee (TMGC) has adopted a strategy to maintain a low to neutral risk of exceeding the fishing mortality limit reference, $F_{ref} = 0.25$ (established in 2002 by the TMGC). When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.

State of Resource

The declining trend in survey biomass to low levels for the past three years, despite reductions in catch to historical low amounts, indicates a poor state of the resource. Recent catch is low relative to the biomass estimated from the surveys but catch curve analyses indicate high total mortality rates (Z>1). In the early-1990s, reductions in fishing mortality (F) resulted in a decrease in Z and a concurrent increase in stock biomass. Following the mid-1990s, Z appears to have increased and

remains high despite decreases in relative F, suggesting increases in mortality from sources other than estimated catches.

Productivity

Recruitment, spatial distribution, and fish growth typically reflect changes in the productive potential. Recent **recruitment** has generally been below average (Figure 2) and age structure is truncated (i.e., both fewer young fish and fewer old fish). **Spatial distribution patterns** from the three bottom trawl surveys generally follow recent averages. **Growth** has recently been variable without trend, and condition (weight at length) has been recently poor but is now approaching the long term average. Stock biomass is low and productivity is poor.

Outlook

This outlook is provided in terms of an empirical approach from the 2014 Georges Bank Yellowtail Flounder Diagnostic and Empirical Approach Benchmark and subsequent Transboundary Resource Assessment Committee (TRAC) meeting in 2014. The lack of a stock assessment model framework means no fishing mortality rate can be calculated for this stock. The empirical approach averages estimates of biomass from the DFO, NMFS spring, and NMFS fall surveys (Figure 3), and applies an exploitation rate to this average to generate catch advice. A range of exploitation rates of 2% to 16% was suggested by the 2014 TRAC as an appropriate scientific basis for calculating the catch advice.

TRAC Advice

The TRAC recommends application of the 2014 Diagnostic and Empirical Benchmark formulation of the empirical approach for catch advice. Assuming survey catchability for all three surveys is 0.37 and applying an exploitation rate of 2% to 16%, results in catch advice of 31 mt to 245 mt (Table 2). This recommendation is based on further declines in the survey biomass since last year.

Holding the 2017 quota constant from the 2016 quota (354 mt) would represent a relative exploitation rate of 23%, assuming a survey catchability (q) of 0.37. If the 2017 quota is fully caught, that would be 36% above the upper range of exploitation rate from the benchmark, but within the range of exploitation rates associated with the quota during 2010-2015 (10%-36%; Table 3). This is a departure from last year when the constant exploitation and constant quota catch advice was essentially identical.

The TRAC was presented with information that suggests survey catchability is less than 0.37. However, more thorough analyses need to be presented to TRAC to determine a new value(s) of survey catchability. In recognition of the uncertainty associated with the current value, a sensitivity analysis was conducted that explored the impact of different values of survey catchability. As survey catchability decreases, the estimated population biomass increases and the historic ratio of quota/survey (a relative exploitation rate) decreases. If the mean of the 2010-2015 quota/survey relative exploitation rate (Table 3) is applied to the current survey estimated population biomass, then the survey catchability term cancels and results in 260 mt no matter what value of survey catchability is assumed. Applying the minimum and maximum exploitation rates calculated from 2010-2015 quota/survey ratios to the average survey biomass results in the

range of 155 mt to 554 mt. This value of 260 mt is only slightly above the high end of the catch advice range recommended above by TRAC of 31 mt to 245 mt. Similarly, applying the mean of the 2010-2015 observed catch/survey ratio to the average survey population biomass results in catch advice of 118 mt (using the minimum catch/survey ratio from the 2010-2015 period results in 68 mt, while using the maximum value results in 245 mt) no matter what value of survey catchability is assumed.

Table 2. Survey biomass from the three bottom trawl surveys, an arithmetic average of these biomasses, and catch advice from two exploitation rates (mu). Catch advice is implemented in the following year (e.g., the row of 2016 catch advice would be implemented in 2017).

					mu =	2%	16%
Year	DFO	Spring	Fall (year-1)	Avg (mt)		Catch Advice (mt)	Catch Advice (mt)
2010	8,233	22,181	26,936	19,117		382	3,059
2011	3,450	9,557	8,976	7,328		147	1,172
2012	5,063	14,908	9,793	9,921		198	1,587
2013	629	4,119	10,065	4,938		99	790
2014	462	2,763	3,493	2,240		45	358
2015	741	1,891	4,092	2,241		45	359
2016	1,557	1,165	1,875	1,532		31	245

For context, recent quotas correspond to exploitation rates of 10-36% (average 17%) and recent catches correspond to exploitation rates of 4-16% (average 8%) (Table 3). Surveys have indicated a declining trend in biomass during this period (Table 2). It is important to note however that quotas for years 2010 to 2014 were not set according to the empirical method.

Table 3. Recent actual quotas and catches by year and associated exploitation rates (computed by dividing by the average survey biomass in Table 2). (VPA = Virtual Population Analysis.)

Year	Quota (mt)	Actual Catch (mt)	Quota/Avg	Catch/Avg	Model Type
2010	1956	1170	10%	6%	VPA
2011	2650	1171	36%	16%	VPA
2012	1150	725	12%	7%	VPA
2013	500	218	10%	4%	VPA
2014	400	159	18%	7%	VPA
2015	354	118	16%	5%	Empirical
Average	1168	593	17%	8%	

Special Considerations

Because a stock assessment model framework is not used for this stock, no historical estimates of biomass, fishing mortality rate, or recruitment can be calculated. As well, status determination relative to reference points is not possible because reference points cannot be defined.

Catch advice for 2018 is not provided because the empirical approach requires the 2017 surveys.

The TRAC notes that catch has been below the quota since 2004 and, on average, catch has been 47% of the quota since 2010 (Figure 1). This can be attributed to management regulations in both countries; for example, yellowtail is not allocated to the directed fishery in Canada, gear restrictions in both countries, bycatch avoidance programs in the USA, and hard Total Allowable Catch (TAC) management of a multispecies fishery in the USA.

Survey catchability remains a large source of uncertainty in the empirical approach. Estimates of survey catchability from a range of studies should be documented and presented prior to the next TRAC meeting for consideration in providing catch advice.

The 2016 NMFS spring survey was delayed by about a month. The location of yellowtail flounder caught during the 2016 NMFS spring survey did not appear to vary from either the recent ten year average distribution map or the locations of yellowtail flounder caught in the spring survey during years 2009 through 2015.

Source Documents

O'Brien, L., and K. Clark, editors. 2014. Proceedings of the Transboundary Resources Assessment Committee for Georges Bank Yellowtail Flounder Diagnostic and Empirical Approach Benchmark: Report of Meeting held 14-18 April 2014. TRAC Proceedings 2014/01.

Brooks, E.N., and K.J. Curran, editors. 2016. Proceedings of the Transboundary Resources Assessment Committee (TRAC): Eastern Georges Bank Cod and Haddock, and Georges Bank Yellowtail Flounder: Report of Meeting held 12-14 July 2016. TRAC Proceedings 2016/01.

Legault, C.M., and D. Busawon. 2016. Stock Assessment of Georges Bank Yellowtail Flounder for 2016. TRAC Reference Document 2016/01.

Correct Citation

TRAC. 2016. Georges Bank Yellowtail Flounder. TRAC Status Report 2016/03.

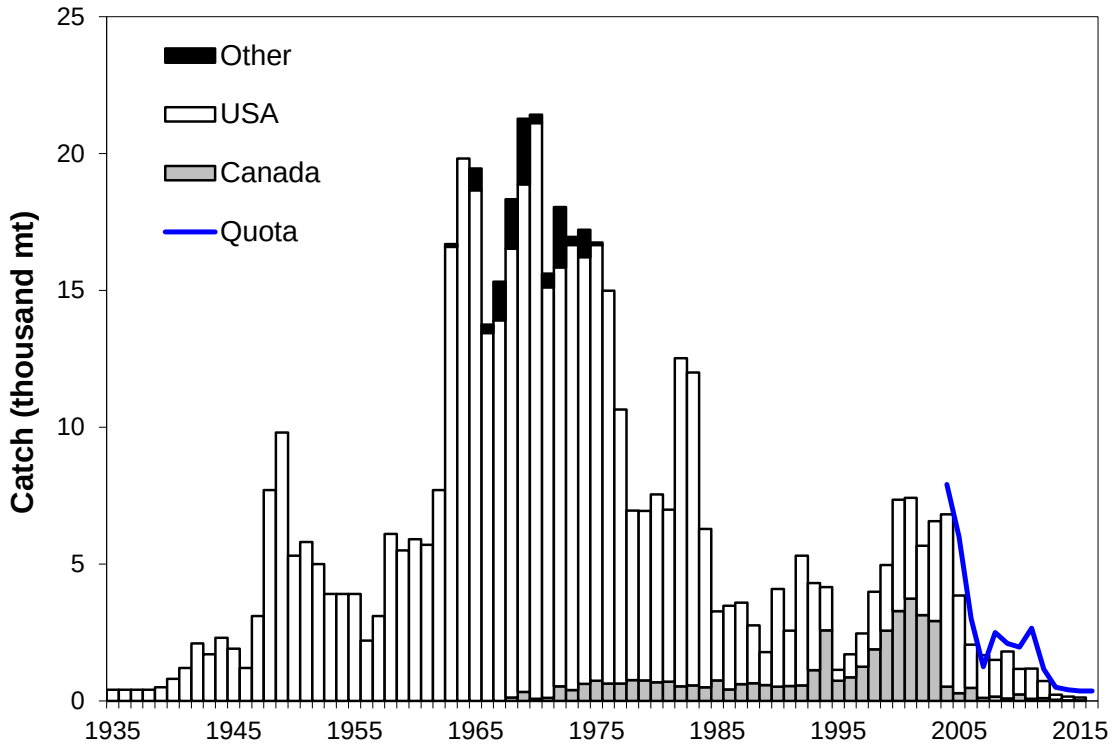


Figure 1. Catches and quota for Georges Bank yellowtail flounder.

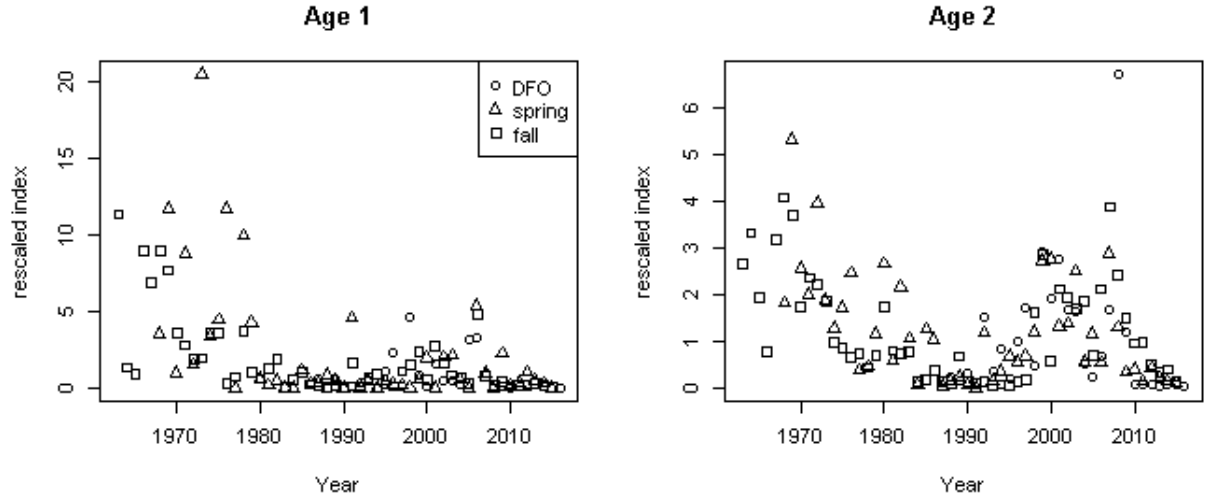


Figure 2. Estimates of recruitment (age 1 has many zeros, so age 2 also shown) from the three bottom trawl surveys standardized to their respective means during 1987 through 2007. Note that the 2016 NMFS spring survey age data are not included due to survey delays.

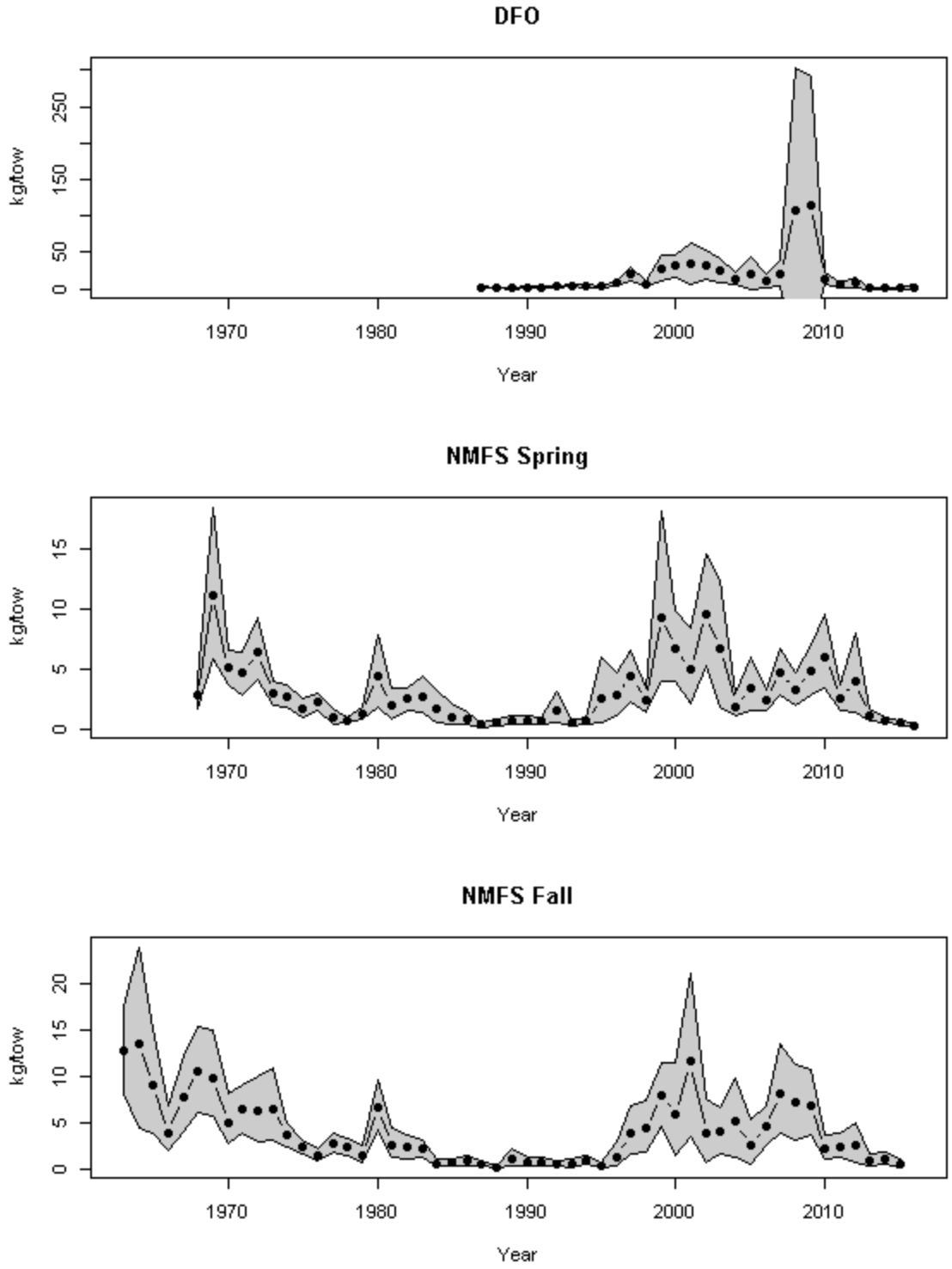


Figure 3. Bottom trawl survey catch rates (in biomass) for Georges Bank yellowtail flounder (filled circles) with 95% confidence intervals (gray area). Note that the amount of Georges Bank area covered in the DFO and NMFS surveys differs and that the NMFS surveys have been standardized to Albatross units.