Transboundary Resources Assessment Committee

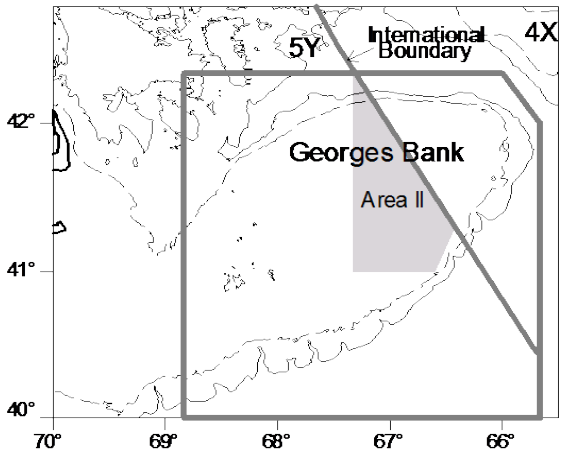
Status Report 2017/03

GEORGES BANK

YELLOWTAIL

FLOUNDER

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



Summary

- Combined Canada and USA catches in 2016 were 44 mt. This is the lowest value in the time series beginning in 1935.
- The declining trend in survey biomass to low levels, 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 above 1 for most years).
- Stock biomass is low and productivity is poor.
- The empirical approach adopted in 2014 averages estimates of biomass from the DFO, NMFS spring, and NMFS fall surveys, and applies an exploitation rate to this average to generate catch advice. The consensus of the 2017 TRAC intersessional meeting was to change survey catchability from 0.37 to 0.31 and to use wing width instead of door width to compute the area of a survey tow. Under these assumptions, average survey biomass is calculated to be approximately three times higher throughout the time series, but the trend does not change.
- The TRAC external reviewers and science members recommend an exploitation rate between 2% and 6% for catch advice, which results in 62 mt to 187 mt for 2018.

TRAC Review Process

In the interest of transparency and in order to avoid any perceived conflict of interest, in 2017 TRAC introduced a new process of review for Eastern Georges Bank Cod and Haddock and Georges Bank Yellowtail Flounder. An overview of the entire process is available at https://www.nefsc.noaa.gov/saw/trac/trac-process-overview-2017.pdf. After the presentation of each assessment by the lead authors, there was initial scientific and technical review by the invited external reviewers (referred to as external reviewers in this document), followed by scientific and technical review by the science assessment staff and a U.S.A. and Canadian resource manager (referred to as science in this document) and then review and contributions by all meeting participants, including stakeholders, external non-government organizations and the general public (referred to as the broader TRAC in this document). At the completion of each level of review, consensus was sought and there was discussion as to whether or not revisions to the initial conclusions were warranted. In the absence of consensus, the advice from the science group will be provided along with the perspective from the broader TRAC.

Table 1. Catches (mt)

		2011	2012	2013	2014	2015	2016	2017	Avg[1]	Min[1]	Max[1]
Canada[2]	**Quota**	1,192	586	285	72	106	85	93			
	Landed	22	46	1	1	3	1		433	1	2,913
	Discard	53	48	39	14	11	10		428	10	815
USA[2]	**Quota[3]**	1,458	564	215	328	248	269	207			
	Catch[3]	1,074	379	93	122	68	26[4]				
	Landed	904	443	130	70	63	26		3,878	26	15,899
	Discard	192	188	49	74	41	7		530	7	3,021
Total[2]	**Quota[5]**	2,650	1,150	500	400	354	354	300			
	Catch[5]	1,149	473	132	136	82	36[4]				
	Catch[6]	1,171	725	218	159	118	44		5,307	44	17,211

[1] 1973 – 2016
[2] unless otherwise noted, all values reported are for calendar year
[3] for fishing year May 1 – April 30
[4] preliminary estimate
[5] for Canadian calendar year and USA fishing year May 1 – April 30
[6] 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 44 mt in 2016 (Table 1) due in part to restrictive management measures. The 2016 value was the lowest catch in the time series beginning in 1935.

The 2016 **Canadian catch** of 10 mt was well below the Canadian quota of 85 mt, with landings of <1 mt and estimated discards of 10 mt from the sea scallop dredge fishery.

USA catches in calendar year 2016 were 33 mt, with landings of 26 mt and discards of 7 mt. The USA landings in calendar year 2016 were predominantly from the trawl fishery, while discards came from both the trawl (5 mt) and sea scallop dredge (2 mt) fisheries. Preliminary estimates of the USA catches (landings plus discards) for fishing year 2016 were 9% of the 269 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. Due to the lack of an assessment model, an estimate of fishing mortality rate can no longer be calculated. Status determination relative to reference points is not possible because reference points have not been defined.

State of Resource

The declining trend in survey biomass to low levels, 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 (relative F; Figure 2), but catch curve analyses indicate high total mortality rates (Z above 1 for most years; Figure 3). In the mid-1990s, reductions in relative F resulted in a slight decrease in Z. Stock biomass increased due to both this decrease in Z and increased recruitment. 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. Fishing does not appear to be a major driver of stock status currently.

Productivity

Recruitment, spatial distribution, and fish growth typically reflect changes in the productive potential. Recent **recruitment** has generally been below average (Figure 4), survey recruits per biomass indicate low reproductive success recently, and age structure is truncated (i.e., both fewer young fish and fewer old fish). The low recent recruitment can create the perception of an increase in the proportion of old fish in the population. **Spatial distribution patterns** from the three bottom trawl surveys generally follow recent averages. **Growth,** as measured by length at age in the surveys, has been variable without trend, and condition (weight at length) has been poor recently. 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, subsequent Transboundary Resource Assessment Committee (TRAC) meeting in 2014, and intersessional TRAC conference call in June 2017. This intersessional conference call examined three working papers related to survey catchability to inform the empirical approach (see 2017 Proceedings for details). The empirical approach adopted in 2014 averages estimates of biomass from the DFO, NMFS spring, and NMFS fall surveys (Figure 5), and applies an exploitation rate to this average to generate catch advice. The consensus of the 2017 TRAC intersessional meeting was to change survey catchability from 0.37 to 0.31 and to use wing width instead of door width to compute the area of a survey tow based on the three working papers discussed during the intersessional. Under these assumptions average survey biomass is calculated to be approximately three times higher throughout the time series, but the trend does not change. 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 because the Fref did not apply. However, the appropriateness of this range for

exploitation rate was questioned by TRAC this year with the new survey catchability and change to wing width in the empirical approach.

TRAC Advice

The **TRAC external reviewers** and **science members** recommend application of the 2014 Diagnostic and Empirical Benchmark formulation of the empirical approach as modified by the 2017 intersessional for catch advice. The continued declines in the surveys to the lowest values in their time series (DFO and NMFS spring surveys) or third lowest in its time series (NMFS fall survey)(Table 2), along with truncated age structure, low recruits per biomass estimated in the surveys, and a high total mortality rate estimated from the surveys all indicate that the catch advice should not increase from the 2017 quota of 300 mt. There are no indications in the data that support increasing the quota. While the changes to survey catchability and wing width affect the magnitude of the average survey biomass, they do not impact the downward trends. The TRAC external reviewers and science members recommend low exploitation to allow for the possibility of rebuilding. The average exploitation rate associated with the quota during the past eight years has been 6% (Table 3). The TRAC external reviewers and science members feel this is an appropriate upper bound for the exploitation rate given the declines continuing in the surveys so recommend using a range of 2% to 6% for setting the 2018 catch advice, resulting in 62 mt to 187 mt (Table 2).

Broader TRAC Perspective

The **broader TRAC** considers the full range of exploitation rates from the 2014 Diagnostic and Empirical Benchmark, 2% to 16%, to still be informative (Table 4).

The broader TRAC agreed there were no indications in the data that support increasing the catch advice for 2018 from the 300 mt quota for 2017, but feel the possibility of low catch advice for yellowtail flounder limiting the catch of other species such as sea scallops and groundfish should be considered as well.

Holding the 2018 quota constant from the 2017 quota (300 mt) would represent an exploitation rate of 10%. If the 2018 quota is fully caught and the average survey biomass remains the same in 2018 as it was in 2017, that 10% exploitation rate would be below the upper range of 16% from the benchmark but within the range of exploitation rates associated with the quota during 2010-2017 (3%-11%; Table 3).

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 2017 catch advice would be implemented in 2018).

	Biomass (mt)				mu =	0.02	0.06
Year	DFO	Spring	Fall (year-1)	Average		Catch Advice (mt)	
2010	29,452	68,752	83,490	60,565		1,211	3,634
2011	12,344	29,621	27,821	23,262		465	1,396
2012	18,113	46,209	30,354	31,559		631	1,894
2013	2,249	12,766	31,199	15,404		308	924
2014	1,654	8,564	10,828	7,015		140	421
2015	2,650	5,861	12,682	7,064		141	424
2016	5,569	3,610	5,811	4,997		100	300
2017	1,104	2,819	5,432	3,118		62	187

For context, recent quotas correspond to exploitation rates of 3-11% (average 6%) and recent catches correspond to exploitation rates of 1-5% (average 2%) (Table 3). Surveys have indicated a declining trend in biomass during this period to low values (Table 2) indicating that the benchmark range of exploitation rates may be too high. 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)	Catch (mt)	Quota/Avg	Catch/Avg	Model Type
2010	1,956	1,170	3%	2%	VPA
2011	2,650	1,171	11%	5%	VPA
2012	1,150	725	4%	2%	VPA
2013	500	218	3%	1%	VPA
2014	400	159	6%	2%	VPA
2015	354	118	5%	2%	Empirical
2016	354	44	7%	1%	Empirical
2017	300		10%		Empirical
mean	958	515	6%	2%	

Table 4. Catch advice for 2018 associated with the full range of exploitation rates from the 2014 benchmark.

Exploitation Rate	Catch Advice (mt)
2%	62
4%	125
6%	187
8%	249
10%	312
12%	374
14%	437
16%	499

Special Considerations

The TRAC reviewed a working paper by Perretti et al. responding to the Terms of Reference about the use of a three year average in the empirical approach and found that it performed worse than the current formulation in simulation tests. The TRAC decided to maintain averaging the most recent survey values when providing catch advice using the empirical approach based on these results.

Uncertainty in the catch advice was examined through a Monte Carlo simulation that added uncertainty to the following components of the empirical approach: survey catch per tow, survey area, tow area, survey catchability from the chain sweep-rockhopper experiment, and efficiency of the chain sweep. The survey catch per tow was the dominant source of uncertainty. The decrease in the average survey biomass was much greater than the uncertainty bounds found during this exercise, meaning the decline in the surveys is significant.

The 2% to 16% range of exploitation rates used previously was based on a number of per-recruit calculations that considered trade-offs in spawning potential and yield over a range of possible natural and fishing mortality conditions. While these calculations did not include any

information about the survey catchability or other variables used to estimate the average survey biomass, the average survey biomass from the benchmark empirical approach was known during the deliberations. It is not known how influential this knowledge was when the decision was made to set the range of 2% to 16% for exploitation rate. The strong decline of the stock since 2010, despite both quotas and catches being well below the upper end of this exploitation range (16%) under the new value of survey catchability (0.31) and use of wing width, is the reason for the reconsideration of the exploitation rate range this year.

The TRAC notes that catch has been below the quota since 2004 and, on average, catch has been 42% of the quota since 2010 (Figure 1). This can be attributed in part 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 Total Allowable Catch (TAC) management of a multispecies fishery in the USA. The US scallop fishery uses rotational management between the Mid-Atlantic and Georges Bank. In years when the scallop fishery is on Georges Bank, higher US catches of yellowtail flounder are expected.

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.

Clark, K. and E.N. Brooks, editors. 2017. Proceedings of the Transboundary Resources Assessment Committee (TRAC): Eastern Georges Bank Cod and Haddock, and Georges Bank Yellowtail Flounder: Report of Meeting held 11-14 July 2017. TRAC Proceedings 2017/01.

Legault, C.M., and Q. McCurdy. 2017. Stock Assessment of Georges Bank Yellowtail Flounder for 2017. TRAC Reference Document 2017/01.

Correct Citation

TRAC. 2017. Georges Bank Yellowtail Flounder. TRAC Status Report 2017/03.

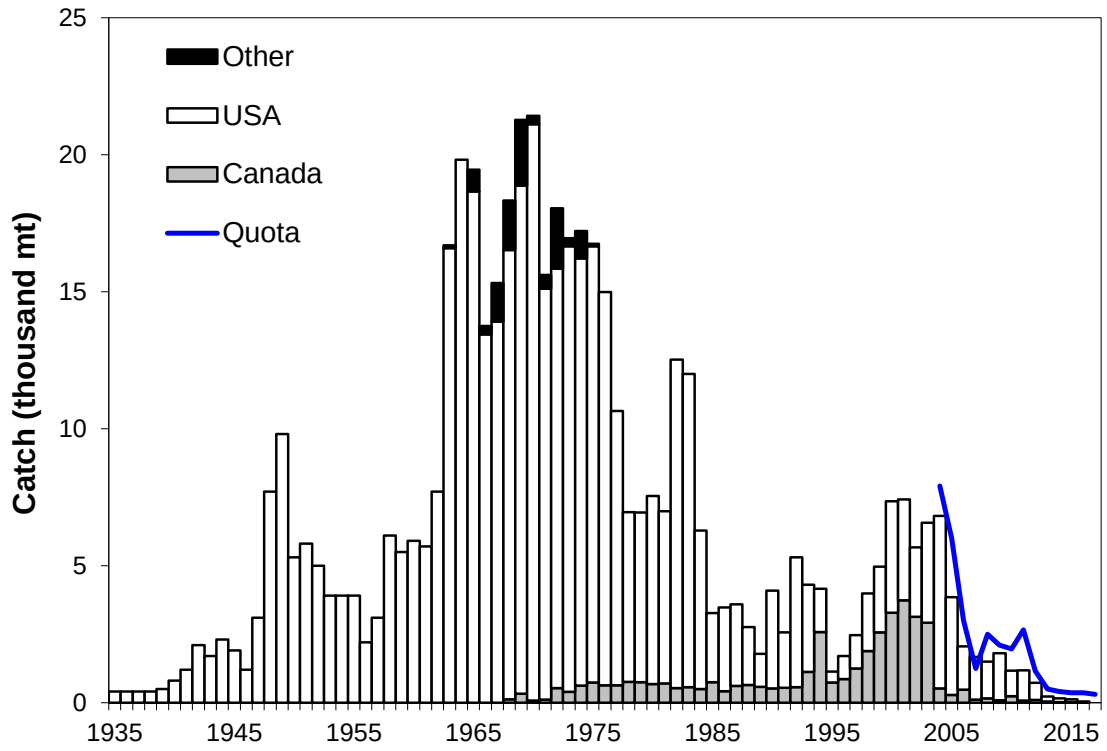


Figure 1. Catches and quota for Georges Bank yellowtail flounder.

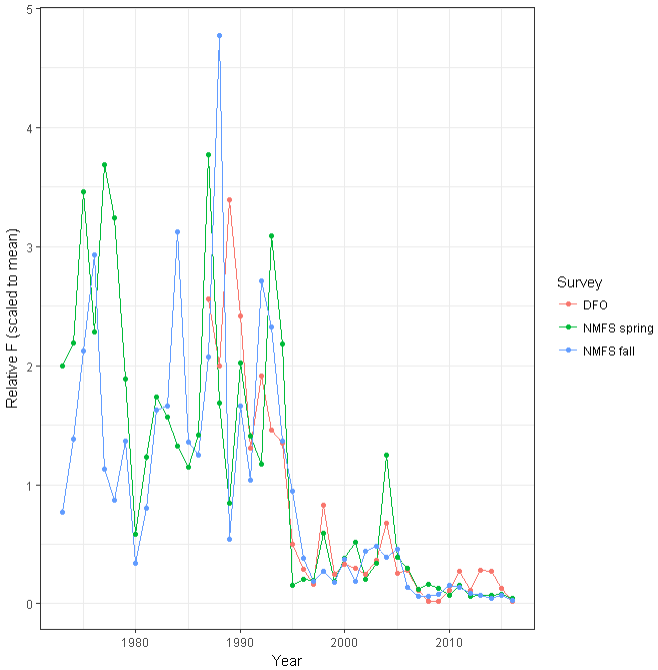


Figure 2. Relative F (catch in mt divided by survey catch in kg per tow) scaled to the mean value during 1987-2007 for the three surveys.

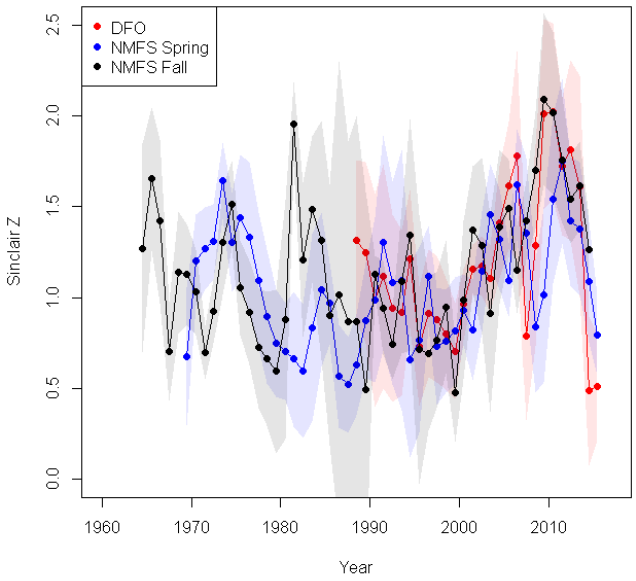


Figure 3. Total mortality (Z) from the three surveys using the Sinclair method with a four year moving window for ages 3 to 8.

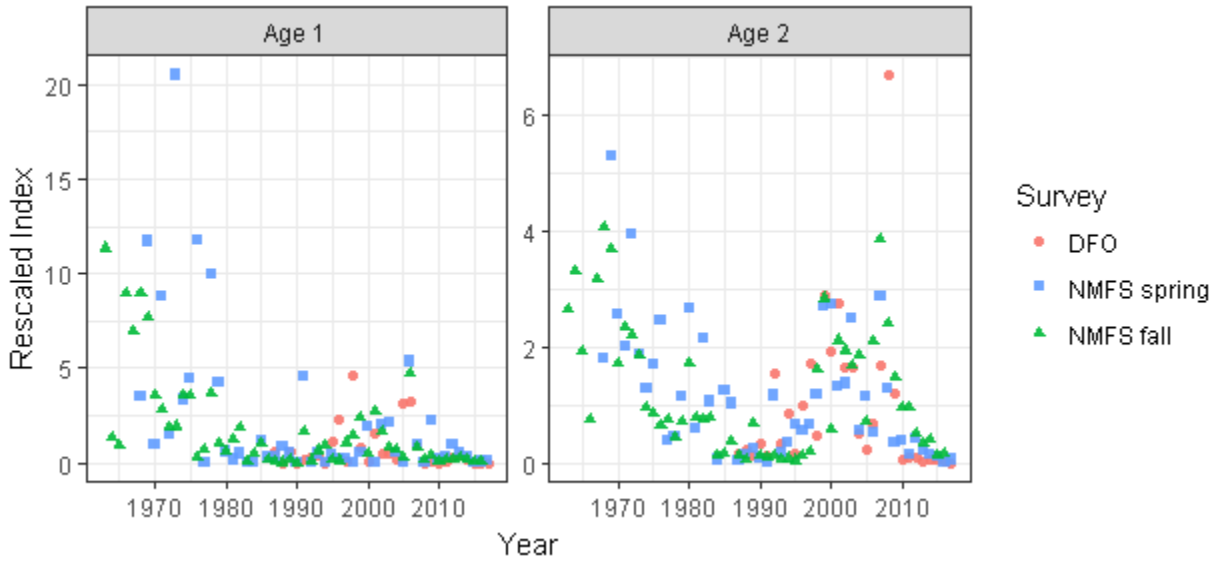


Figure 4. Estimates of recruitment (age 1 has many zeros, so age 2 also shown) from the three bottom trawl surveys standardized to their respective means during 1987 through 2007.

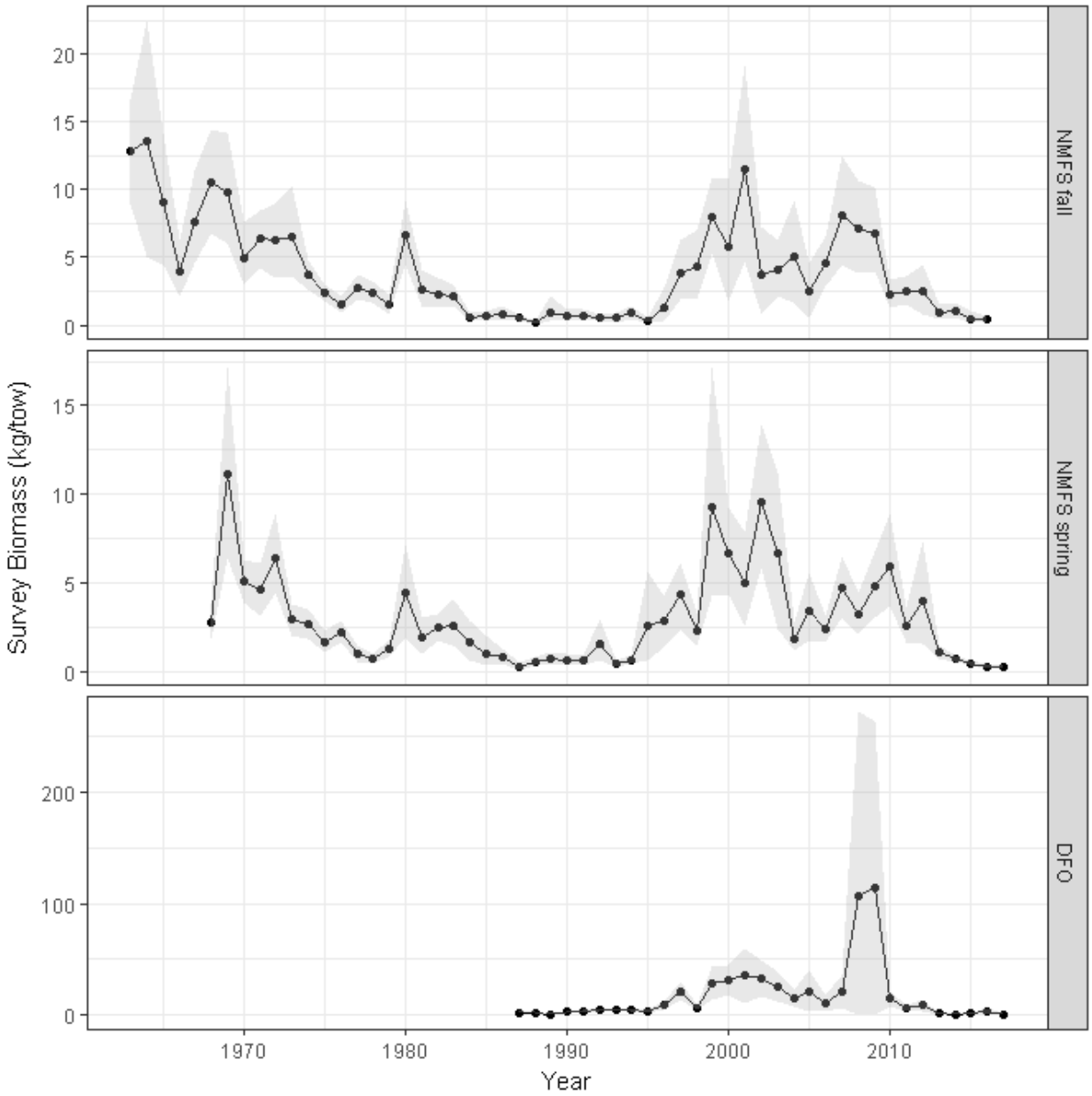


Figure 5. Bottom trawl survey catch rates (in biomass) for Georges Bank yellowtail flounder (filled circles) with 90% confidence intervals (gray area). Note that the amount of Georges Bank area covered in the DFO and NMFS surveys differs and that the NMFS surveys have been standardized to Albatross units.