2020 TRAC Status Reports

NEFMC Meeting
September 30, 2020

Tara Trinko Lake
NEFSC

Georges Bank Yellowtail Flounder

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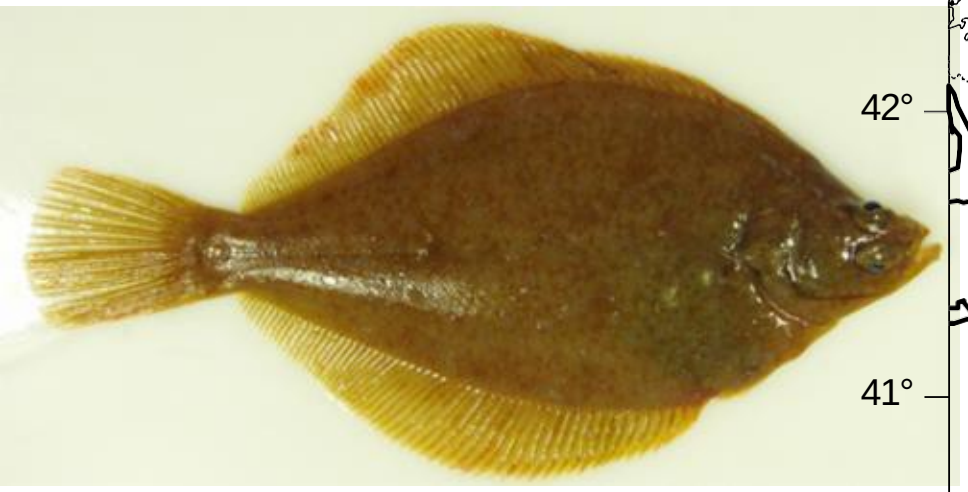
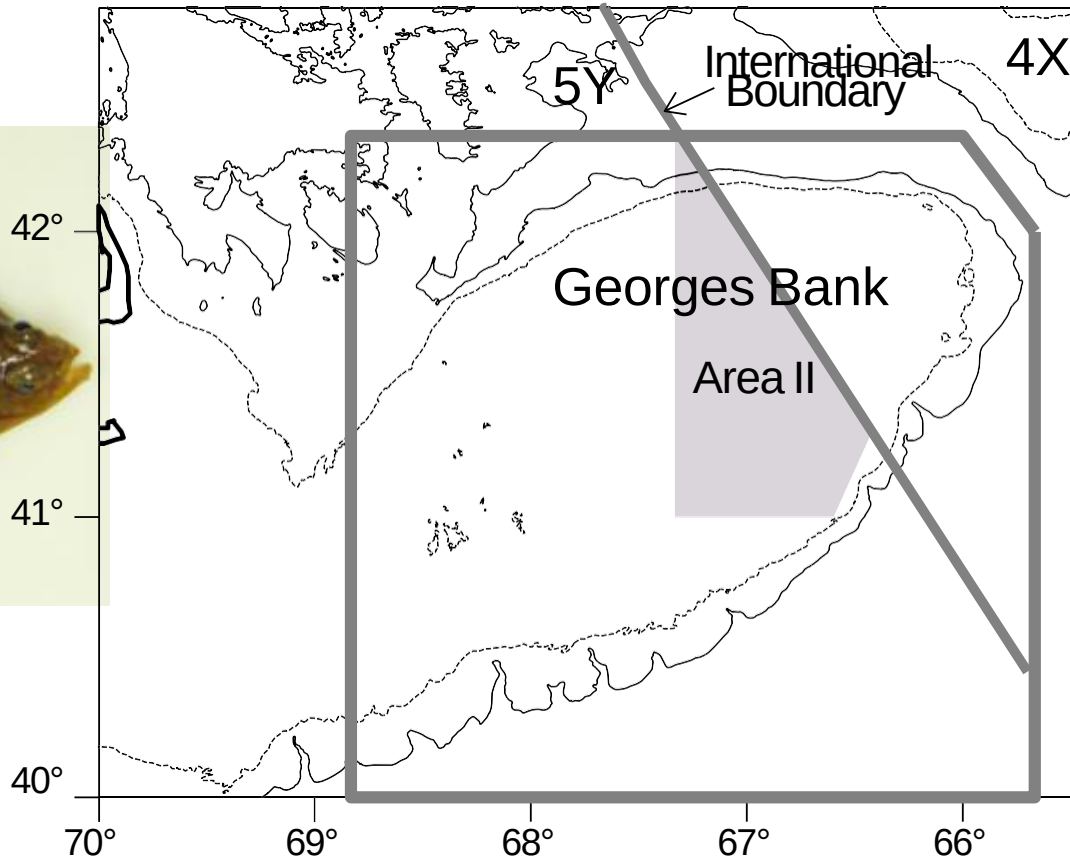
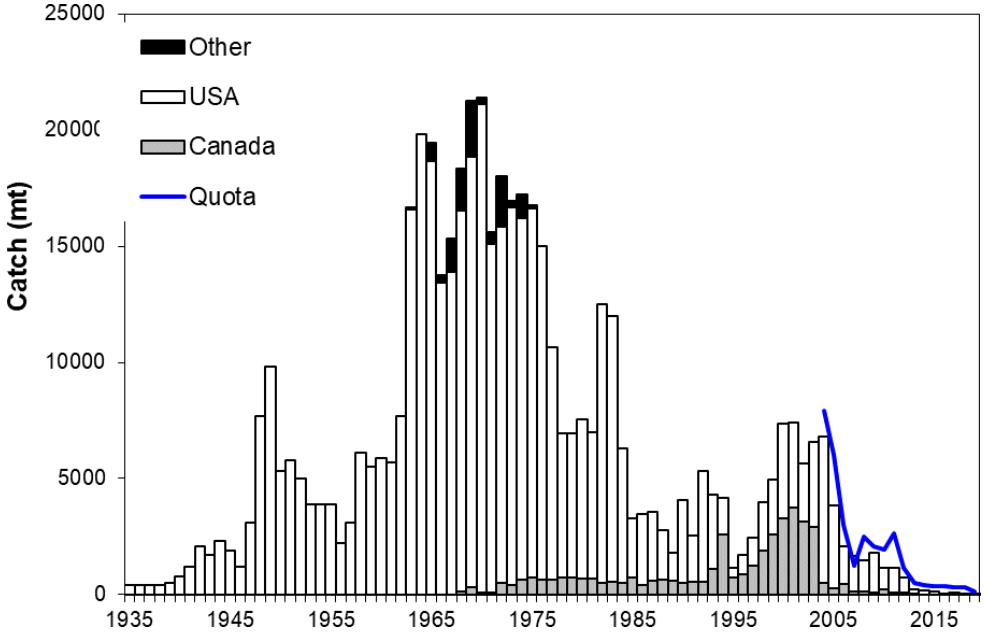
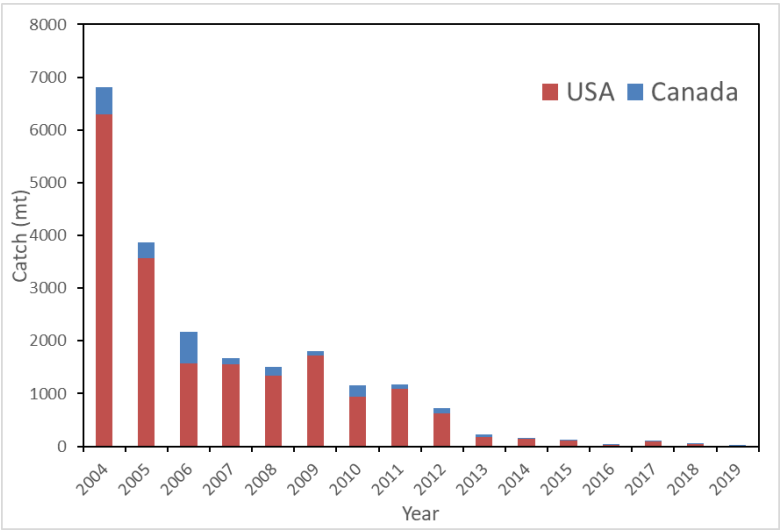
Georges Bank Yellowtail Flounder





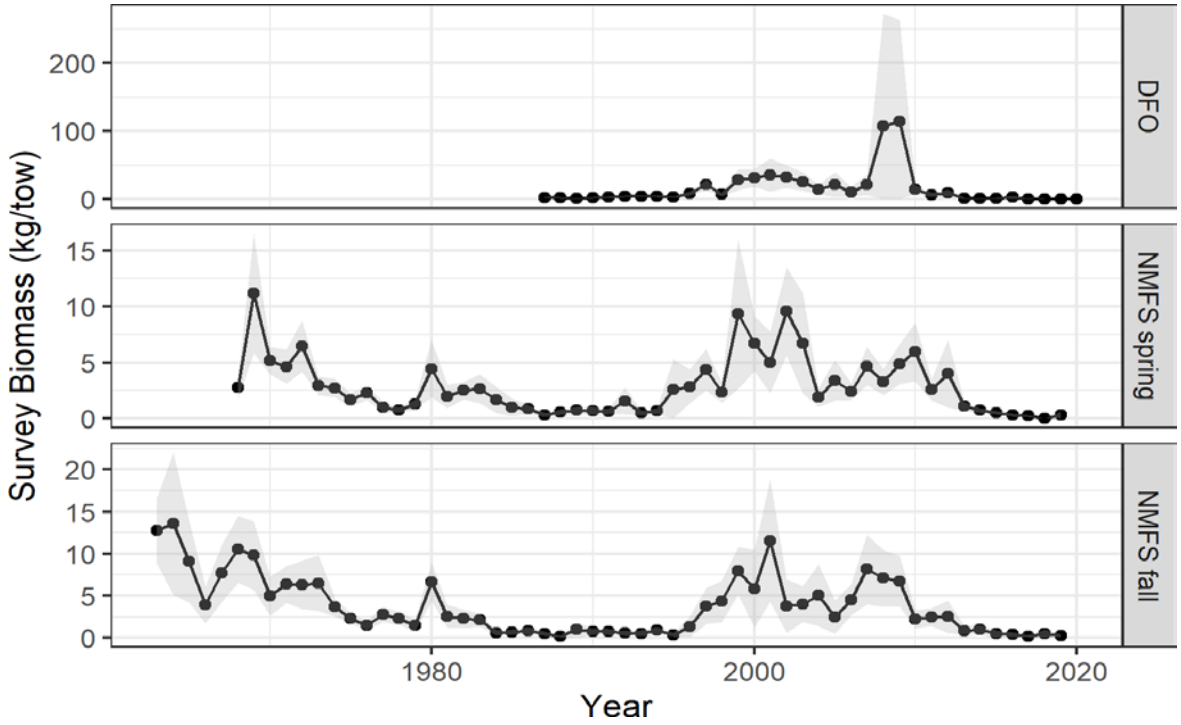
GB Yellowtail Flounder Catch





- Canadian + USA 2019 total catch **8** mt (Quota **140** mt)
- Canadian 2019 catch **4** mt (Quota **34** mt)
- USA catch **5** mt (USA using different quota year, **106** mt)
- 2019 Catch was ~75% discards, 25% landings

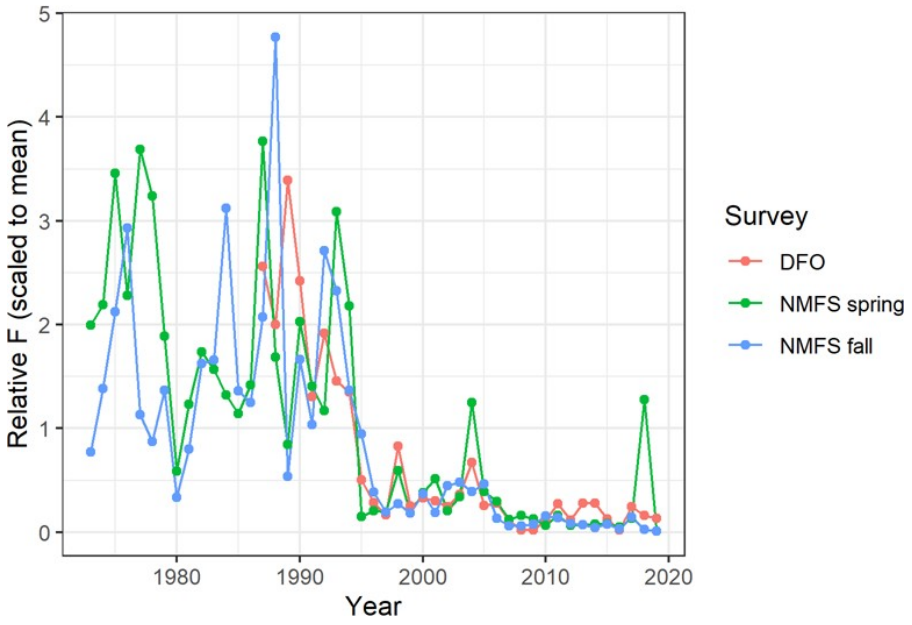
Survey Trends



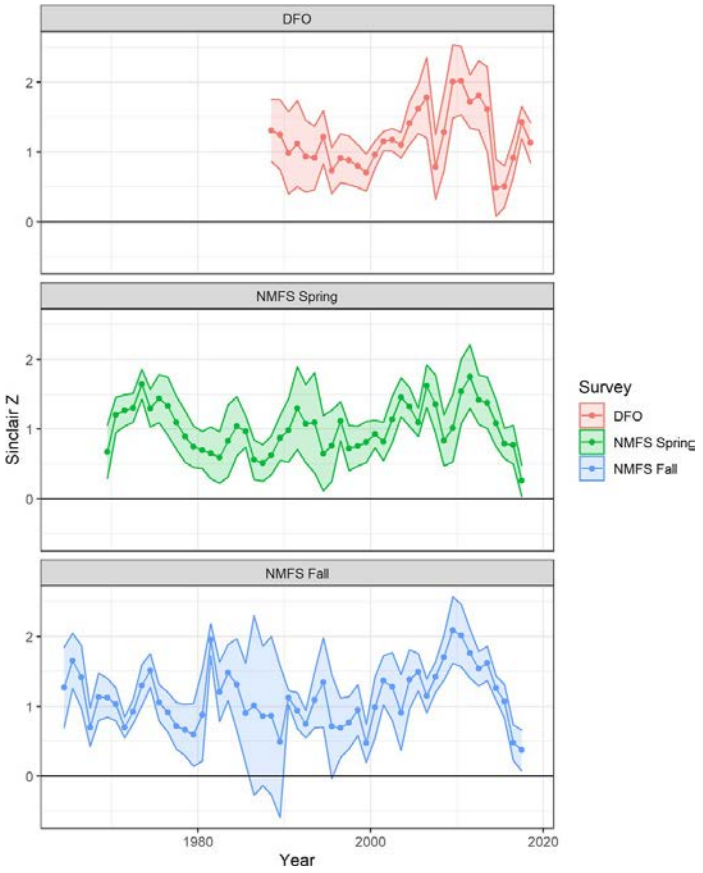
- DFO 2020 is the 2nd lowest in 34 years
- Spring 2019 4th lowest in 52 years
- Fall 2019 3rd lowest in 57 years
- The biomass index of the three surveys indicate the capacity of the stock is significantly diminished.
- Stock biomass is low and productivity is poor.

Relative Fishing and Total Mortality

Relative F = catch / survey



Survey Z



- Relative fishing mortality has declined since 1995, although total mortality(Z) from all sources has remained high.
- Fishing does not appear to be a major driver of stock status currently

Empirical Results

Year	Biomass (mt)				Catch Advice (mt)
	DFO	Spring	Fall (year-1)	Average	
2010	29,452	68,752	83,490	60,565	3,634
2011	12,344	29,621	27,821	23,262	1,396
2012	18,113	46,209	30,354	31,559	1,894
2013	2,249	12,766	31,199	15,404	924
2014	1,654	8,564	10,828	7,015	421
2015	2,650	5,861	12,682	7,064	424
2016	5,569	3,610	5,811	4,997	300
2017	1,104	2,819	5,432	3,118	187
2018	812	143	2,424	1,126	68
2019	182	3,735	6,047	3,322	199
2020	404	NA	3,749	2,077	125

- Catch advice for 2021 was computed using only two of the three surveys.
- The TRAC recommends an upper bound for the exploitation rate of 6% for catch advice, which results in 125 mt for 2021.

Empirical Results
full range of exploitation rates

Exploitation Rate	Catch Advice (mt)
2%	42
4%	83
6%	125
8%	166
10%	208
12%	249
14%	291
16%	332

Potential for Multi-Year Catch Advice

- Georges Bank yellowtail flounder currently at very low abundance
- Empirical approach is making minor changes to quota
- Catch is well below quota
- Simplify management by selecting a constant quota that would hold as long as surveys remain about where they are now
- R Shiny app built to explore possible limits within which a constant quota could be applied
  - Developed during TRAC meeting
  - Recommended as option for future catch advice

TRAC GBYT Limiter

Limits for Average Biomass:

600 5,000 15,000

0 1,500 3,000 4,500 6,000 7,500 9,000 10,500 12,000 13,500 15,000

First Year to Show in Plot:

2,010 2,014 2,019

2,010 2,011 2,012 2,013 2,014 2,015 2,016 2,017 2,018 2,019

Blue Percent Line in Lower Plot:

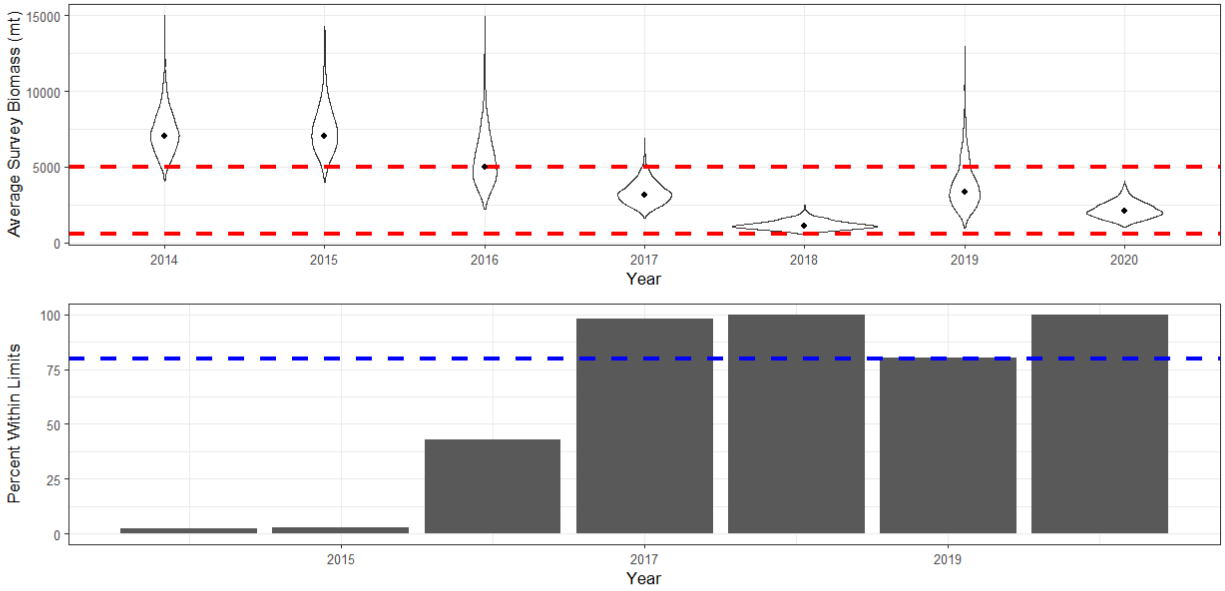
0 80 100

0 10 20 30 40 50 60 70 80 90 100

Constant Quota (mt):

50 200 500

50 100 150 200 250 300 350 400 450 500



Limits	Catch6	Quota	ExplRate
600	36.00	200	33.30
5000	300.00	200	4.00

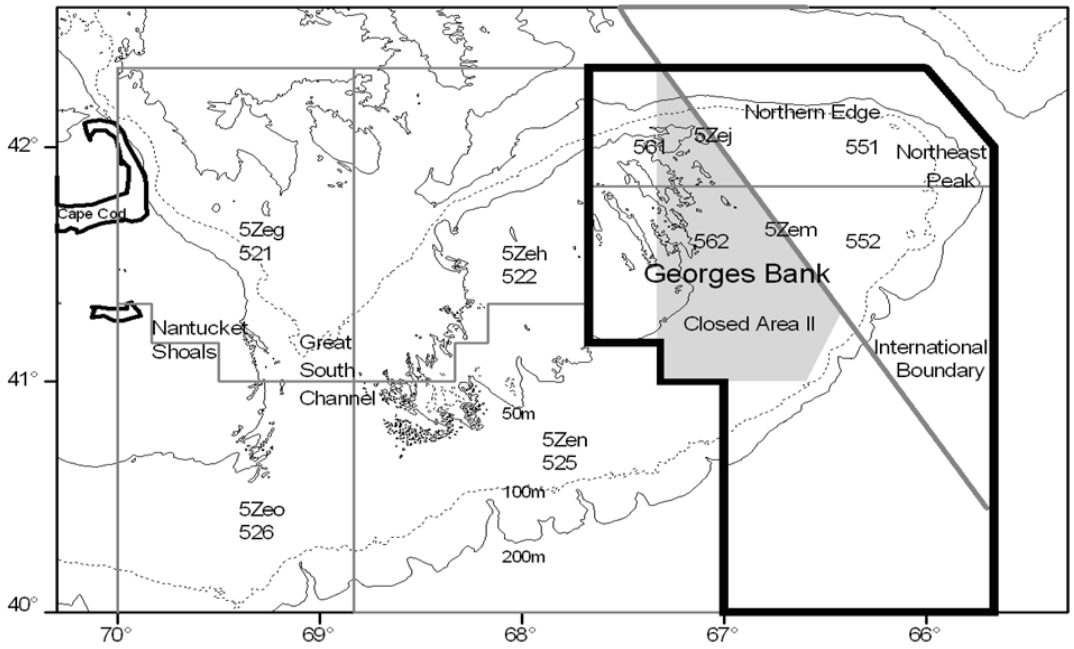
TRAC Advice

- The TRAC recommends an upper bound for the exploitation rate of 6% for catch advice, which results in 125 mt for 2021.
- Survey biomass decreased 97% from 2010 to 2020.
- Historical exploitation rates can be computed from either the quota or the catch. The TRAC used the exploitation rate associated with the quota to set the catch advice because it has limited the catch directly and indirectly.

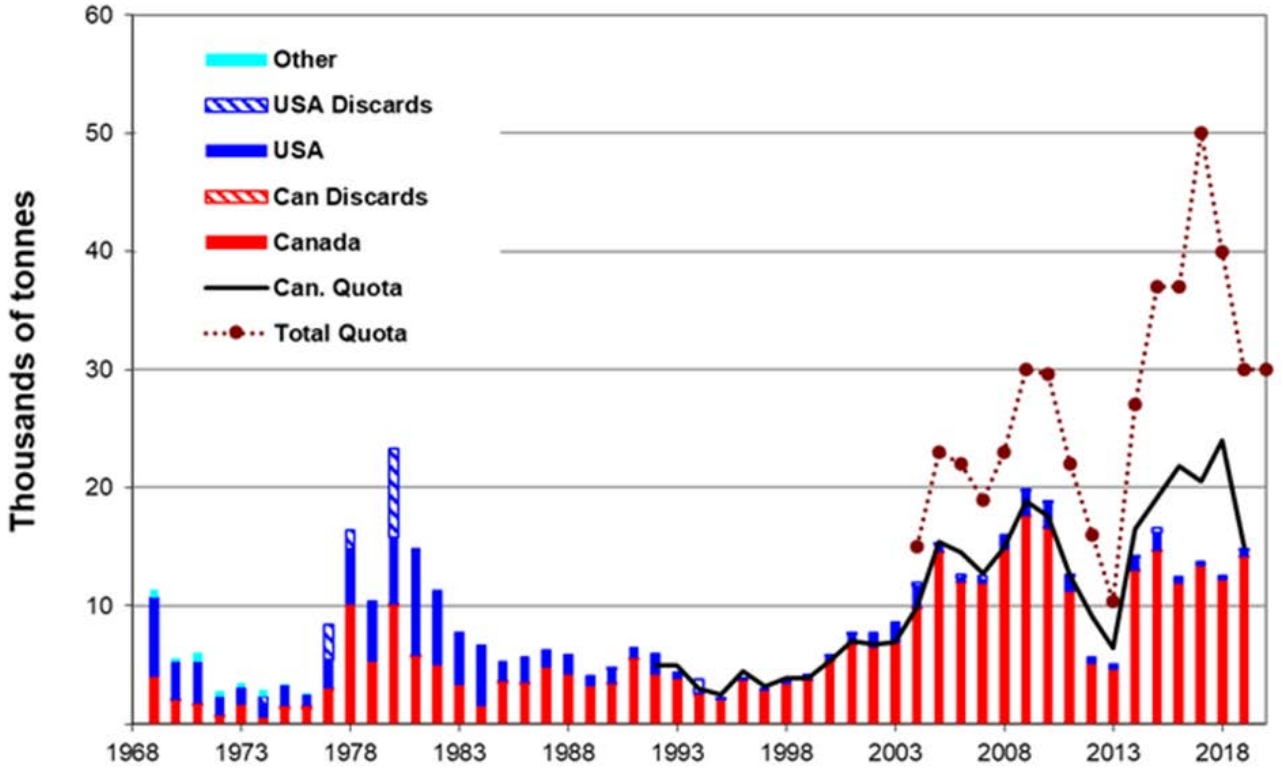
TRAC Advice

- The TRAC recommends low exploitation to allow for the possibility of rebuilding.
- The 2020 quota of 162 mt was set below the maximum value recommended by TRAC (199 mt). Despite the possibility of other factors influencing the population trends, such as environmental factors or missing catch, the TRAC recommends setting the exploitation rate as low as possible below the upper bound of 6%.
- For future catch advice, the TRAC suggests changing the approach for setting the quota from the empirical approach to a fixed quota.

2020 TRAC Report
Eastern Georges Bank Haddock

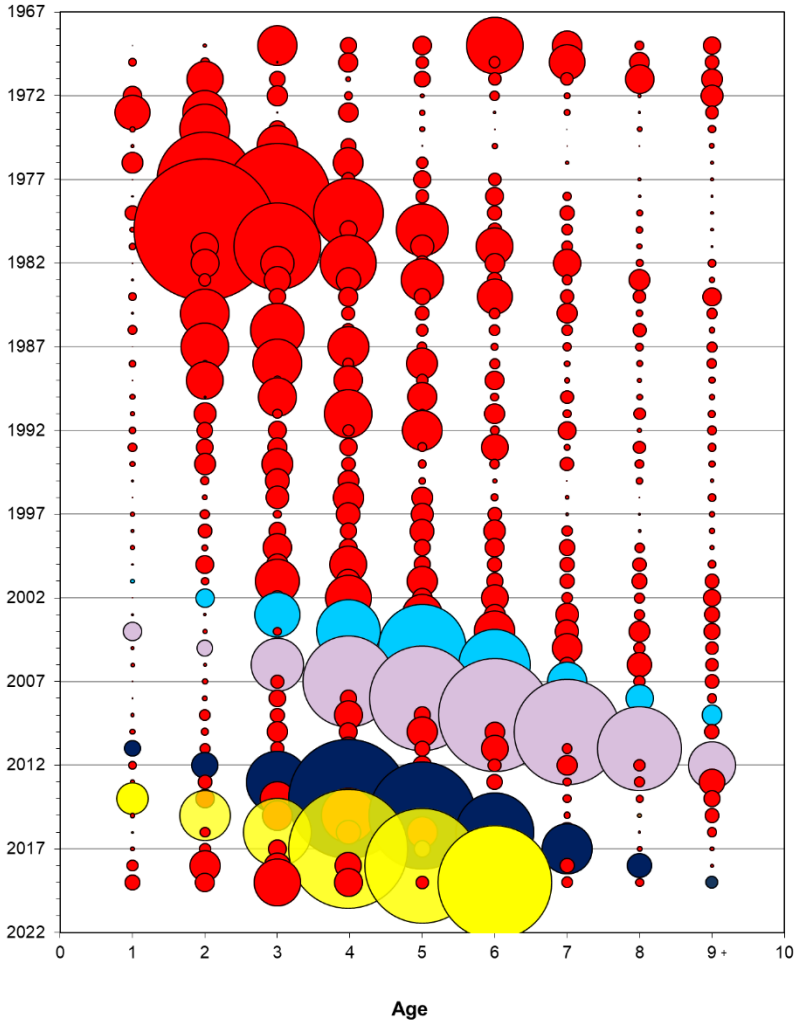


2019 Fishery



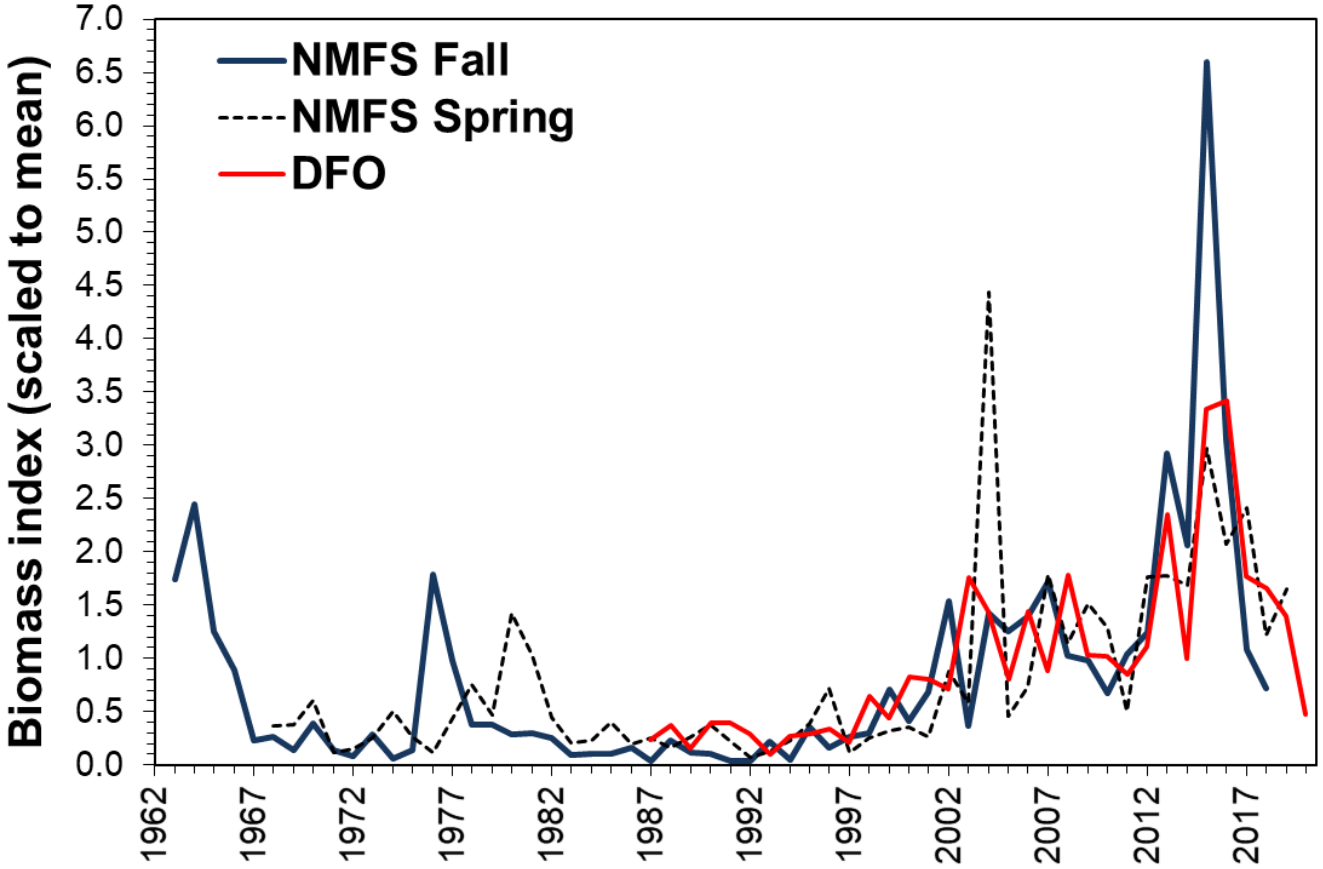
- Combined Canadian and US catches were 14,762 mt against a quota of 30,000 mt.
- Canada caught 94% of allocation (14,168 mt against a quota of 15,000 mt); USA caught 0.4% (594 mt against a quota of 15,000 mt).
- As expected, the catch was dominated by the exceptionally strong 2013 year class at age 6 (75% for USA & 75% for Canada by weight)

2019 Fishery



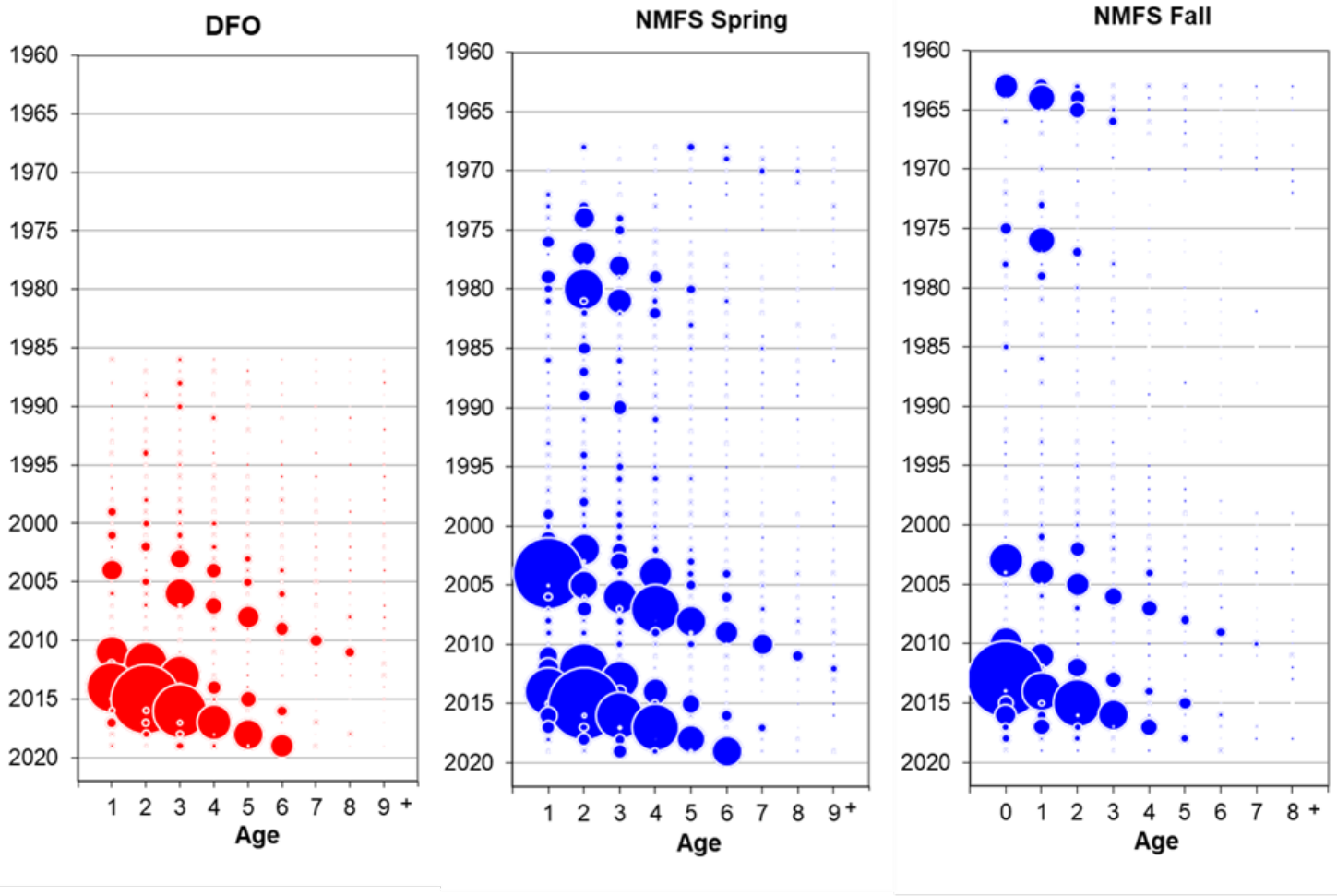
- As expected, the catch was dominated by the exceptionally strong 2013 year class at age 6 (75% for USA & 75% for Canada by weight)

Surveys



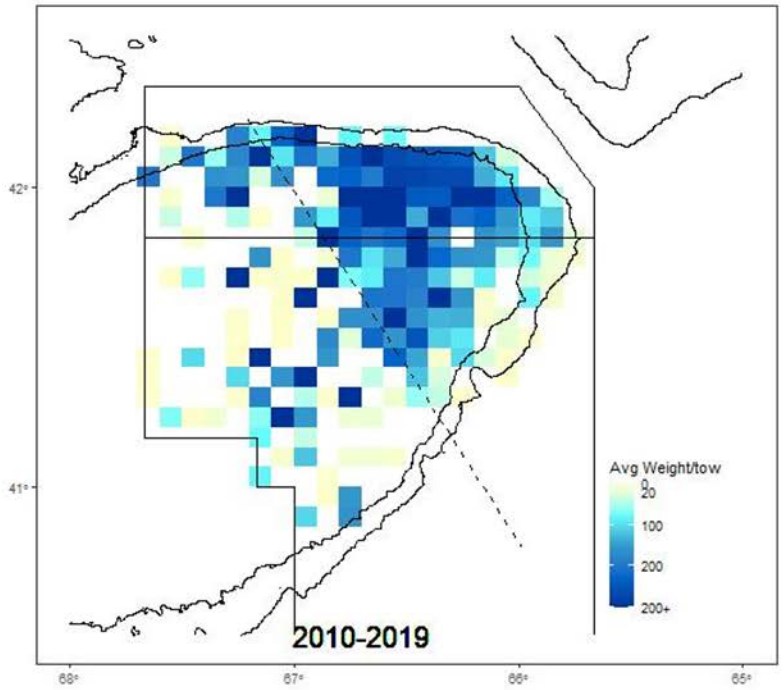
- The swept area biomass of the NMFS Fall survey decreased 75% from 25,304 mt in 2018 to 6,292 mt in 2019. A similar decrease occurred for the 2020 DFO survey with a 66% decrease from 96,905 mt in 2019 to 32,765 mt in 2020.

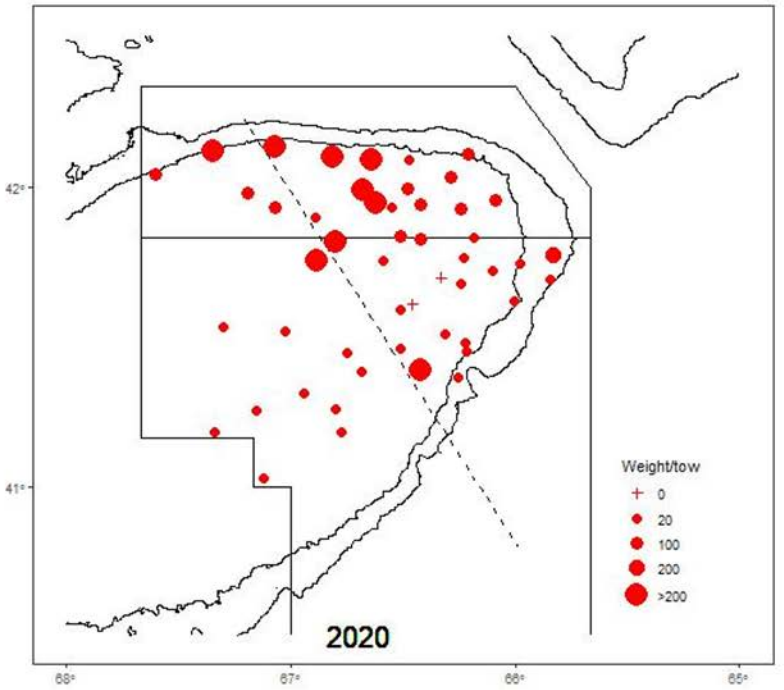
Surveys



- Survey age structure through 2019 displays a broad representation of age groups, reflecting improving recruitment since 1995.
- There are no indications of exceptional year classes coming into the population from the NMFS Fall survey. Model predicted year class strength has been above the median since 2010.

Surveys



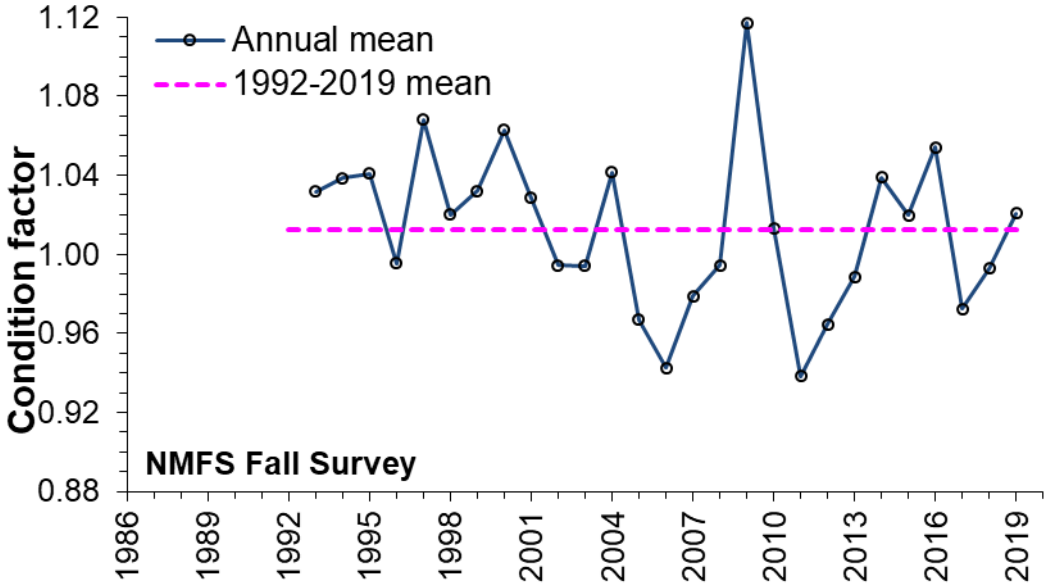


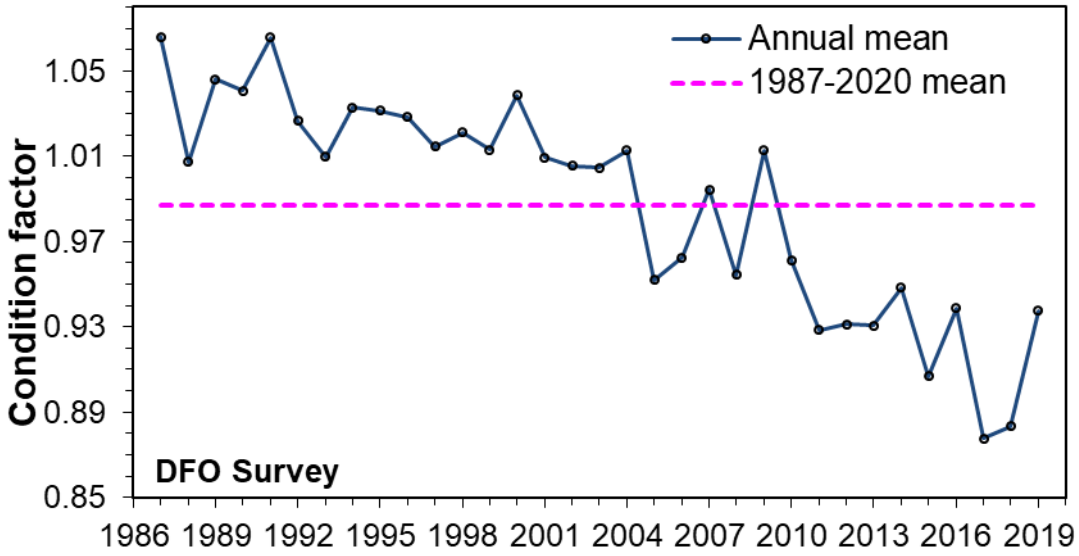
- Spatial distribution patterns from the most recent surveys similar to average patterns over the last ten years. Positive tows with haddock from the DFO survey have been broadly and consistently distributed across EGB over the time series of the survey.

Surveys

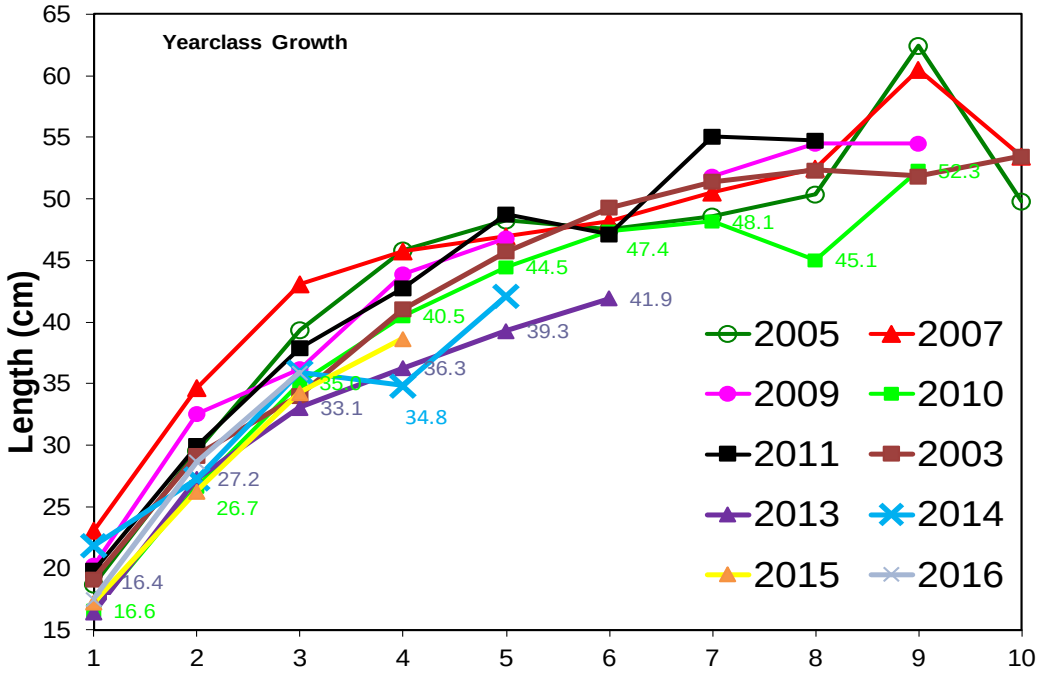
Fulton's K = weight/length^3

- NMFS Fall: Increased above time-series mean in 2019
- DFO Spring: Condition increased from last year but remains below the time-series mean





Growth



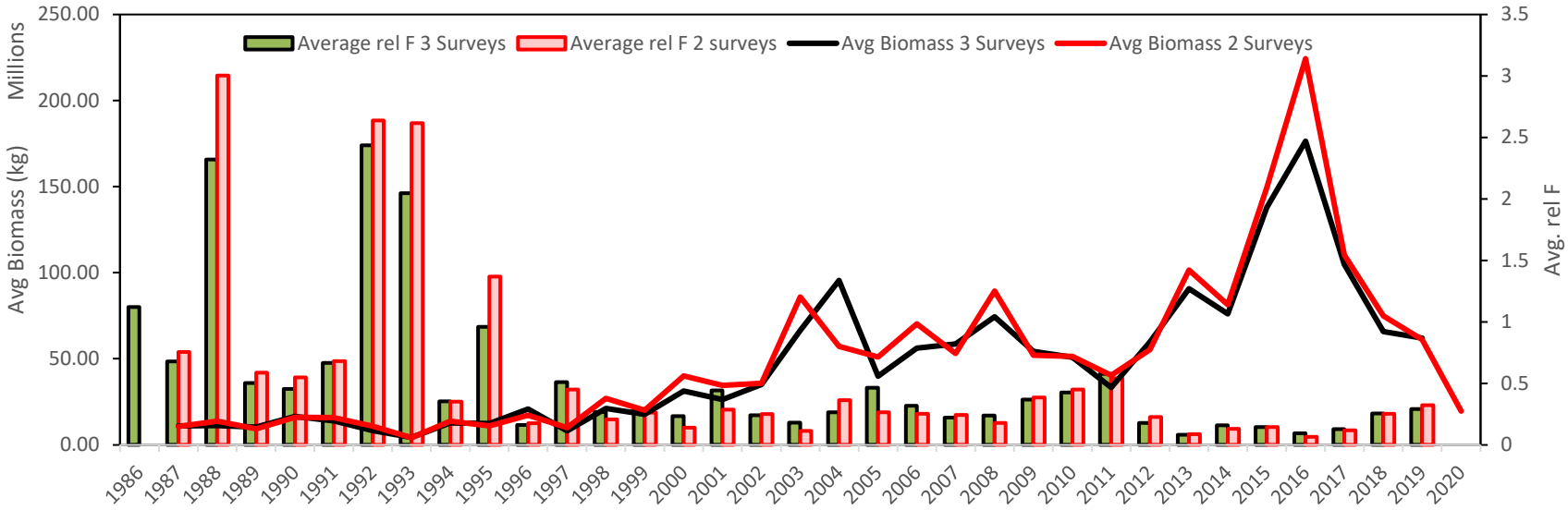
- The 2013 year class is growing even more slowly than the last large year class (2010).
- Weights at age:
  - 2019 fishery WAA are at or near the lowest values in the time series;
  - Declining trends in the DFO survey weights and lengths at age since 2000
- Maximum size at age has decreased

Indicator	Summary
Condition	DFO: **Increase** but below long-term mean NMFS Fall: **Increase** and above long-term mean TRAC 2019: NMFS Spring **Increase** above mean
Swept Area Biomass	DFO: **Decrease** (96,905 t in 2019 to 32,765 t in 2020) NMFS Fall: **Decrease** (25,304 t in 2018 to 6292 t in 2019) TRAC 2019: NMFS Spring **Increase** from 2018 survey
Survey Number-at-Length	DFO: 2013 year class **increased** in mean length by 2 cm and decreased in abundance. NMFS Fall: **Decrease** in number at length TRAC 2019: NMFS Spring **Increased** from 38.5 cm in 2018 to 40.5 cm in 2019
Catch	**Increase** in landings (12,470 t in 2018 to 14,706 t in 2019) **Increase** in discards (26 t in 2018 to 54 t in 2019)
Fishery Catch-at-Length	CND OT: **No change** (40.5 cm); USA OT: **Increase** (42 cm in 2018 vs. 43 cm in 2019) LL: **Decrease** (40.5 cm in 2019 vs. 44.5 cm in 2018) DR: **No change** (38.5 cm)
Fishery Catch-at-Age	2013 year class dominates catch.
Relative F	**Increase** in relative F
Z	**High** in recent years.

State of the Resource

- Estimates of biomass from the two available surveys and total catch were summarized to describe the state of the resource, rather than using estimates from three surveys or the results from the rejected model.
- The 2013 year class remains the largest observed in the entire survey time series, but decline is expected in the immediate future as the exceptionally large 2013 year class declines in number.
- The average survey biomass is below the time series mean.

State of the Resource



- In the absence of a model there is no model derived estimate of fishing mortality (F). However, relative fishing mortality (catch/survey biomass) was calculated from the three surveys (1987 to 2019) and two surveys (1987 to 2020).
- Relative F (bars) tended to be above the mean during the earlier years of the time series until 1997 but has remained low since 2012.

From the 2012 VPA

F if the entire quota was caught

			3 Surveys		2 Surveys						
Year	F5-8	B	Rel. F	AvgSurvB	Rel.F	AvgSurvB	Catch	Quota	Quota/Catch	Quota/AvgSurvB (2 surveys)	F*Q/C
2009	0.12	132,500	0.94	54,250	0.38	52,099	19,855	30,000	1.51	0.55	0.19
2010	0.15	102,000	0.99	50,800	0.45	51,292	18,794	29,600	2	0.58	0.24
2011	0.15	75,000	1.2	33,400	0.54	40,426	12,656	22,000	2	0.66	0.27
2019	x	x	x	62,000	0.32	61,104	14,762	30,000	2	0.48	x
2020	x	x		x		19,528		30,000		1.54	x
2021	x	x						**			x

- Only have two surveys this year, not three.
- Looked at ratio of average survey biomass between DFO(2020) and Fall(2019), and DFO(2010) and Fall(2009)
- Ratio of these two average biomasses is 0.38
- Multiplied 2011 quota by 0.38 for 2021 mean quota of 8,367 mt.
- Used confidence intervals (0.12 – 0.64) to get range of 2021 quota of 2,635 – 14,117 mt.

Advice

Positive considerations	Negative Considerations
The 2013 year class is still the largest ever observed in the time series.	The very large 2010 year class is in the 9+ group in 2019. Availability to the fishery of the 2010 year class is likely to be low, and it is therefore not expected to contribute much at all to future catch.
The 2016 year class are above the long term median (bubble plot; age 3 in 2019).	Even if no catch were taken in 2020, biomass is expected to decline.
Based on length frequency, the number of fish between 26-36 cm (indicator of 2018 year class at age 2 in 2020) are above the long term median.	The 2018 year class was below the long term mean and only 25% of the median (bubble plot; age 1 in 2019).
Positive tows with haddock from DFO survey continue to be broadly and consistently distributed.	Weights at age are the lowest observed for the 2013 year class, and slow growth is expected to continue in the near term.
Broad representation of age groups from survey, reflecting improving recruitment.	Average survey biomass from the two available surveys is below the long term mean and median.
Growth of younger ages appear to be increasing with recent declines in density.	
Recent year classes (2010 – 2018) are above long term median.	

Summary

- The population is expected to decline from 2019 to 2020 and is expected to decline further in 2021 even if no catches are taken in 2020. This is primarily due to the decline in numbers of the 2013 year class.
- The population is below the time series average survey biomass and maintaining a constant quota on a declining population (where catch is primarily coming from a single year class) will lead to an increasing trend in relative F.
- There is consensus that the stock condition is not poor and the TRAC recommends a range of quota advice for 2021 of 2,635 – 14,117 mt.

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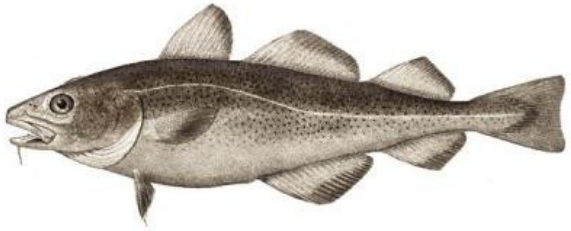
2020 TRAC
Eastern Georges Bank Cod



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Terms of Reference

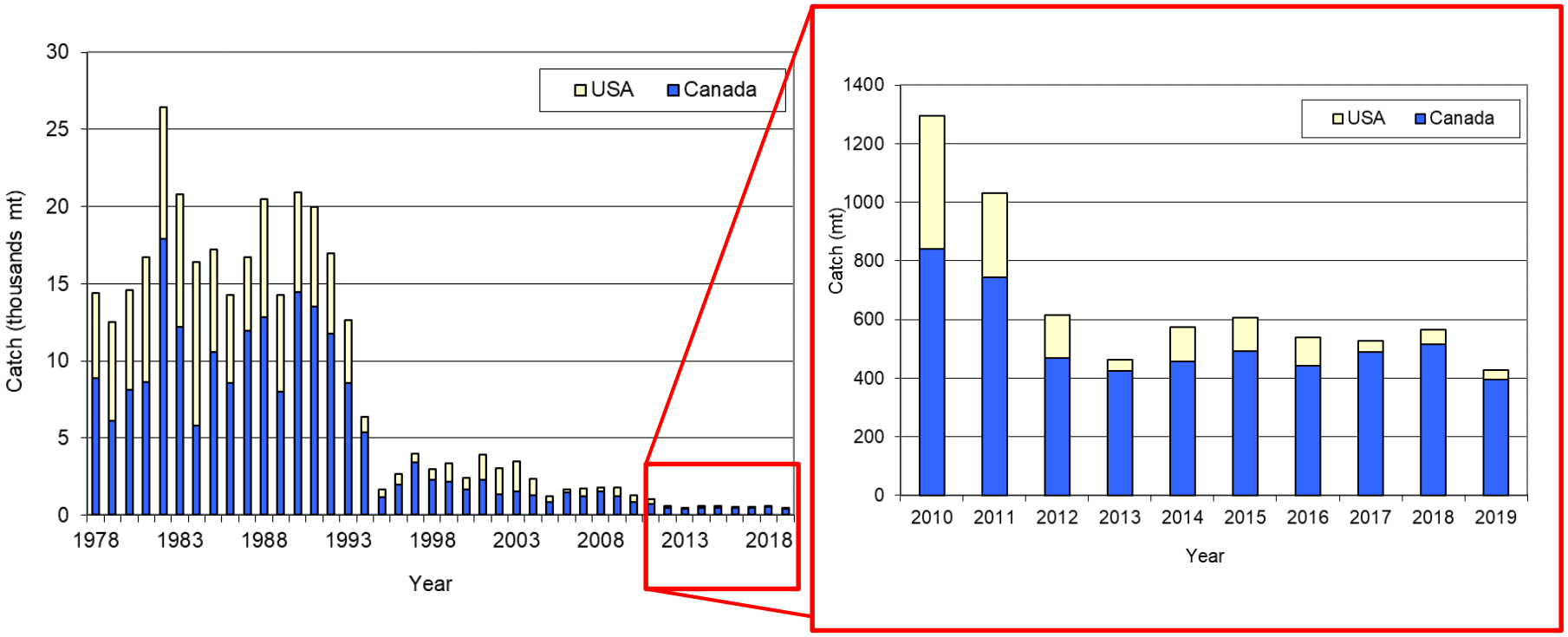
1.Update the following biological and fishery indicators of the state of cod in the eastern GB management area with 2019-2020 data: **condition factor, swept area survey biomass indices, fishery and survey catch at length, relative F, total mortality (Z), and catch**.

2. Identify and comment on **changes in survey and fishery indicators** (relative to the 2019 TRAC).

3. Determine if there is a need to revisit the 2018 TRAC advice.

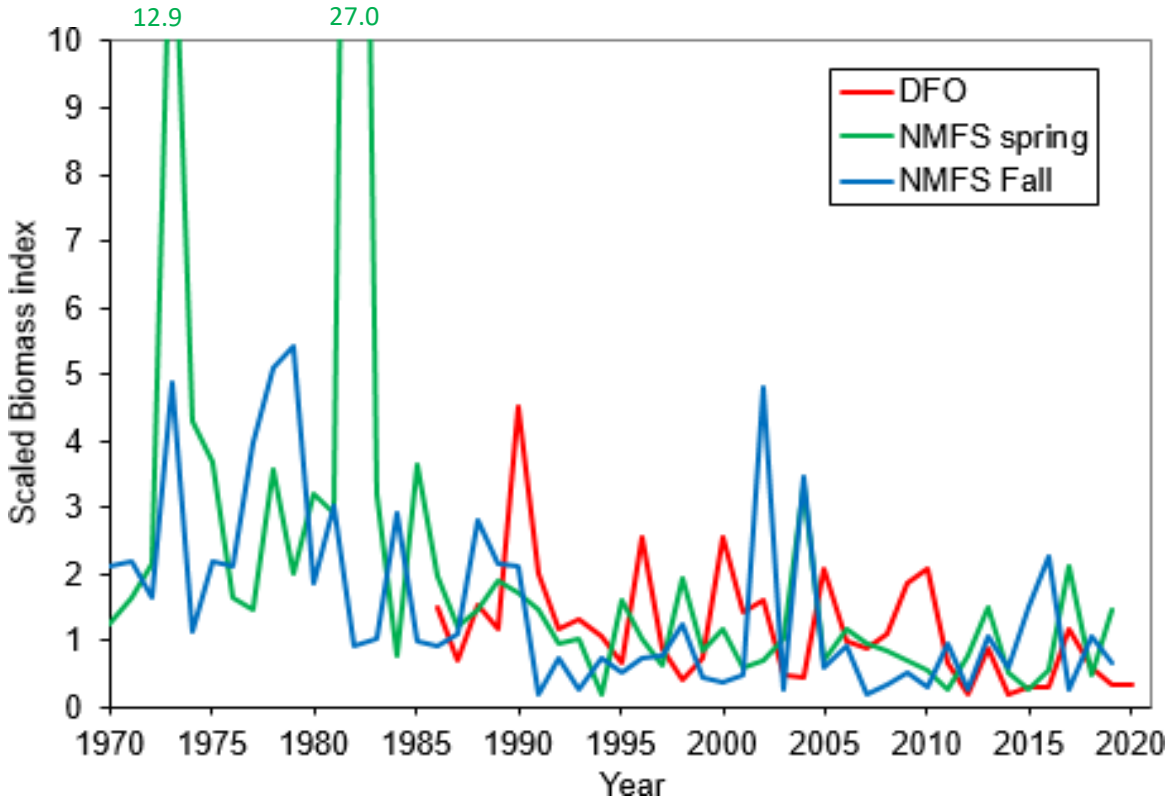
4.Report on the progress in the development of the DLMTool approach in reference to the timeline drafted by TMGC (Fall 2019)

5Zjm Cod – Catches



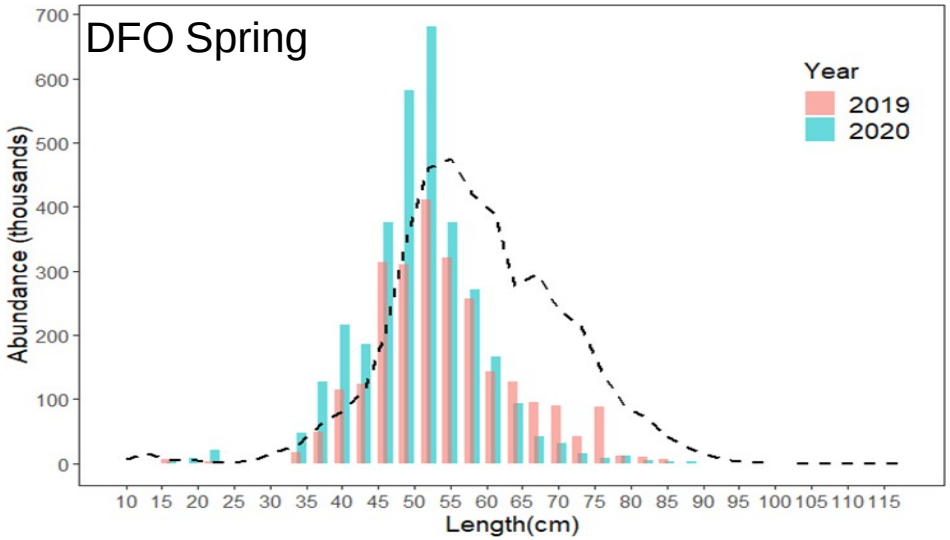
- Canadian + USA 2019 total catch: **428** mt (Quota **650** mt).
- Canadian 2019 catch **396** mt (Quota **461.5** mt).
  - Canadian discards were estimated at **3** mt from the groundfish fishery, **5** mt from the scallop fishery
- USA 2019 catch **31** mt (USA using different quota year, **66** mt).
  - US discards were **1** mt from the groundfish fishery

5Zjm Cod - Survey Biomass Indices



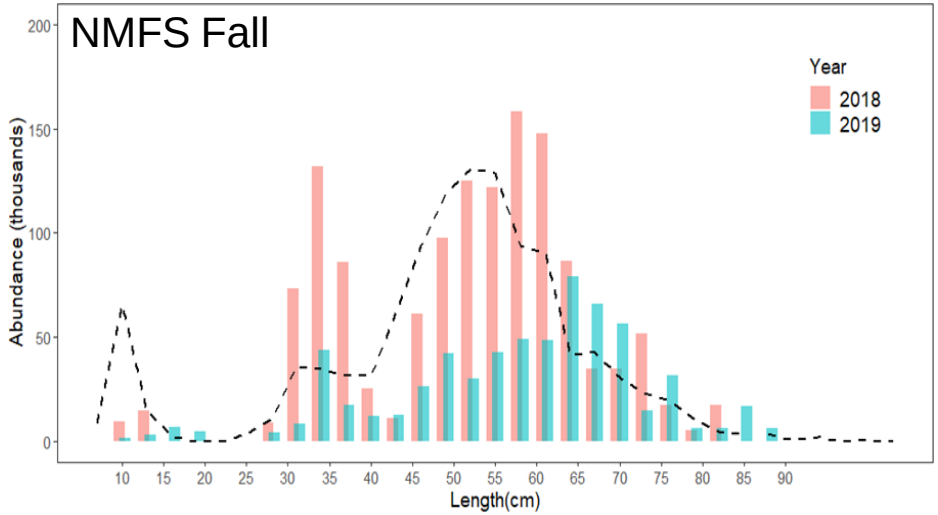
- Survey biomass indices updated for NMFS fall and DFO
- Biomass for NMFS fall and DFO consistent with recent years
- All three surveys remain below the time series mean

DFO and US Fall – Length Frequencies



DFO Spring

- Length frequency distribution for 2020 similar to 2019.
- Fewer large individuals in 2020, but more fish at smaller lengths.

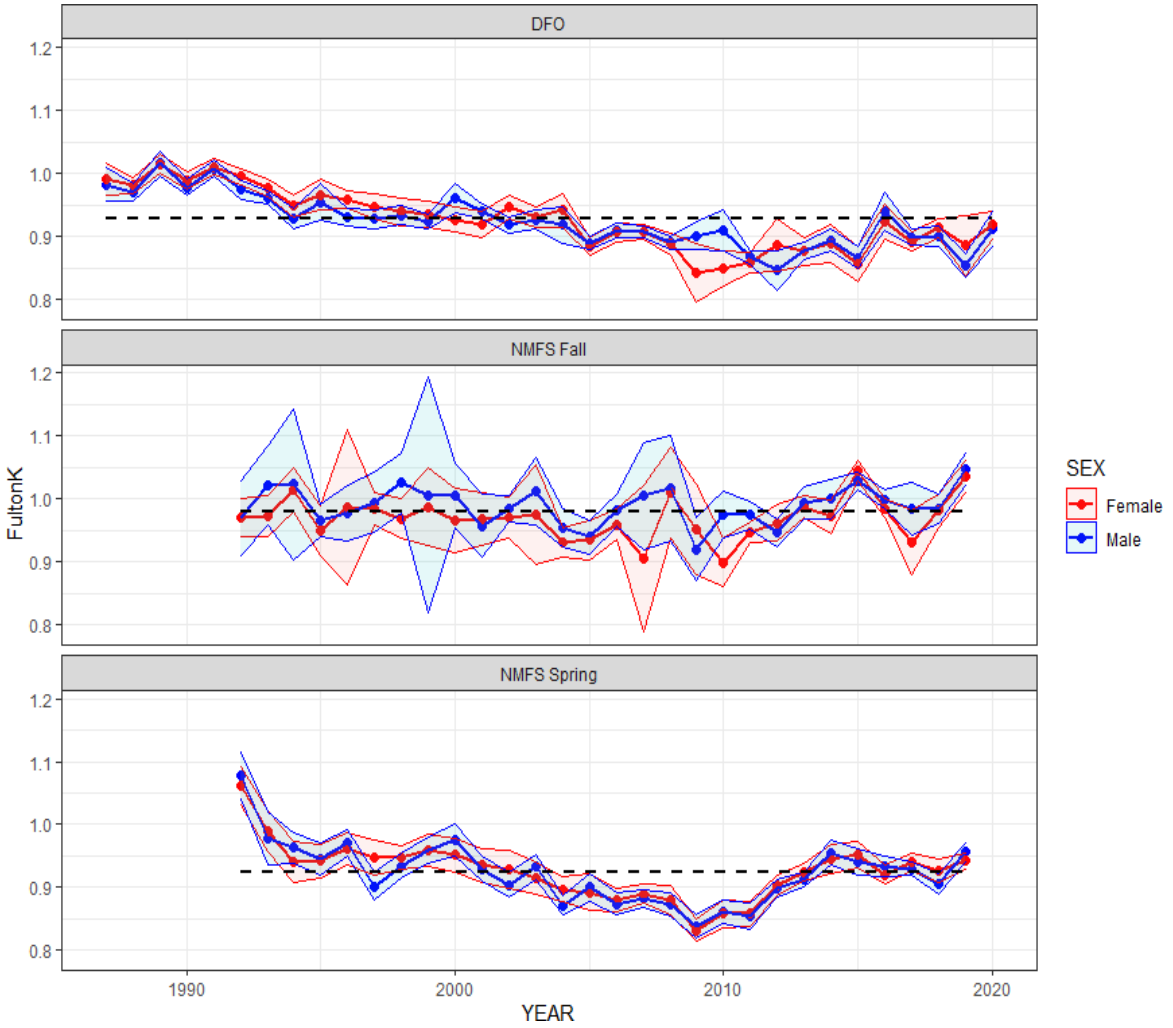


NMFS Fall:

- Distribution similar to 2018, but lower catch in 2019

Condition (Fulton's K; weight/length^3)

- DFO Spring condition currently at the long term average.
- NMFS Fall condition is above the long term average for both sexes in 2019.
- NMFS spring data has not been updated.



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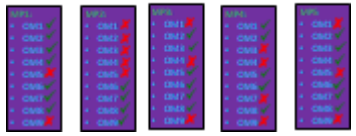
3. Determine if there is a need to revisit the 2018 TRAC advice.

4. Report on the progress in the development of the DLMTool approach in reference to the timeline drafted by TMGC (Fall 2019)

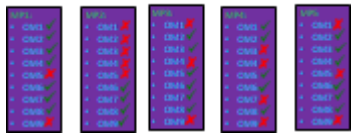
Updated Timeline

TRAC	Date	TMGC/ working group
Develop Operating Models (OM) ✓	Spring 2020	Form working group. Develop strawman Management Objectives (MO) ✓
Propose OMs and MPs, based on strawman Objectives ✓	July 7-9, 2020	
Continue QA/QC ✓	September 2020?	Review OMs, MOs, **and MPs** approve MOs **and MPs** ✓
Test approved MOs and MPs. Provide initial report card to TMGC on which MPs pass/fail against MOs.	Fall 2020?	
Continue QA/QC	?	Refine and approve Management Objectives **and Management Procedures**
Test refined MOs and MPs, and provide revised Report Card.	?	
Continue QA/QC	?	**Select MP to be applied in 2021**
Present simulation work. Apply chosen MP and provide advice.	July 2021	

Initial Report Card



Final Report Card



TRAC Summary

- There was no assessment model run for cod at TRAC in 2019 and 2020.
- There has been no indication of a change in stock status from fishery or survey indicators (low biomass, no recruitment events, but some improvement to condition).
- There is no basis for a change in catch advice from 2018 or 2019 (602 mt ('low') to 676 mt ('neutral')).
- This advice was based on the mean of all 3 approaches at low risk (602 mt) and at neutral risk (676 mt) from 2018.

Model	Catch Advice		
	25%	50%	75%
VPA	743 mt	860 mt	991 mt
ASAP	418 mt	524 mt	631 mt

Model	Catch Advice		
	25th Percentile	Median	75th Percentile
Empirical	600 mt	644 mt	697 mt

Allocation shares for Canada and the USA on Georges Bank through fishing year 2021

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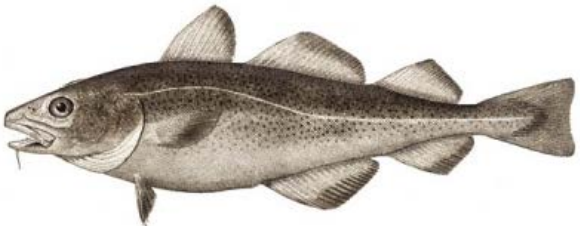
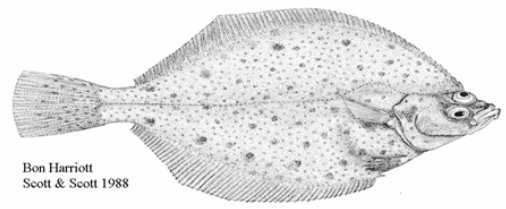
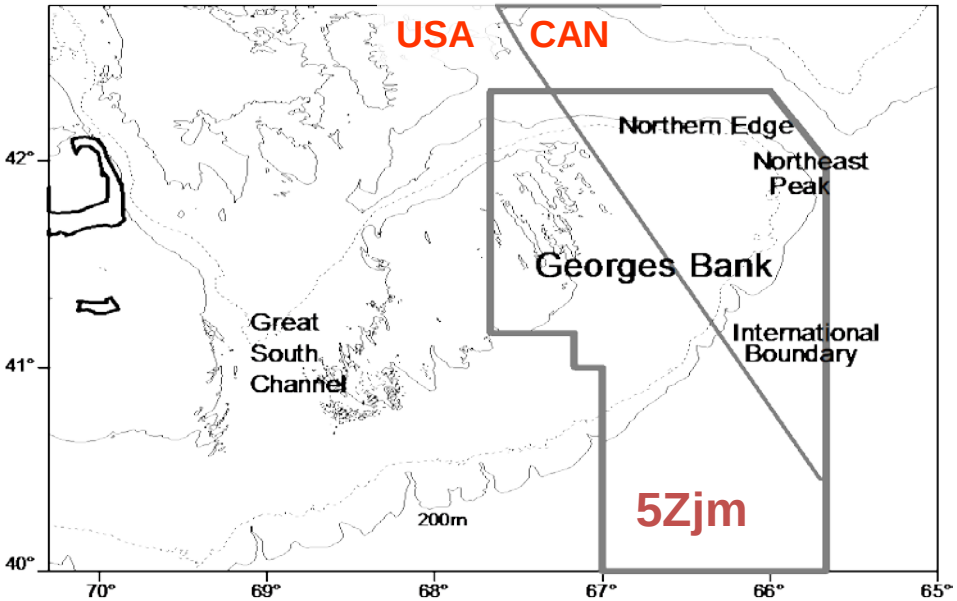
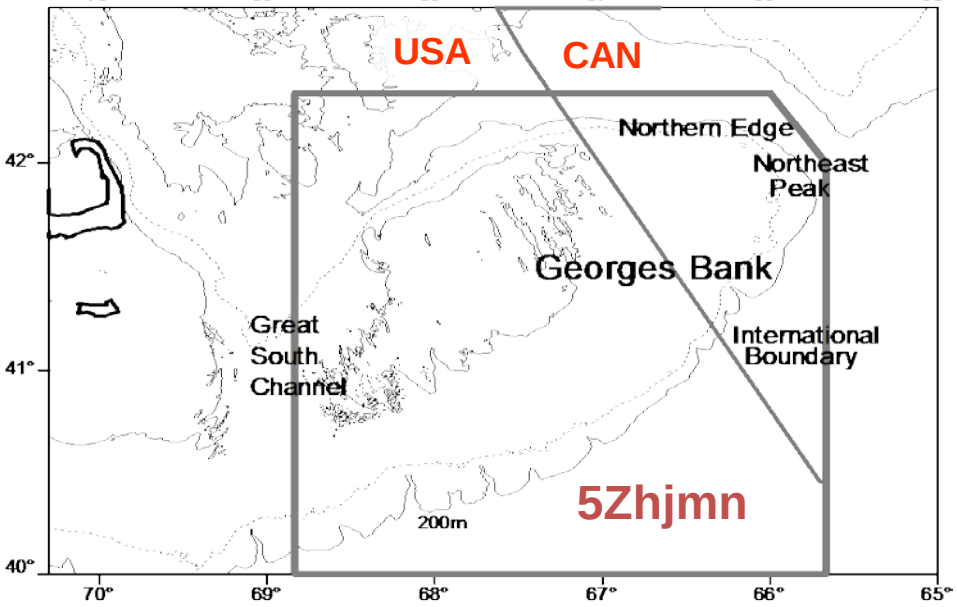
Canada/USA Joint Management Unit Area









Canada/USA Allocation Shares

- The purpose of the allocation shares is to achieve similar exploitation rates on the Canadian and USA sides.

- That is, to achieve similar ratios of catch to biomass

Canada/USA Allocation Shares

- Agreement is to use a combination of updated resource distribution and catch history(1967 to 1994)

$$\%share_{year,country} = (\alpha_{year} \times \%utilization_{year,country}) + (\beta_{year} \times \%resource\ distribution_{year,country})$$

where α_{year} = percentage weighting for utilization in year

β_{year} = percentage weighting for resource distribution in year

$\alpha_{year} + \beta_{year} = 100\%$

2003	2004	2005	2006	2007	2008	2009	2010
60/40	60/40	65/35	70/30	75/25	80/20	85/15	90/10

- From 2010 on, Resource Distribution (β) = 90% and Country Utilisation (α) = 10%

Smoothed Survey Distribution

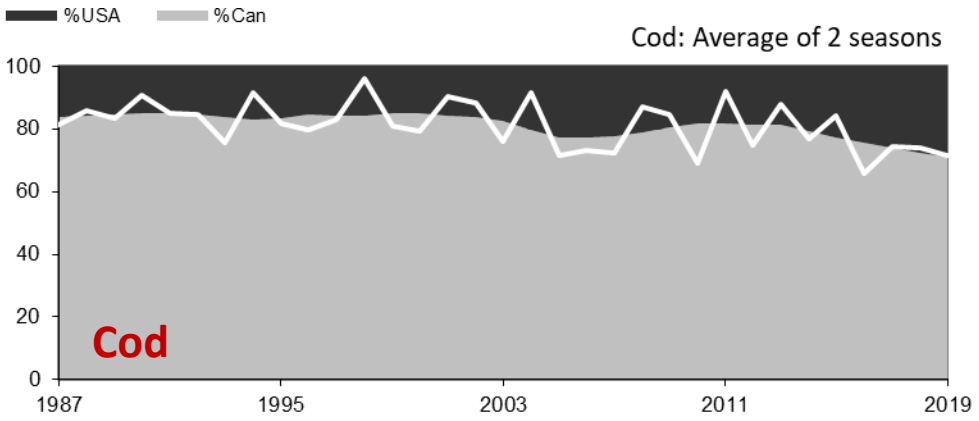
White line is proportion of resource in CDN waters before smoothing.

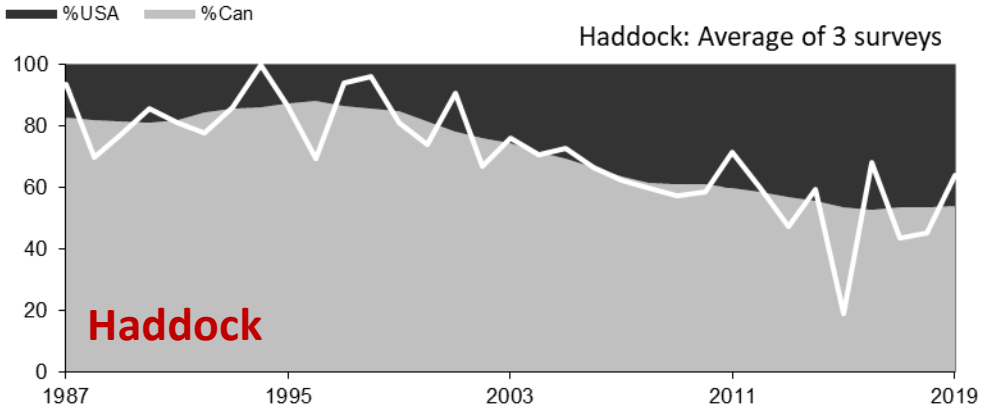
Resource distribution in 2019:

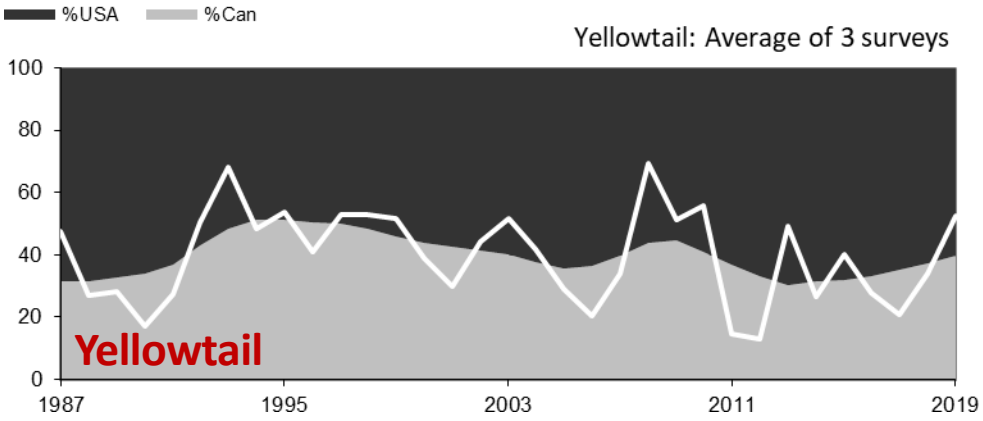
<u>Cod:</u> 29% USA, 71% CDN

<u>Had:</u> 46% USA, 54% CDN

<u>Ytl:</u> 60% USA, 40% CDN

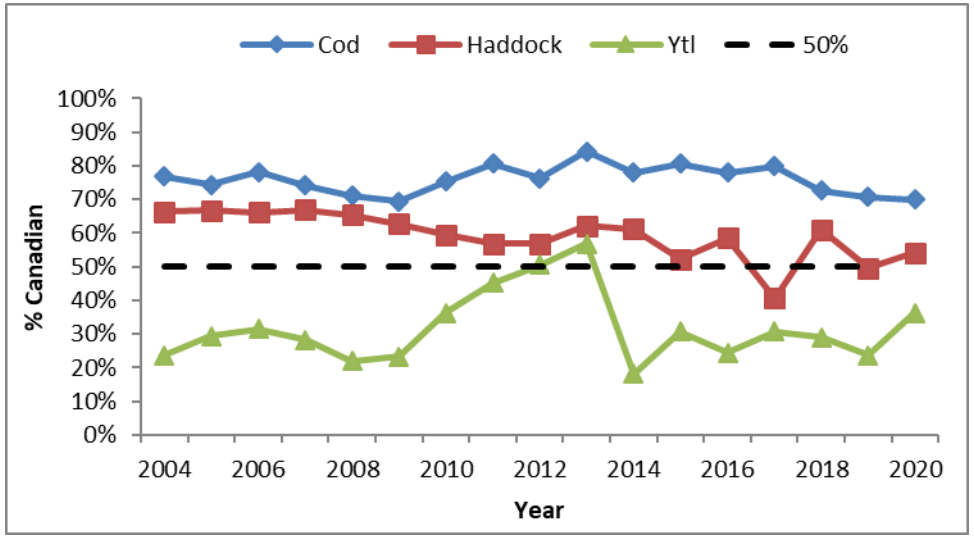






Allocation Shares in 2021

	Cod	Haddock	YTL
USA	29%->**30%**	54%->**46%**	74%->**64%**
Canada	71%->**70%**	46%->**54%**	26%->**36%**



Allocation shares trend

Questions?