Transboundary Resource Assessment Committee Results for 2016

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Northeast Fisheries Science Center

Presentation to NEFMC Sept 2016

Fisheries and Oceans Canada | Pêches et Océans Canada

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Canada / U.S.A. Allocation Shares[1]

Elizabeth Brooks
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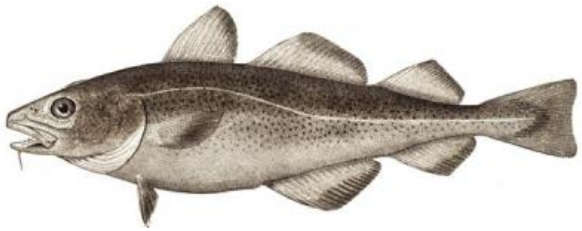
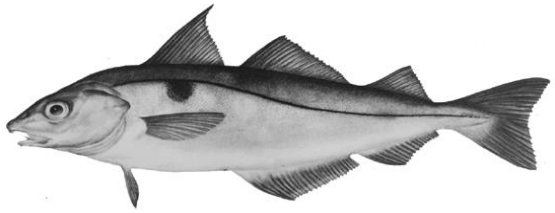
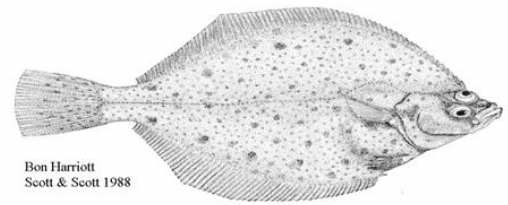
Presented at
New England Fisheries Management Council Meeting
September 21, 2016

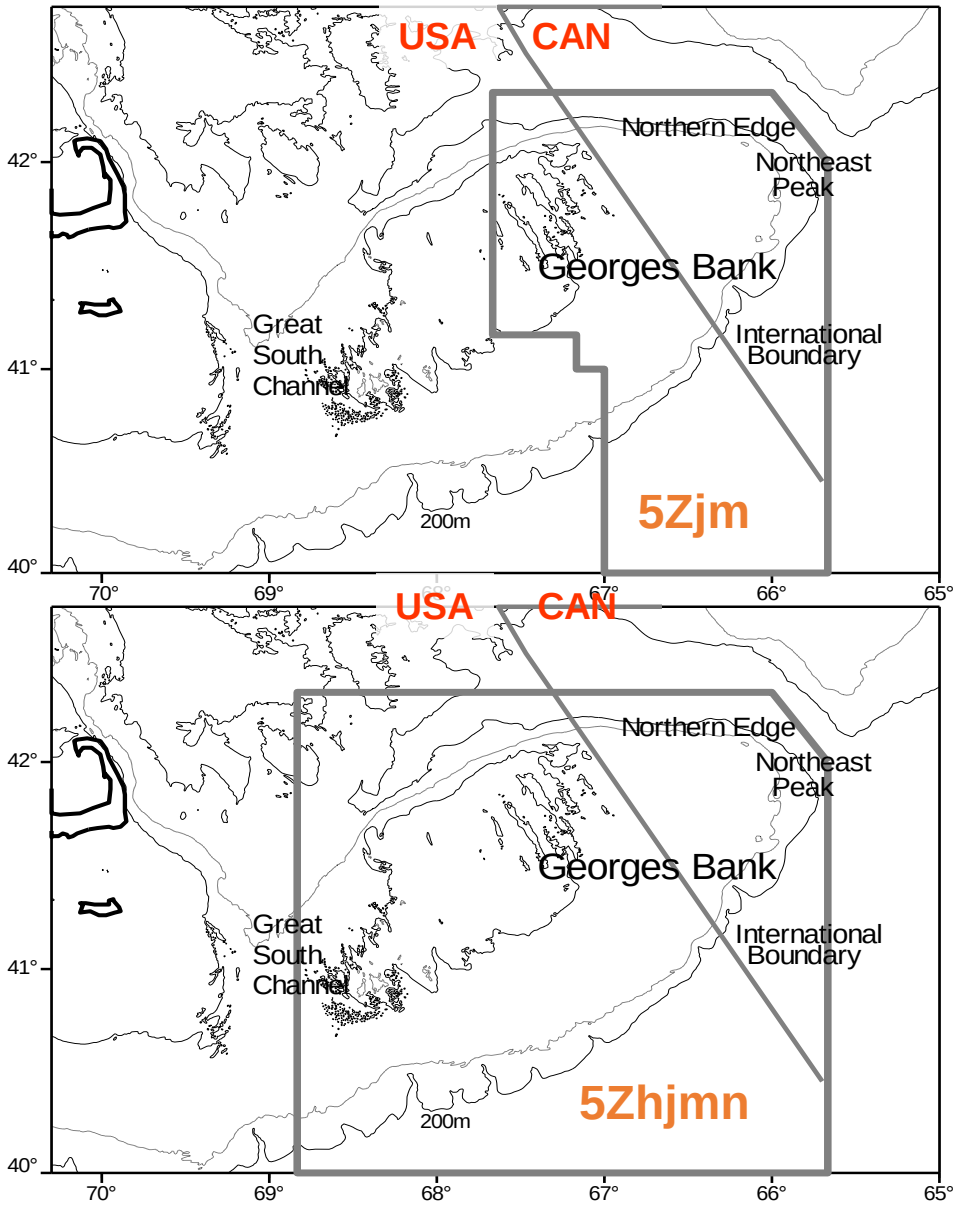
[1] Prepared by Yanjun Wang
Fisheries and Oceans Canada

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

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

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%

Survey Distribution

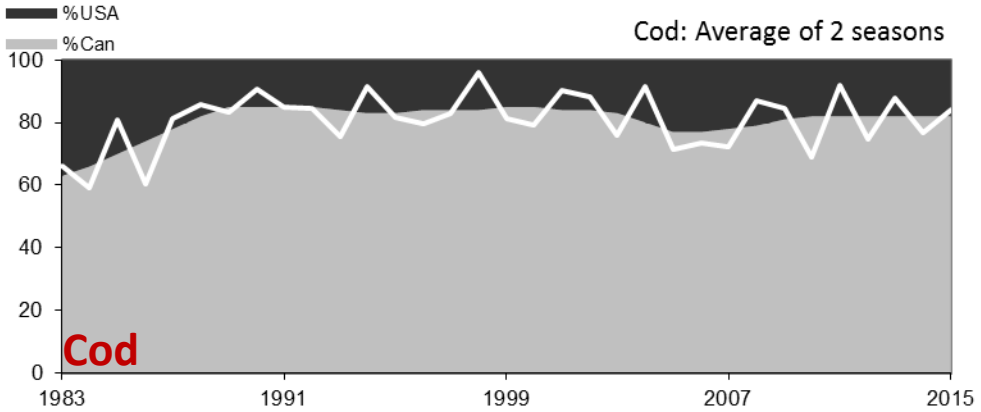
- Smoothed 3 species spatial distribution in 33 years window.
- White line is proportion of resource in CDN waters before smoothing.

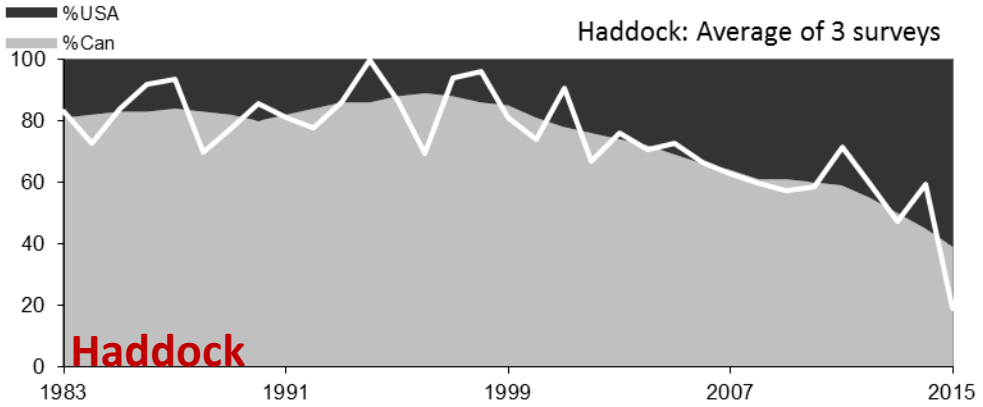
Resource distribution in 2015:

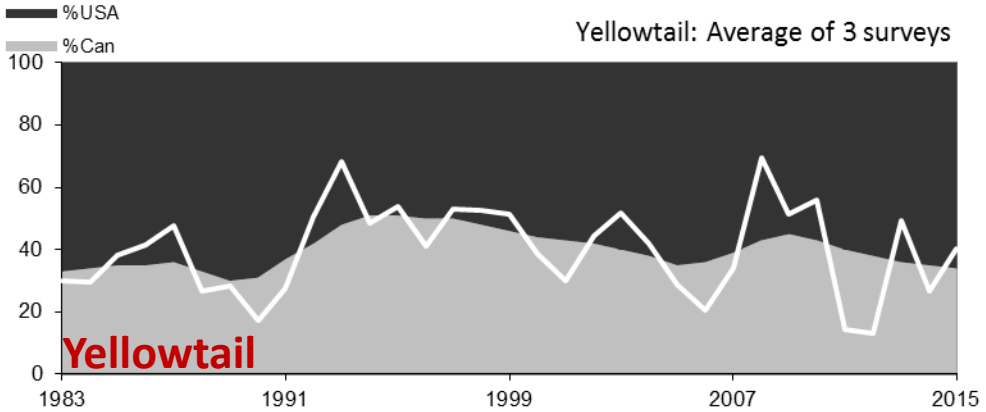
Cod: 18% USA, 82% CDN

Had: 61% USA, 39% CDN

Ytl: 66% USA, 34% CDN

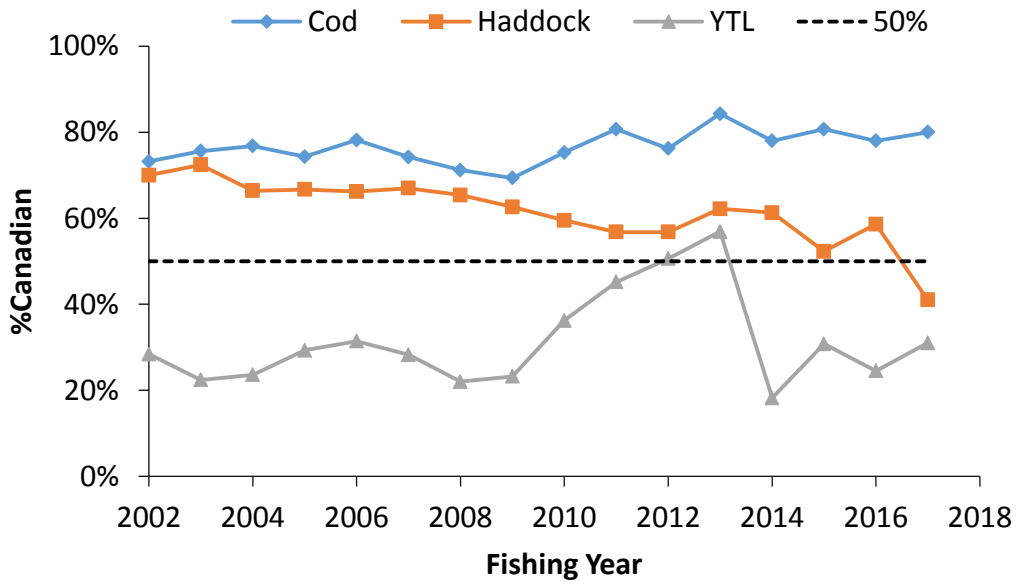






Allocation Shares in 2017

	Cod	Haddock	YTL
USA	22%->20%	41%->59%	75%->69%
Canada	78%->80%	59%->41%	25%->31%



Allocation shares trend

Thanks!

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Eastern Georges Bank Haddock

Elizabeth Brooks
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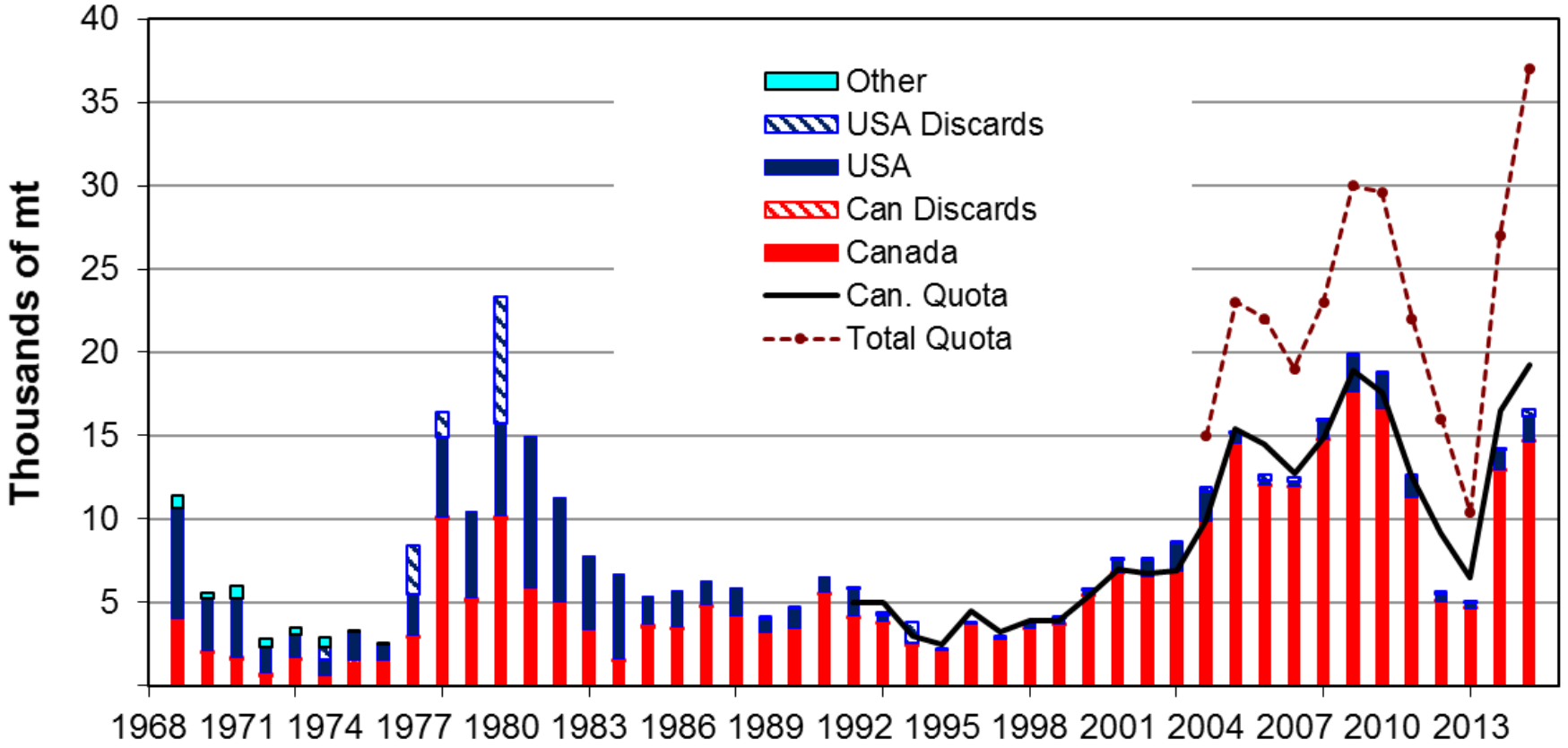
Haddock Interim Report

- In 2015, the Terms of Reference for the TRAC haddock assessment included the request for 2 years of catch advice (2016 and 2017)

- In 2016, the TRAC was tasked with preparing an interim report for Eastern Georges Bank Haddock focusing on selected indicators of stock status to ensure that the 2016 advice from the 2015 assessment was still appropriate and, if not, to revise the advice.

USA and Canadian Catch



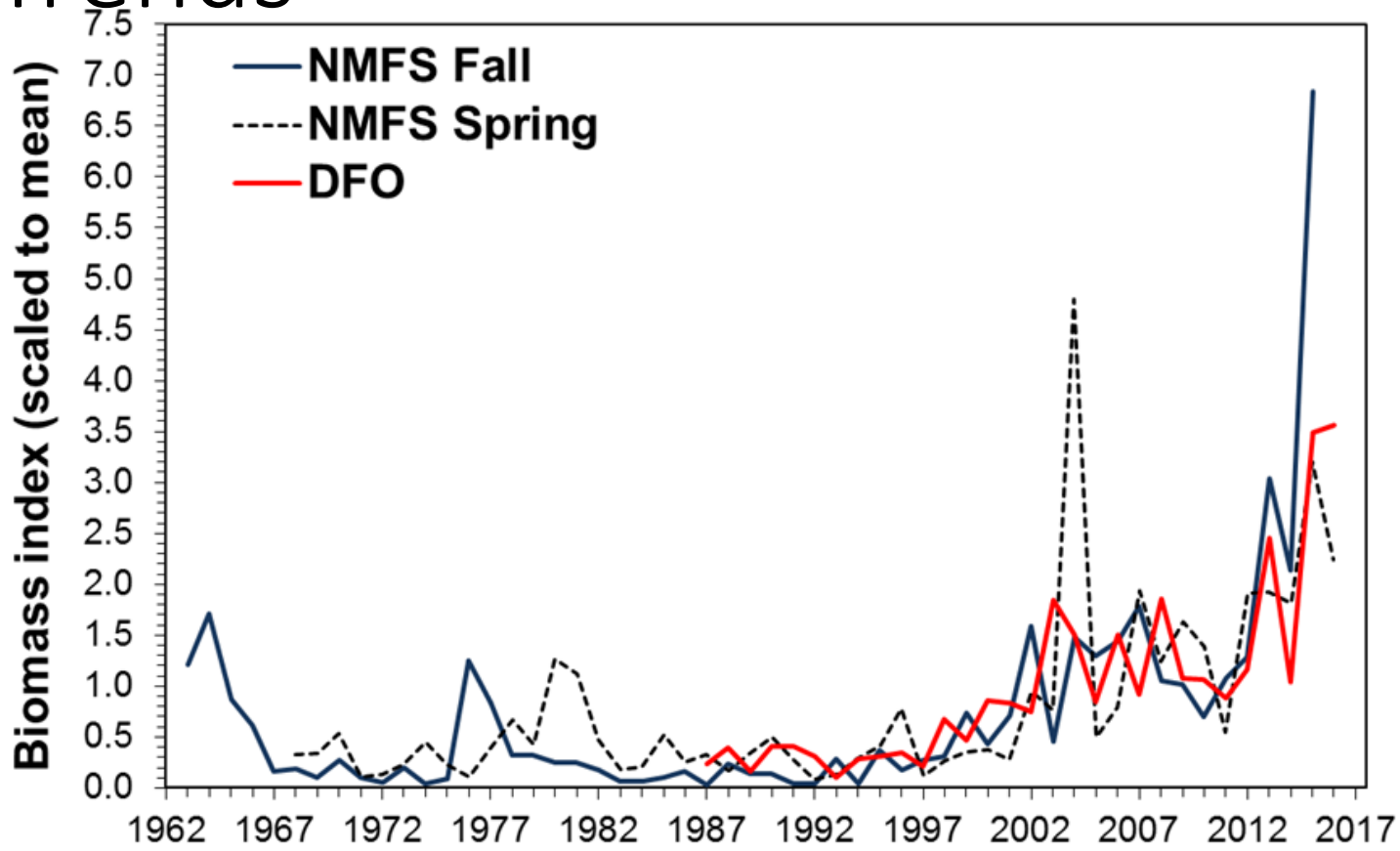
- Canadian + USA 2015 total catch **16,577** mt (Quota **37,000** mt), 44.8% of total quota.
- Canadian 2015 catch **14,631** mt (Quota **19,240** mt), 76% of quota
- USA 2015 catch **1921** mt (USA using different quota year, **17,760** mt), catch in fishing year 2015 was 6.2% of quota

Projected vs Observed WAA

Year	Weight at age								
	1	2	3	4	5	6	7	8	9+
2015 Projection	0.07	0.26	0.41	0.72	0.94	1.09	1.17	1.15	1.38
2016 Observed	0.04	0.18	0.34	0.70	1.12	1.02	1.24	1.15[1]	2.11

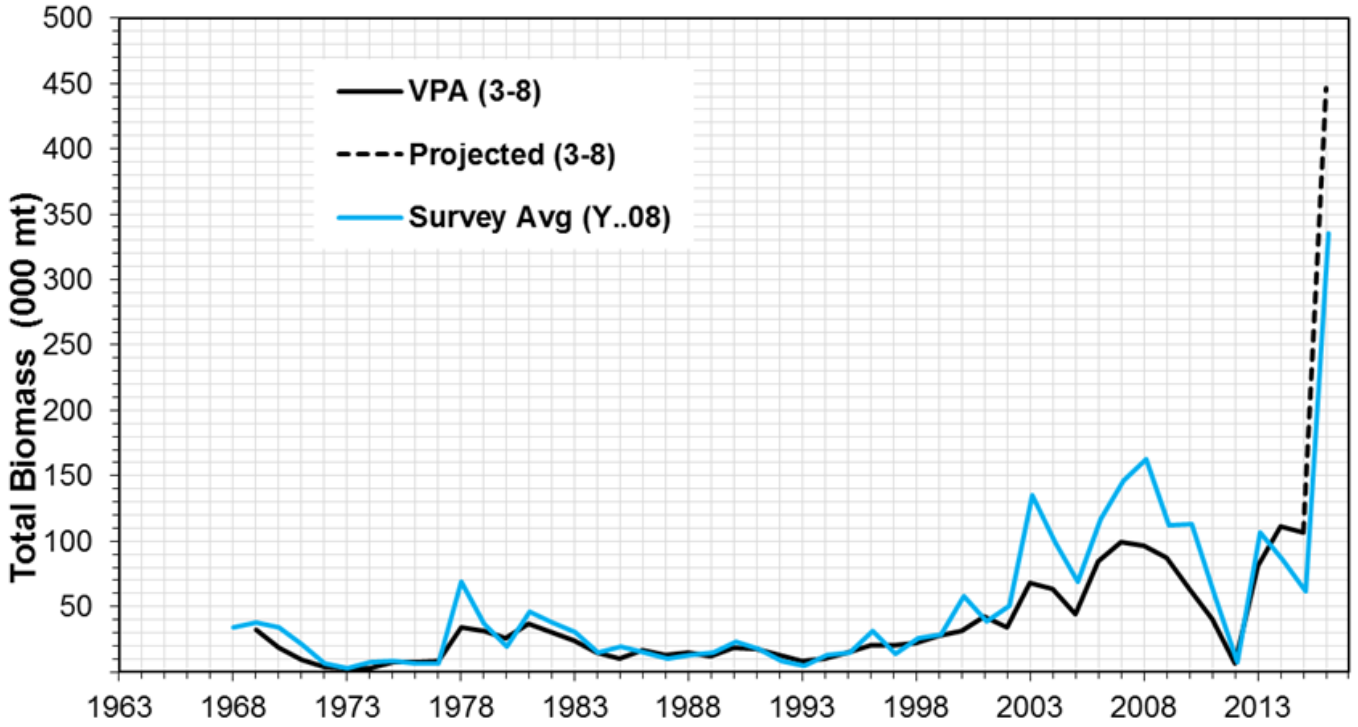
- **Weights-at-age** (WAA) from the DFO survey exhibit a declining trend from 2000 to present, especially for ages 3 to 6.
- WAA for fish ages 7 and older are showing an increase in 2016
- The beginning of year WAA used in projecting the 2016 biomass were comparable with the 2016 DFO survey WAA for many ages, but did under-estimate the weight of fish aged 5 (2011 year-class) and fish aged 9+

Survey Trends



- **The 2016 DFO and 2015 NMFS Fall survey biomass indices are the highest for the time series**
- **2016 NMFS spring is the third highest level for the time series**

VPA Projection vs Average Survey Biomass



- Adult biomass from 2015 VPA was projected to increase from 117,019 mt to 455,806 mt in 2016 (assuming all quota caught)
- 2016 Average survey biomass (adjusted by q from VPA) was 334,966 mt

Harvest Strategy

- TMGC (2002) has adopted a strategy to maintain a low to neutral risk of exceeding the fishing mortality reference.
- When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.

Risk of fishery catch exceeding F_{ref} = 0.26 (from 2015 assessment)

Probability of exceeding Fref	12.5%	25%	50%	75%
2016 catch	29,000 mt	32,000 mt	37,500 mt	43,500 mt
2016 catch (rho adjusted)	14,000 mt	16,000 mt	19,500 mt	22,500 mt
2017 catch	58,000 mt	66,000 mt	81,000 mt	97,000 mt
2017 catch (rho adjusted)	32,000 mt	37,000 mt	45,000 mt	55,000 mt

- 2016 quota was 37,000 mt
- 2015 TMGC Guidance Document: "…the TMGC recommends a target of 50,000 mt be used as an upper bound when determining 2017 catch advice. This number will be reviewed subject to the 2016 TRAC monitoring report."

Summary

Maintain Existing Catch Advice	Reduce Catch Advice
In 2016, spring NMFS and DFO survey indices of abundance for 2013 year-class are at the highest level observed for the time series.	Average biomass from the surveys was 27% lower than the biomass predicted in the VPA for 2016.
VPA estimated adult biomass in 2015 is the highest in the time series.	Weights at age from the DFO survey have been declining since 2000, although there was an increase in the weights at age of 7+ in 2016.
Less than half of the 2015 quota was caught.	Recent quotas selected for neutral risk have not been fully caught, yet $F>F_{ref}$ (2010-2012). Risk is being underestimated and catch is being overestimated.
2015 NMFS fall and 2016 DFO survey total biomass indices are at the highest level observed for the time series.	A retrospective pattern has been observed in the 2015 TRAC assessment. The pattern leads to overestimated biomass and underestimated F.

- There are several reasons for considering both the standard projection and the sensitivity projection (rho adjusted) for catch advice.
- The TRAC has agreed to provide both projections for Transboundary Management Guidance Committee's (TMGC) consideration.

Thank you for your attention.
Questions?

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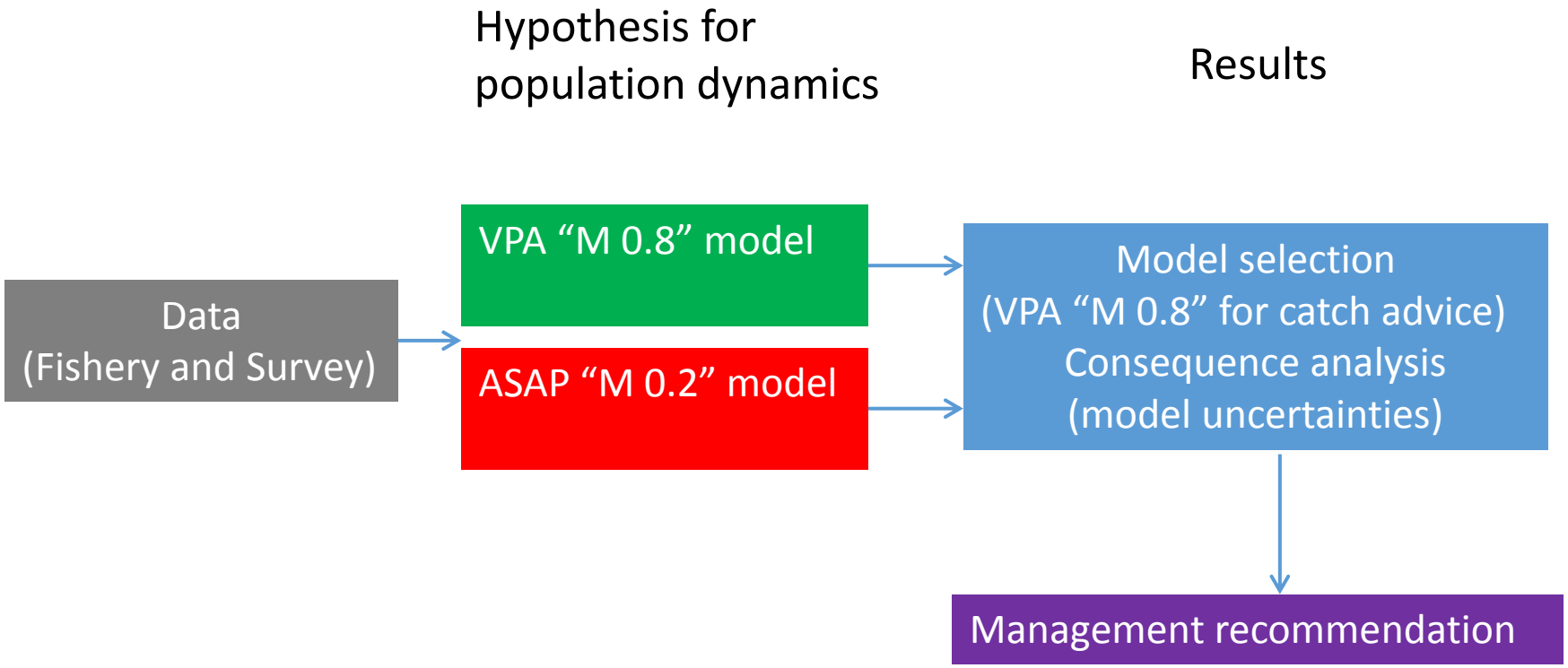
2016 TRAC Status Report Eastern Georges Bank Cod[1]

Elizabeth Brooks
Northeast Fisheries Science Center

Presented at
New England Fisheries Management Council Meeting
September 21, 2016

[1] Prepared by Yanjun Wang
Fisheries and Oceans Canada

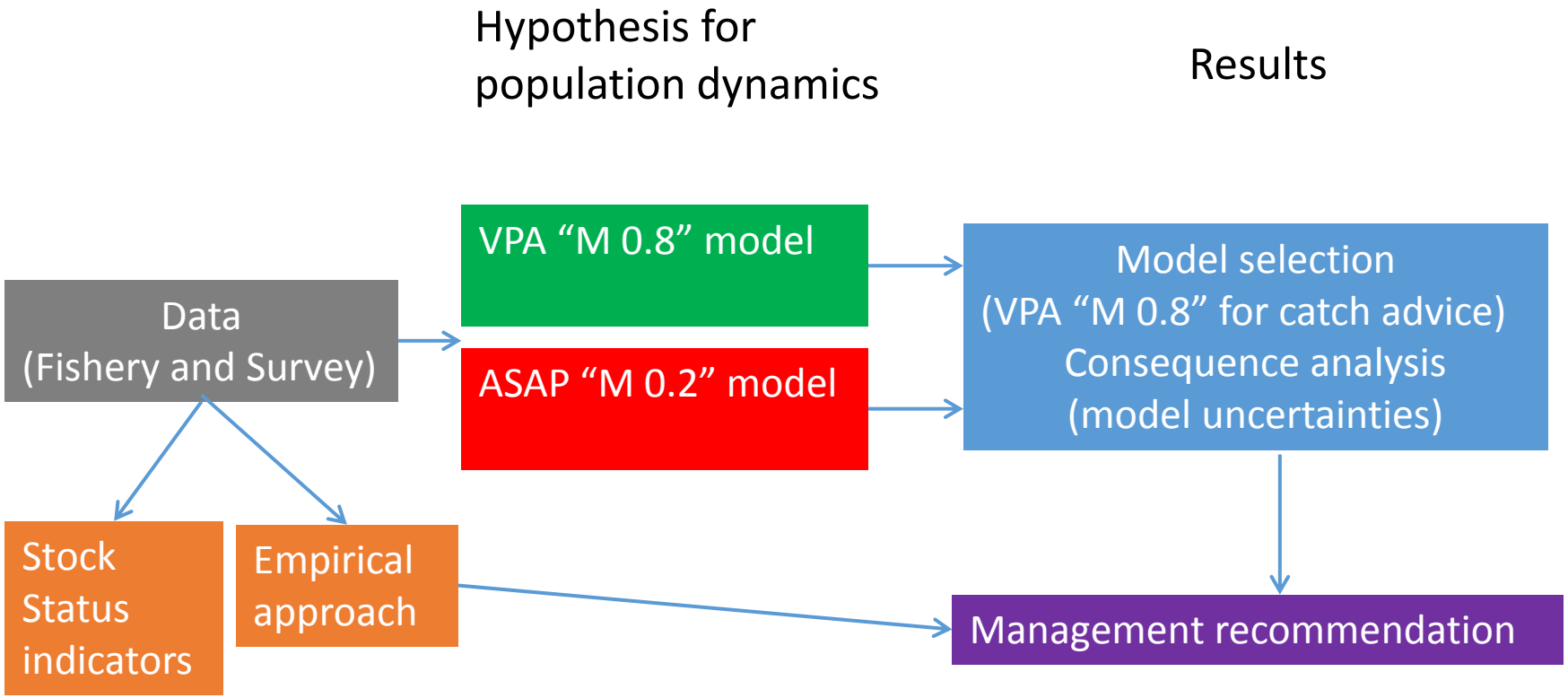
Background (2013 benchmark)



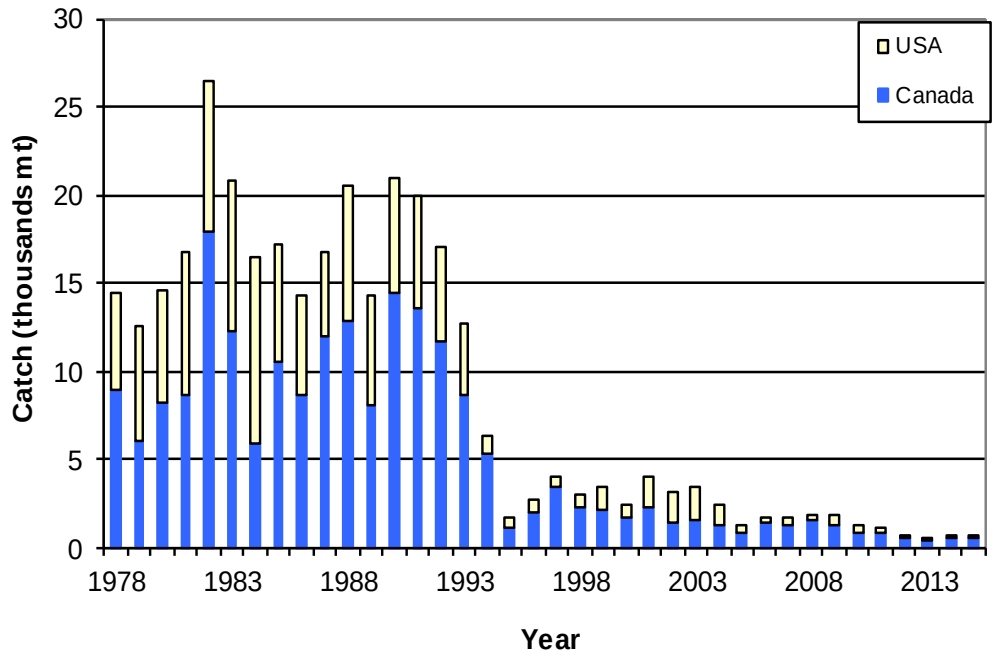
Background

- 2015 TRAC advice: EGB->VPA 675mt and ASAP 223mt at 50% risk of not exceeding Fref.
- 2015 GB assessment: GB-> ASAP 135 mt (the final catch advice was from an empirical approach).
- 2015 TMGC: concern about significant management impacts for both countries from the divergent catch advice (between the two models, and between advice for eastern Georges Bank and Georges Bank); this situation poses potential risk for cooperative management.
- Since 2015 TMGC and SC meeting, every TRAC member has worked hard in good faith to find solutions that are mutually acceptable.
- 2016 TOR for cod: Provide catch advice in consideration of all scientific analytical results … Describe the rationale for how the catch advice was chosen, recognizing that it may depart from the approach outlined in the 2013 Benchmark Proceedings.

2016 EGB cod stock assessment approach

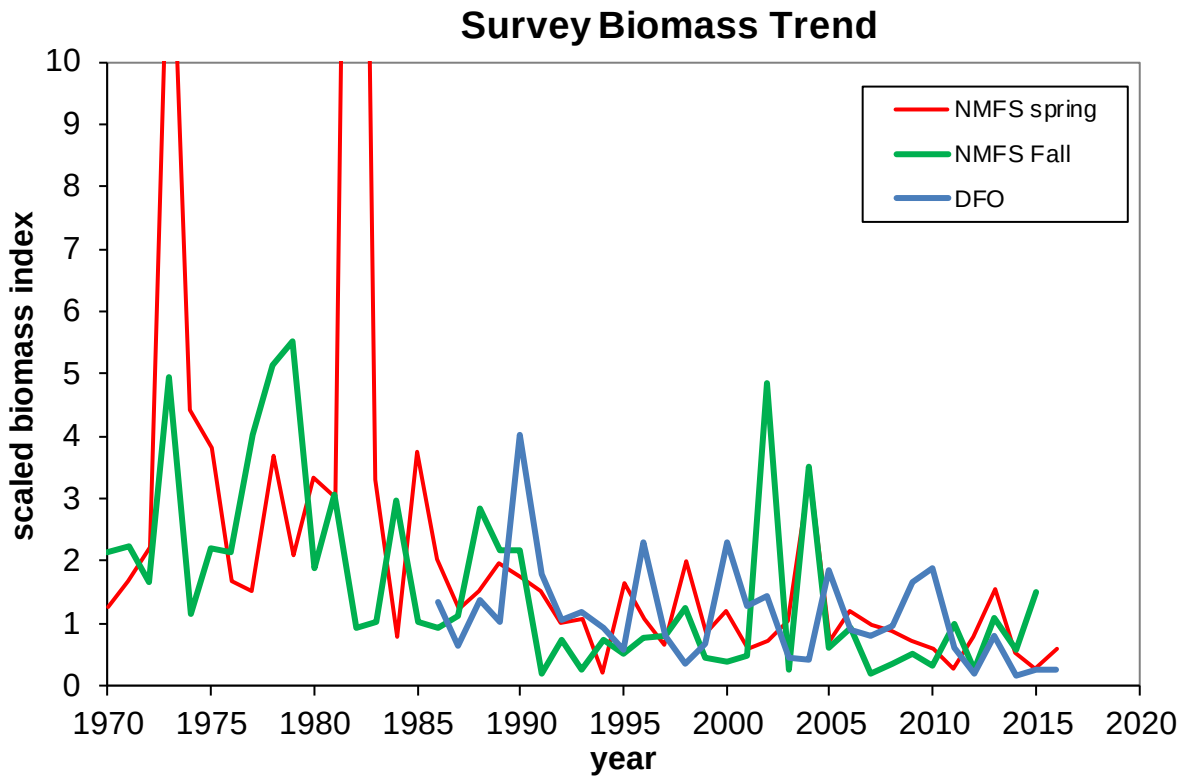


Canadian and USA Catches



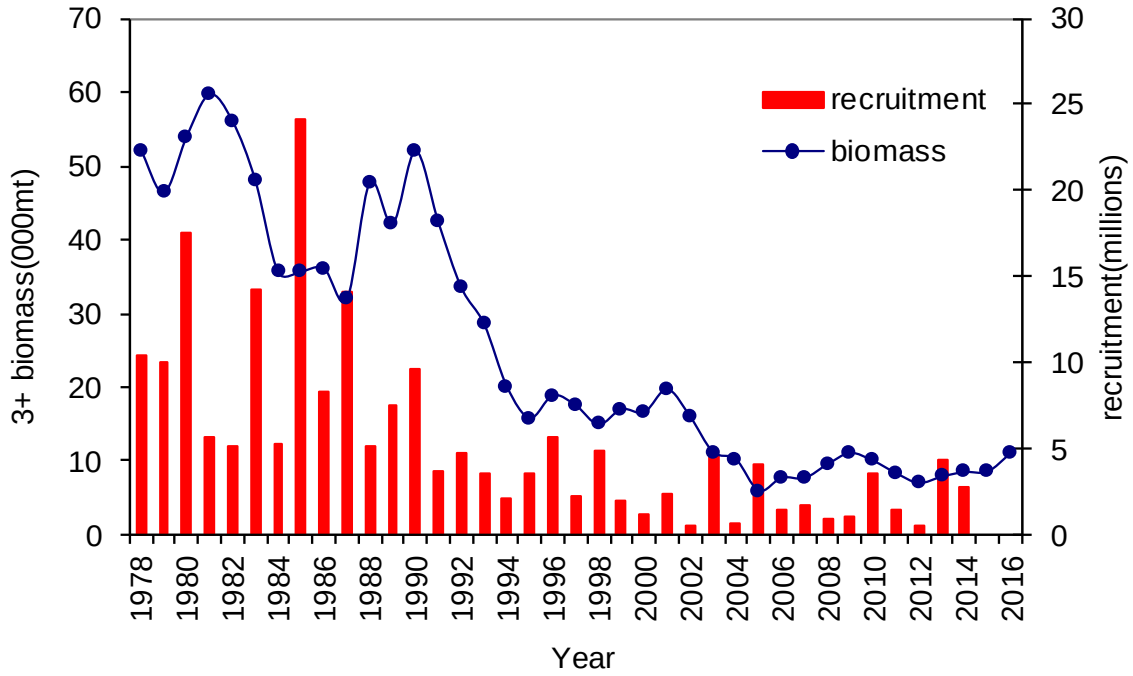
- 2015 combined Canada/USA catches were **608** mt(Quota **650** mt), including **25** mt of discards.
- 2015 Canadian catch **492** mt (Quota **526** mt)
- 2015 USA catch **116** mt (USA using different quota year, **124** mt)

Survey



- All 3 surveys biomass increased from 2015, NMFS fall increased to highest since 2004.
- Generally 3 surveys show similar trend, biomass has been low in recent years

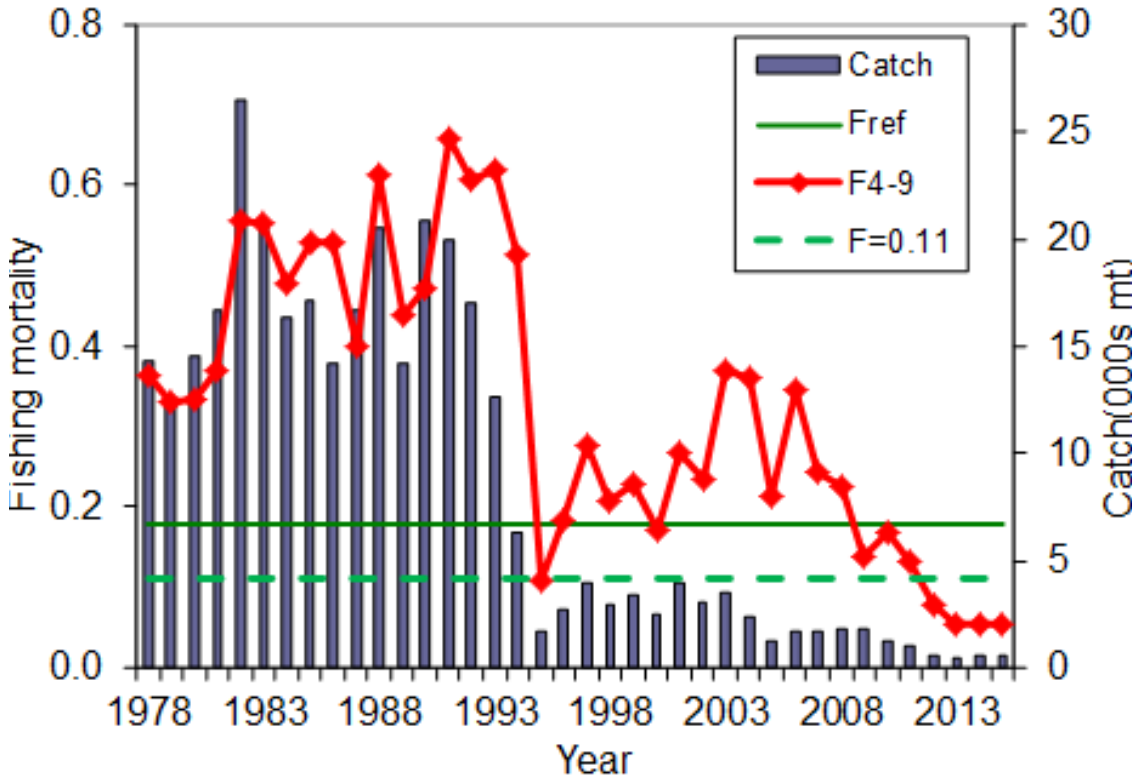
VPA “M 0.8” model



- The estimated adult population biomass at the beginning of 2016 was about 11,000 mt.

- Recruitment at age 1 has been low in recent years, with the 2003 year class remaining the highest estimated recruitment since 2000. The 2010 year class at age 1 constitutes two thirds of the 2003 year class based on the 2016 assessment. The current estimate of the 2013 year class is 4.4 million fish.

VPA “M 0.8” model



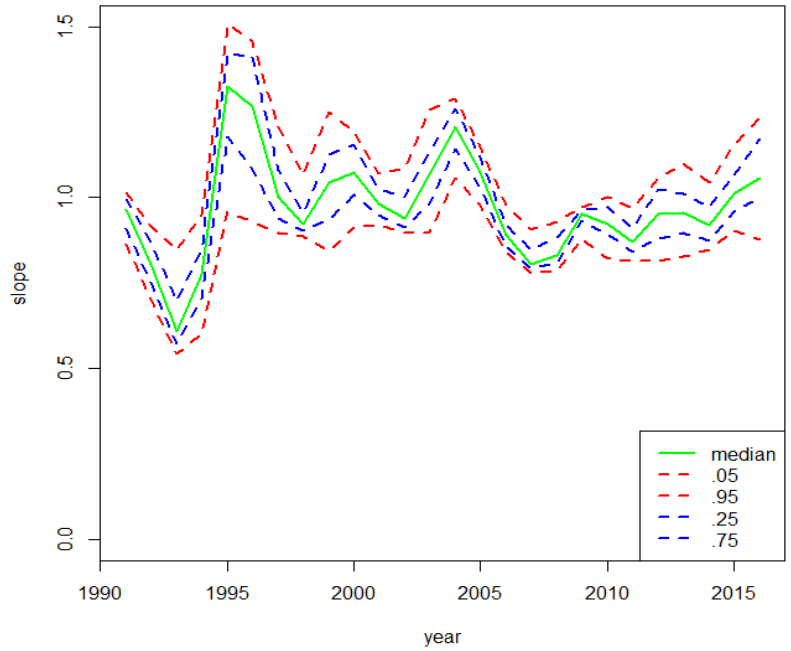
- Fishing mortality (ages 4-9) in 2015 was estimated to be 0.05.
- In recent years, ages 6+ are not fully selected by the fishery. In 2015, ages 3-4 were fully recruited.
- Consequently, the average $F_{4\text{-}9}$ cannot be directly compared to F=0.11, so it is difficult to conclude whether we are achieving low risk of exceeding F=0.11.

Stock status indicators

- A suite of indicators derived solely from survey and fishery data were summarized.
- Briefly, average survey biomass shows no evidence of rebuilding, and recruitment has been poor for the last 25 years.
- Although relative exploitation rate has declined since 1995, total mortality has remained high.
- Average weight at length, used to reflect condition, declined throughout the time series, but has started to show improvement since 2009. Lower weights at age in the population in recent years, a truncated age structure, poor recruitment and high total mortality have contributed to the lack of rebuilding.

Empirical approach

- The method adjusts recent quotas by recent population biomass trends derived from fitting the average of the three surveys (DFO spring, NMFS spring, NMFS fall) to a *loess* smoother.



- The trend estimated from the most recent 3 year block of the *loess* smooth (2014-2016) was used to adjust quota , and uncertainty about the trend was derived by bootstrapping the original *loess* fit.

- This method is essentially a constant exploitation approach, and relies on recent quotas (2013-2015).

Summary of 3 approaches

- **VPA "M 0.8" model**: Indicates that the main issue for the low stock abundance of cod and its failure to recover is elevated M (aliasing some other factors) on older fish.
- **ASAP "M 0.2" model**: Overfishing is the principal reason for severely depleted the cod stock. Hard to explain when there was low fishing effort.
- **Empirical approach:** The decline and lack of rebuilding is due to high total mortality, regardless of whether the fishery has been the major contributor to stock decline or if the decline is caused by something else. If survey biomass has decreased, this approach further reduces fishing, with the aim of the conservation of the cod stock and stock rebuilding. If fishery is not the main cause of the decline in biomass, then further reducing catch may not result in stock increase.

Consequence analysis

CONSEQUENCE ANALYSIS				
Catch 2015		492 mt		
Quota 2016		625 mt		
			VPA 0.8	**ASAP**
2015 biomass (3+)			10,048	1,717
2016 biomass (3+)			11,026	N/A
Projected catch				
VPA F=0.11			"true state"	"alternate state"
2017 catch = 1319 mt		2017 F	0.11	0.53
		2018 Biomass (mt)	12,811	3,215
		% B from 2017	5.1%	-0.5%
2018 catch = 1483 mt		2018 F	0.11	0.62
		2019 Biomass (mt)	14,003	3,551
		% B from 2018	9.3%	10.4%
ASAP F=0.18			"alternate state"	"true state"
2017 catch = 515 mt		2017 F	0.044	0.18
		2018 Biomass (mt)	13,484	4,016
		% B from 2017	10.6%	19%
2018 catch = 646 mt		2018 F	0.046	0.18
		2019 Biomass (mt)	15,477	5,185
		% B from 2018	26.9%	29%
	F<=Fref & biomass increase > 10%			
	F< =Fref & biomass increase < 10%			
	F> Fref and biomass increase < 10%			
	F> Fref and biomass increase > 10%			

TRAC Catch advice

- Given the extremely low spawning stock biomass (SSB), TRAC advises that management aim to rebuild SSB.

- A projection using VPA “M 0.8” model was made that considered a constant F=0.06(Exploitation rate 4-5%) approach, which is consistent with the TMGC harvest strategy to reduce F to promote rebuilding when stock conditions are poor.

- The empirical approach yielded a range of potential catch advice.

Year	5%	25%	50%	75%	95%
2017	565.5	643.5	689	760.5	806

- For the 2017 quota, consistent with catch advice from both approaches (VPA projection: 719 mt ; Empirical approach: 565-806 mt (5%-95%)), TRAC recommends an upper bound of 700 mt, which reflects precision associated with both lines of evidence.

Special Considerations

- Despite the models uncertainties, all assessment results, and all biological and fishery indicators suggest that low catches are needed to promote rebuilding.

- As of May 2016, US quota for eGB cod can be transferred to western GB (but not the other way). It is unclear if this provision will result in a decrease in the number of trips that fish exclusively in the eastern area - which could impact US catch sampling for the 2017 TRAC assessment.

Thanks!

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2016 TRAC Status Reports
Georges Bank yellowtail flounder

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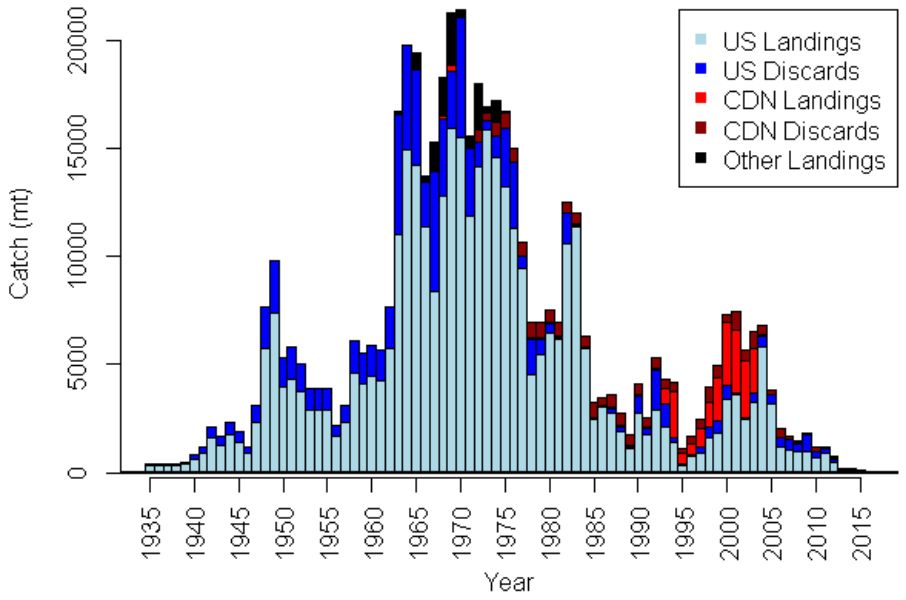
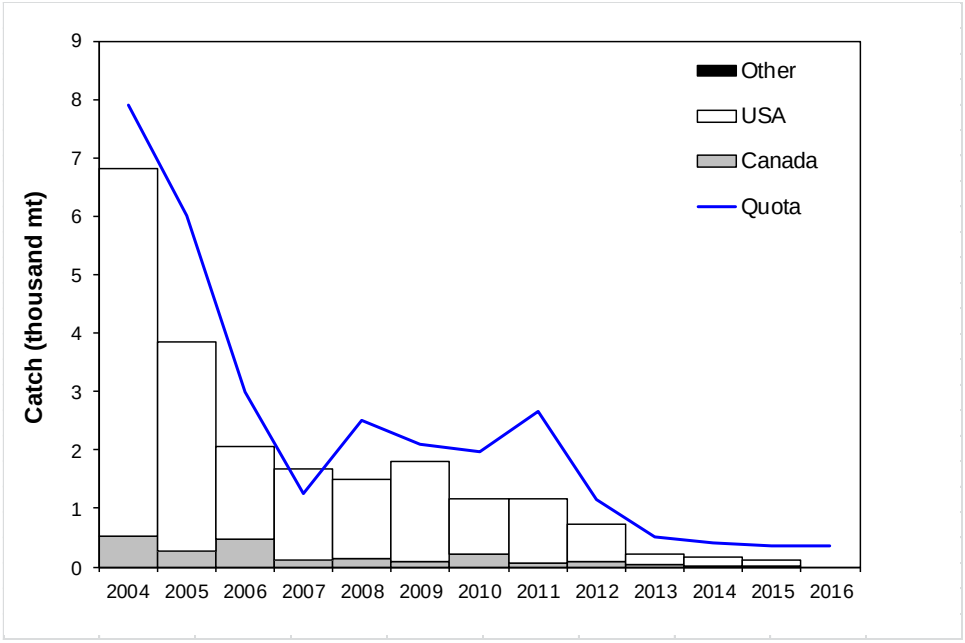
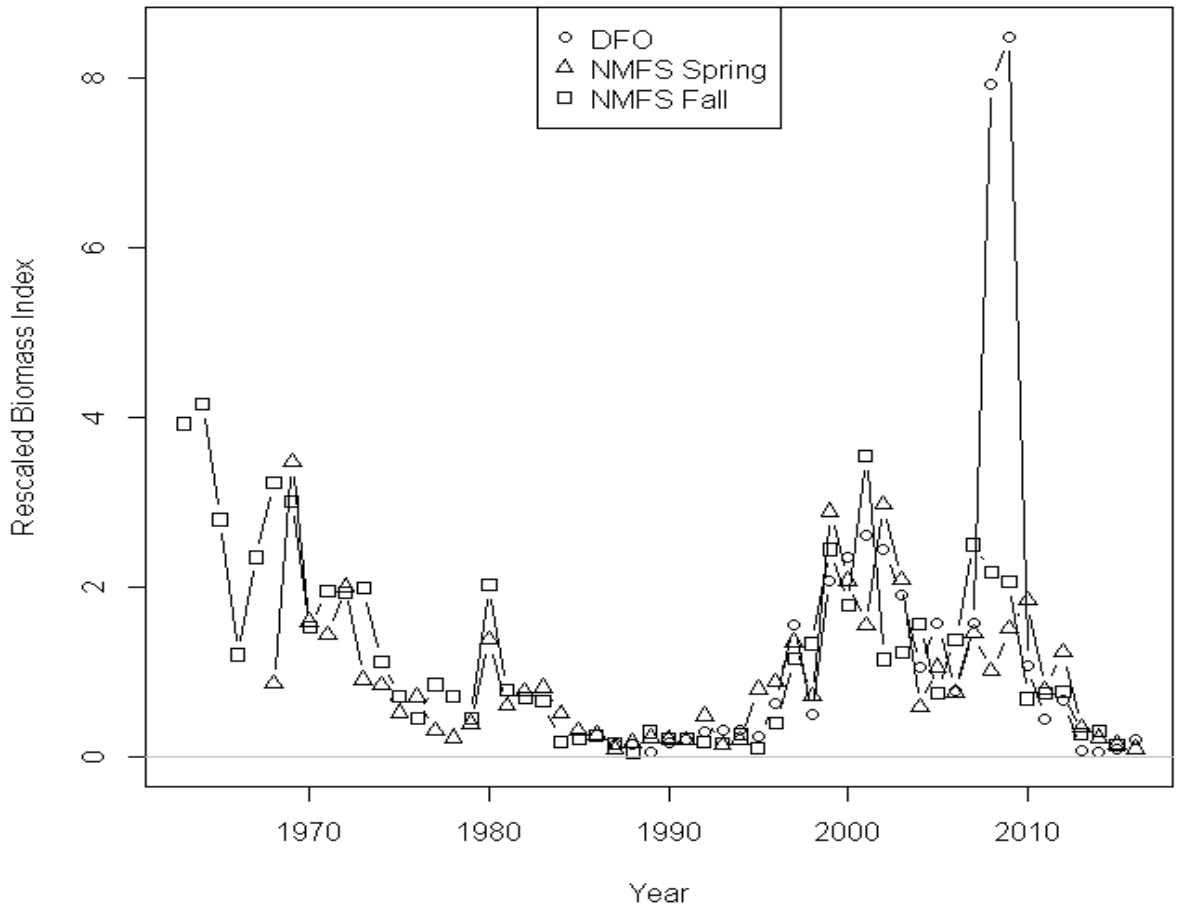
GB Yellowtail Flounder Catch





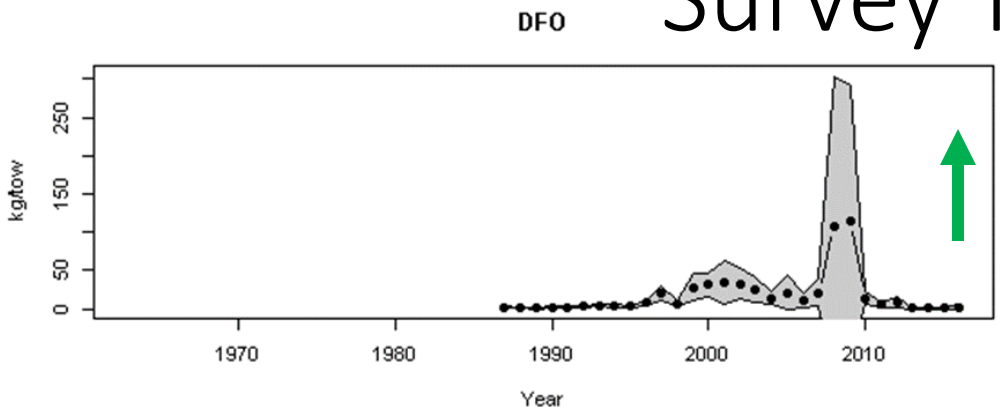
- Canadian + USA 2015 total catch **118** mt (Quota **354** mt), lowest catch ever (1935-2015)
- Canadian 2015 catch **14** mt (Quota **106** mt)
- USA catch **104** mt (USA using different quota year, **248** mt)
- 2015 Catch was 56% landings, 44% discards

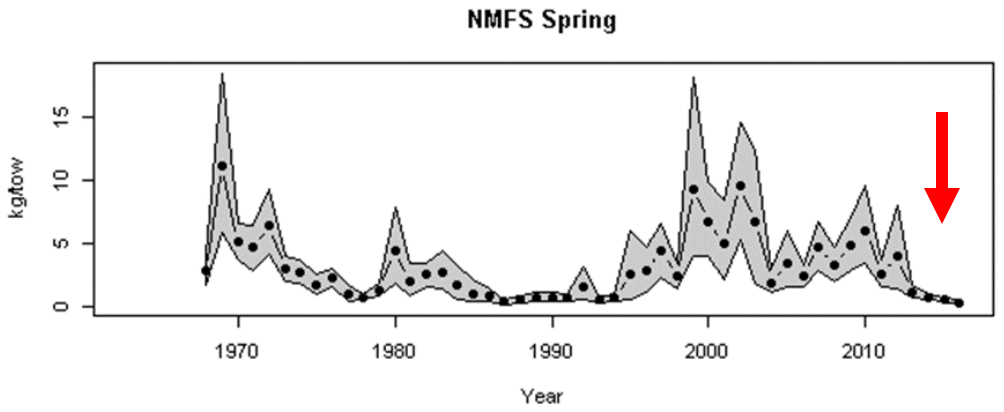
Survey Trends

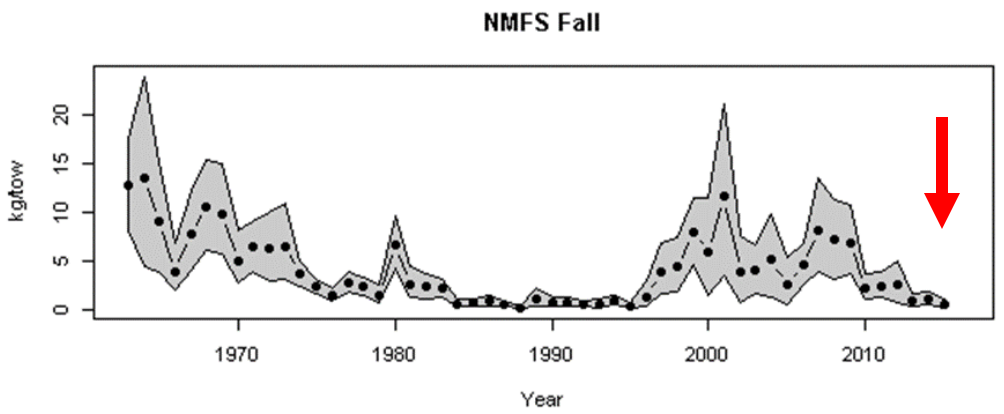


- Trend of all 3 surveys is very consistent
- Current survey levels are very similar to early 1990s

Survey Trends

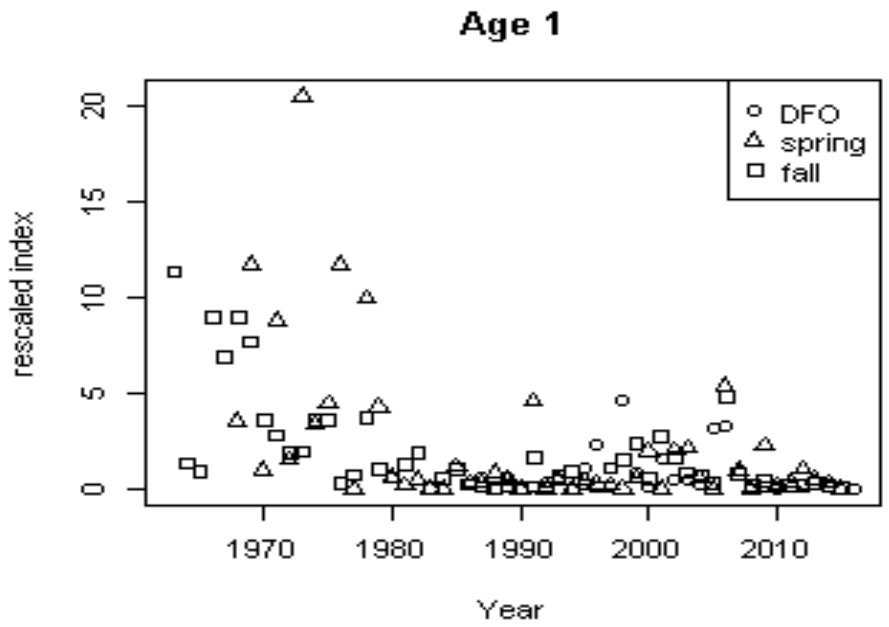


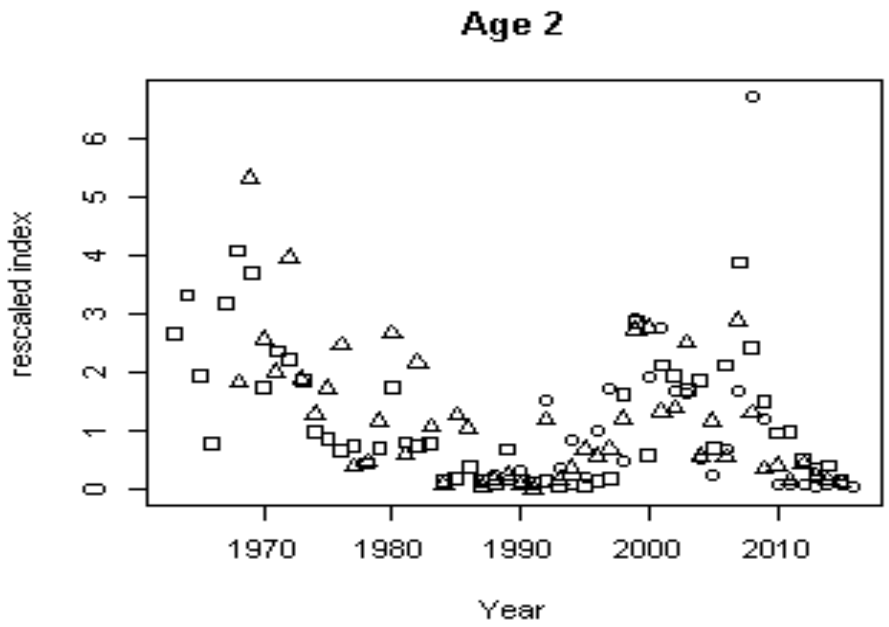




- DFO survey increased (8th lowest out of 30 years)
- NEFSC Spring survey decreased (lowest out of 49 year)
- NEFSC Fall survey decreased (3rd lowest out of 53 years)
- The three survey biomasses indicate the capacity of the stock is significantly diminished.
- Stock biomass is low and productivity is poor.

Survey Trends





- No sign of incoming recruitment

Empirical Model Approach

- Abandoned VPA
- Empirical approach
  - Expand 3 bottom trawl surveys to B (q=0.37)
  - Average 2016 DFO, 2016 NEFSC spring, 2015 NEFSC fall
  - Apply exploitation rate (range: 2% - 16%)
  - 16% exploitation rate results in 245 mt catch advice for 2017 quota

Harvest Strategy

- 2014 TRAC: There are two approaches to management that could be considered: constant exploitation rate and constant quota. The TRAC recommends the TMGC implement and maintain one of these approaches over three years to see if the stock responds.
  - An exploitation rate of 16% was identified as an upper bound. Using a constant exploitation rate of 2% to 16% results in catch advice of 31 mt to 245 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). For 2016, a 354 mt quota corresponds to an exploitation rate of 23%.

Special Considerations

- 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.
- Recent (quota/ave. survey biomass) exploitation rates (2010-2015) have ranged from 10%-36%, with a mean of 17%, although quotas from 2010-2014 were not based on the empirical method.
- Multiplying 10%, 17%, or 36% (quota/ave. survey biomass) exploitation rates by 2016 average survey biomass results in a quota of 155, 260, or 554 mt, respectively.*

****Note: This multiplication results in the assumed catchability (q) cancelling out.***

Recent quotas and catches and associated exploitation rates

Year	Quota (mt)	Actual Catch (mt)	Quota/Avg B	Catch/Avg B	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%**	

Summary

- 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.

- This recommendation is based on further declines in the survey biomass since last year.

- Although recent exploitation rates have been 10%-36%, surveys have declined in this period.

Thank you for your attention.
Questions?