



3. GROUND FISH (Sept. 23–26, 2019) M

2019 TRAC Status Reports

#3c

**NEFMC Meeting
Gloucester, MA
September 25, 2019**

**Tara Trinko Lake
NEFSC**

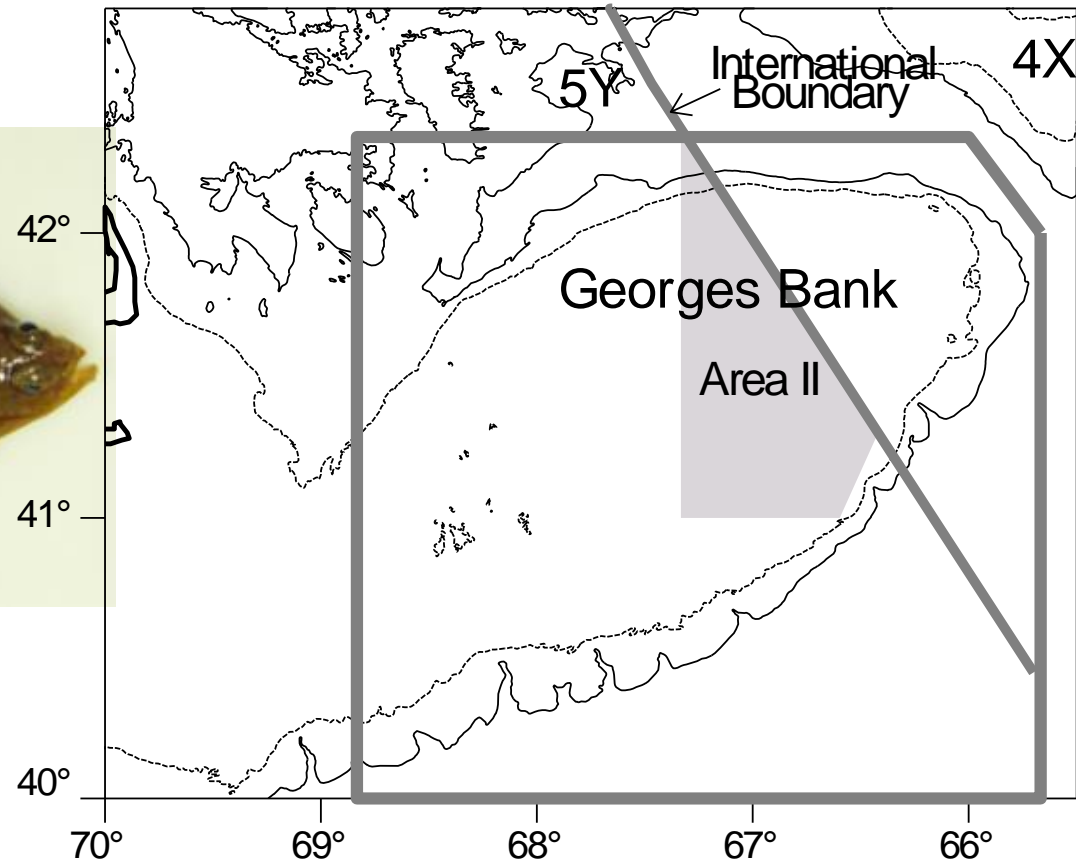


2019 TRAC Report

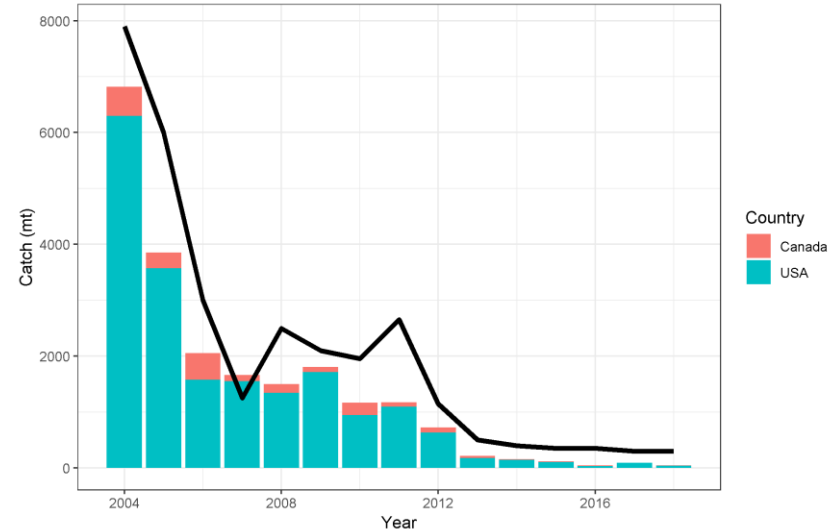
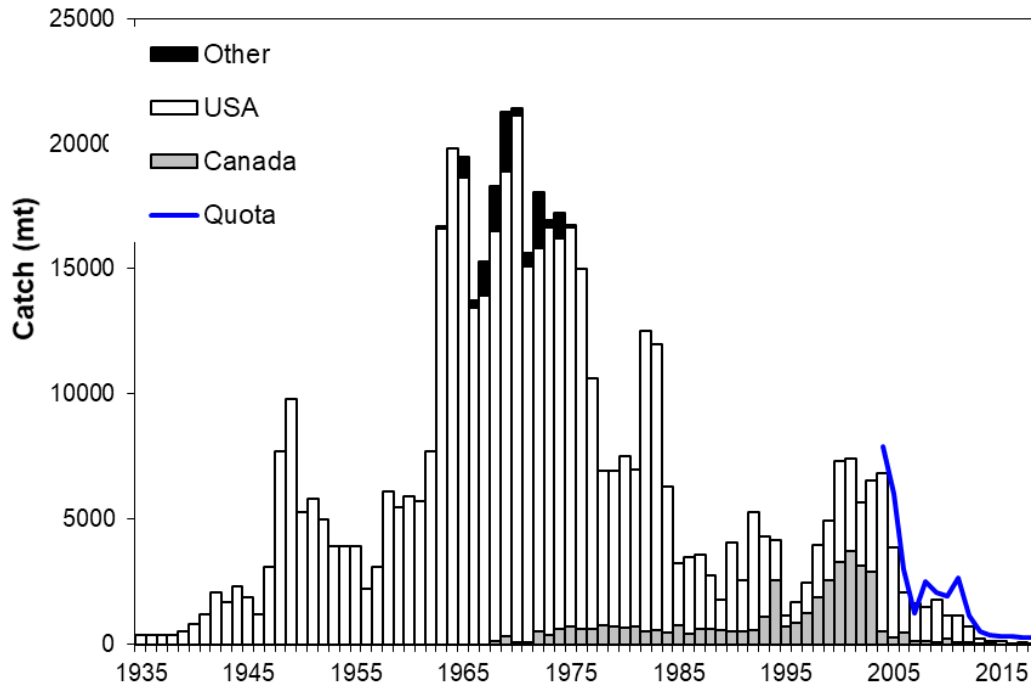
Georges Bank Yellowtail Flounder

Chris Legault and Monica Finley

Georges Bank Yellowtail Flounder

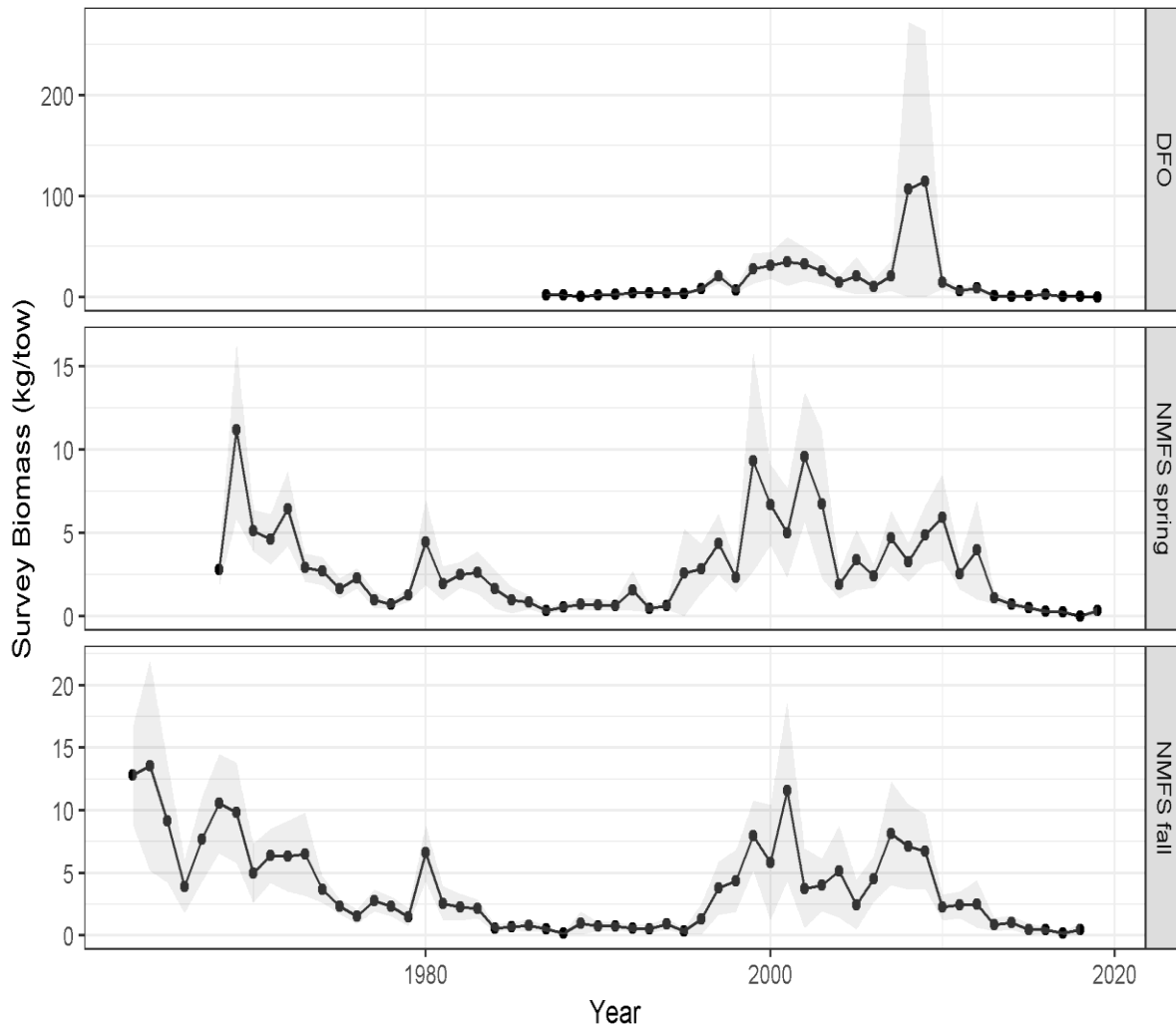


GB Yellowtail Flounder Catch



- Canadian + USA 2018 total catch **45** mt (Quota **300** mt)
- Canadian 2018 catch **3** mt (Quota **87** mt)
- USA catch **42** mt (USA using different quota year, **213** mt)

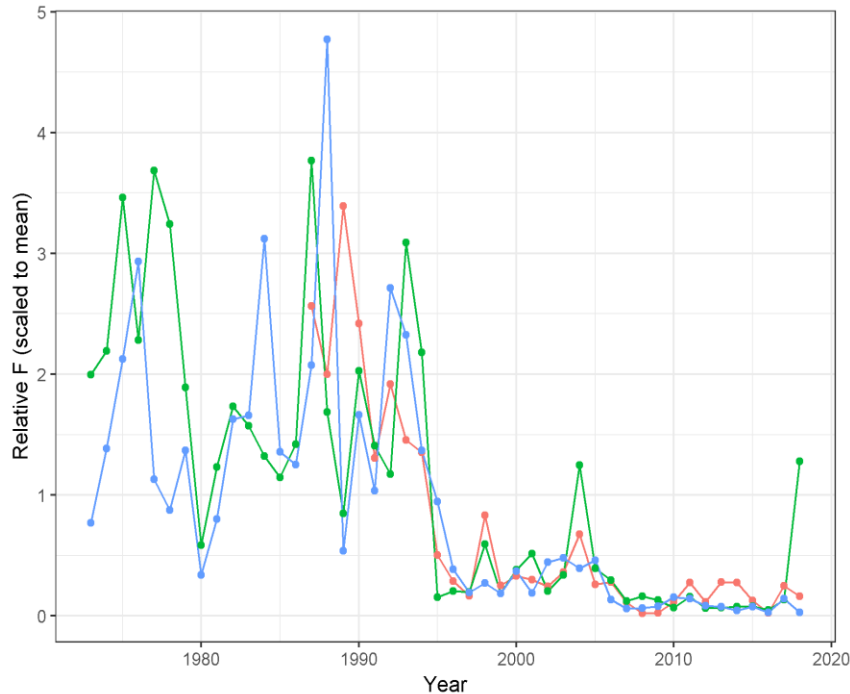
Survey Trends



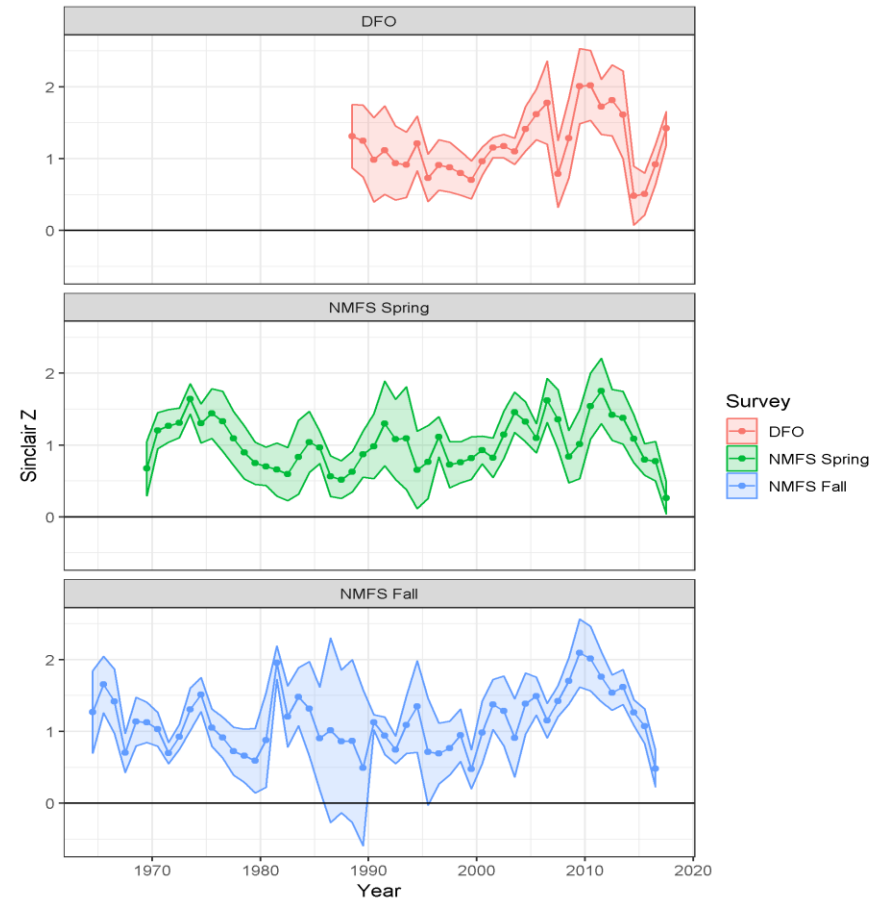
- DFO 2019 survey is the lowest in 33 years
- NMFS Spring 2019 survey is the 4th lowest in 52 years
- NMFS Fall 2018 survey is the 6th lowest in 56 years
- The biomass indices of the three surveys indicate the capacity of the stock is significantly diminished.
- Stock biomass is low and productivity is poor.

Relative Fishing and Total Mortality

Relative F = catch / survey



Survey Z



- Relative reported catch 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) Wings				Exploitation Rate (0.06)
	DFO	Spring	Fall (year-1)	Average	Catch Advice (mt)
2010	29452	68752	83490	60565	3634
2011	12344	29621	27821	23262	1396
2012	18113	46209	30354	31559	1894
2013	2249	12766	31199	15404	924
2014	1654	8564	10828	7015	421
2015	2650	5861	12682	7064	424
2016	5569	3610	5811	4997	300
2017	1104	2819	5432	3118	187
2018	812	143	2424	1126	68
2019	182	3735	6047	3322	199

- The TRAC recommends an upper bound for the exploitation rate of 6% for catch advice: 199 mt for 2020.

Empirical Results from 2019 TRAC

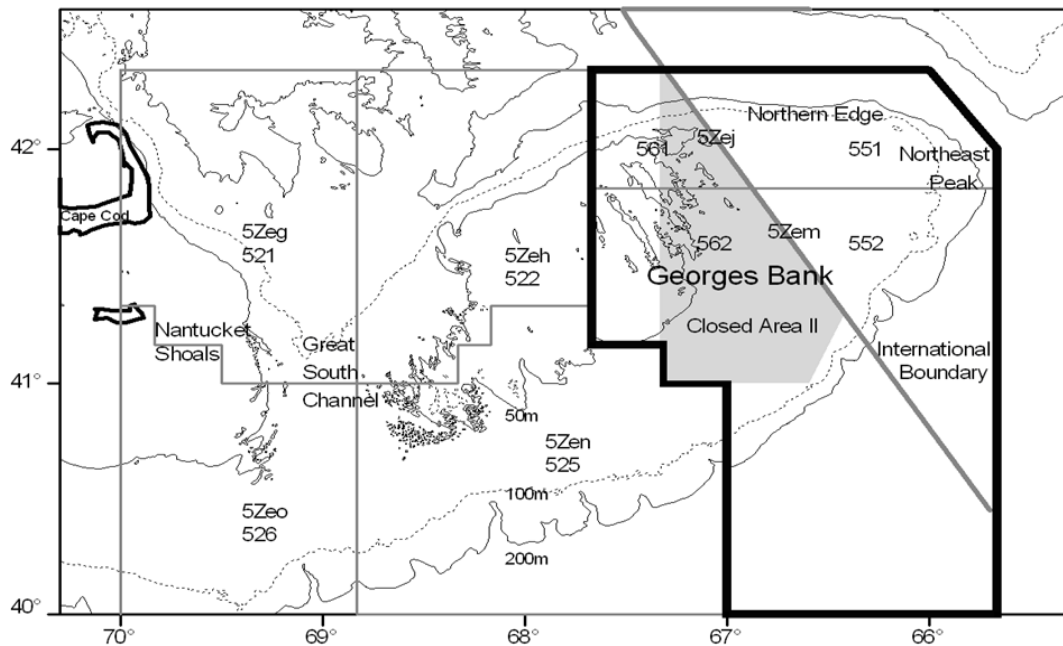
Exploitation Rates from 2 to 16%

Exploitation Rate	Catch Advice (mt)
2%	66
4%	133
6%	199
8%	266
10%	332
12%	399
14%	465
16%	531

- The TRAC advice (6% exploitation) is in red

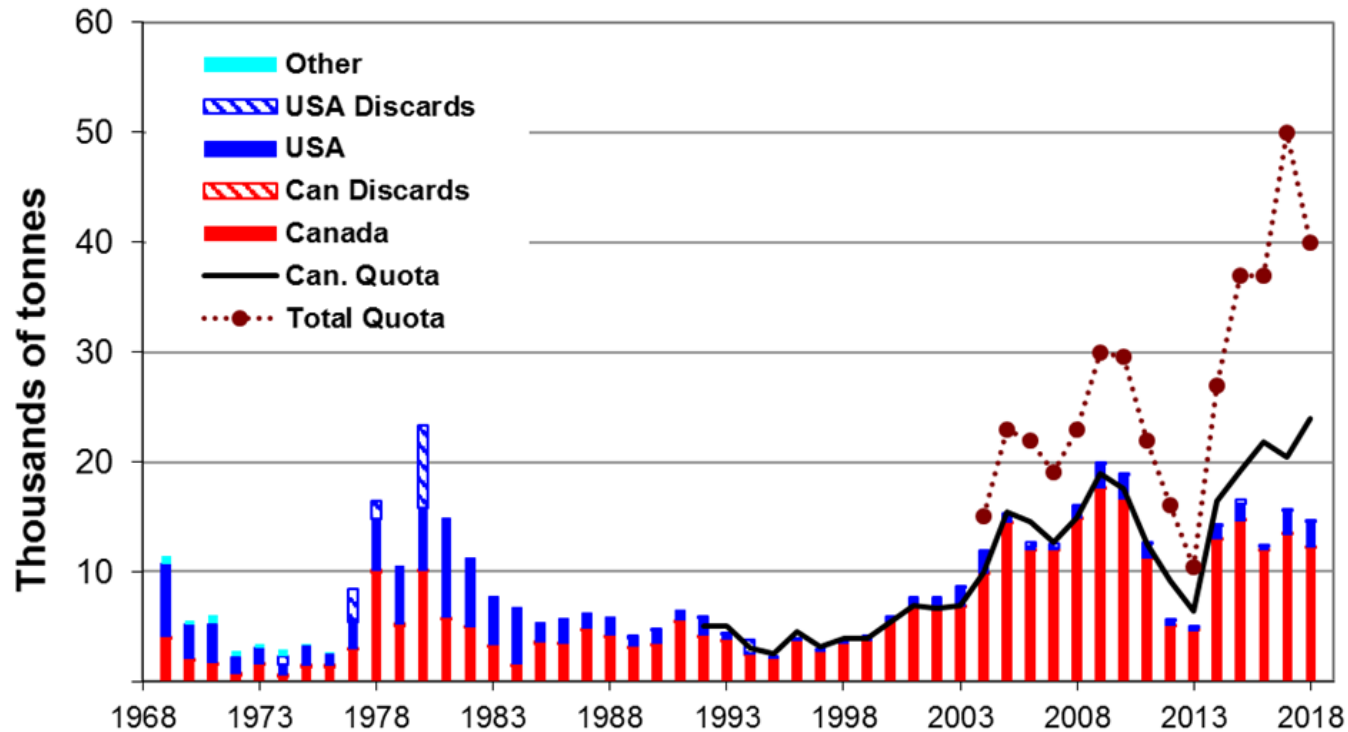
2019 TRAC Report

Eastern Georges Bank Haddock



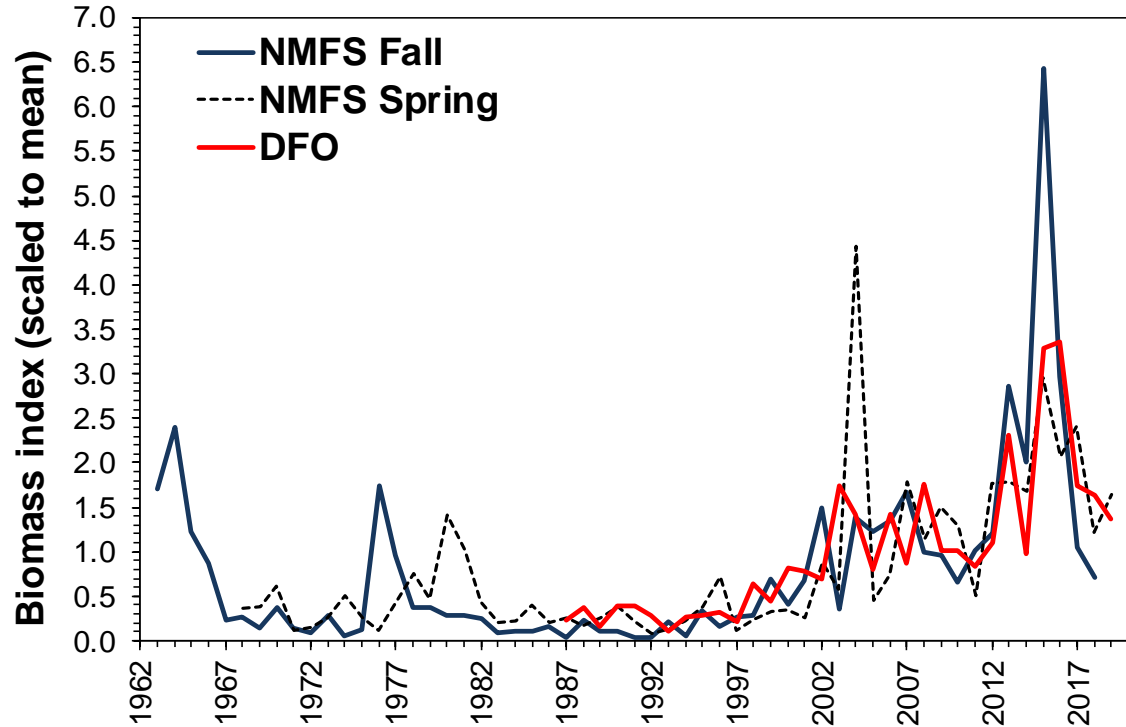
M. Finley, L. Brooks, Q. McCurdy, M. Barrett & Y. Wang

Input Data – 2018 Fishery



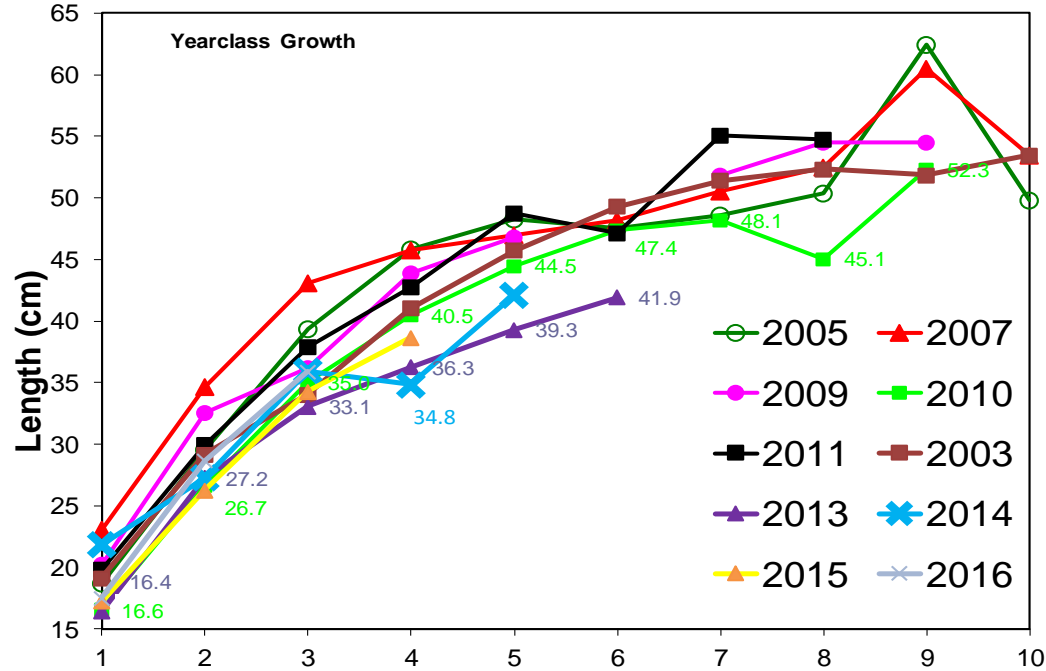
- Combined Canadian and US catches were 12,495 mt against a quota of 40,000 mt.
- Canada caught 51% of allocation (12,221 mt against a quota of 24,000 mt); USA caught 1.4% (274 mt against a quota of 16,000 mt).
- As expected, the catch was dominated by the exceptionally strong 2013 year class at age 5 (81% for USA & 78% for Canada by weight).
- However, the numbers and biomass of both the 2013 and 2010 year classes were lower than predicted by the model run from the 2017 TRAC.

Input Data – Surveys



- There has been a decrease in the biomass indices for the most recent DFO (16%) and NMFS fall (27%) surveys, an increase for NMFS spring (35%).
- Age 6 abundance (2013 year class) in 2019 is the highest in the time series for DFO and NMFS spring.
- The 2013 year class was the 3rd highest in the time series for the 2018 NMFS fall (after 2003 yc and 2010 yc at the same age).

Input Data – Growth



- The 2013 year class is growing even more slowly than the last large year class (2010).
- Weights at age:
 - 2018 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.
- Condition has generally been below the time series average since 2004. However, it was above the mean in 2019 for NMES fall and spring

Rejection of the Model

- In 2019, TRAC rejected the model that has been used to provide catch advice since 1998 because of:
- The strong retrospective pattern. This first emerged in 2014, increased each year and became extreme in 2019.
- The fit of the model to the indices was poor, displaying consecutive years where nearly all ages were overestimated or underestimated.
- Aging issues around the strong year class. The length distributions of the less abundant year classes on either side of the 2013 year class overlap with the strong year class. This results in "smearing" of the 2013 age class into adjacent ages when an age length key is applied to those lengths.

Summary for 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 average survey biomass is well above the time series average	Even if no catch were taken in 2020, biomass is projected to decline
Preliminary indication of above average recruitment for 2016 (length frequency and bubble plots), although that observation is uncertain; it also would not contribute to very much to catch in 2020 at age 4 as that age is not fully selected	Weights at age are the lowest observed for the 2013 year class, and slow growth is expected to continue for the projection years.
	Availability to the fishery is very uncertain for the 2013 year class at age 7 in 2020 or age 8 in 2021; reduced availability at older ages has been indicated in many of the recent VPAs

Advice

- In the absence of a model, there are no analytical projections to characterize risk for catches in 2020 and 2021.
- To provide guidance, TRAC examined the information from the 2012 VPA model run.
 - No retrospective pattern
 - Similar large year class (2003)

Table 2. Information from 2009 to 2011 and the 2019 average survey biomass.

Year	F5-8	Rel.F	AvgSurvB	Catch	Quota
2009	0.12	0.94	54,250	19,855	30,000
2010	0.15	0.99	50,800	18,794	29,600
2011	0.15	1.2	33,400	12,656	22,000
2019		*	62,000	*	30,000
2020					
2021					

*Indicates values that will be filled in at TRAC in 2020

- The quotas and catch for the 2009 to 2011 fishery, provide some context for catch and quota for the 2020 and 2021 fisheries.
- Both year classes (2003 and 2013) at age 6.
- The survey biomass in 2019 is higher than it was in 2009.
- Relative fishing mortality has been low in recent years.

Summary

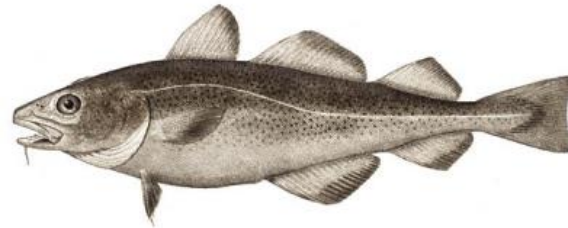
- The population is expected to decline from 2019 to 2020 and 2021 even if no catches are taken in 2020. This is primarily due to the decline in numbers of the 2013 year class.
- The population is still abundant, and well above the time series average survey biomass. However, maintaining a constant quota on a declining population (where catch is primarily coming from a single year class) will lead to an increasing trend in relative F .

Summary continued

- TRAC recommends no increase in quota in 2020 above the 2019 quota of 30,000 mt, but recommends a decrease in quota in 2021. There was no TRAC consensus on whether to decrease quota in 2020.
- For guidance on a potentially reasonable range of quota advice, TMGC could consider the quota advice for the 2003 year class in 2009-2011, as a starting point.

Year	F5-8	Rel. F	AvgSurvB	Catch	Quota
2009	0.12	0.23	54,250	19,855	30,000
2010	0.15	0.22	50,800	18,794	29,600
2011	0.15	0.26	33,400	12,656	22,000
2019		*	62,000	*	30,000
2020			*		**
2021					**

2019 TRAC Eastern Georges Bank Cod



TMGC meeting

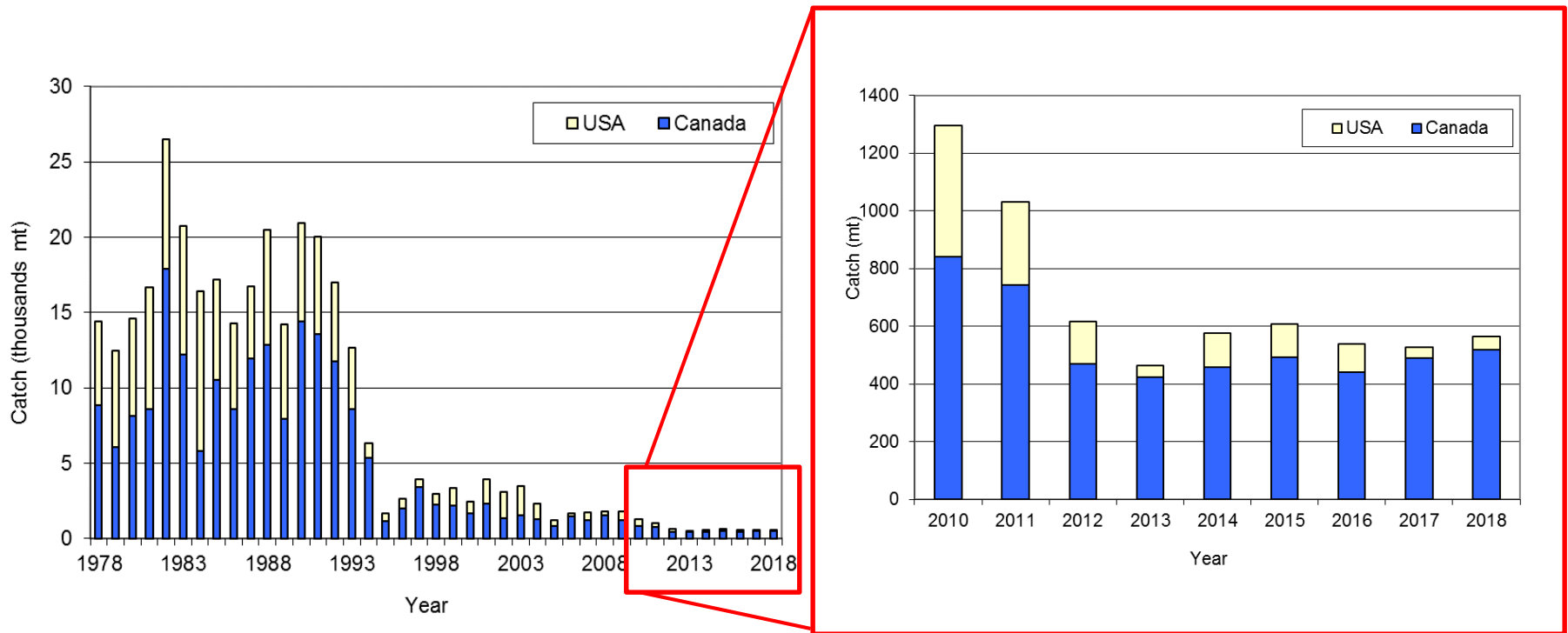
Halifax, NS

M. Barrett, C.M. Legault, I. Andrushchenko,, F. Irvine

Terms of Reference

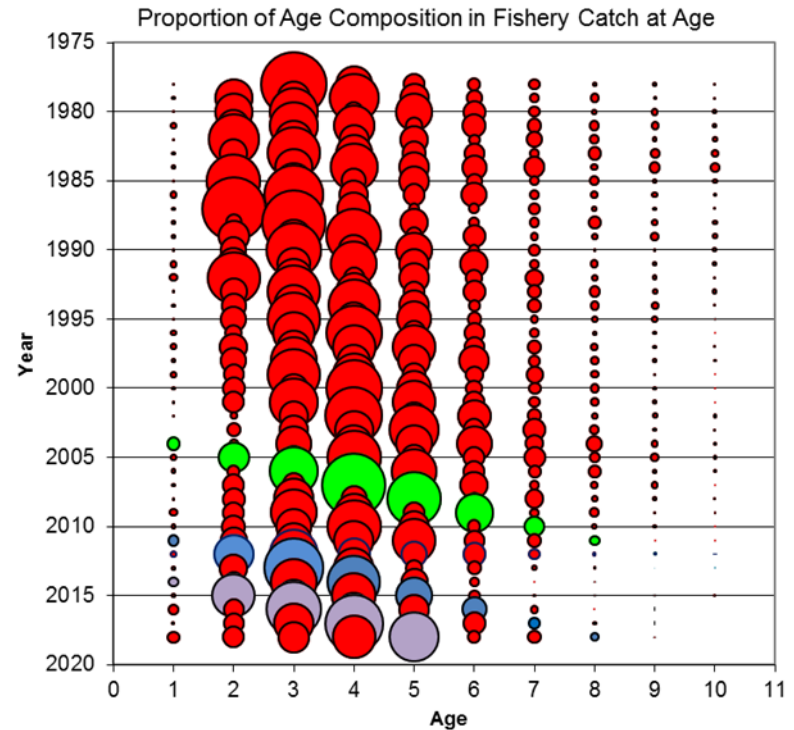
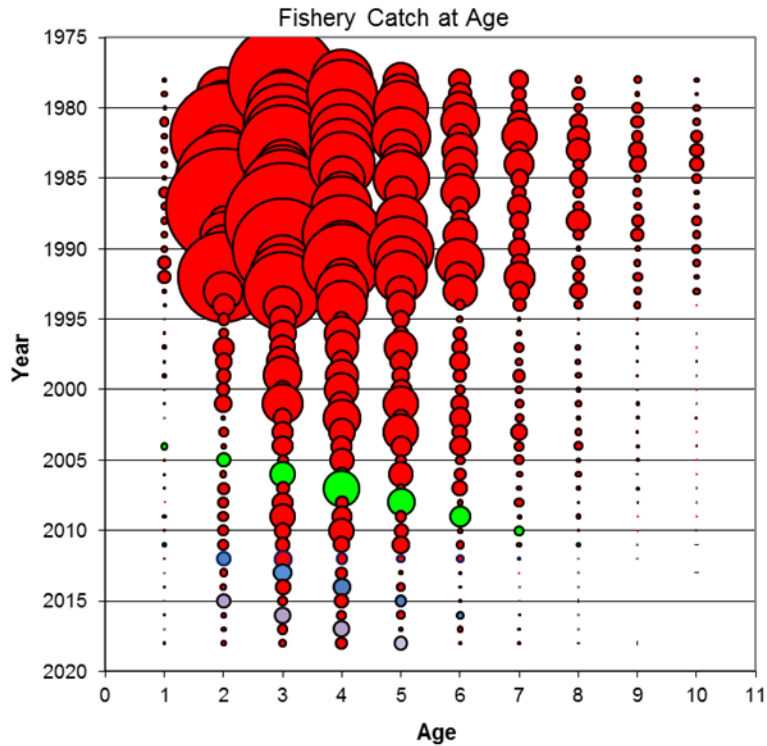
1. Update the following biological and fishery indicators of the state of cod in the eastern GB management area with 2018-2019 data: **condition factor, swept area survey biomass indices, fishery and survey catch at length, relative F, total mortality (Z), and catch.**
2. Identify and comment on **changes in survey and fishery indicators** (relative to the 2018 TRAC).
3. Investigate alternative methodologies of providing catch advice, and report on the most promising approaches. Describe plans for further investigation of the identified approach, which will be reviewed at the 2020 TRAC and will then provide catch advice until a benchmark assessment can be completed for this resource.

5Zjm Cod – Catches



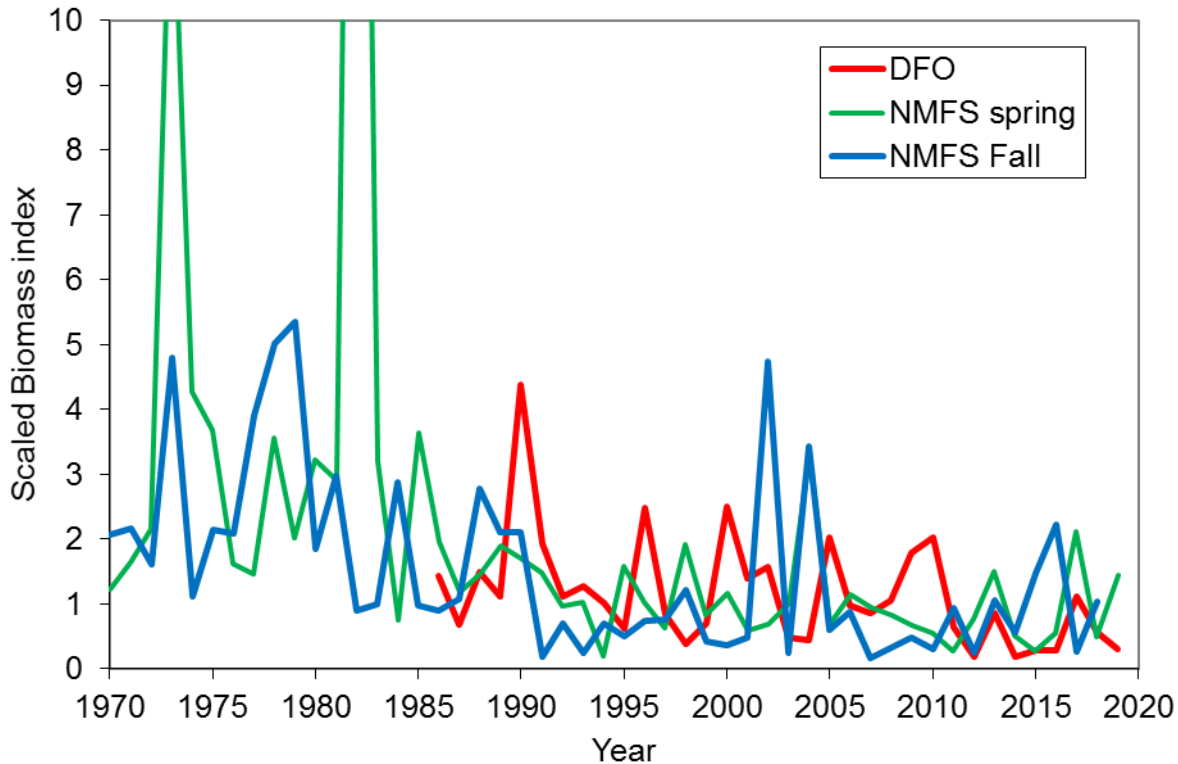
- Canadian + USA 2018 total catch: **565** mt (Quota **951** mt).
- Canadian 2018 catch **517** mt (Quota **694** mt).
 - Canadian discards were estimated at **2** mt from the groundfish fishery, **5** mt from the scallop fishery
- USA 2018 catch **48** mt (USA using different quota year, **257** mt).
 - US discards were **2** mt from the groundfish fishery

5Zjm Cod – Fishery Catch at Age



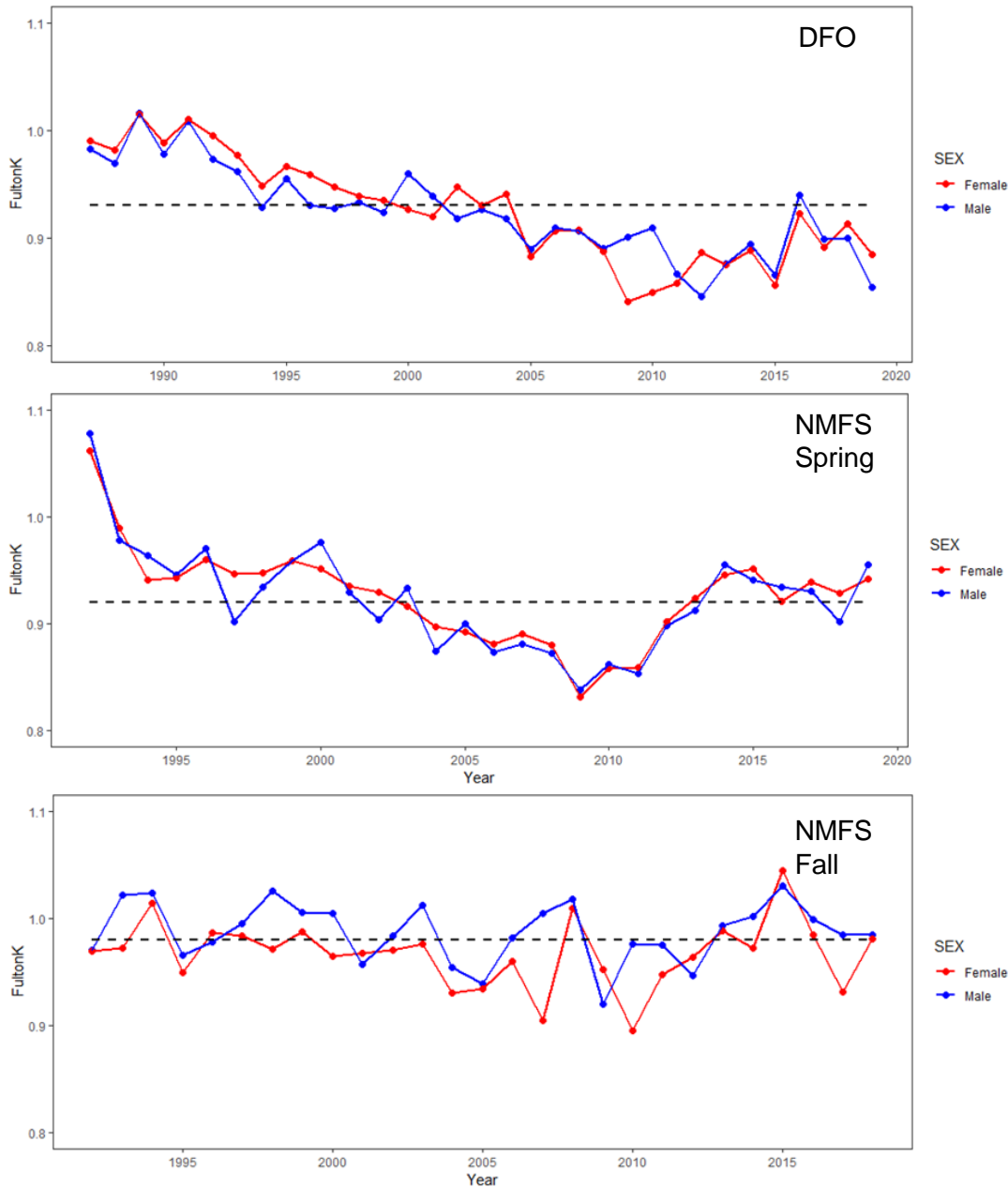
- Ages 4 and 5 made major contribution to the catch in 2018
- Older ages still low/absent

5Zjm Cod - Survey Biomass Indices



- Small increases in biomass in both NMFS surveys
- All three most recent values decreased below the series mean

Fulton's K(weight/length³)



- Fulton's K decreased to series low in late 2000s.
- Recovered since then and is currently around long-term mean for NMFS fall and Spring.
- Remains at low levels for DFO survey.

Alternative Methodologies

Two approaches were discussed at TRAC for providing catch advice until a cod benchmark.

- 1) DLMtool - simulation framework that tests simple harvest strategies against the range of uncertainty we see in EGB cod
- 2) Rose Approach-ensemble of models that are applied after the retrospective pattern has been fixed

The TRAC discussed the advantages and disadvantages of both approaches and agreed to proceed with the development of the DLMtool.

TRAC Summary

- No major changes in the biological and fishery indicators for the stock.
- Moving forward biological and fishery indicators will be monitored and the new methodology will be explored.
- There was no model run for cod at TRAC 2019 and no catch advice was provided.
- With the absence of new catch advice, the 2018 catch advice remains in place (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		
	25 th Percentile	Median	75 th Percentile
Empirical	600 mt	644 mt	697 mt



CERT
Comité d'évaluation des
ressources transfrontalières

TRAC
Transboundary Resource
Assessment Committee

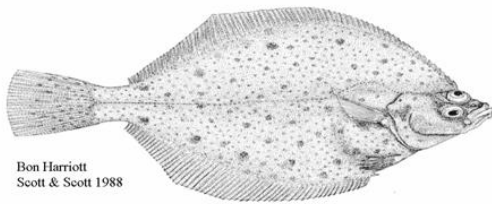
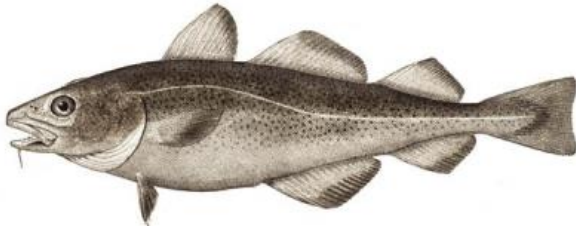
Allocation shares for Canada and the USA on Georges Bank through fishing year 2020

Melanie Barrett¹ and Liz Brooks²

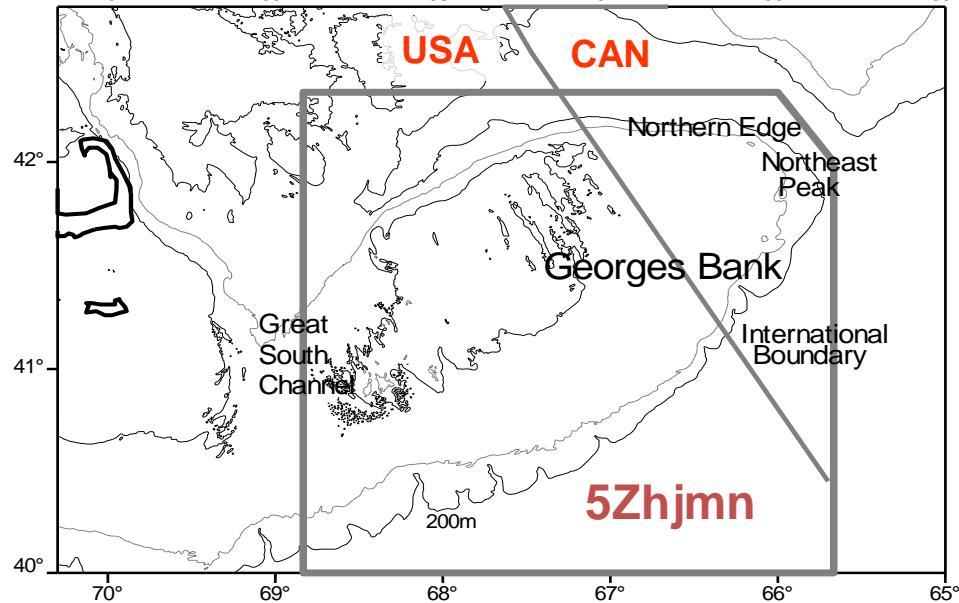
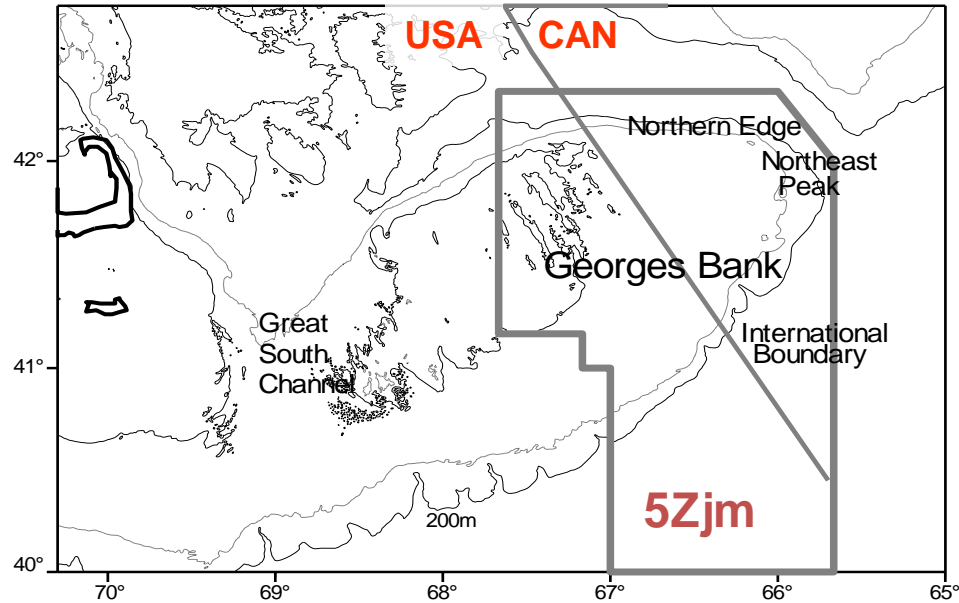
¹Fisheries and Oceans Canada
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Canada

²NOAA/NMFS Northeast Fisheries Science
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166 Water Street
Woods Hole, Massachusetts 02543
USA

Canada/USA Joint Management Unit Area



Bon Harriott
Scott & Scott 1988



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)

$$\% \text{share}_{\text{year,country}} = (\alpha_{\text{year}} \times \% \text{utilization}_{\text{year,country}}) + (\beta_{\text{year}} \times \% \text{resource distribution}_{\text{year,country}})$$

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

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

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

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

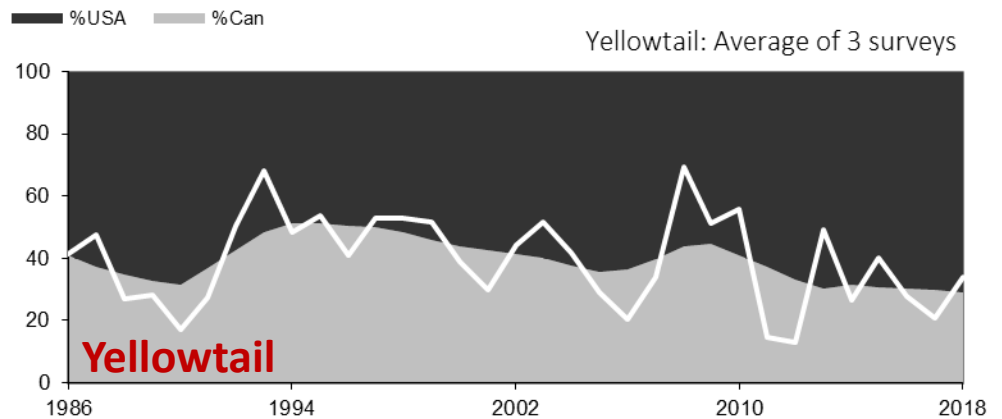
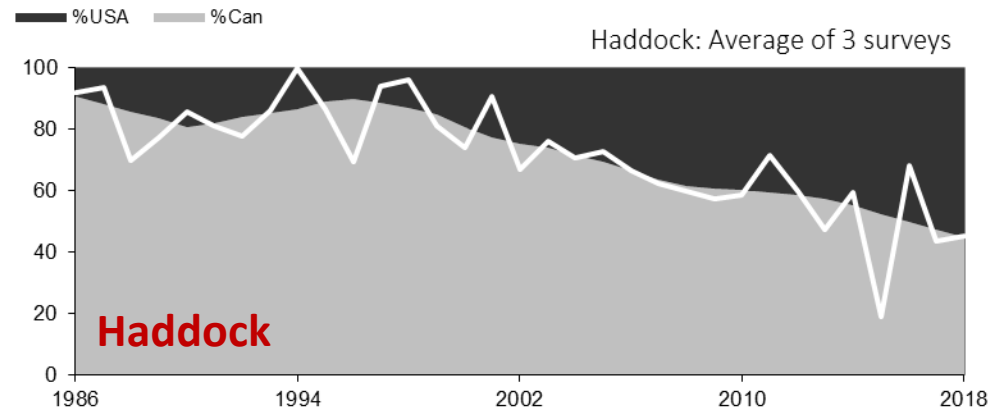
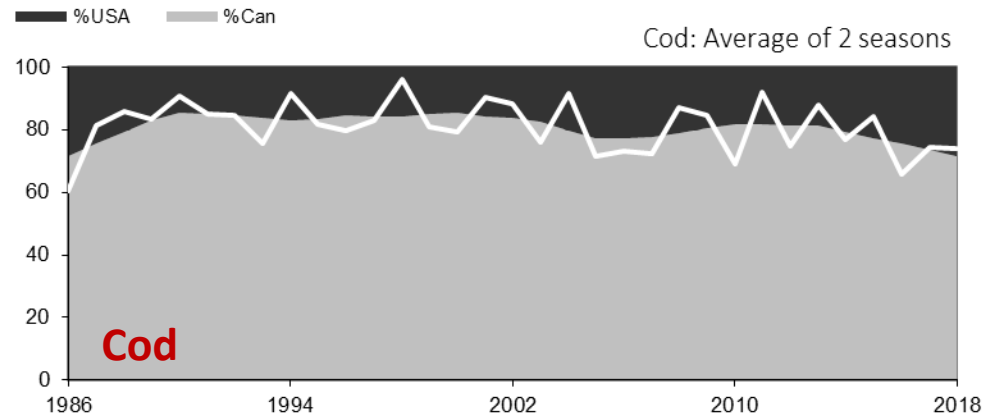
White line is proportion of resource in CDN waters before smoothing.

Resource distribution in 2018:

Cod: 28% USA, 72% CDN

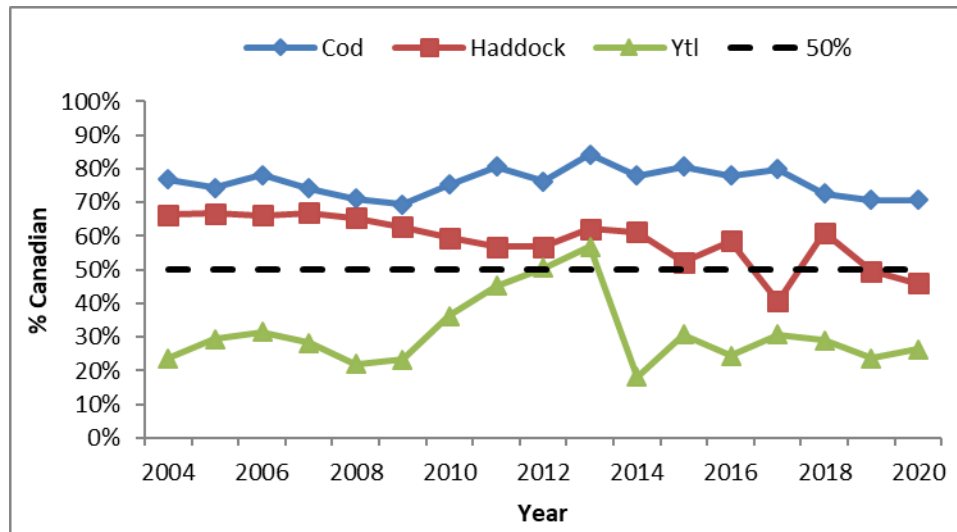
Had: 55% USA, 45% CDN

Ytl: 71% USA, 29% CDN



Allocation Shares in 2020

	Cod	Haddock	YTL
USA	29%→29%	50%→54%	76%→74%
Canada	71%→71%	50%→46%	24%→26%



Allocation shares trend

Questions?