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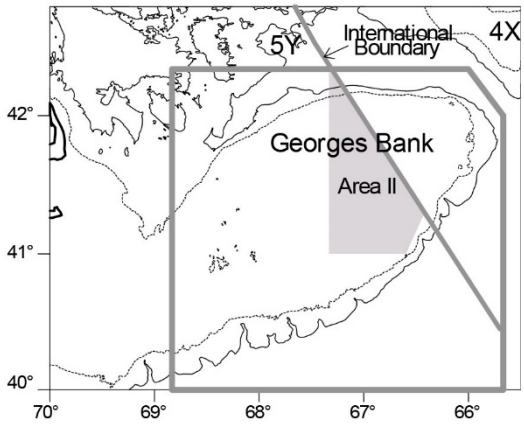
NOAA FISHERIES NATIONAL MARINE FISHERIES SERVICE

Transboundary Resources Assessment Committee

Status Report 2015/03

GEORGES BANK YELLOWTAIL FLOUNDER

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



Summary

- Combined Canada and USA catches in 2014 were 159 mt. This is the lowest value in the time series beginning in 1935. Discards were greater than landings for the first time in 2014.
- The declining trend in survey biomass to low levels for the past two 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.
- There are two approaches to management that could be considered: constant exploitation rate and constant quota. The Transboundary Resources Assessment Committee (TRAC) recommends the Transboundary Management Guidance Committee (TMGC) implement and maintain one of these approaches over three years to see if the stock responds.
- Using a constant exploitation rate of 2% to 16% results in catch advice of 45 mt to 359 mt. Using a constant quota approach, the TRAC recommends a quota of 354 mt or lower (based on not increasing the quota relative to the 2015 quota due to concerns about stock declines).

Ce document est disponible sur l'internet a: This document is available on the internet @
http://www.bio.gc.ca/info/intercol/trac-cert/index-en.php

Table 1. Catches (thousands mt)

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Avg[1]	Min[1]	Max[1]
Canada[2]	**Quota**	0.9	0.4	0.6	0.5	0.8[3]	1.2	0.6	0.3	<0.1	0.1			
	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	0.5	0.1	0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1		0.4	<0.1	0.8
USA[2]	**Quota[4]**	2.1	0.9	1.9	1.6	1.2[3]	1.5	0.6	0.2	0.3	0.2			
	Catch[4]	1.9	1.0	1.6	1.8	1.1	1.1	0.5	0.1	0.1[5]				
	Landed	1.2	1.1	0.7	1.0	0.7	0.9	0.4	0.1	<0.1		4.1	<0.1	15.9
	Discard	0.4	0.5	0.4	0.7	0.3	0.2	0.2	<0.1	<0.1		0.6	<0.1	3.0
Total[2]	**Quota[6]**	3.0	1.3	2.5	2.1	2.0[3]	2.7	1.2	0.5	0.4	0.4			
	Catch[6]	2.5	1.1	1.7	1.9	1.3	1.1	0.6	0.1	0.1[5]				
	Catch[7]	2.1	1.7	1.5	1.8	1.2	1.2	0.7	0.2	0.2		5.6	0.2	17.2

[1] 1973 – 2014
[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 159 mt in 2014 (Table 1) due to restrictive management measures. The 2014 value was the lowest catch in the time series beginning in 1935. Discards were greater than landings for the first time in 2014.

The 2014 **Canadian catch** of 15 mt was well below the Canadian quota of 72 mt, with landings of <1 mt and estimated discards of 14 mt from the sea scallop dredge fishery.

USA catches in 2014 were 144 mt, with landings of 70 mt and discards of 74 mt. The USA landings in 2014 were predominantly from the trawl fishery, while discards came from both the trawl (10 mt) and sea scallop dredge (64 mt) fisheries. Preliminary estimates of the USA catches for fishing year 2014 were 37% of the 328 mt quota.

Harvest Strategy and Reference Points

The 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 two 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).

Productivity

Recruitment, spatial distribution, and fish growth typically reflect changes in the productive potential. Recent **recruitment** has generally been below average and age structure is truncated (i.e., both fewer young fish and fewer old fish). **Spatial distribution patterns** from the three groundfish surveys generally follow recent averages. **Growth** has recently been variable without trend, and condition (weight at length) remains below 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. 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 2), and applies an exploitation rate to this average to generate catch advice. A range of exploitation rates of 2% to 16% was suggested last year by the TRAC as an appropriate scientific basis for calculating the catch advice.

TRAC Advice

There are two approaches to management that could be considered: constant exploitation rate and constant quota. The TRAC recommends the TMGC implement one approach (one exploitation rate if that approach is selected or one quota if that approach is selected) and maintain that approach over three years to see if the stock responds.

Given the range of exploitation rates (mu) of 2% to 16%, the catch advice for 2016 ranges from 45 mt to 359 mt (Table 2). An advantage of the constant exploitation rate approach is that it responds to changes in the population as measured by the surveys. The risks of this approach are that it does not account for uncertainty in the catch advice due to uncertainty in the survey catch per tow, survey catchability assumption, or the uncertainty associated with the appropriate exploitation rate. The variability in the surveys will translate directly into variability in the catch advice using this approach.

Alternatively, the TMGC could consider a constant quota approach. If this approach is selected, the TRAC recommends a quota of 354 mt or lower (based on not increasing the quota relative to the 2015 quota due to concerns about stock declines). The selected quota amount should be maintained for three years (based on life history traits) to see if the stock responds. The risks of a constant quota approach are that if the constant quota is set too high it will lead to stock declines, while if the constant quota is set too low it will lead to forgone yield. This approach has the advantage of fixing the quota to reduce one source of variability in the system, but has the difficulty of determining when to change from the constant quota.

Table 2. Survey biomass from the three bottom trawl surveys, an arithmetic average of these biomasses, and catch advice from two exploitation rates (mu). The "2014 revised" row reflects changes to the NEFSC spring survey when full Quality Assurance/Quality Control could be conducted. Catch advice is implemented in the following year (e.g., the 2015 row of catch advice will be implemented in 2016).

Year	DFO	NMFS Spring	NMFS Fall (year-1)	Avg. (mt)	mu = 2% Catch Advice (mt)	16% 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	2,684	3,493	2,213	44	354
2014 revised	462	2,763	3,493	2,240	45	358
2015	741	1,891	4,092	2,241	45	359

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), while 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
Average	1331	689	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.

During the Diagnostic and Empirical Approach Benchmark , the following text and table were agreed to and are included in the proceedings document for that meeting (O'Brien and Clark 2014). An updated version is provided here for context, "In the current year *y*, the catch is being set for the next fishing year, *y* +1, without making projections for population dynamics (e.g. catch, survey catch, recruitment, weight at age, selectivity) in year *y*."

Reasons to decrease quota	Reasons to maintain or increase quota
Lack of convincing evidence the stock is increasing.	Lack of convincing evidence that the stock is declining.
Recent recruitment below average.	Current relative F low, M potentially increasing (relative F is not driving the stock).
Poor condition factor.	
Survey biomass indices declining.	MSY approach: do not forgo potential catch.
Precautionary approach (first do no harm).	Closed area 'safety net'.
Danger of further reducing age structure and spawning opportunities if M stays high.	Bycatch avoidance programs.

Applying these considerations, the assessment findings support reasons to both decrease the quota and to maintain or increase the quota for 2016. For example, the mean of the three surveys is essentially identical to the revised 2014 value, and last year's catch was less than half the quota, providing no reason to increase the quota. Recent recruitment continues to be below average and fish condition (i.e., Fulton's K) continues to be low relative to the available time series, which both support decreasing the quota. Alternatively, the relative F continues to be low and bycatch avoidance programs continue, and these considerations may support maintaining or increasing the quota. In 2015, the U.S. New England Fishery Management Council developed a proposal for consideration by the National Marine Fisheries Service that would revise the configuration of the closed areas on Georges Bank to protect habitat and spawning fish. At present, it is unclear what impact these management measures would have on stock dynamics, if implemented.

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.

Curran, K.J., and E.N. Brooks, editors. 2015. Proceedings of the Transboundary Resources Assessment Committee (TRAC): Eastern Georges Bank Cod and Haddock, and Georges Bank Yellowtail Flounder: Report of Meeting held 7-9 July 2015. TRAC Proceedings 2015/01.

Legault, C.M., L. Alade, D. Busawon, and H.H. Stone. 2015. Stock Assessment of Georges Bank Yellowtail Flounder for 2015. TRAC Reference Document 2015/01.

Correct Citation

TRAC. 2015. Georges Bank Yellowtail Flounder. TRAC Status Report 2015/03.

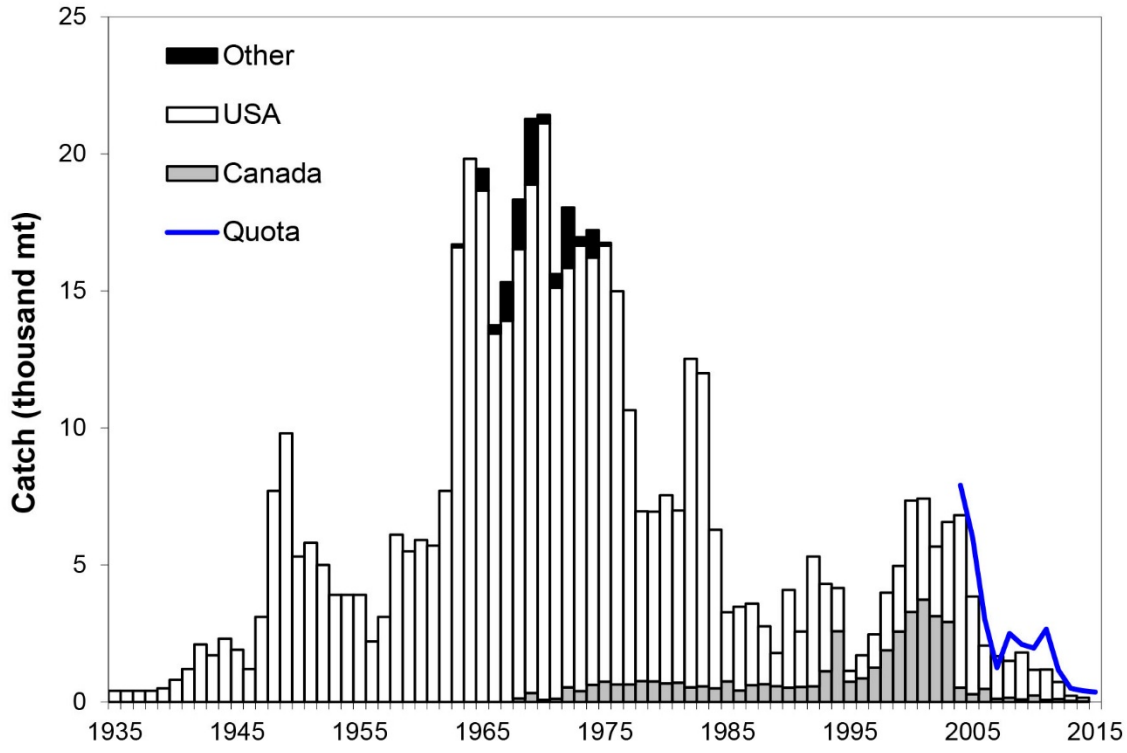


Figure 1. Catches and quota for Georges Bank Yellowtail Flounder.

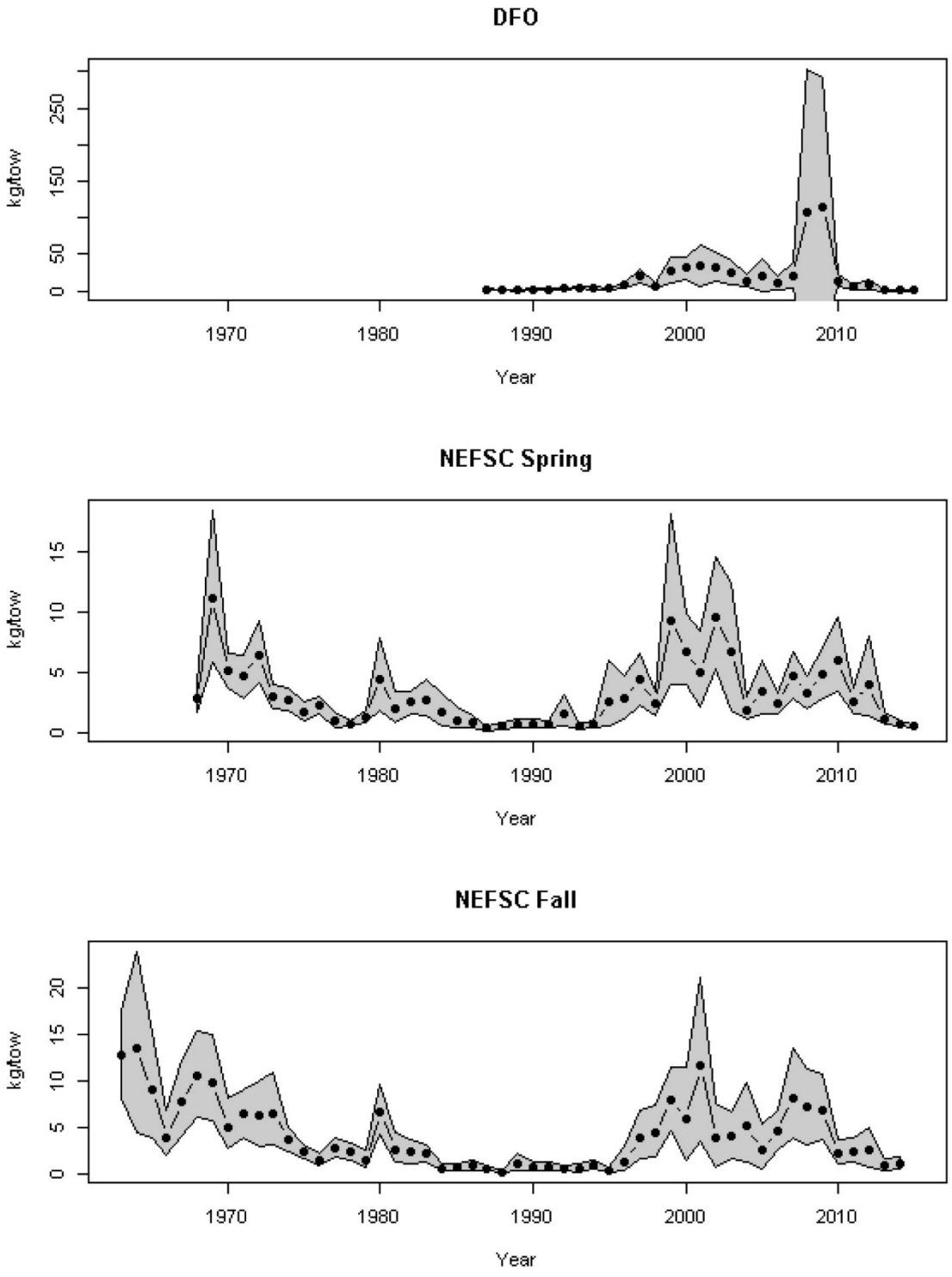


Figure 2. Research survey estimates of biomass for Georges Bank Yellowtail Flounder (filled circles) with 95% confidence intervals (gray area).