

Compilation of Scientific Advice for EGB Cod and Haddock

US-Canada Technical Science Coordination Meeting Summary

Information Session for

US Transboundary Management Guidance Committee

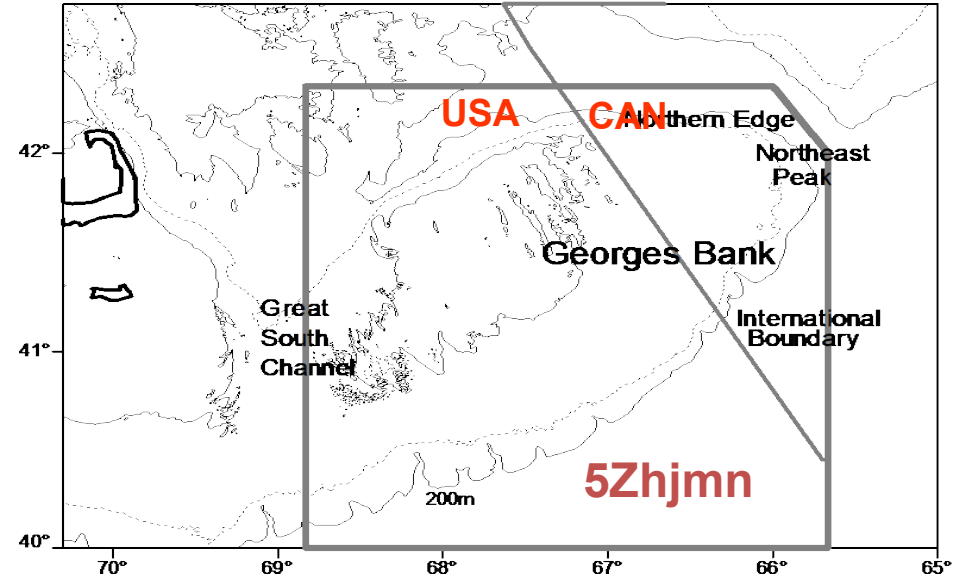
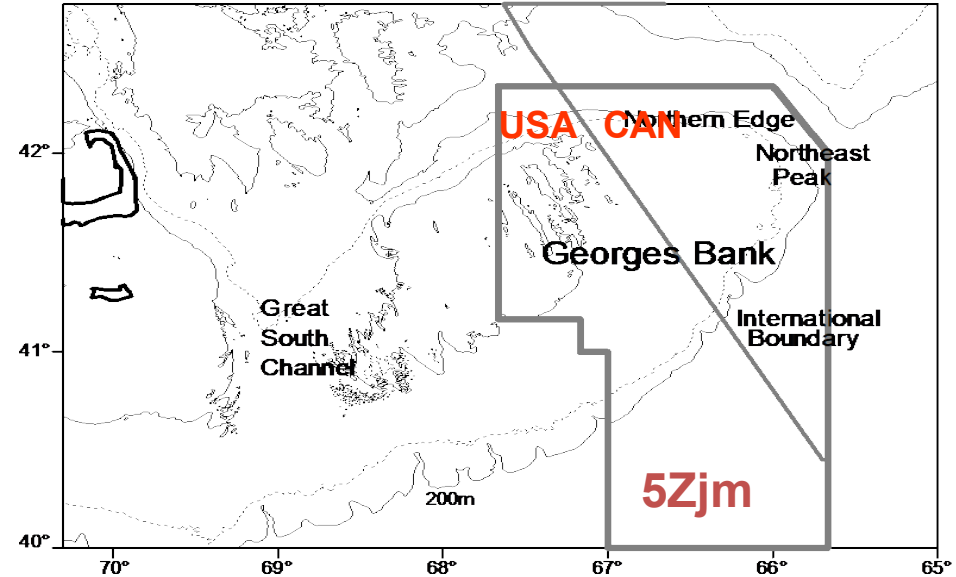
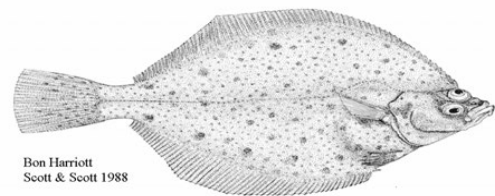
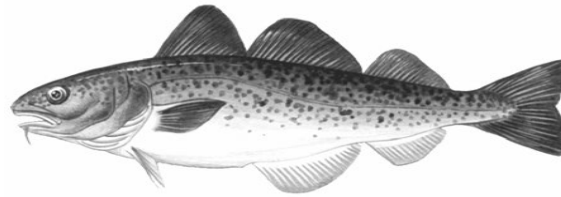
September 2025

Information Session for US TMGC

- Allocation Shares & Apportionment
- US transboundary yellowtail assessment
- US and Canada transboundary haddock assessments
- US and Canada transboundary cod assessments



Allocation Shares for Fishing Year 2026





Allocation Shares Formula

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

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

Percentage weighting for Resource Distribution (β) = 90% and for Utilization (α) = 10% from 2010 onward.

% Utilization (*based on historical landings; 1967-1994*)

Cod: Can 60%, USA 40%

Haddock: Can 56%, USA 44%

Yellowtail: Can 2%, USA 98%

% Resource Distribution

uses swept area biomass indices from 3 surveys (DFO, NMFS Spring, NMFS Fall) for each species; a 33-year moving-window is used in these calculations(1992-2024).

Results are averaged; then smoothed (LOESS) to generate time series for % biomass on CDN and USA side.



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Smoothed Survey Distribution

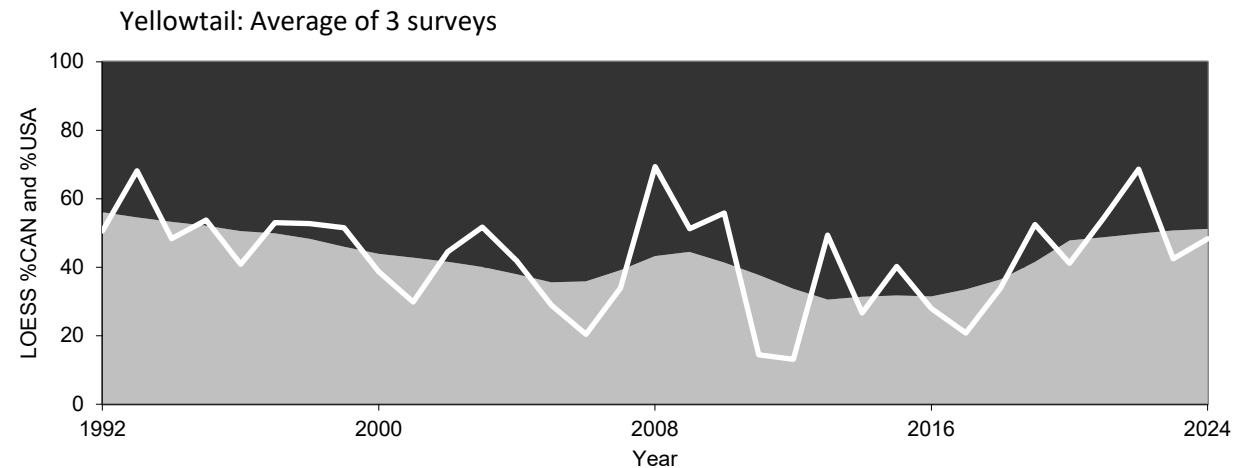
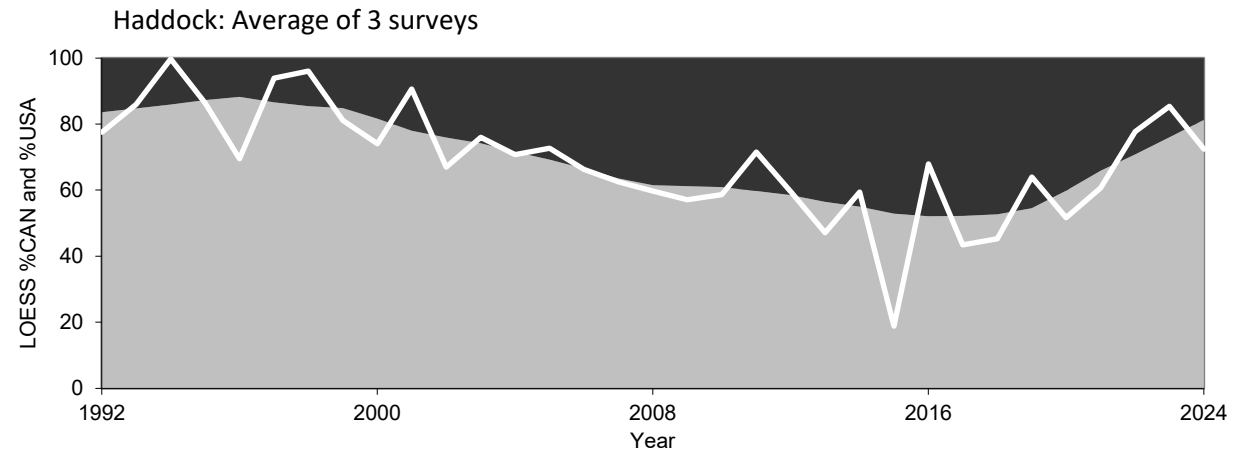
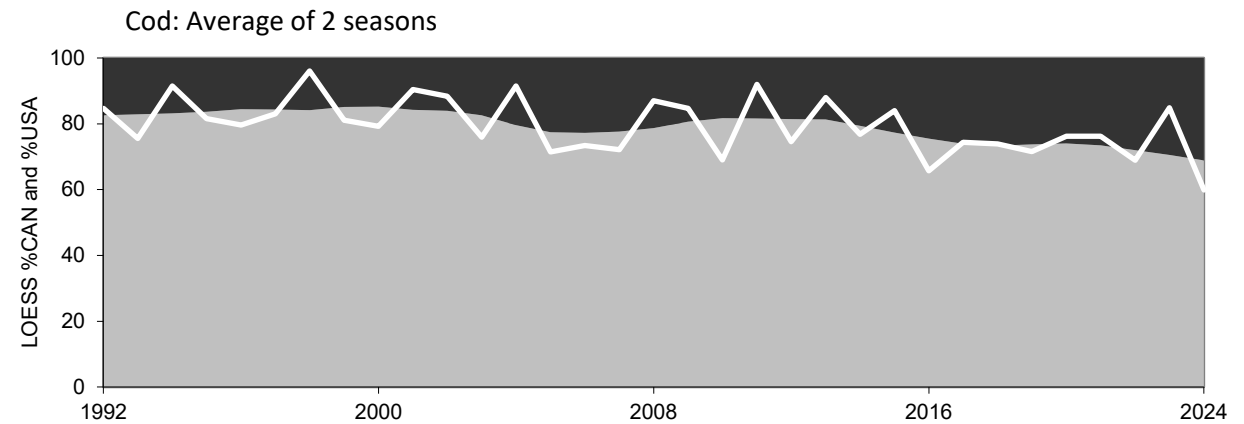
Smoothed resource distribution in 2024:

Cod: 31% USA, 69% CDN

Had: 19% USA, 81% CDN

Ytl: 49% USA, 51% CDN

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





Final Allocation Shares

<i>Resource Utilization</i>										
		Cod	Haddock	Yellowtail						
USA		40%	45%	98%						
CANADA		60%	55%	2%						
<i>Resource Distribution</i>					<i>Weighting</i>		<i>Allocation Shares</i>			
	Survey Year	Cod	Haddock	Yellowtail	Fishing Year	Utilization	Distribution	Cod	Haddock	Yellowtail
USA	2020	27%	47%	57%	2022	10%	90%	28%	47%	61%
CANADA		73%	53%	43%				72%	53%	39%
USA	2021	25%	42%	48%	2023	10%	90%	26%	42%	53%
CANADA		75%	58%	52%				74%	58%	47%
USA	2022	27%	30%	36%	2024	10%	90%	29%	31%	42%
CANADA		73%	70%	64%				71%	69%	58%
USA	2023	21%	18%	43%	2025	10%	90%	23%	21%	48%
CANADA		79%	82%	57%				77%	79%	52%
USA	2024	31%	19%	49%	2026	10%	90%	32%	21%	54%
CANADA		69%	81%	51%				68%	79%	46%





NOAA
FISHERIES

Northeast
Fisheries Science
Center

2025 Apportionment Summary: GB Cod, GB Haddock

U.S.-Canada Technical Science Coordination Meeting
July 16, 2025

Overview

- Apportionment refers to the effort to derive comparable information from GB and EGB assessments
- Particularly – this approach takes catch advice from GB assessments for cod and haddock and apportions that advice to the EGB management unit based on estimated proportions of GB cod and haddock biomass in EGB area
- Apportionment provides roughly comparable information from assessments that apply to different stock areas
- The results are informational, not determinative



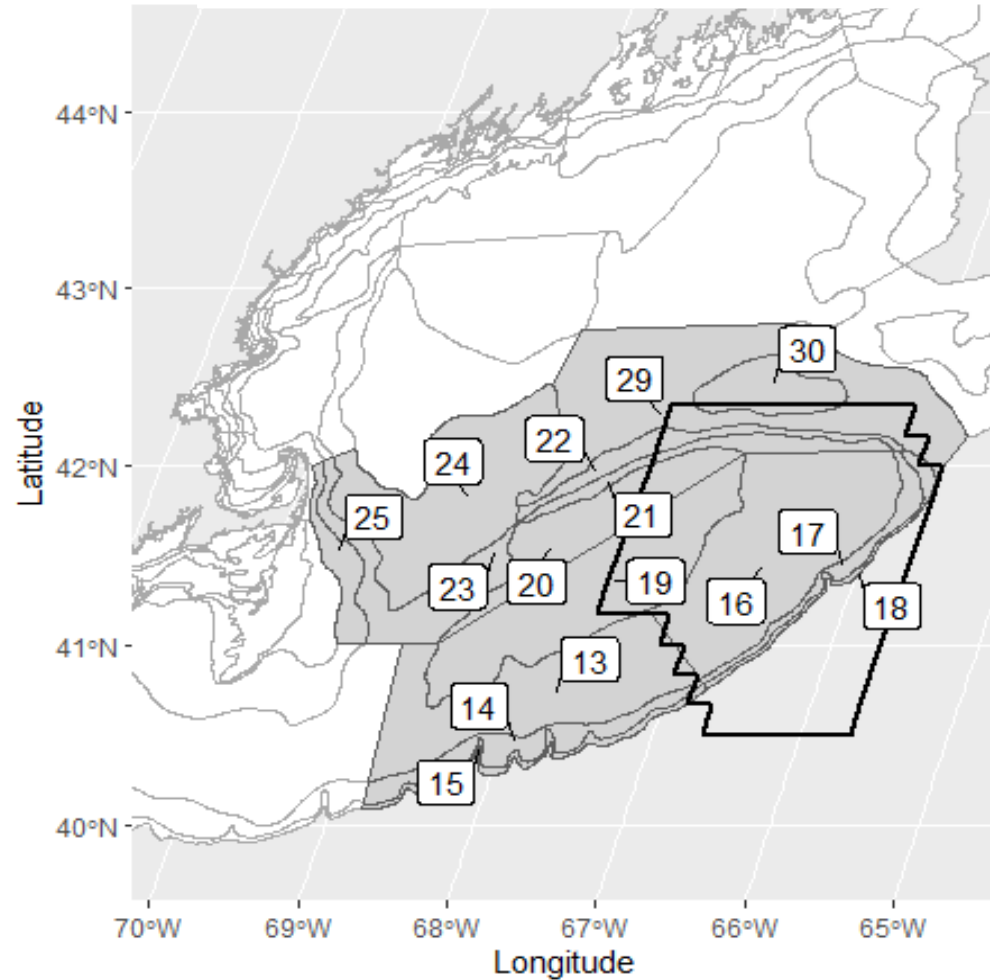
Overview

- Apportion catch advice from GB cod and haddock assessments (NMFS) to the EGB management unit
- Methods developed and peer reviewed in 2024
- Here:
 - Update apportionment calculations with data through 2024
 - Implement a revision to haddock apportionment methods to fully align apportionment calculations with the survey footprint used in the NMFS GB haddock assessment (no change to GB cod methods)

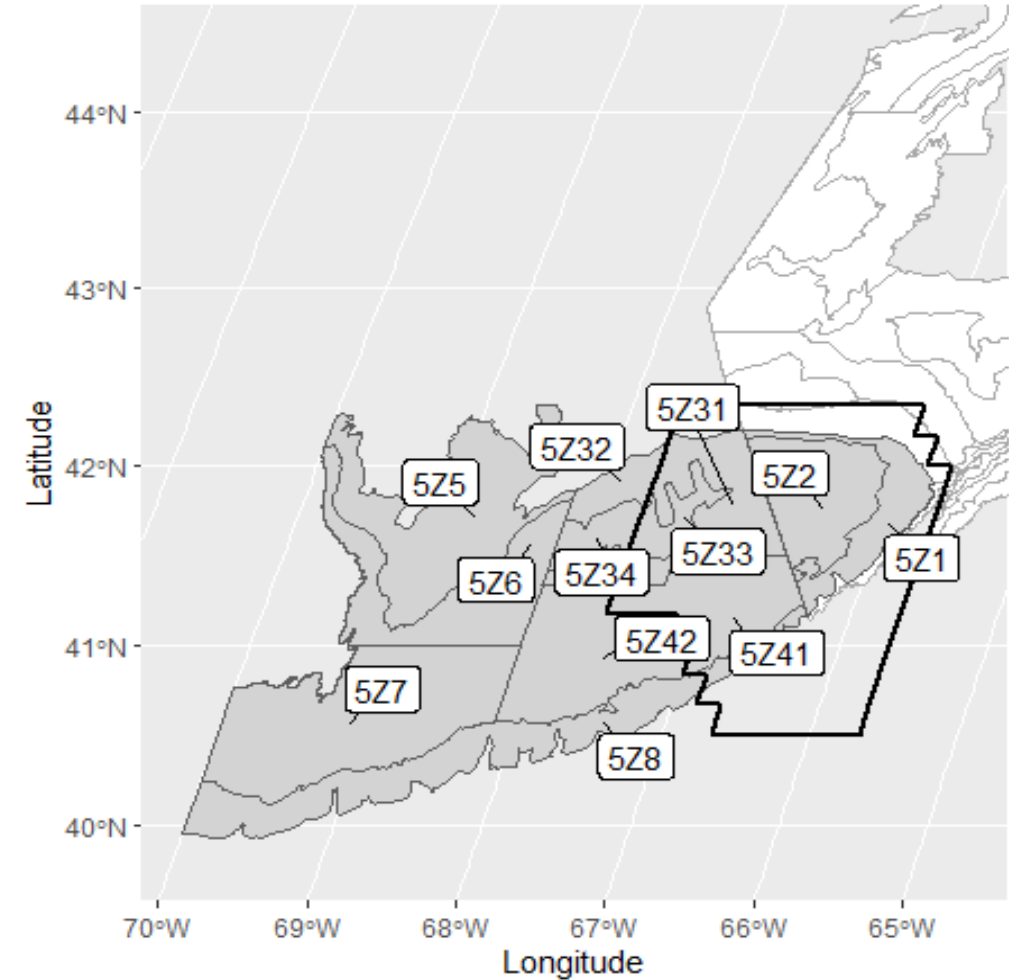


Methods

NEFSC spring and fall survey



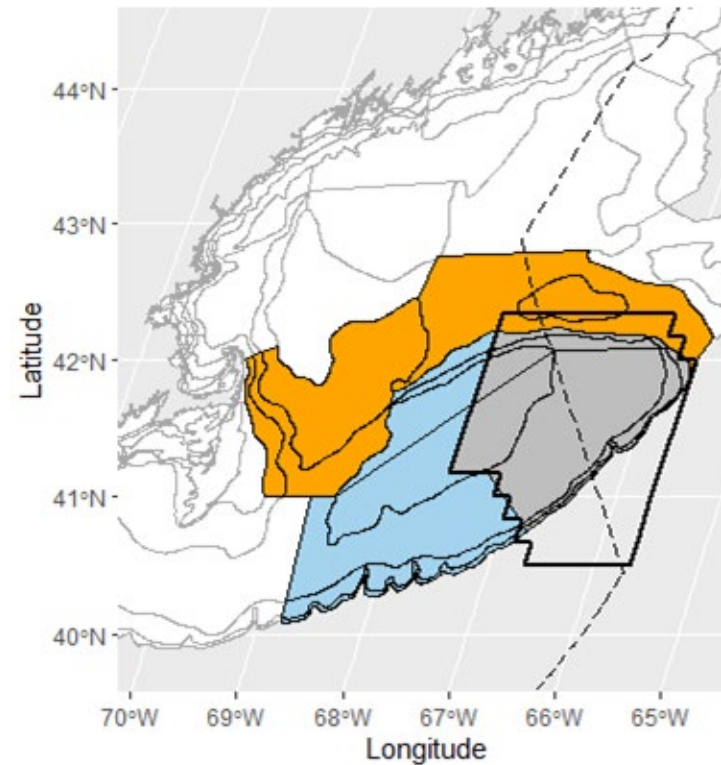
DFO spring



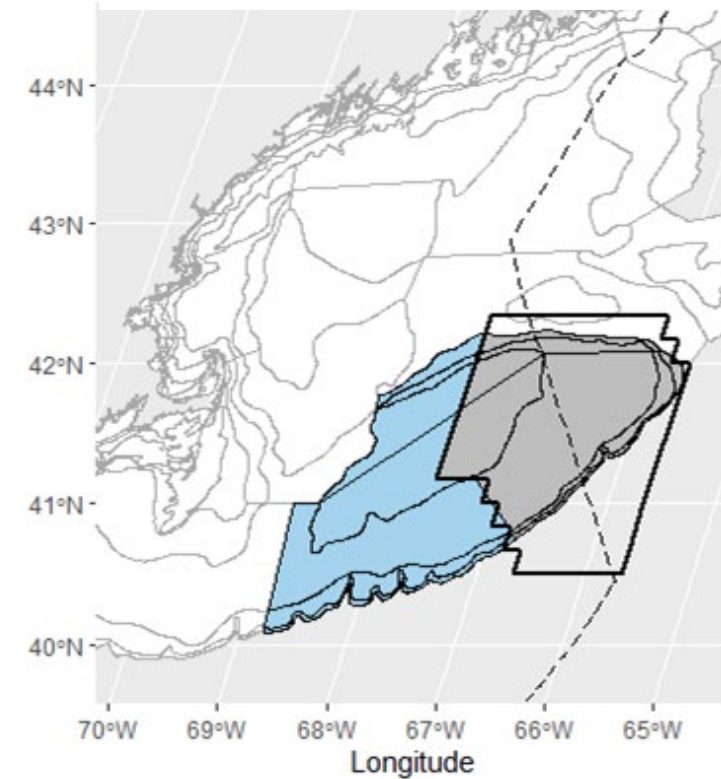
Methods

1. Post-stratify NEFSC spring and fall surveys to EGB and Outside EGB

GB haddock



GB cod



NOAA
FISHERIES

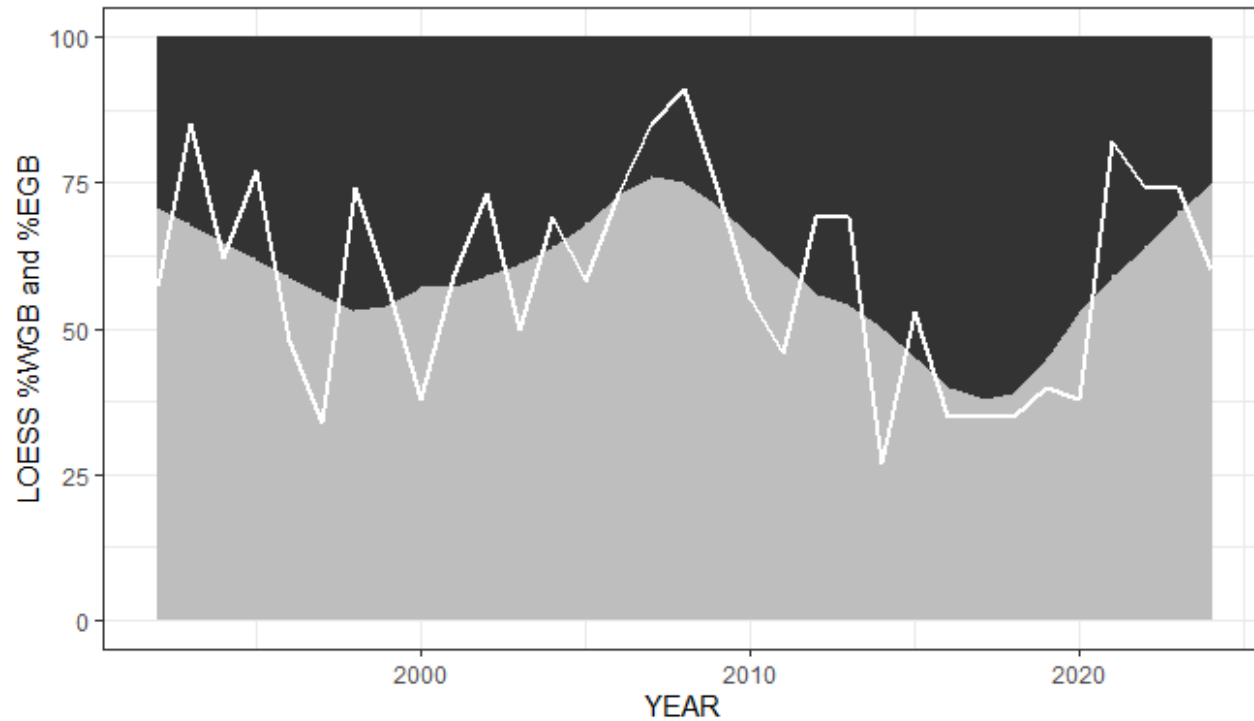


Methods

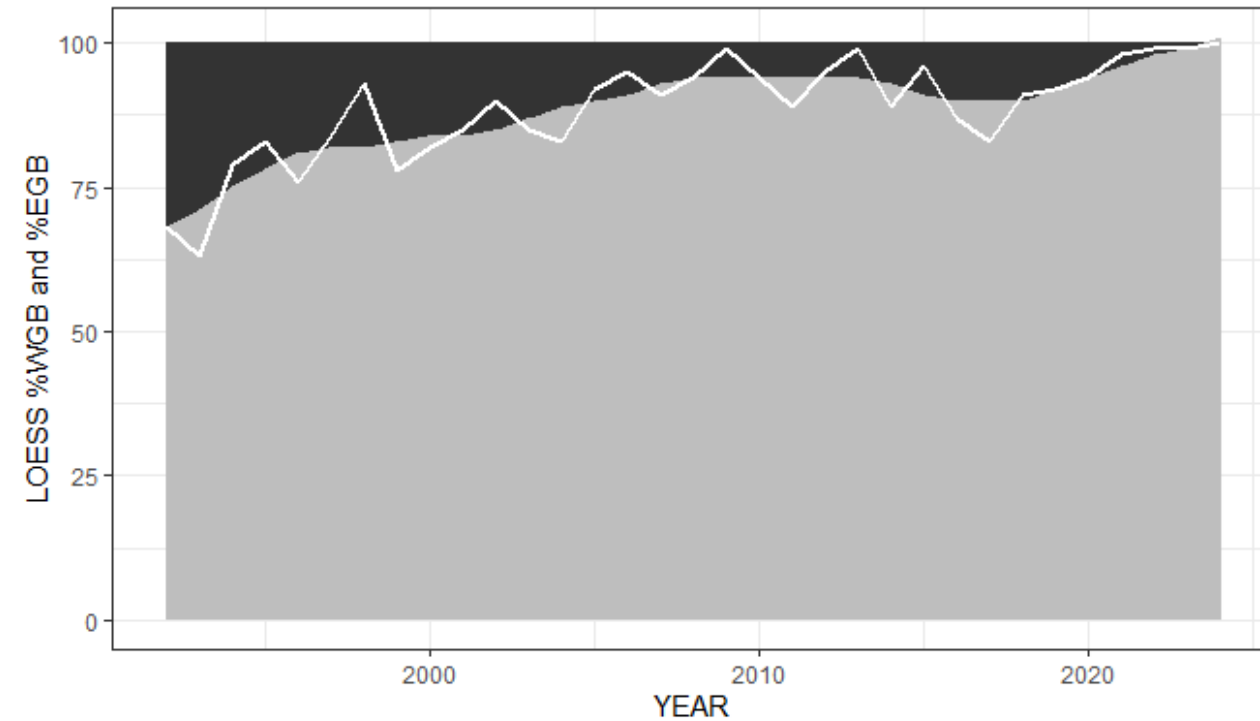
- Post-stratify NEFSC spring and fall surveys and DFO spring survey to EGB and outside of EGB
- Calculate survey swept area biomass for EGB strata and compare to the survey swept area biomass for GB area to calculate a time series of EGB biomass proportions
- Average EGB biomass proportions across surveys
- Apply loess smoother to 33 year time series
- Last year of time series is the apportionment value

2025 Apportionment Results

GB haddock smoothed biomass distribution



GB cod smoothed biomass distribution



2025 Apportionment Results

- Used data from 1992-2024

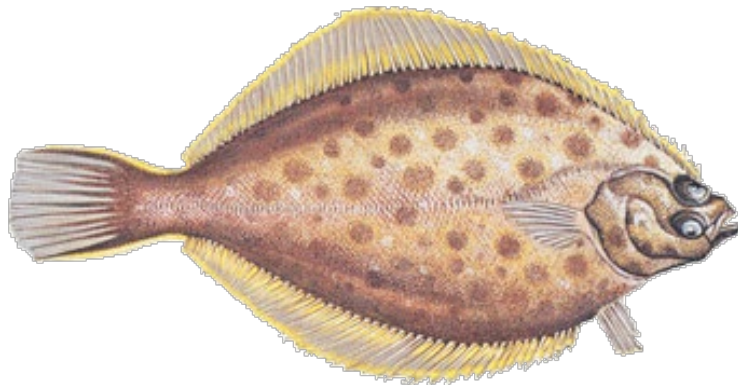
	EGB apportionment	Terminal year
GB Haddock	75%	2024
GB Cod	100%	2024

Q&A

Management Track Georges Bank Yellowtail Flounder

Sept 15th, 2025

NEFSC, Woods Hole, MA



NOAA
FISHERIES

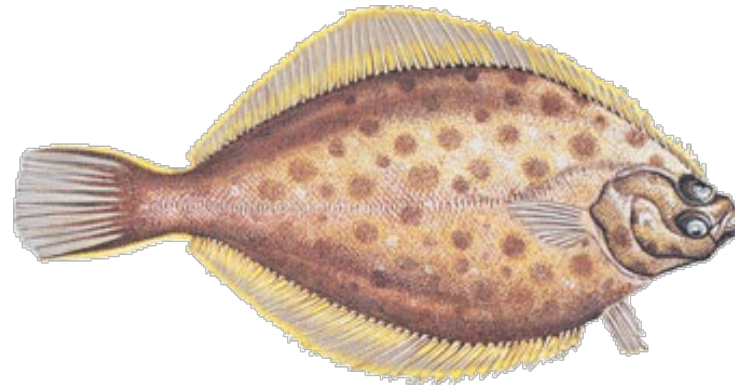
Background

Last time (2024):

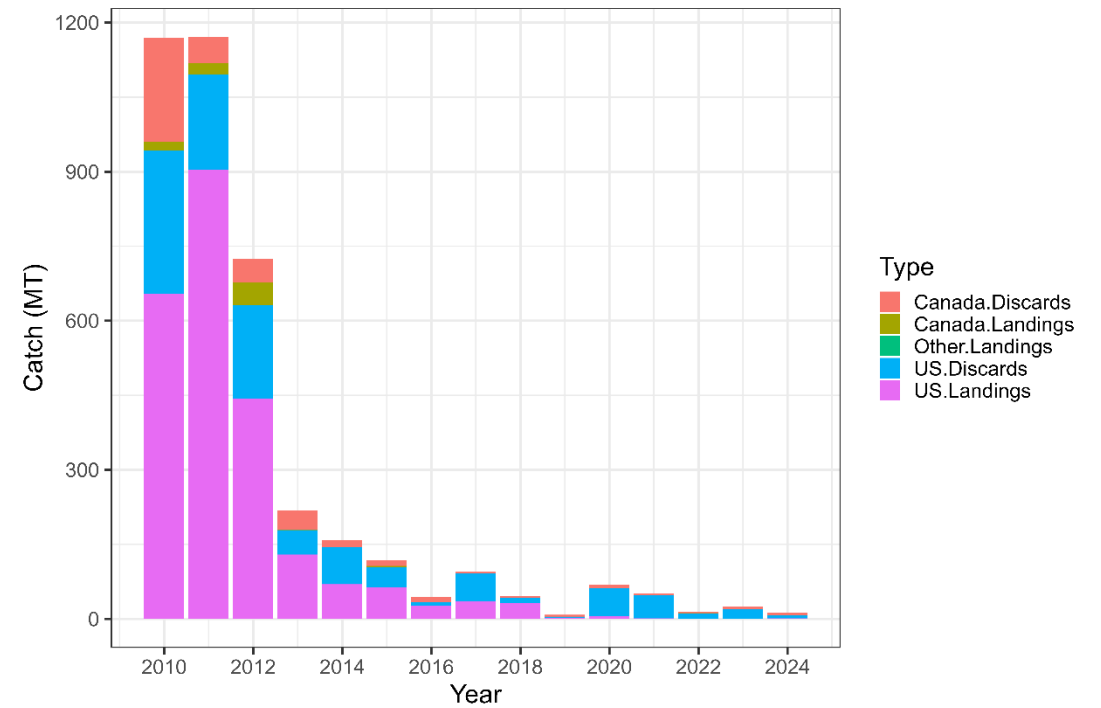
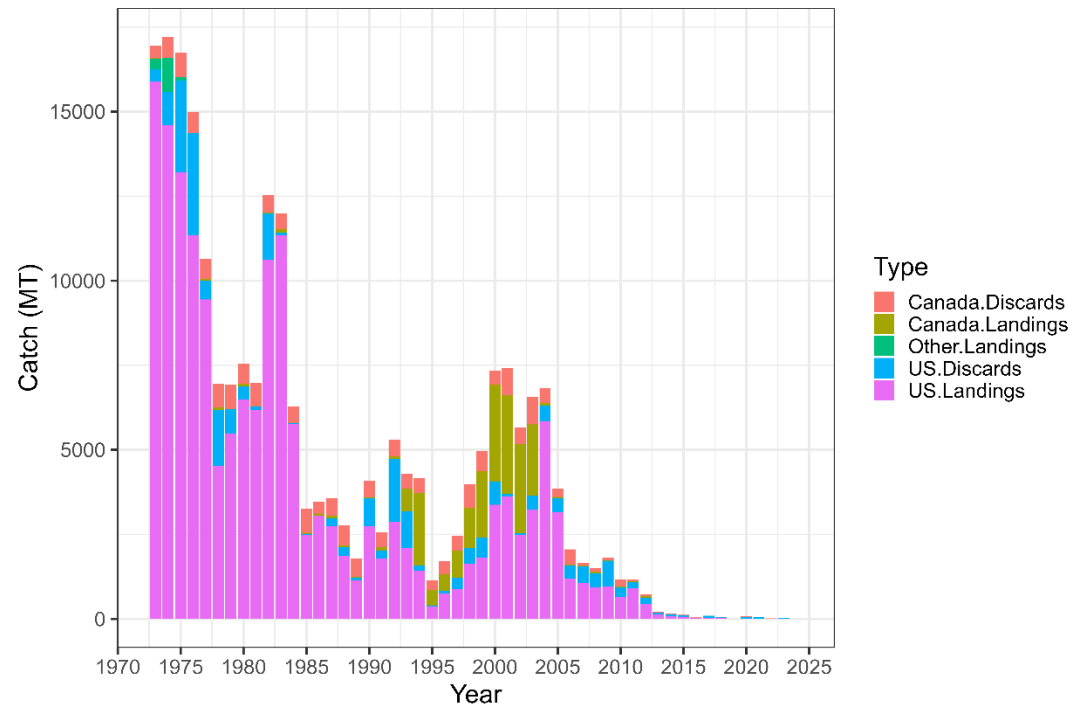
- Management track
 - The Limiter
 - Level 1 review
- Research track
 - Terminal year 2022
- WHAM
 - 1973–2022; Ages 1–6+
 - 1 fleet (US & CA)
 - 3 indices
 - Beverton-Holt SR
 - Bottom temp
 - RE on fleet selectivity and NAA

This time (2025):

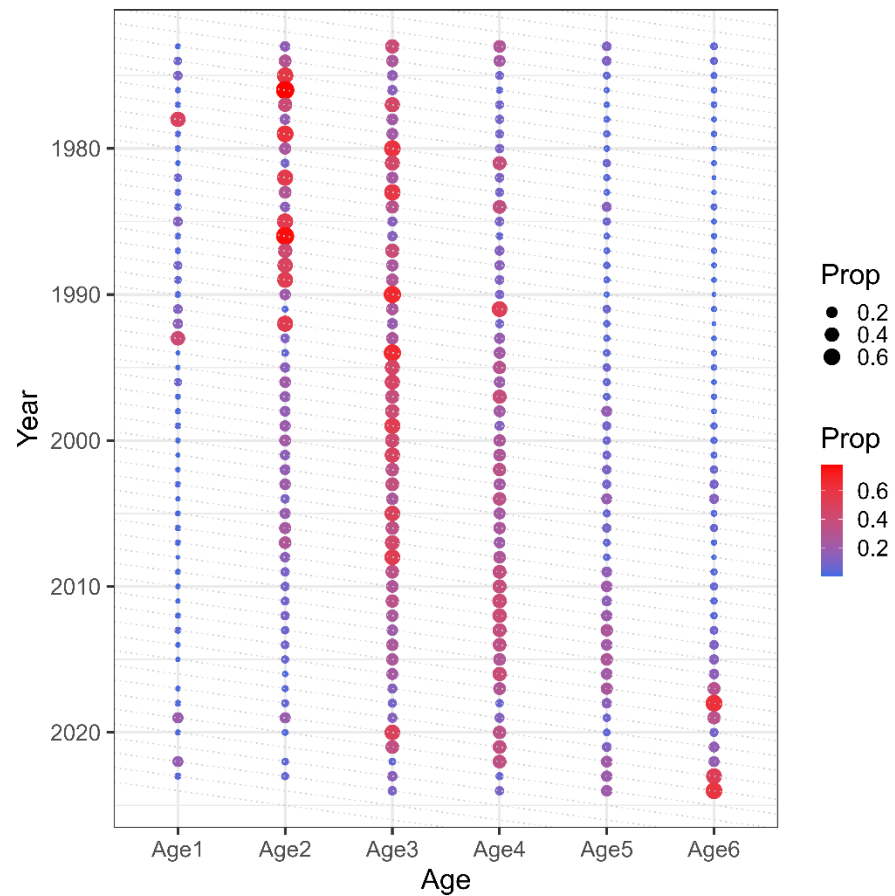
- Level 2 review
- WHAM
- Update data
- Correction in maturity



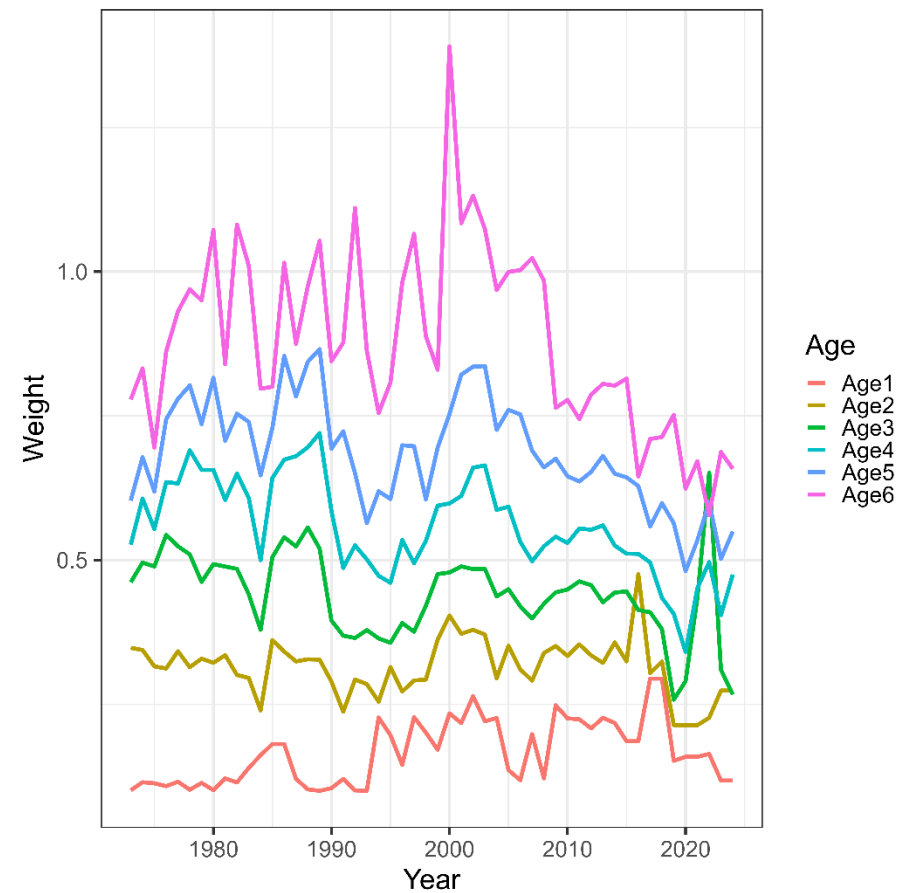
US and Canada



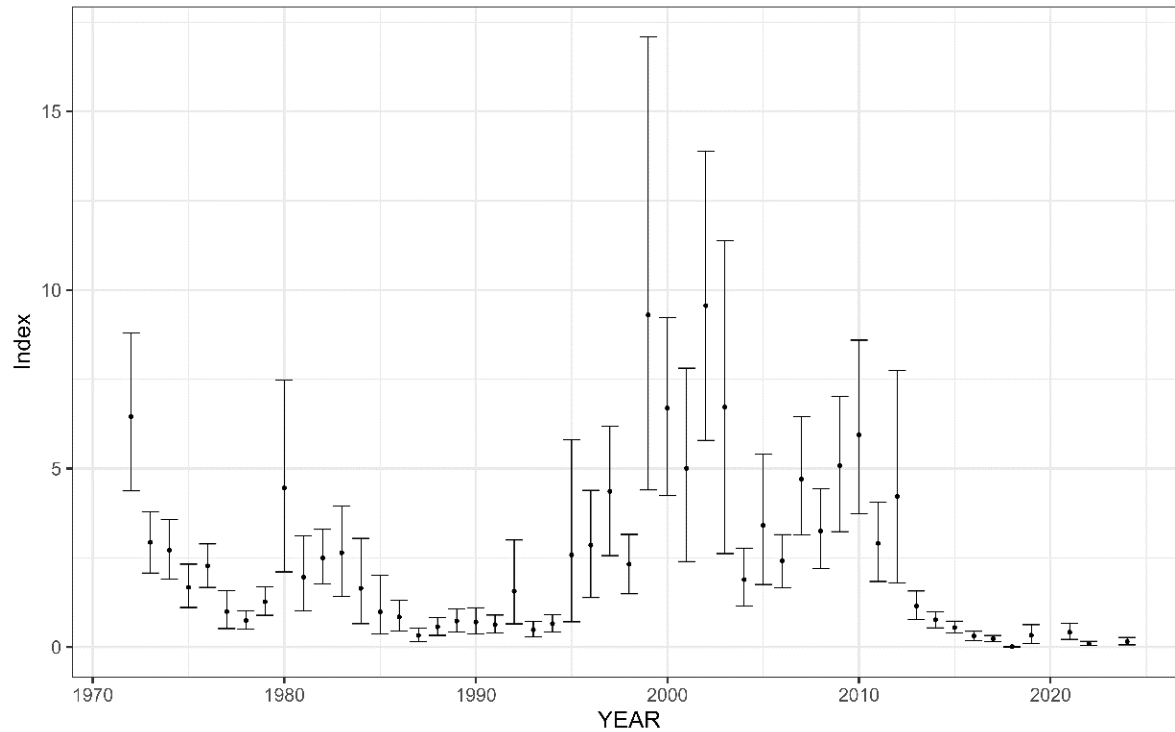
Catch and catch weight at age



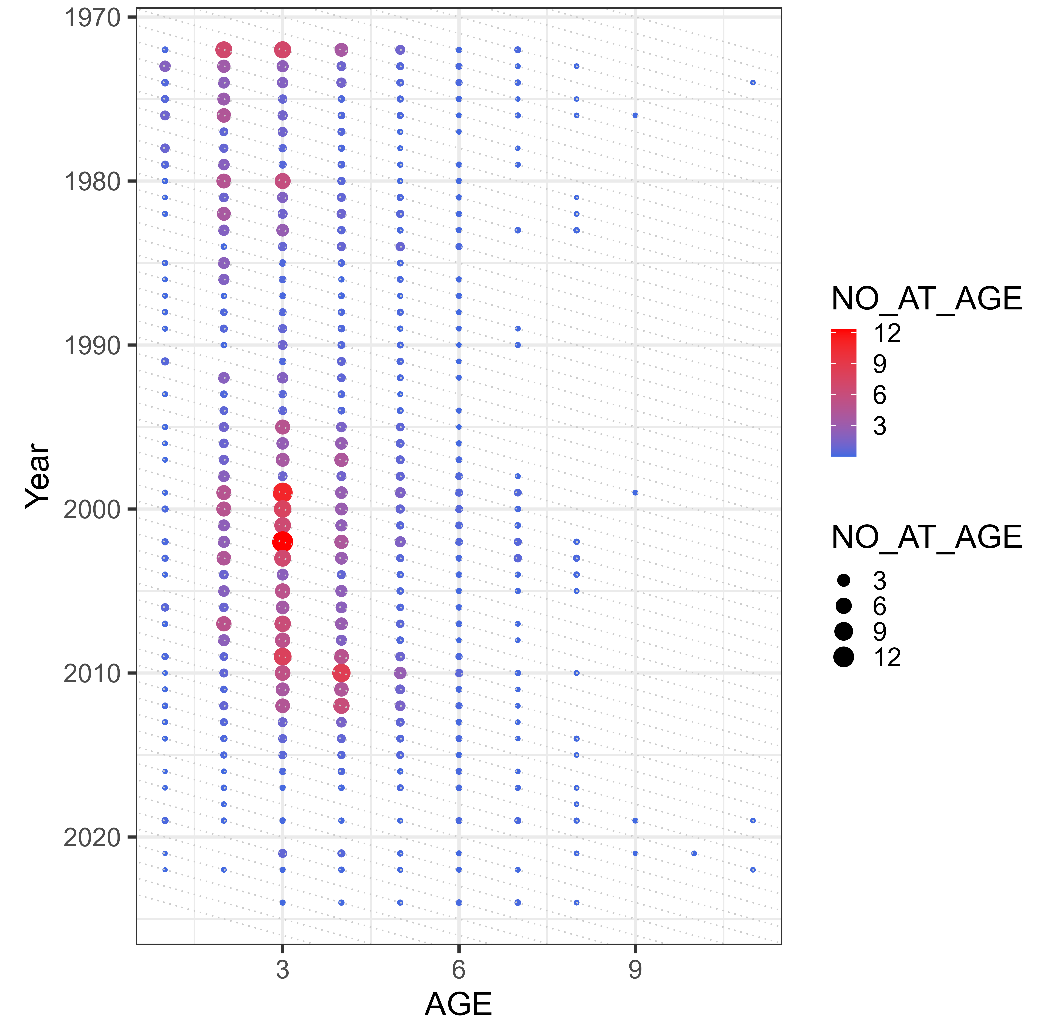
Age 6 is a plus group



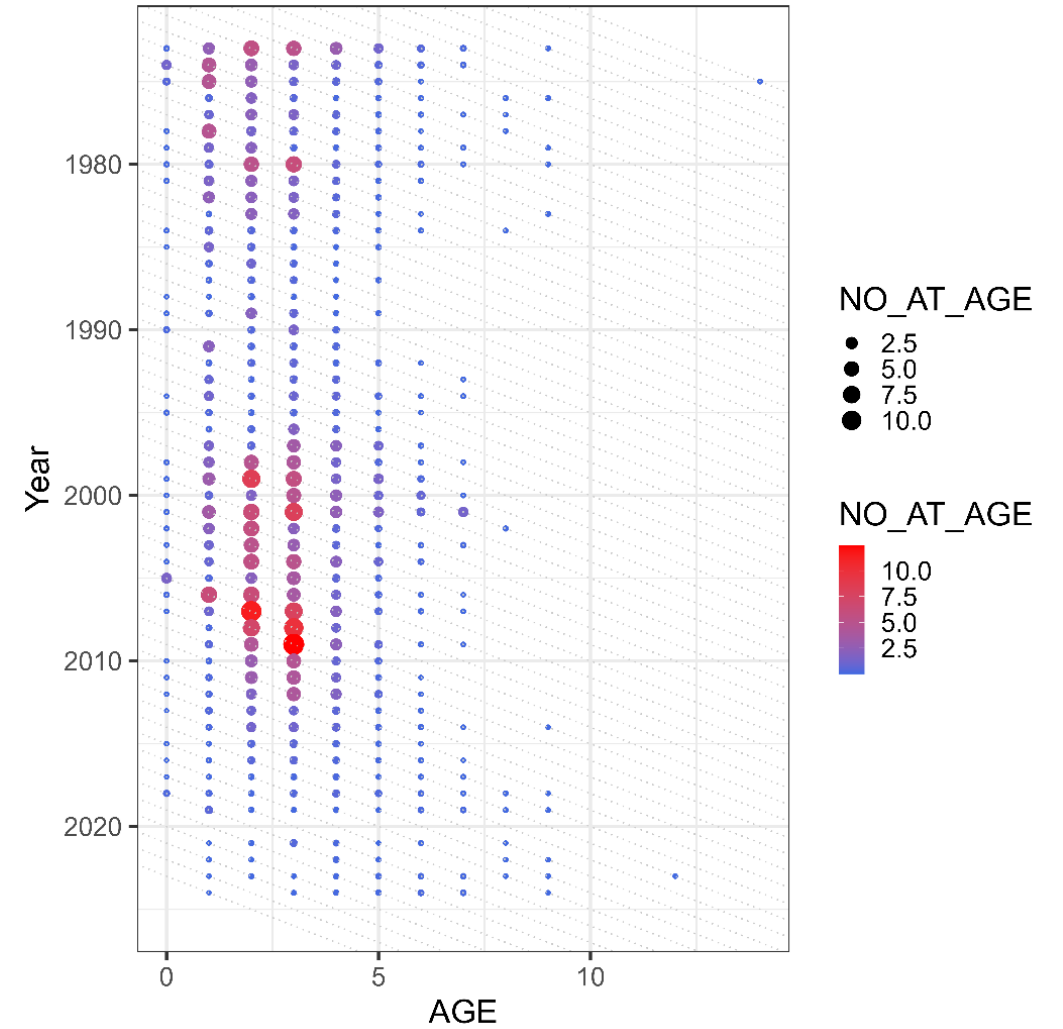
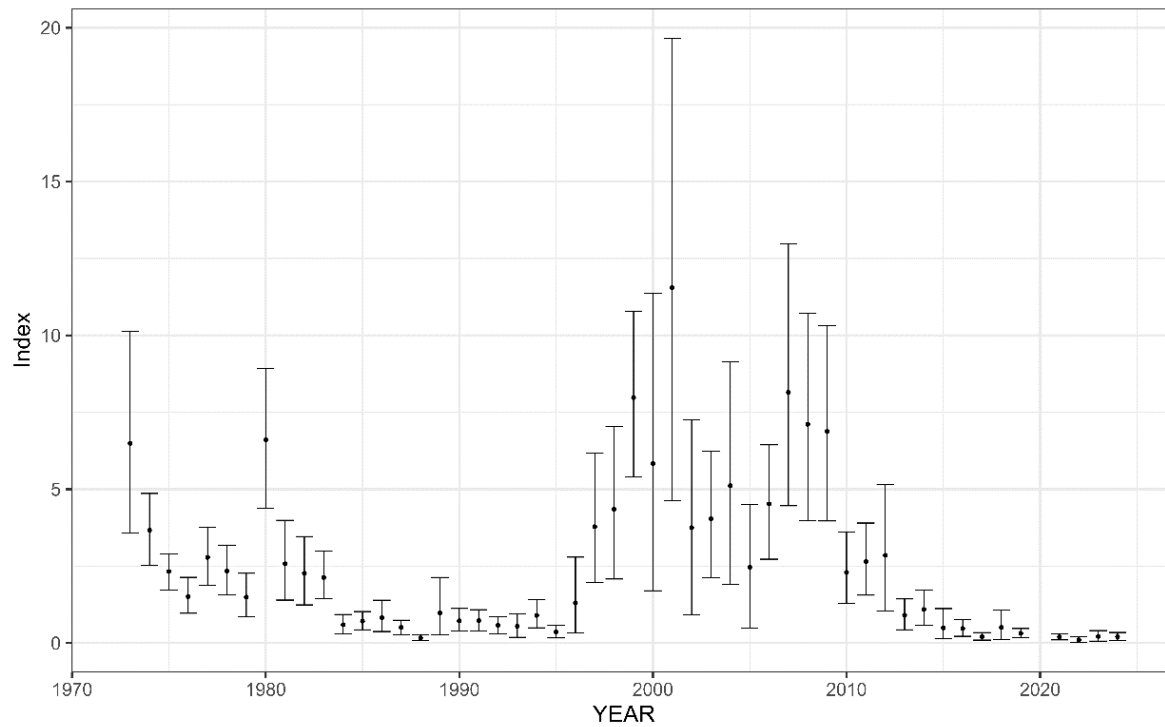
Spring NEFSC survey



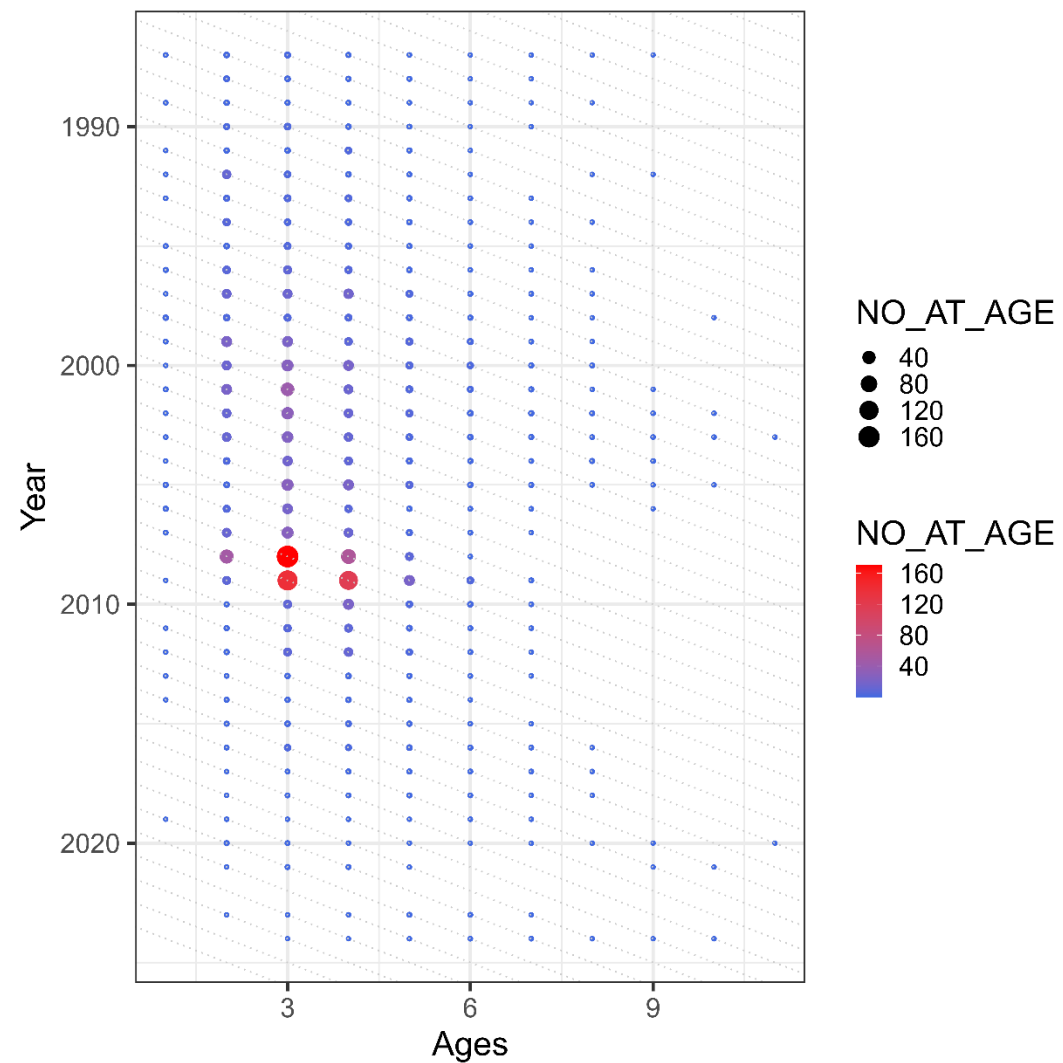
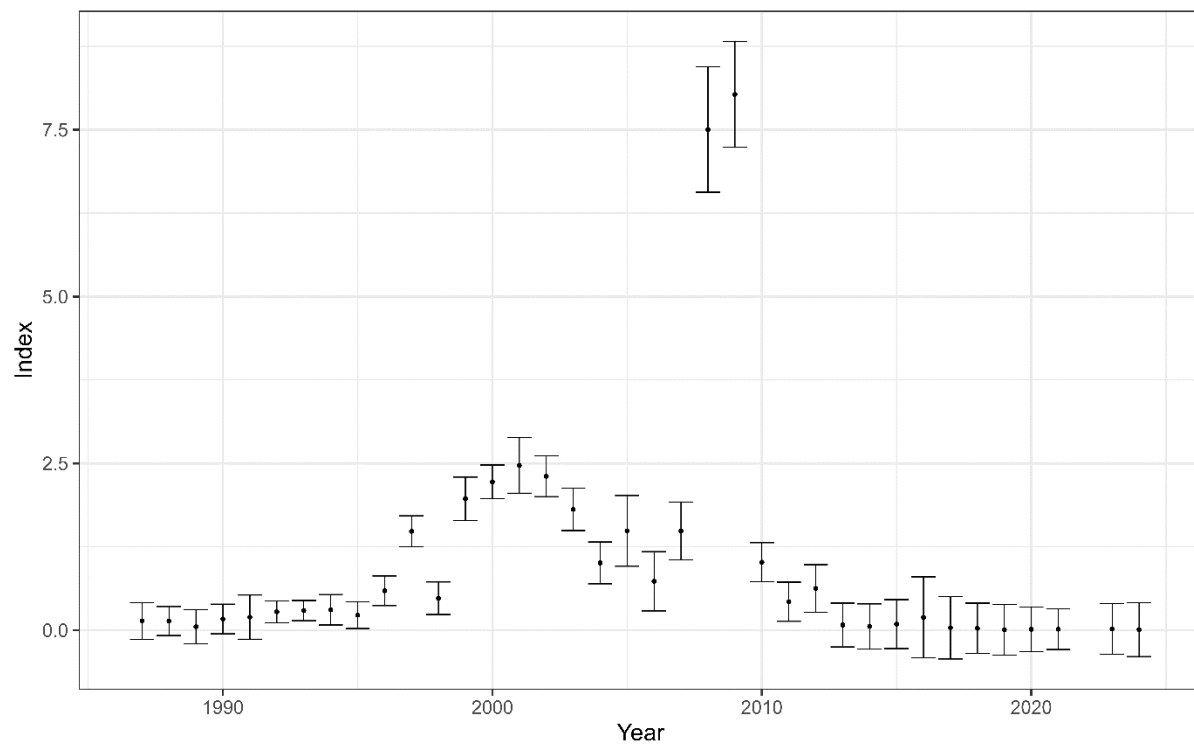
Spring 2023 is treated as missing. Sampling only occurred during daylight hours.



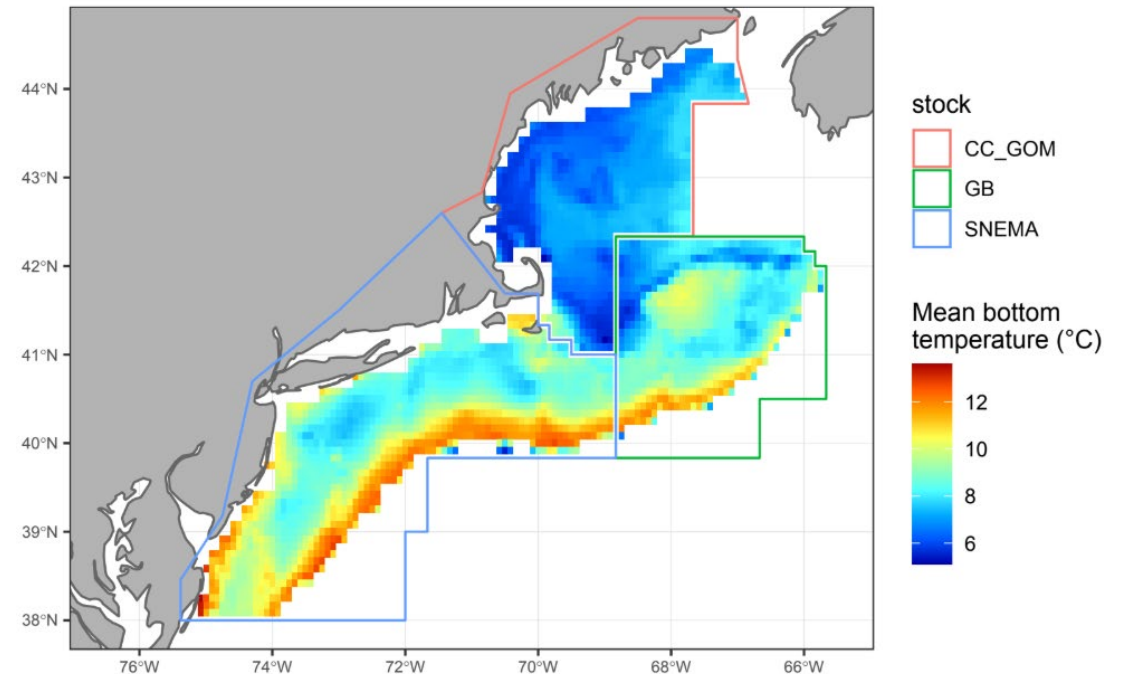
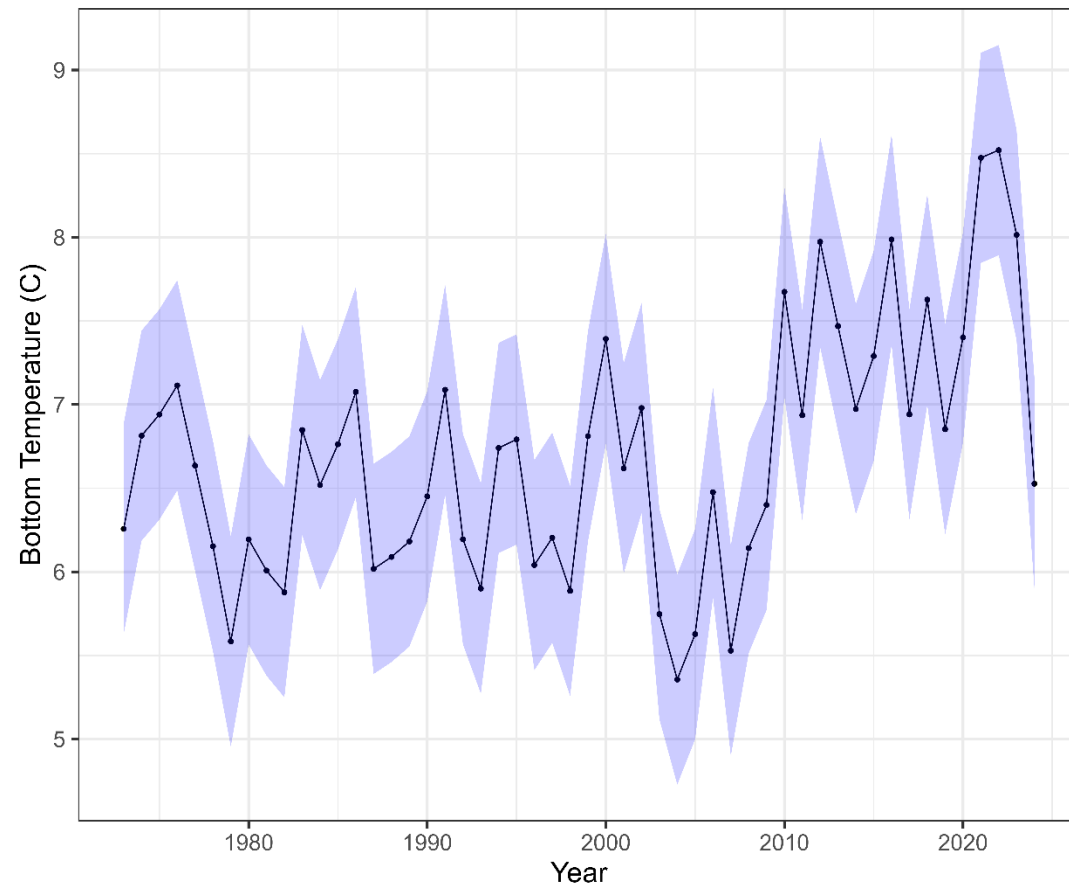
Fall NEFSC survey



DFO survey



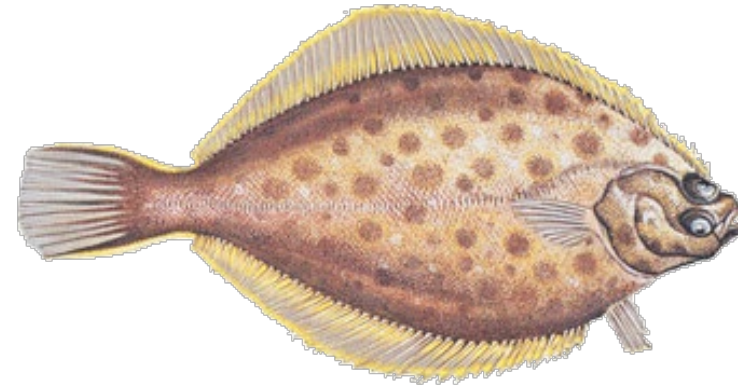
Bottom water temperature



du Pontavice et al., 2024

Model

- Ages 1–6+
- Fleet
 - Commercial (CV = 0.05)
 - AR1_Y on age-based selectivity
- Indices:
 - Spring NEFSC (1973 – 2024)
 - Fall NEFSC (1973 – 2024)
 - DFO (1987 – 2024)
- Beverton-Holt SR
 - Bottom water temp
- Natural mortality at age:



The *oods ole ssessment odel*
WHAM

Age	1	2	3	4	5	6+
M	0.57	0.33	0.26	0.23	0.22	0.22

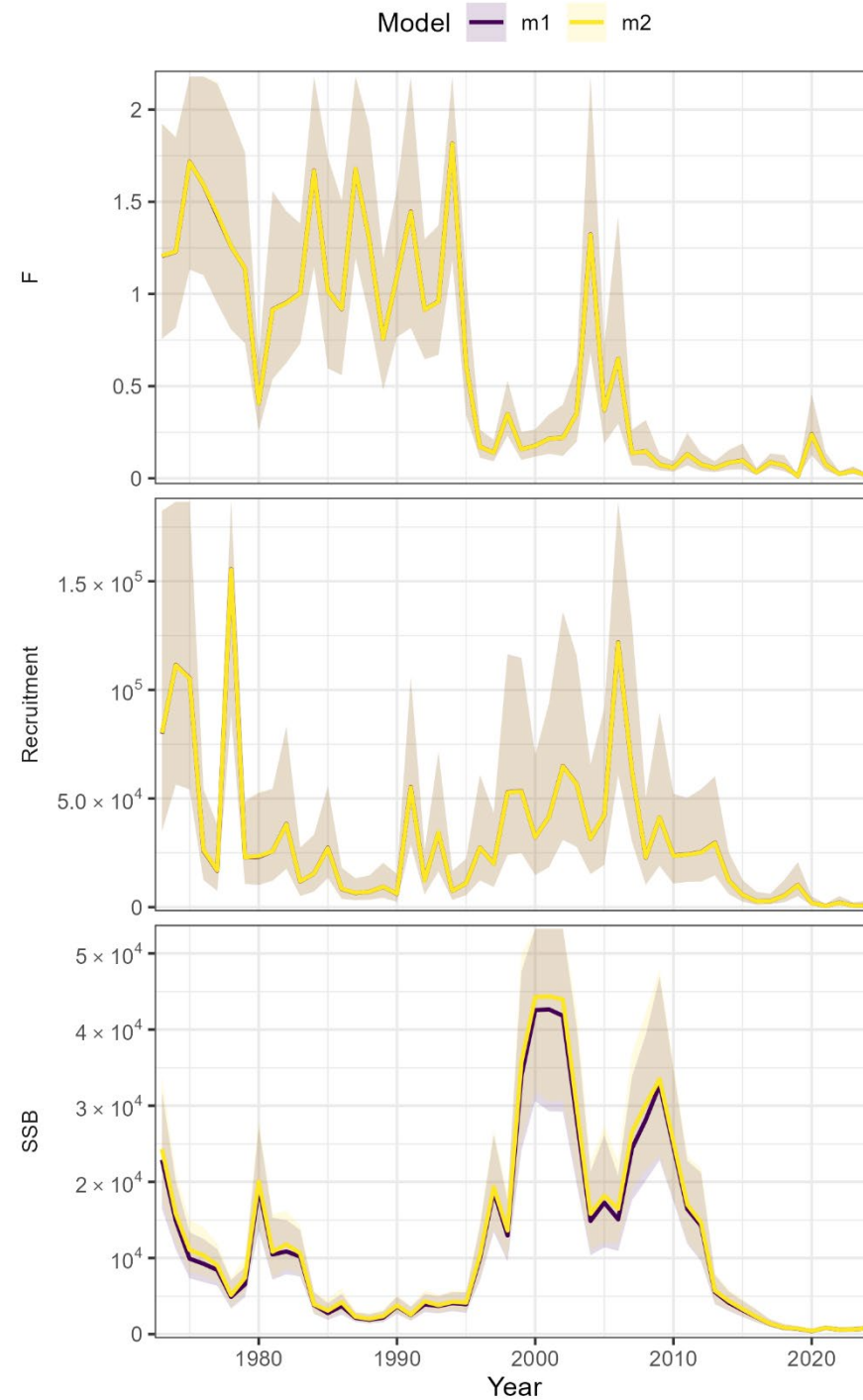
Runs

- Run1: Bridge run (add data for 2023 and 2024)
- Run2: Revised maturity

Bridge run

	Run	ρ_{SSB}	ρ_{Fbar}
RT	m1	0.079	-0.048
Bridge	m2	0.054	-0.012

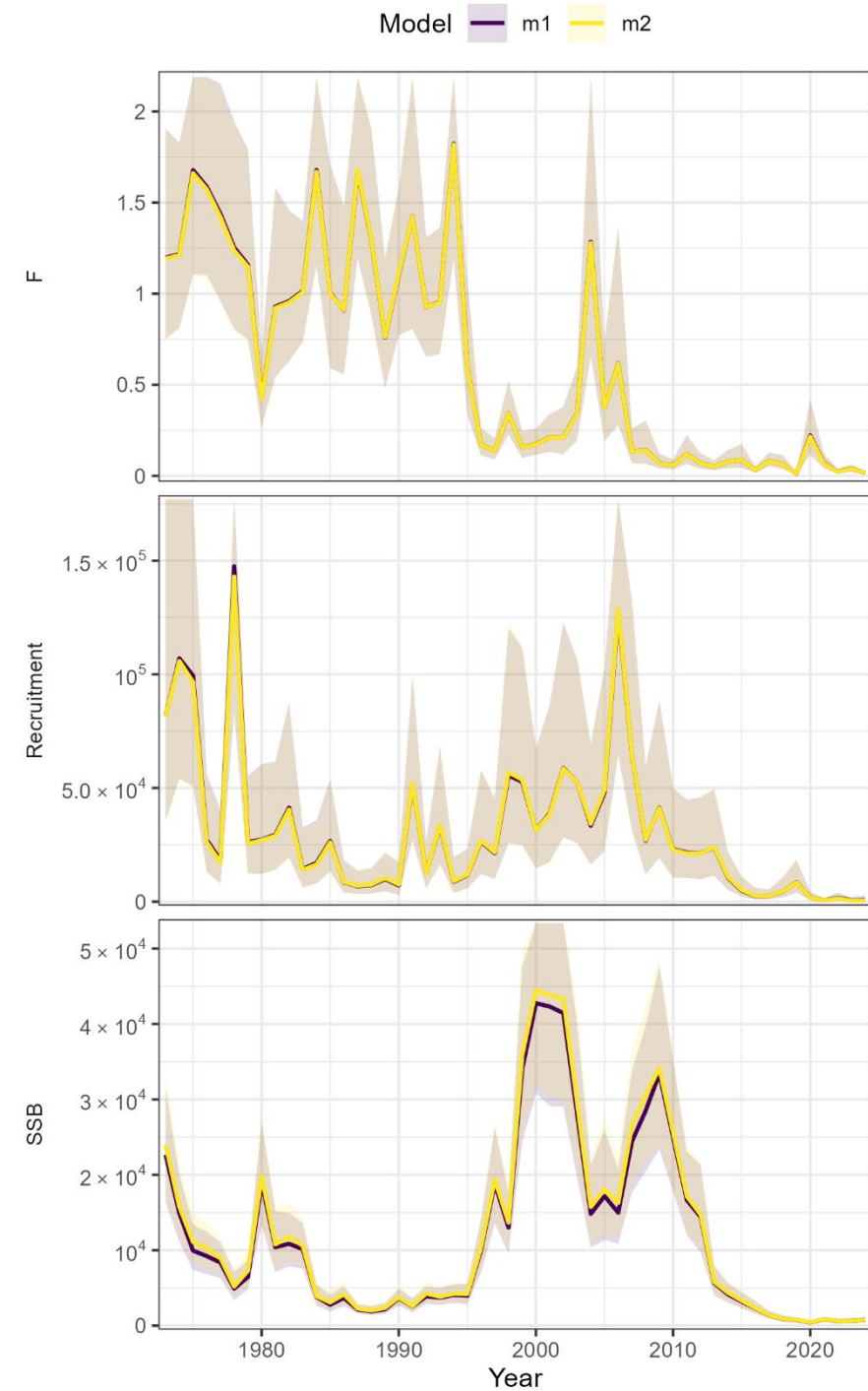
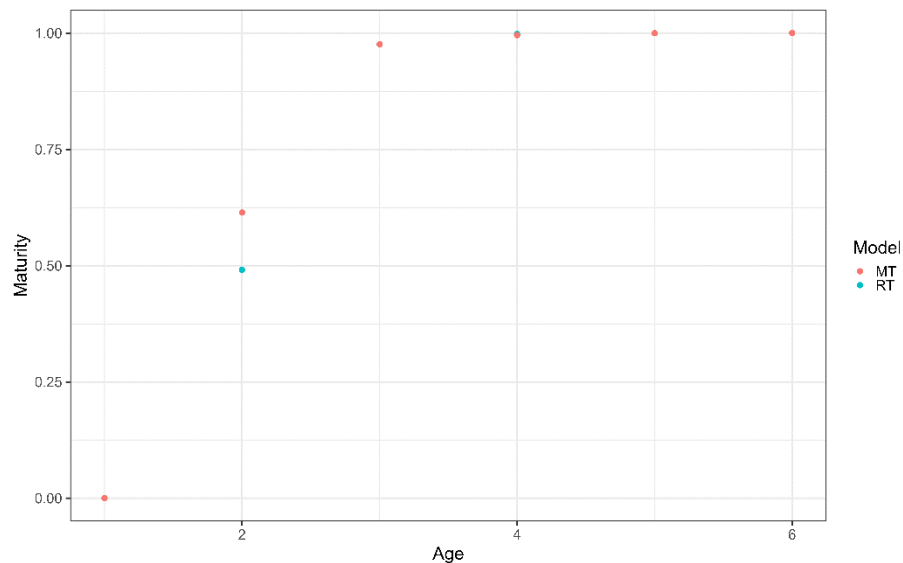
Adding 2023 and 2024 data



Update maturity

	Run	rho_SSB	rho_Fbar
Bridge	m1	0.054	-0.012
Maturity	m2	0.042	0.007

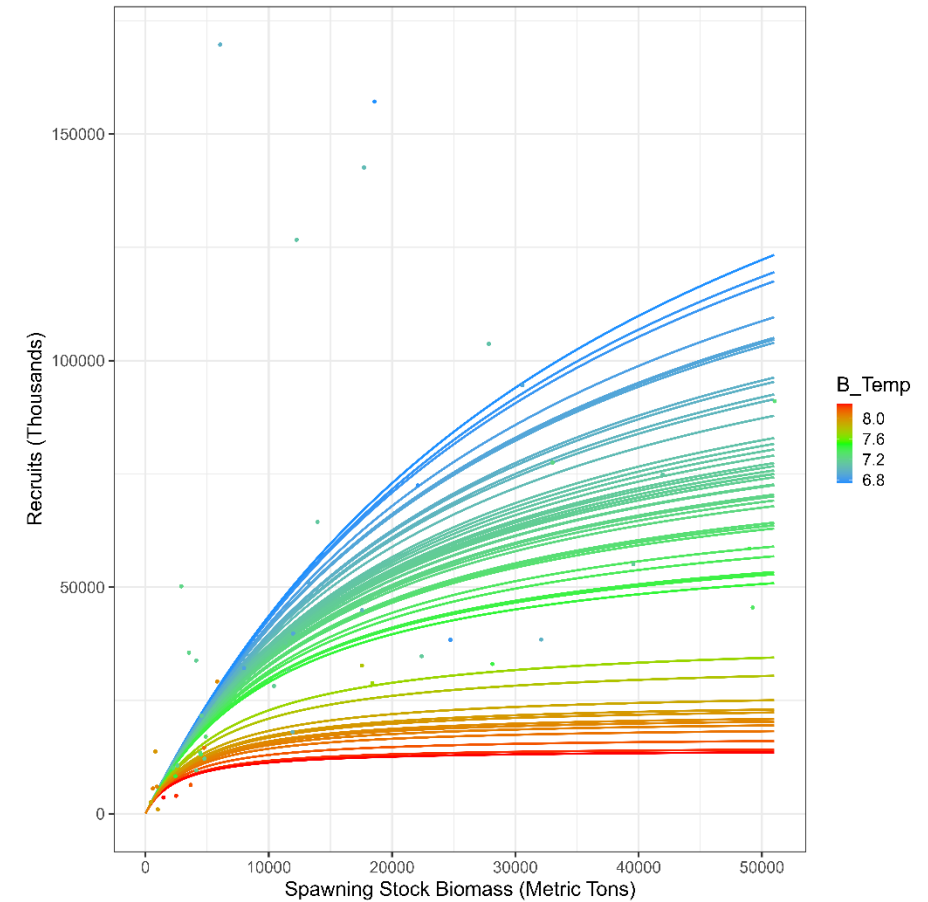
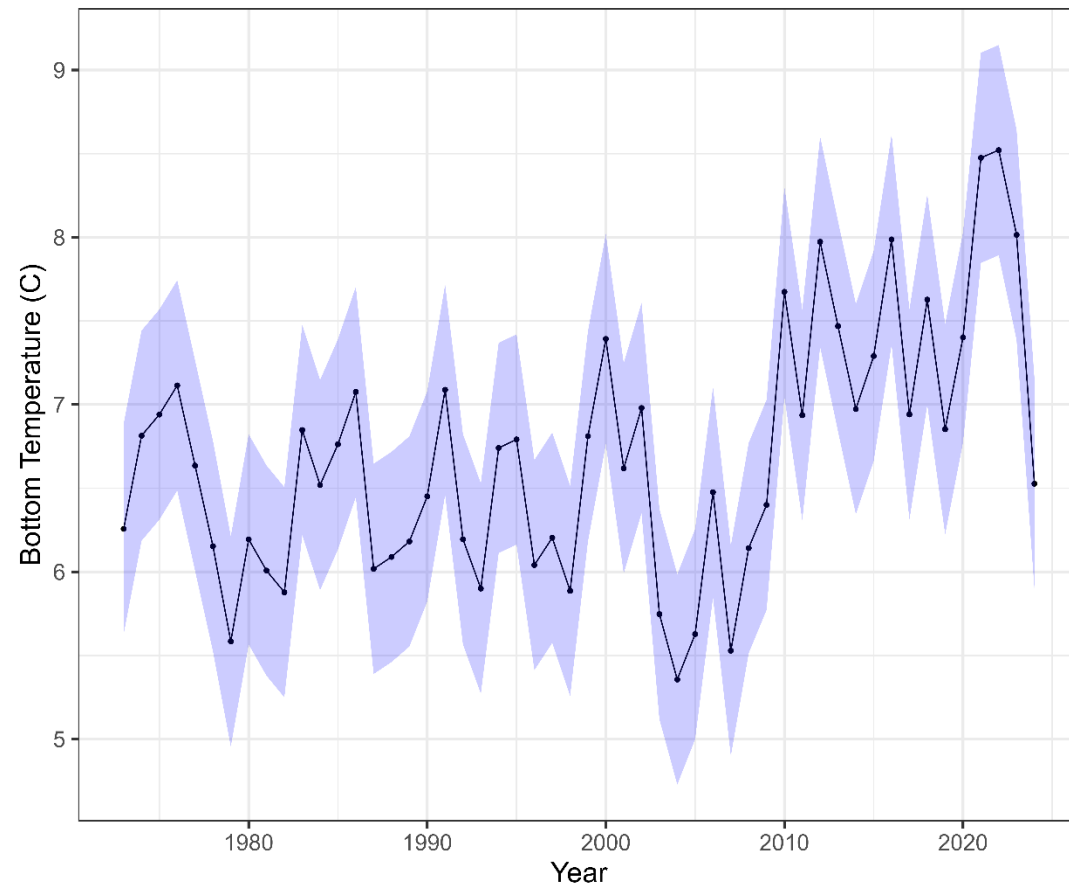
Run	1	2	3	4	5	6+
RT	0	0.49	0.98	0.99	1	1
MT	0	0.61	0.98	0.99	1	1



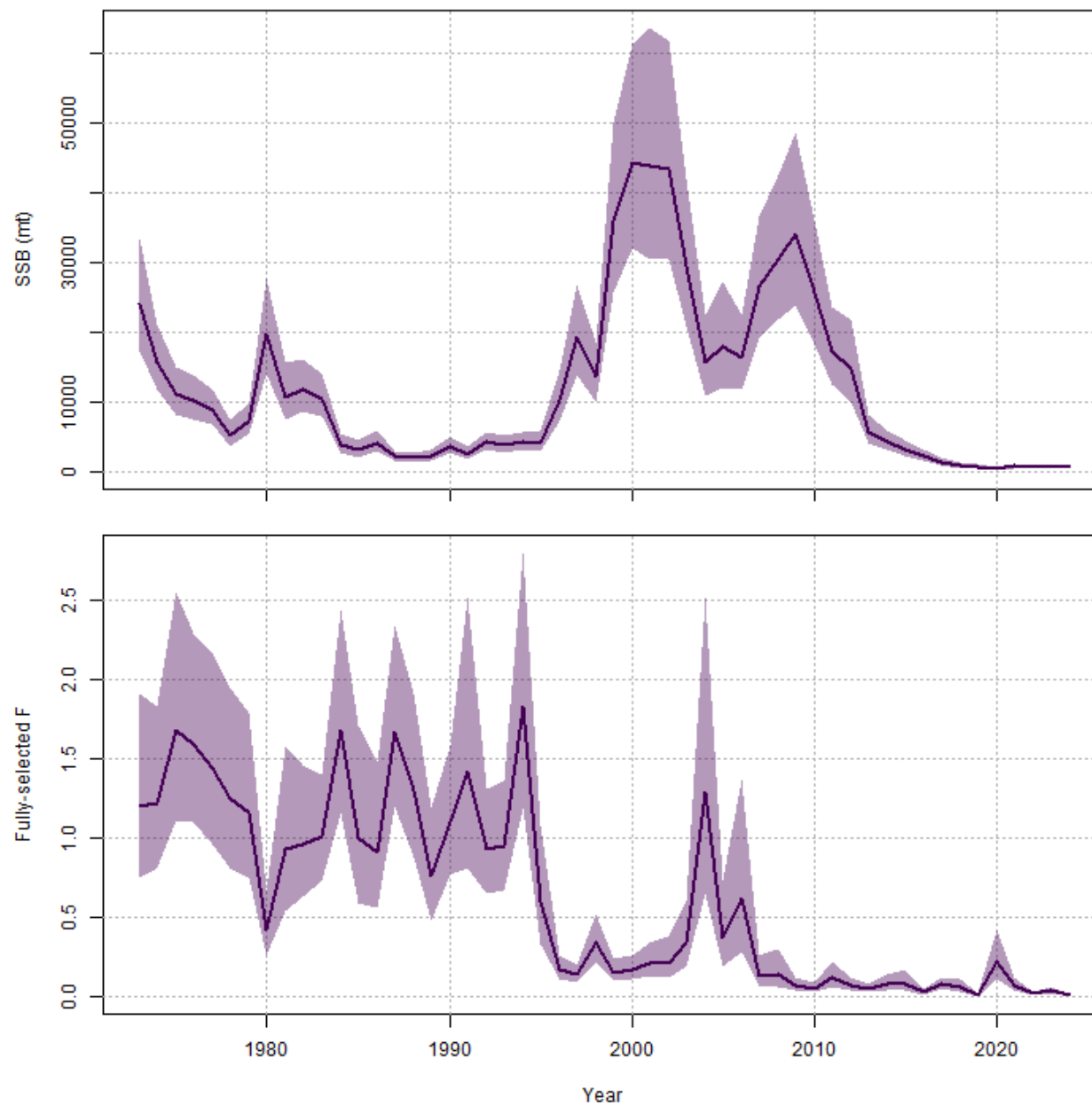
Model summary

- No major changes since the research track
- Change in maturity had a minimal effect
- No major diagnostic issues

Bottom water temperature and Recruitment

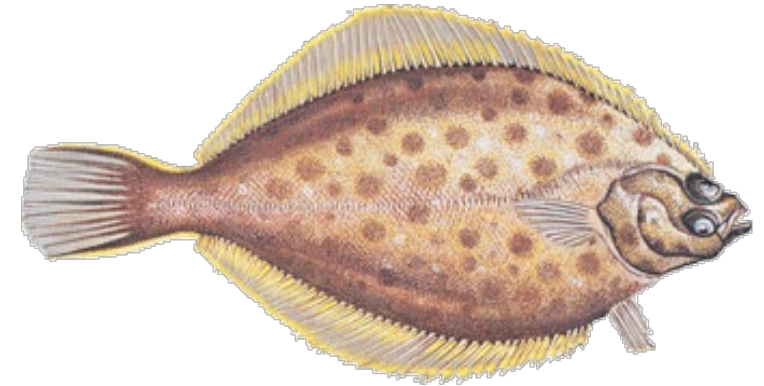


SSB and F

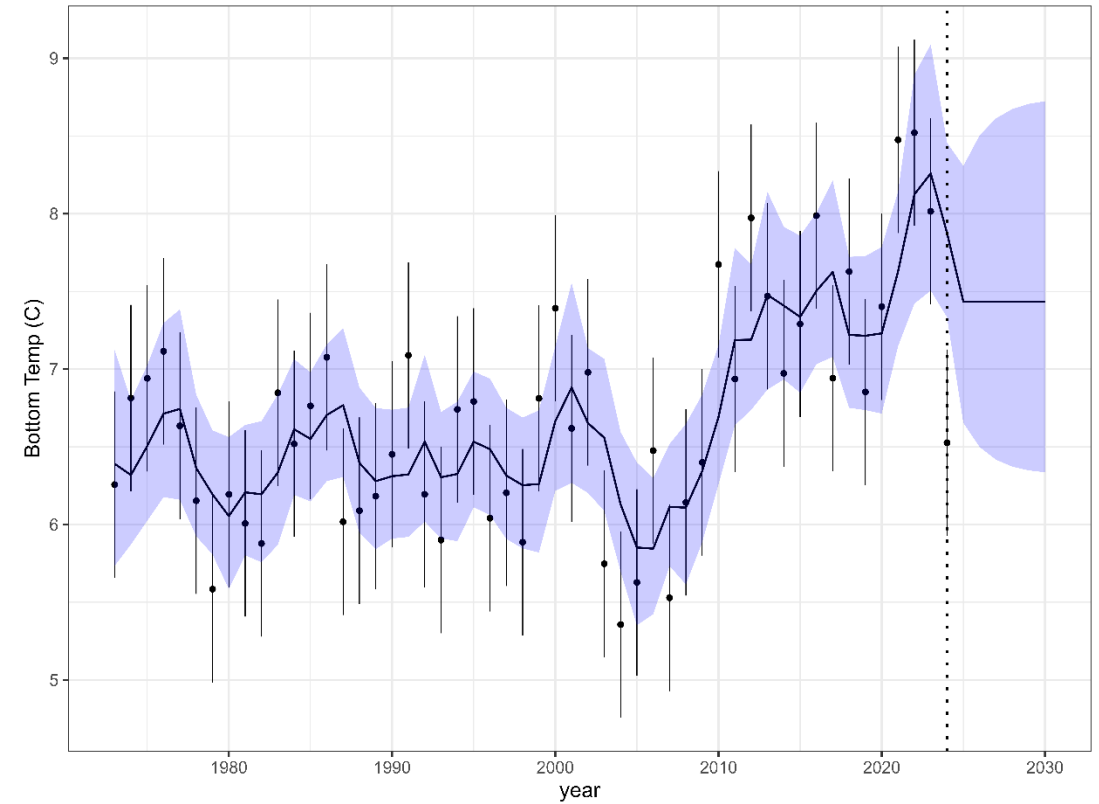
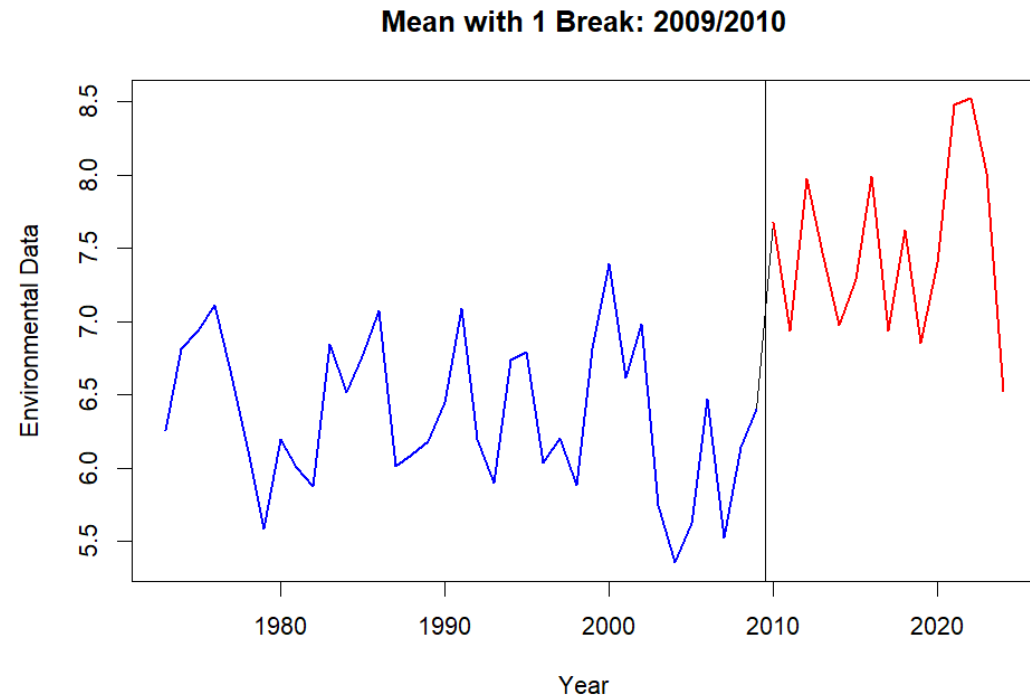


BRP inputs

- MSY
 - Natural mortality → age-based
 - Maturity → constant
 - Selectivity → most recent two year average
 - Weights at age → most recent two year average
 - Recruitment → Beverton-Holt
-
- A change point analysis on the bottom water temperature time series is done to inform the most recent recruitment conditions
 - Average water temperature associated with the breakpoint to determine FMSY, SSBMSY and MSY



Bottom water temperature



BRPs

Table 2: Comparison of reference points estimated in the last management track and from the current management track assessment. The previous management track assessment was an empirical approach so biological reference points could not be estimated. FMSY was used for the overfishing threshold.

	2024	2025
F_{MSY}		0.09
SSB_{MSY} (mt)		7,072 (2,700 - 18,521)
MSY (mt)		597 (23 - 2,440)
Mean recruits (age 1) (000s)		31,190
<i>Overfishing</i>	Unknown	No
<i>Overfished</i>	Unknown	Yes

Status

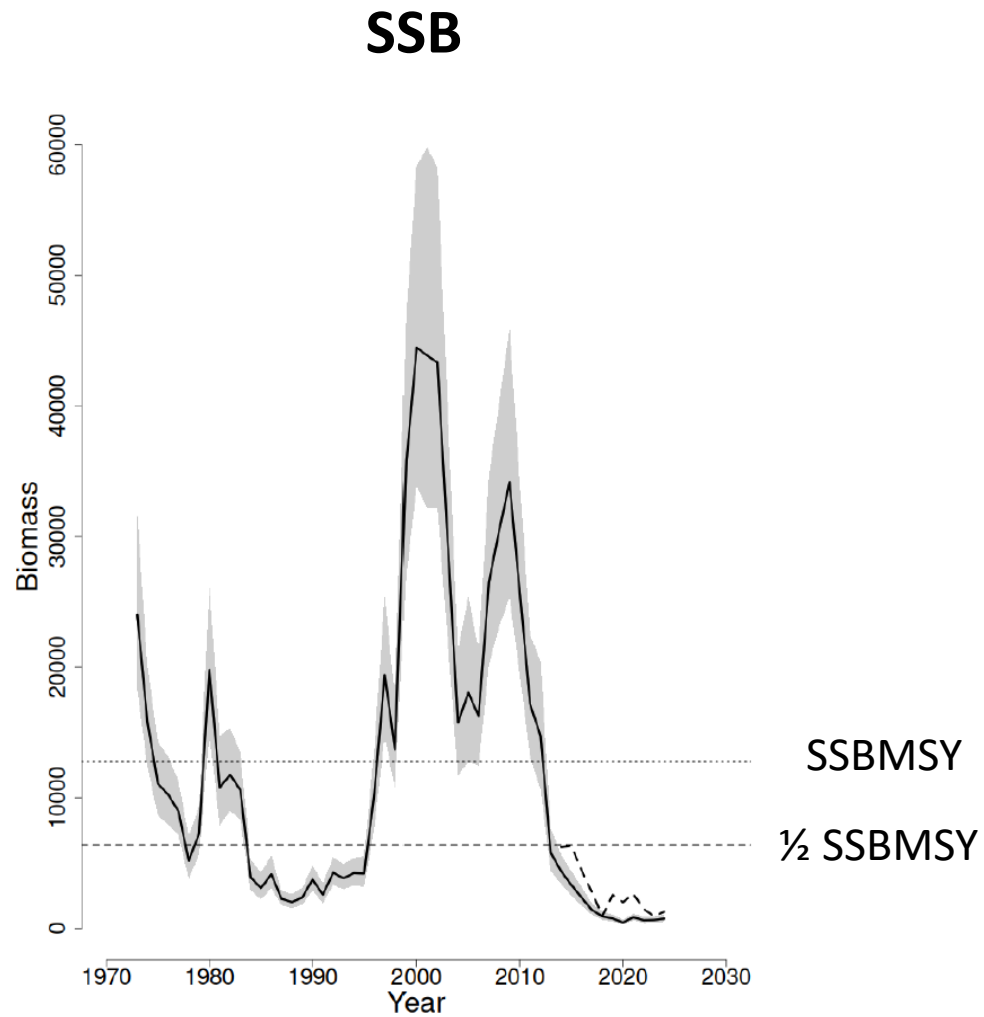


Figure 1

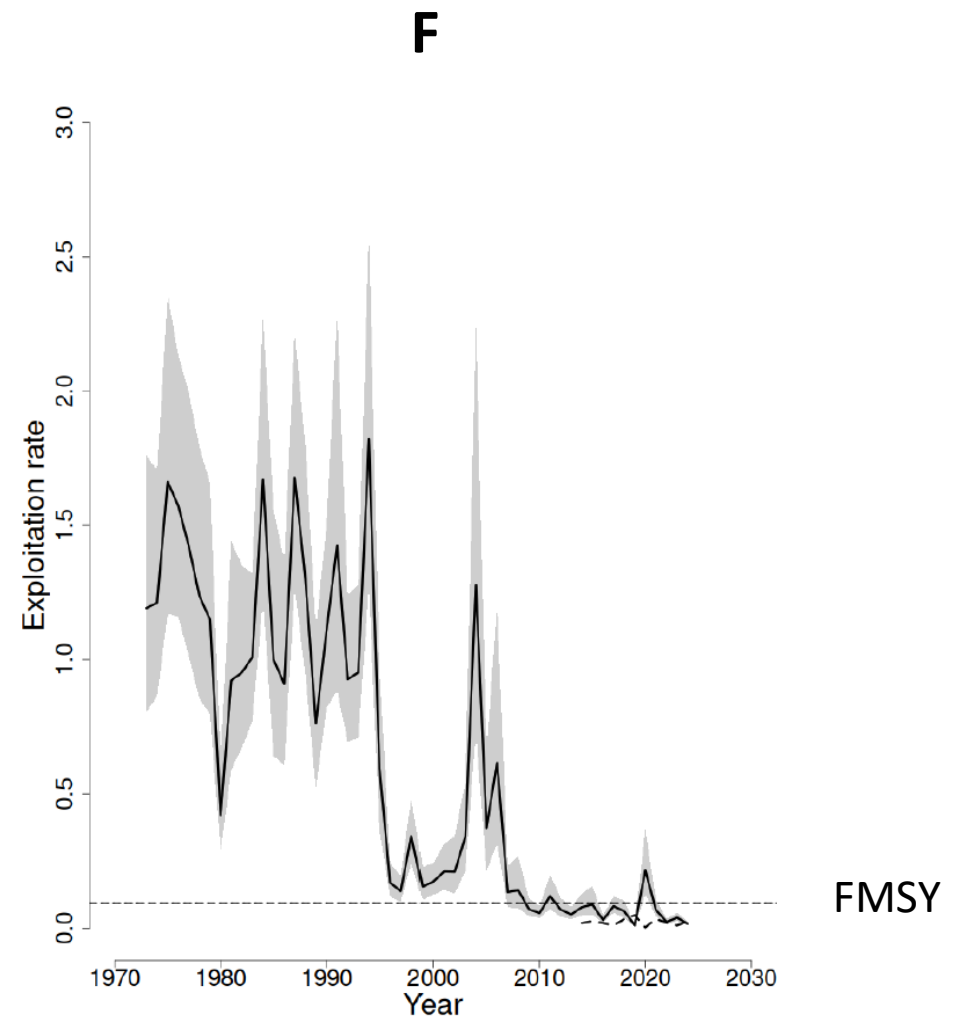
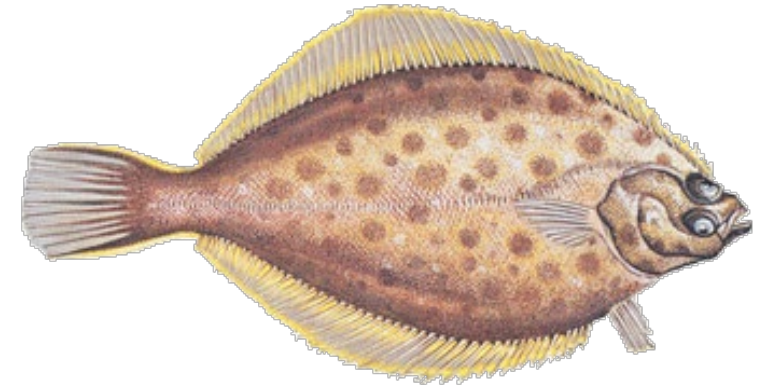


Figure 2

Projection inputs

- MSY
 - Natural mortality → age-based
 - Maturity → constant
 - Selectivity → most recent two year average
 - Weights at age → most recent two year average
 - Recruitment → Beverton-Holt
 - Temperature → average of 2009:2024
-
- Bridge year catch (22 mt) from PDT in 2025, then catch at FMSY (0.09) till 2028



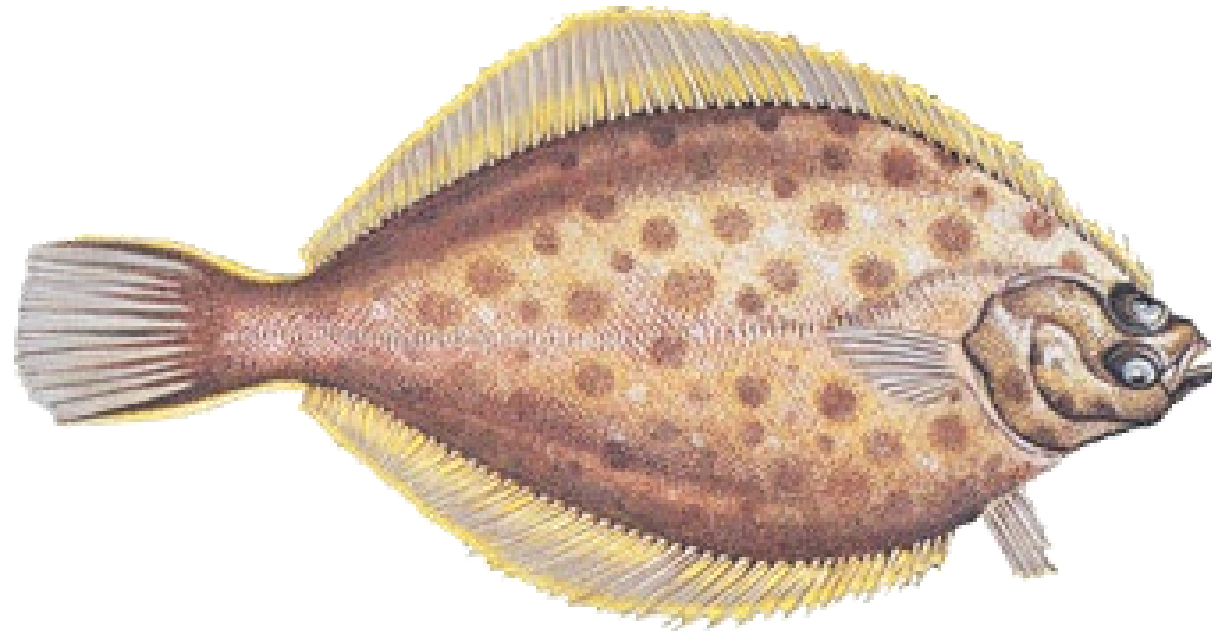
Projections

Table 3: Short term projections of total fishery catch and spawning stock biomass for Georges Bank Yellowtail Flounder based on a harvest scenario of fishing at F_{MSY} between 2026 and 2028. Catch in 2025 was assumed to be 22 (mt).

Year	Catch (mt)	SSB (mt)	F_{Full}
2025	22	655 (230 - 1,860)	0.034

Year	Catch (mt)	SSB (mt)	F_{Full}
2026	57	646 (190 - 2,198)	0.09
2027	57	654 (180 - 2,374)	0.09
2028	60	699 (181 - 2,707)	0.09

Questions?





NOAA
FISHERIES

Northeast
Fisheries Science
Center

2024 Georges Bank Haddock Assessment Summary

U.S.-Canada Technical Science Coordination Meeting
July 16, 2025



Assessment Background

- Model platform = Woods Hole Assessment Model (WHAM)
- Current model was developed via a Research Track (RT) Assessment, peer reviewed in 2022
- The 2024 Management Track (MT) Assessment updates the 2022 MT that implemented the RT model and methodologies
- Data update through 2023



Assessment Model Results

2023 SSB

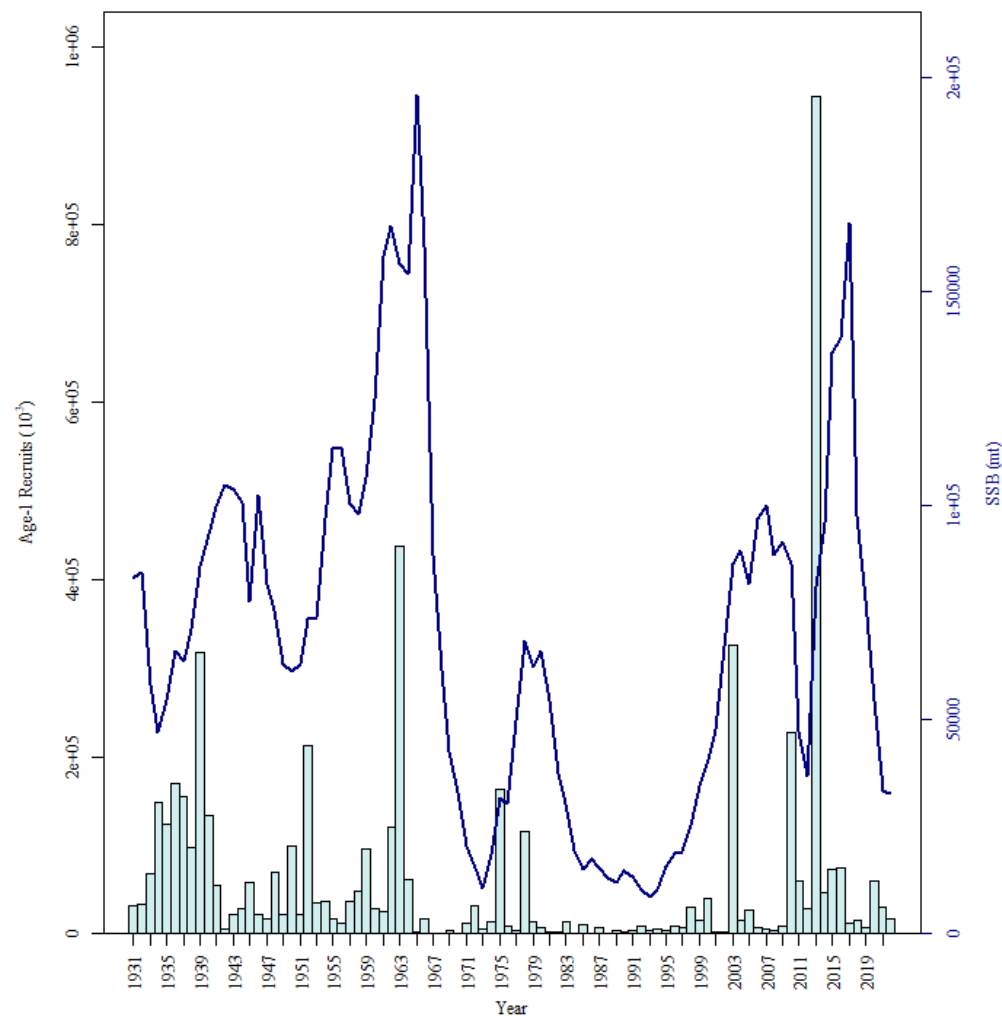
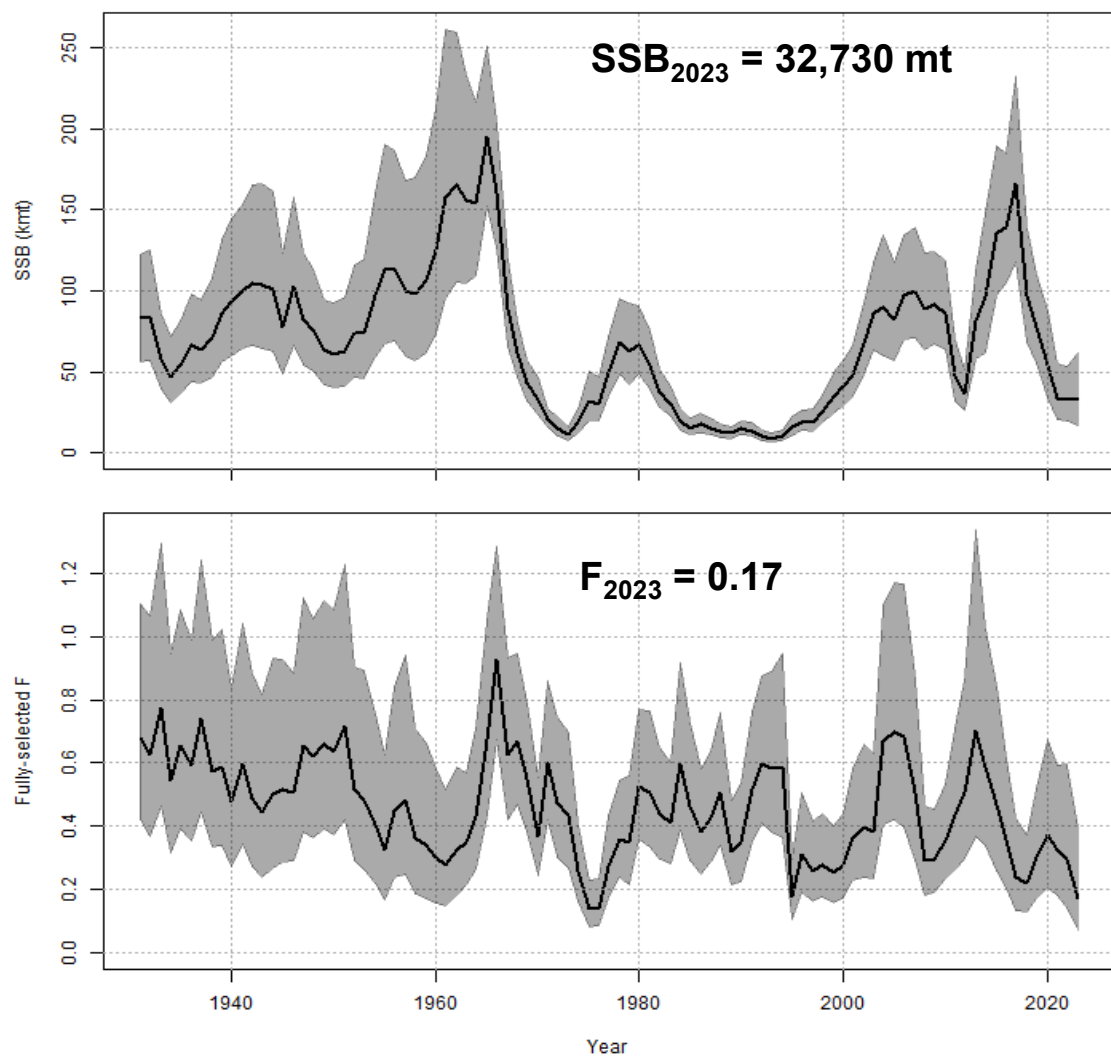
32,730 mt

2023 F

0.17

2023 R

17,848 (000s)

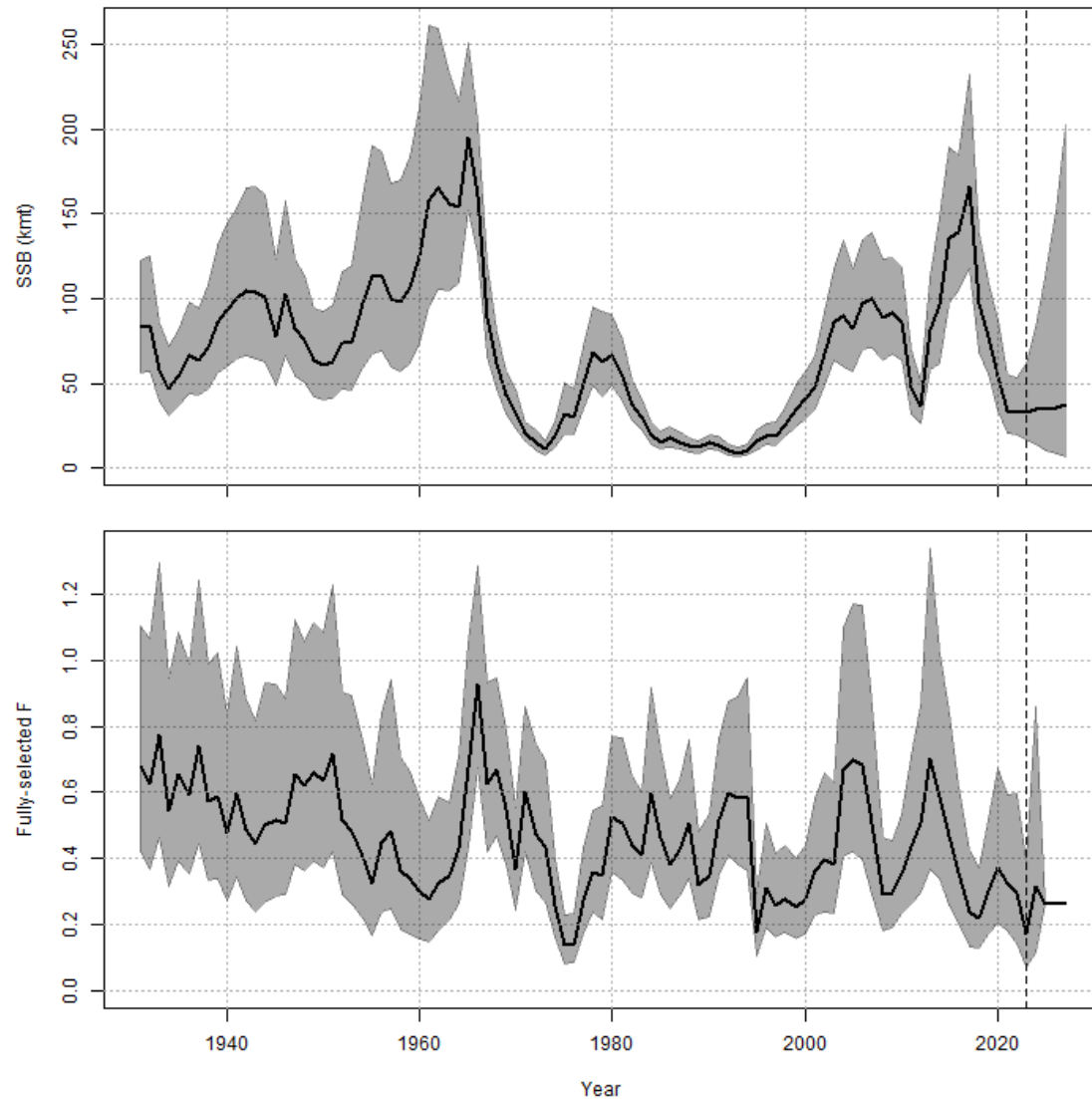


2024 GB Haddock BRPs and Stock Status

	2024 MT
$F_{MSY} proxy$	0.26
SSB_{MSY} (mt)	24,225 (13,101 - 44,793)
Median recruits (age 1) (000s)	16,841 (468 - 605,926)

- Not overfished ($SSB_{2023}/SSB_{MSY} = 135\%$)
- Not experiencing overfishing ($F_{2023}/F_{MSY} = 65\%$)

GB Haddock Short-term Projections



Year	Catch (mt)	SSB (mt)	F_{5-7}
2024	9,627	34,180 (14,038 - 83,225)	0.316 (0.116 - 0.859)

Year	Catch (mt)	SSB (mt)	F_{5-7}
2025	8,034 (2,430 - 26,570)	34,516 (10,532 - 113,116)	0.264
2026	8,177 (1,956 - 34,188)	36,029 (8,534 - 152,117)	0.264
2027	8,439 (1,553 - 45,865)	37,263 (6,843 - 202,924)	0.264



Eastern Georges Bank (5Zjm) Haddock Assessment Summary

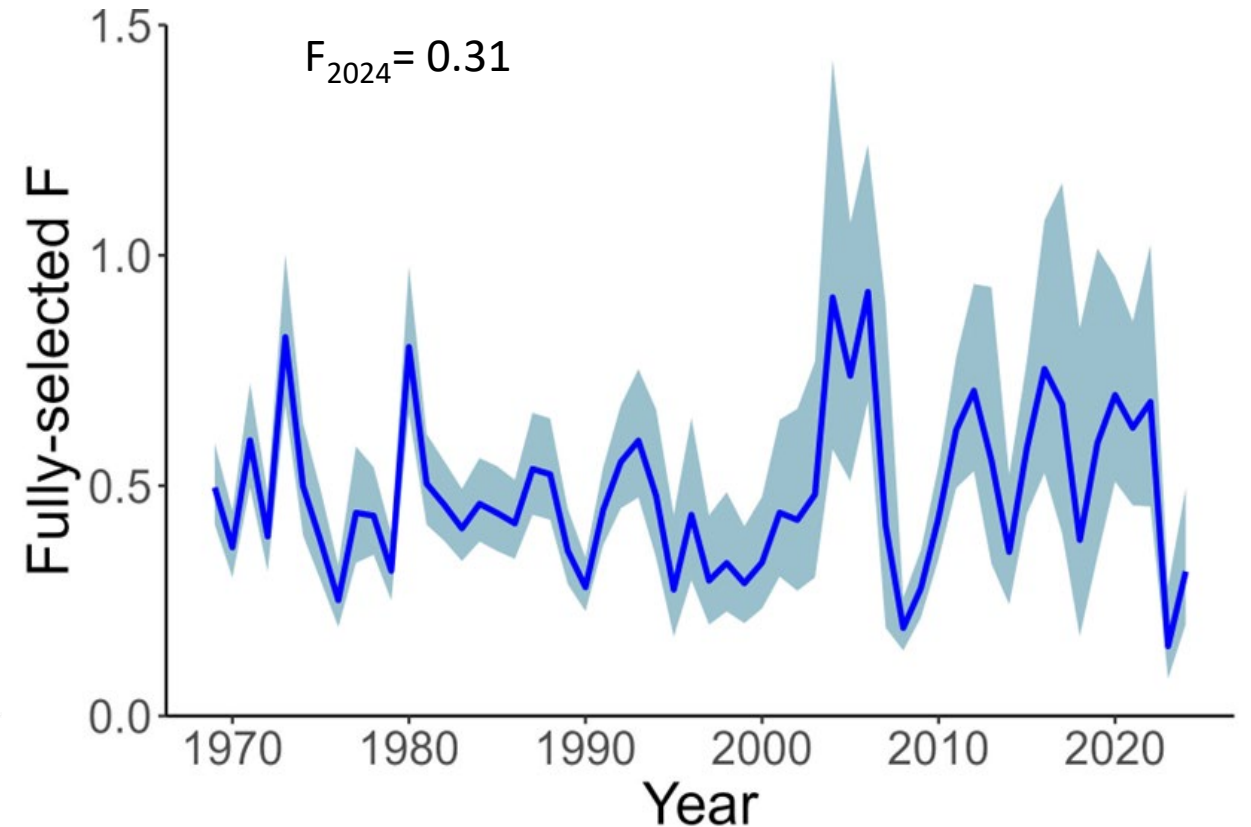
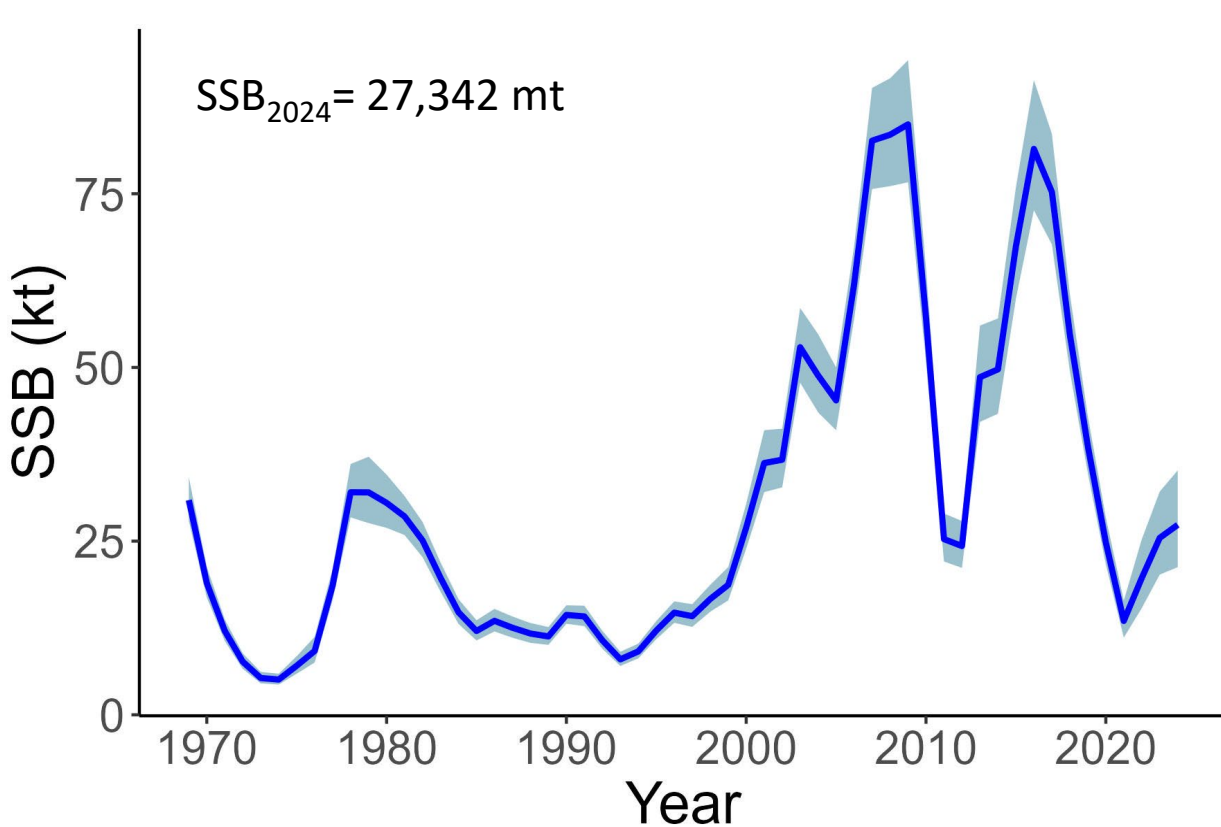


Assessment Background

- Model platform = Woods Hole Assessment Model (WHAM)
- Current model was developed via a Research Track (RT) Assessment, peer reviewed in 2022
- The 2025 EGB Haddock assessment updates the research track model with the most recent data (2024)
- The only change includes the addition of the DFO 5Z9 stratum since 2010

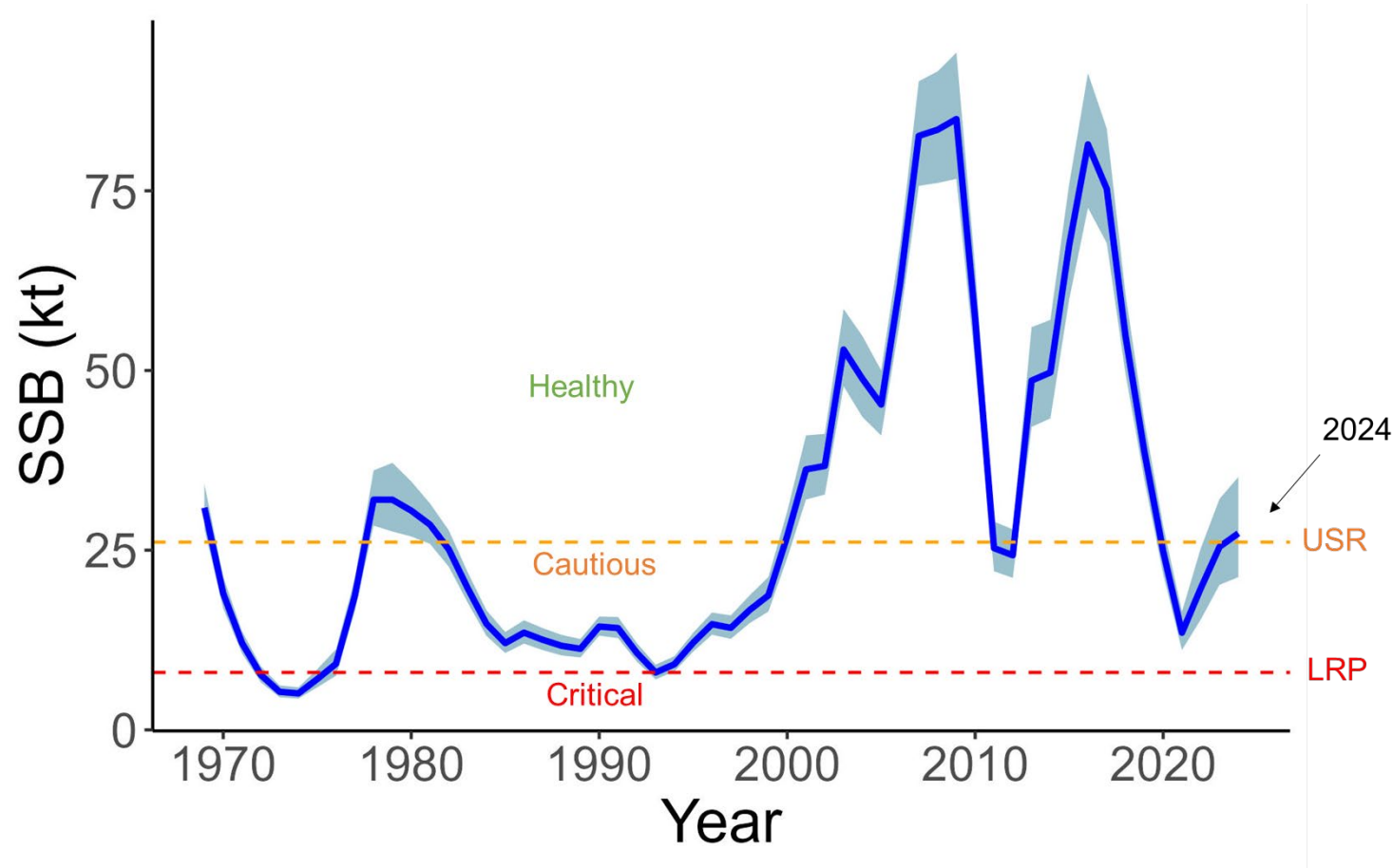


Assessment Model Results





EGB Haddock Stock Status

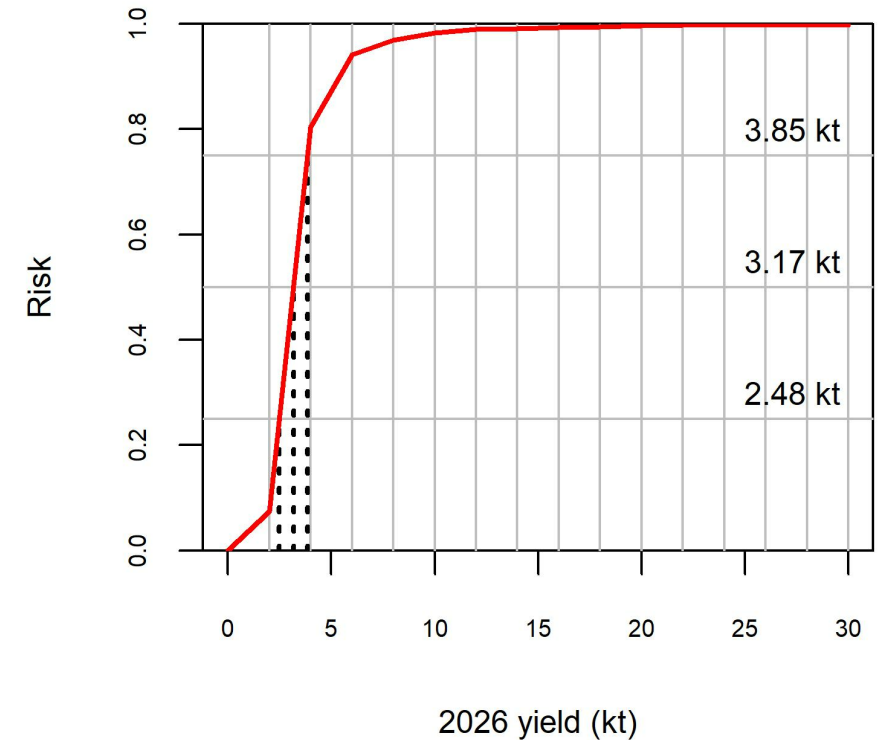


- The SSB_{2024} is above the USR
- EGB Haddock Stock is considered Healthy
- F_{ref} updated in 2025 (2020-2024) following previously approved method of $F_{40\%}$ ($F_{ref}=0.339$)



EGB Haddock Short-term Projections

Year	Age 1 Recruitment (000s)	Biomass (mt)	SSB (mt)	Fishing Mortality (F)
2025	15,143	26,543	23,713	0.534
2026	19,397	19,794	15,180	0.339
2027	-	20,575	13,963	-



Probability of exceeding F_{ref}	25%	50%	75%
2026 catch advice	2,480 mt	3,170 mt	3,850 mt

Technical Science Coordination Meeting

EGB and GB Haddock Models – Key Outputs

Model	Parameter	2024 Value	2025 Value	2026 Value
DFO EGB Haddock Model Values (terminal year of data = 2024)	SSB (mt)	27,342	23,713	15,180
	F	0.311	0.534	0.339
	Catch (mt)	6,219	7,410	2,480–3,850 ¹
NMFS GB Haddock 2024 Model Values (terminal year of data = 2023)	SSB (mt)	34,180 (14,038 - 83,225)	34,516 (10,532 - 113,116)	36,029 (8,534 - 152,117)
	F ₅₋₇	0.316 (0.116 - 0.859)	0.264	0.264
	Catch (mt)	9,627	8,034 (2,430 - 26,570)	8,177 (1,956 - 34,188)
	Apportioned catch (mt) in EGB for 2026			6,133

Technical Science Coordination Meeting

EGB and GB Haddock Models - Comparison

- Spatial footprint
 - Drives different survey data inputs – DFO survey not able to be used in some years by GB model due to insufficient coverage of GB footprint
- Scaling
 - Inclusion of 2024 data in EGB model resulted in lower estimates of 2020 and 2021 year classes and lower overall SSB than previous EGB model
 - EGB model estimates higher M in recent years than the constant M assumed in GB model
 - GB model accounts for natural variability in numbers-at-age
 - M and numbers-at-age variability combine to impact fish survivorship and scaling differences between models
 - Implementation of log-normal adjustment differs between models

Technical Science Coordination Meeting

EGB and GB Haddock Models - Comparison

- Projections
 - Different projection assumptions layer on top of model scaling differences
 - EGB projections have higher M
 - Different selectivity patterns between models in projections
 - Inherent highly variable recruitment of haddock adds projection uncertainty
- Catch outputs reported
 - EGB catch range is risk of exceeding F_{ref} (based on F40% SPR, proxy for F_{msy})
 - GB catch is also based on F40%, and range is uncertainty

Technical Science Coordination Meeting

EGB and GB Haddock Models – Key Differences

- Scaling - Inclusion of 2024 data drives lower SSB estimates for EGB
 - Likely influences scale differences between EGB (lower) and GB (higher) models
- Scaling – M
 - EGB model estimates higher M in recent years
 - GB model assumes lower constant M
 - Interactions with random effects on numbers-at-age complicate interpretation

Q&A



NOAA
FISHERIES

Northeast
Fisheries Science
Center

2024 Georges Bank Cod Assessment Summary

U.S.-Canada Technical Science Coordination Meeting
July 16, 2025

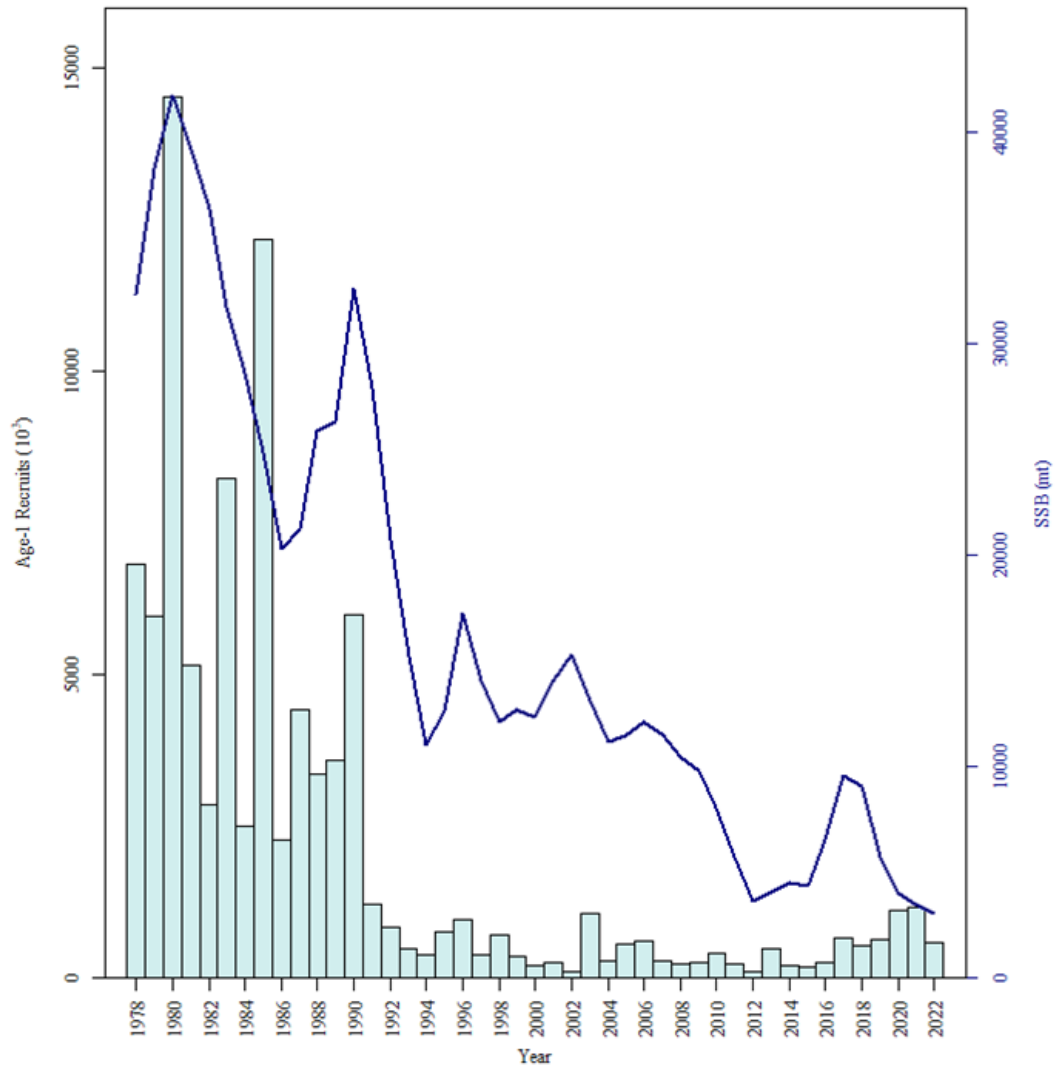
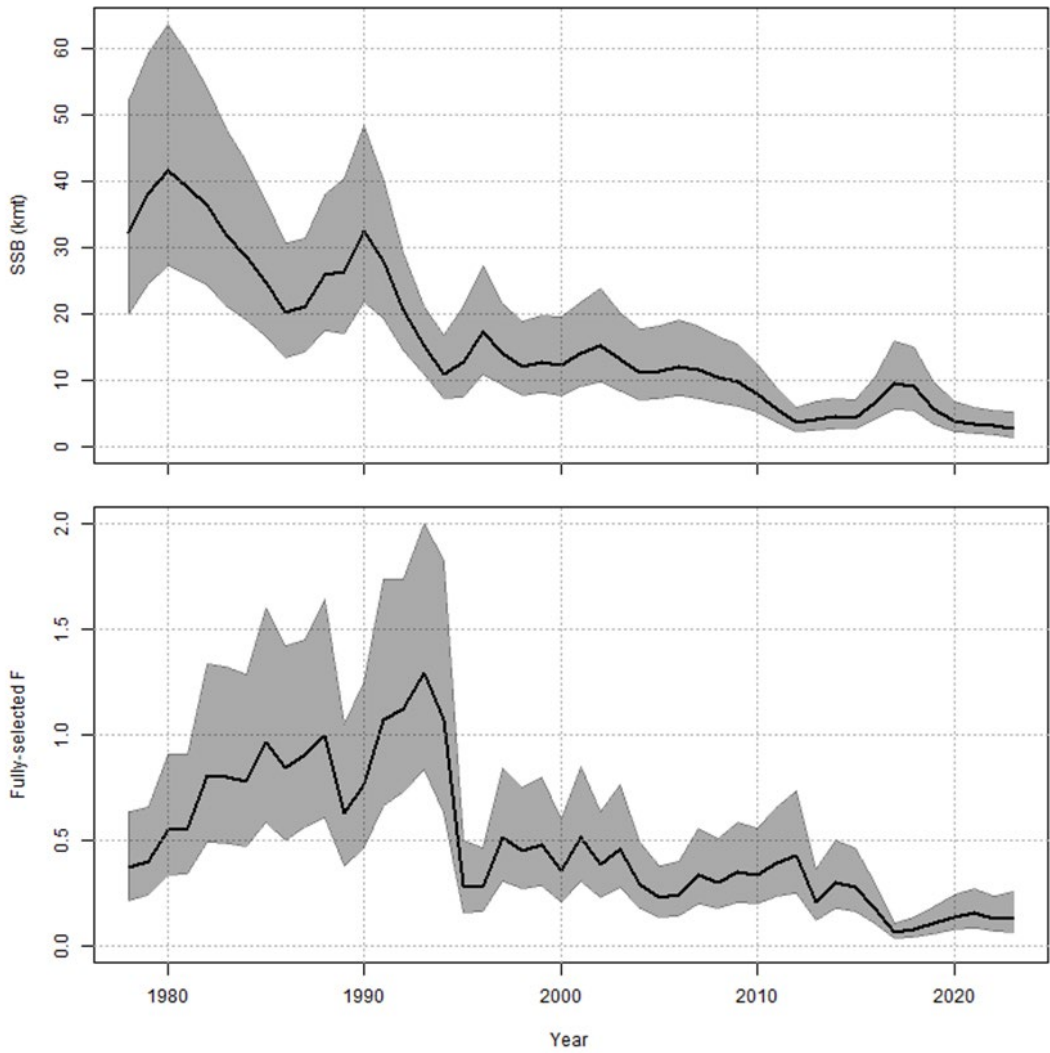
Assessment Background

- Model platform = Woods Hole Assessment Model (WHAM)
- Current model was developed via a Research Track (RT) Assessment, peer reviewed in 2023
- The 2024 Management Track (MT) Assessment was the first MT assessment following the 2023 Research track
- Data updated through 2023



Assessment Model Results

2023 SSB	2,668 mt
2023 F	0.13
2023 R	605 (000s)



2024 Stock status and reference points

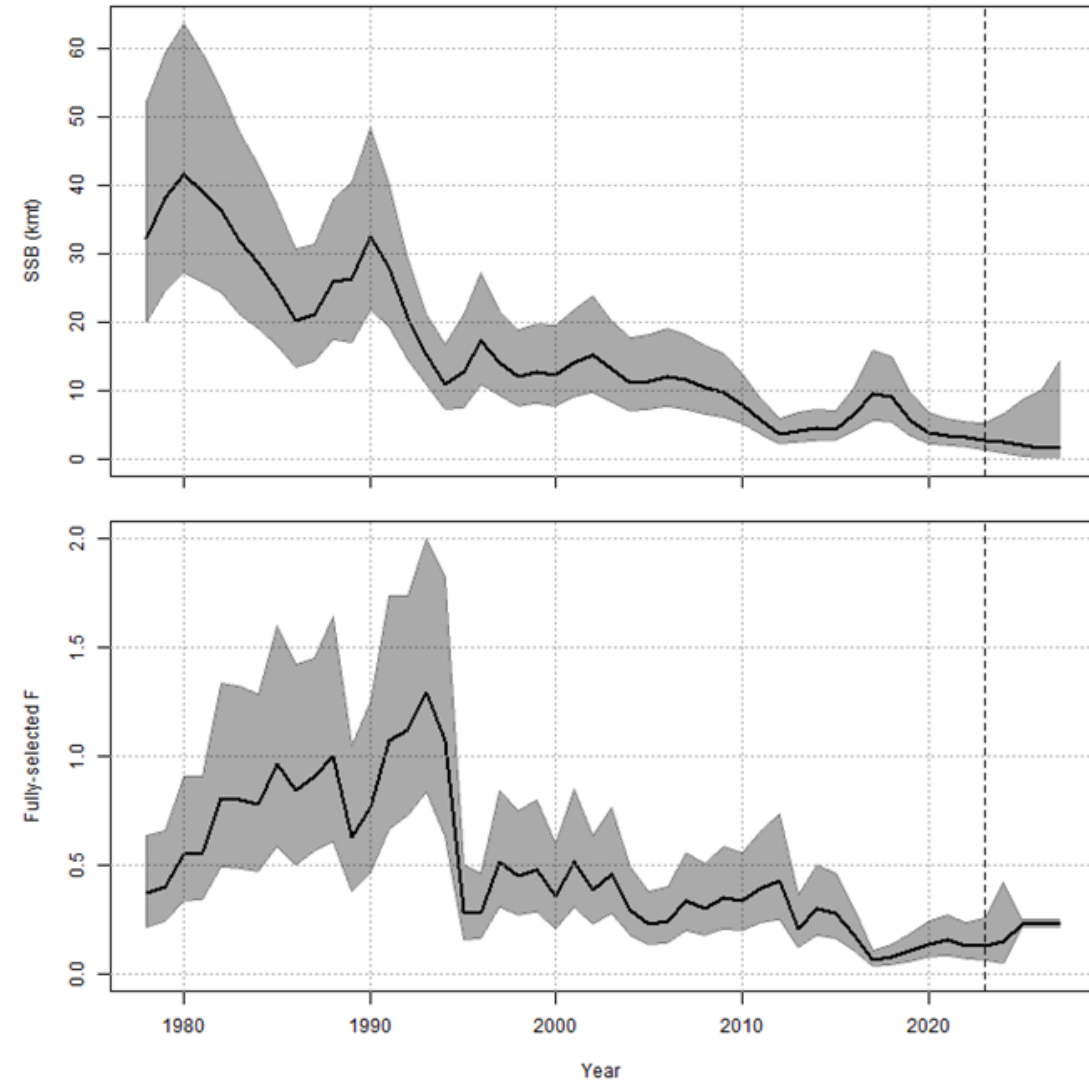
- Stock has a high probability of being overfished (2023 SSB estimate of 2668 mt is 32% of SSB msy proxy)
- Overfishing is not occurring (2023 F estimate of 0.13 is 56% of Fmsy proxy)

BRP	2024 MT estimate
Fmsy proxy	0.23 (0.22 – 0.25)
SSBmsy proxy (mt)	8290 (4678 – 14690)
Mean recruits (age 1, 000s)	2224
Median recruits (age 1, 000s)	646

2024 Short-term projections

	Year	Catch (mt)	SSB (mt)	F _{full}
Interim	2024	417	2486 (929 – 6653)	0.152
Projection	2025	518	2089 (499 – 8739)	0.233
	2026	419	1658 (277 – 9937)	0.233
	2027	400	1567 (170 – 14457)	0.233

- Interim 2024 catch assumed to be equal to 2023 catch based on PDT recommendation
- 2025-2027 projected at F_{msy} proxy = F_{40%}



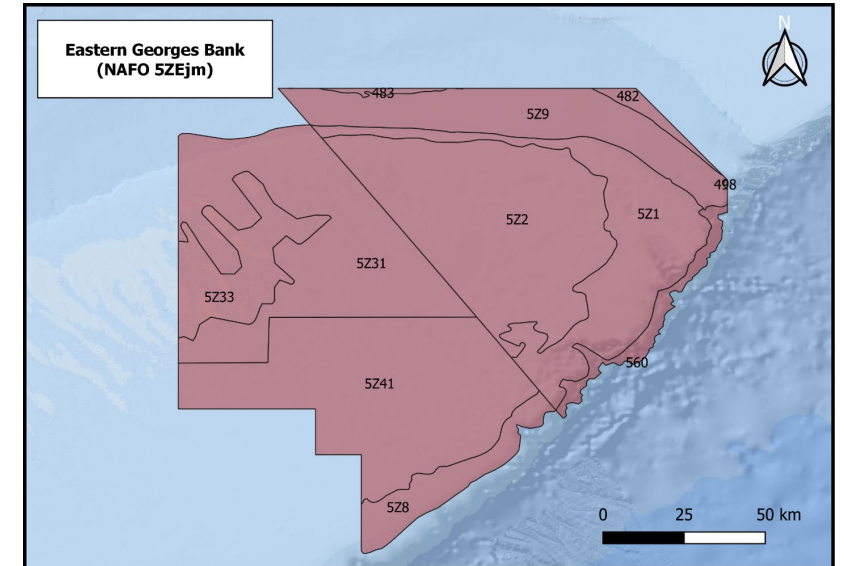


Eastern Georges Bank (5Zjm) Cod Assessment Summary



Overview

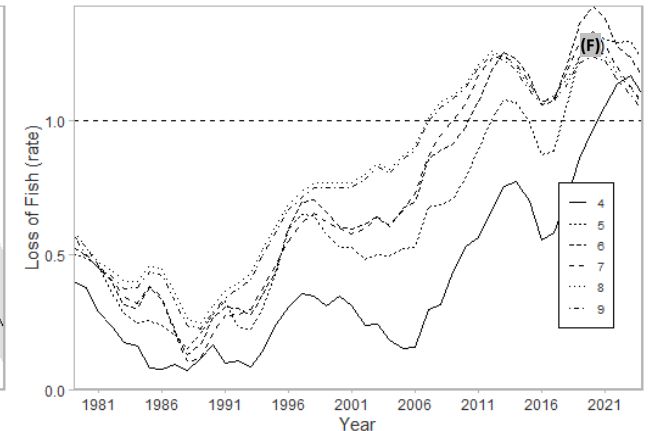
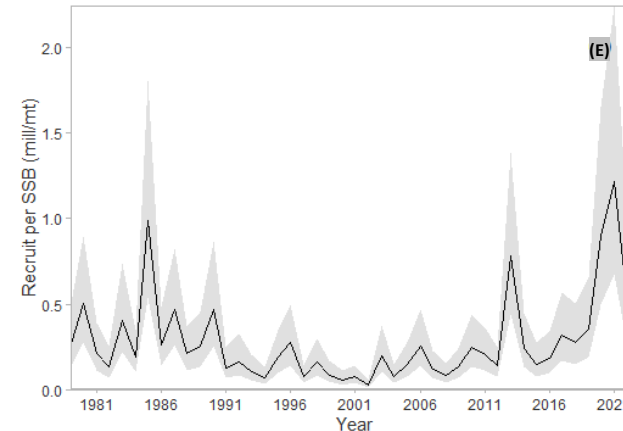
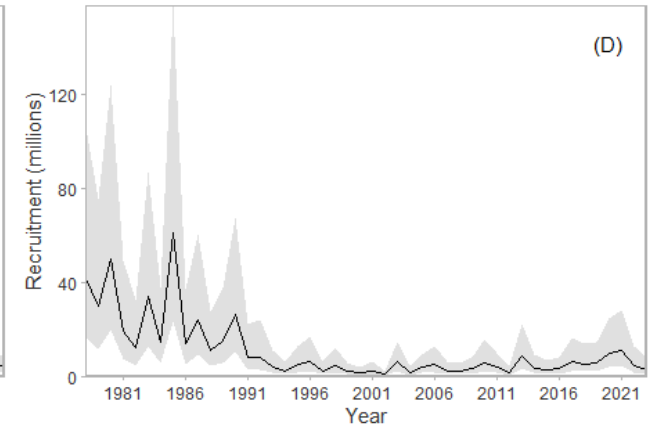
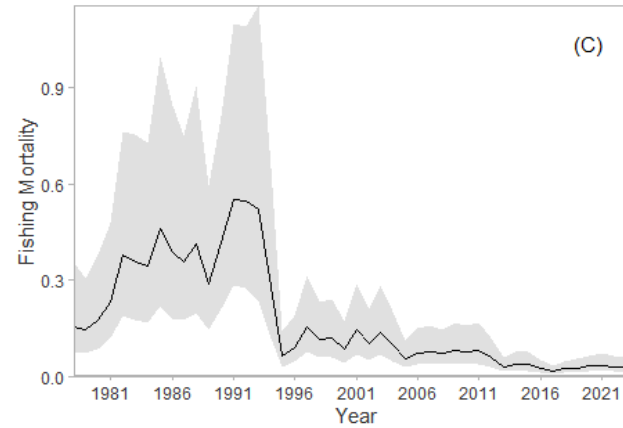
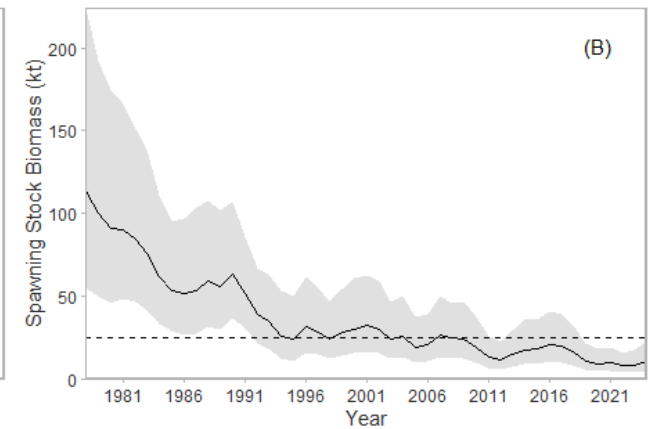
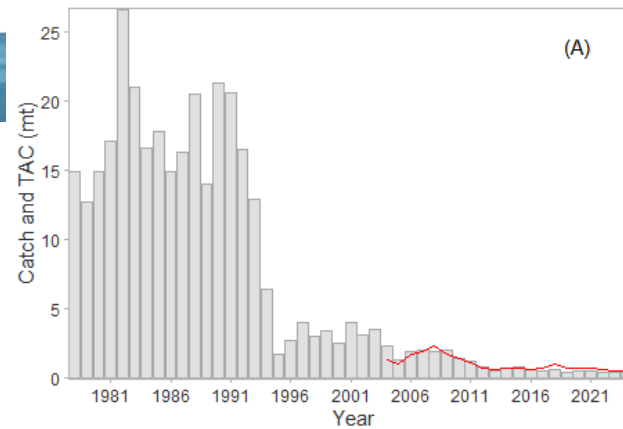
- **Canadian Framework for EGB Cod completed in May 2025: EGB.**
- **Assessment (application of Framework) in June 2025. Since previous assessment:**
 - Updated data to 2024 and projections 2025+.
 - Included deepwater stratum within EGB management area from DFO survey (5Z9); helps account for movement within EGB.
 - Filled in previously missing 2022 DFO Survey year.
 - Missing US Catch Composition since 2020.
- **PA-compliant limit reference point accepted. Biological basis provided for an upper stock reference – acceptance requires further consultation with stakeholders (in process).**
- **Next assessment in Spring/Summer 2026.**
- **Future recommendation around estimating Natural Mortality, application of Conversion Factors, improved accounting for fish movement and US fishery assumptions.**





Model Results

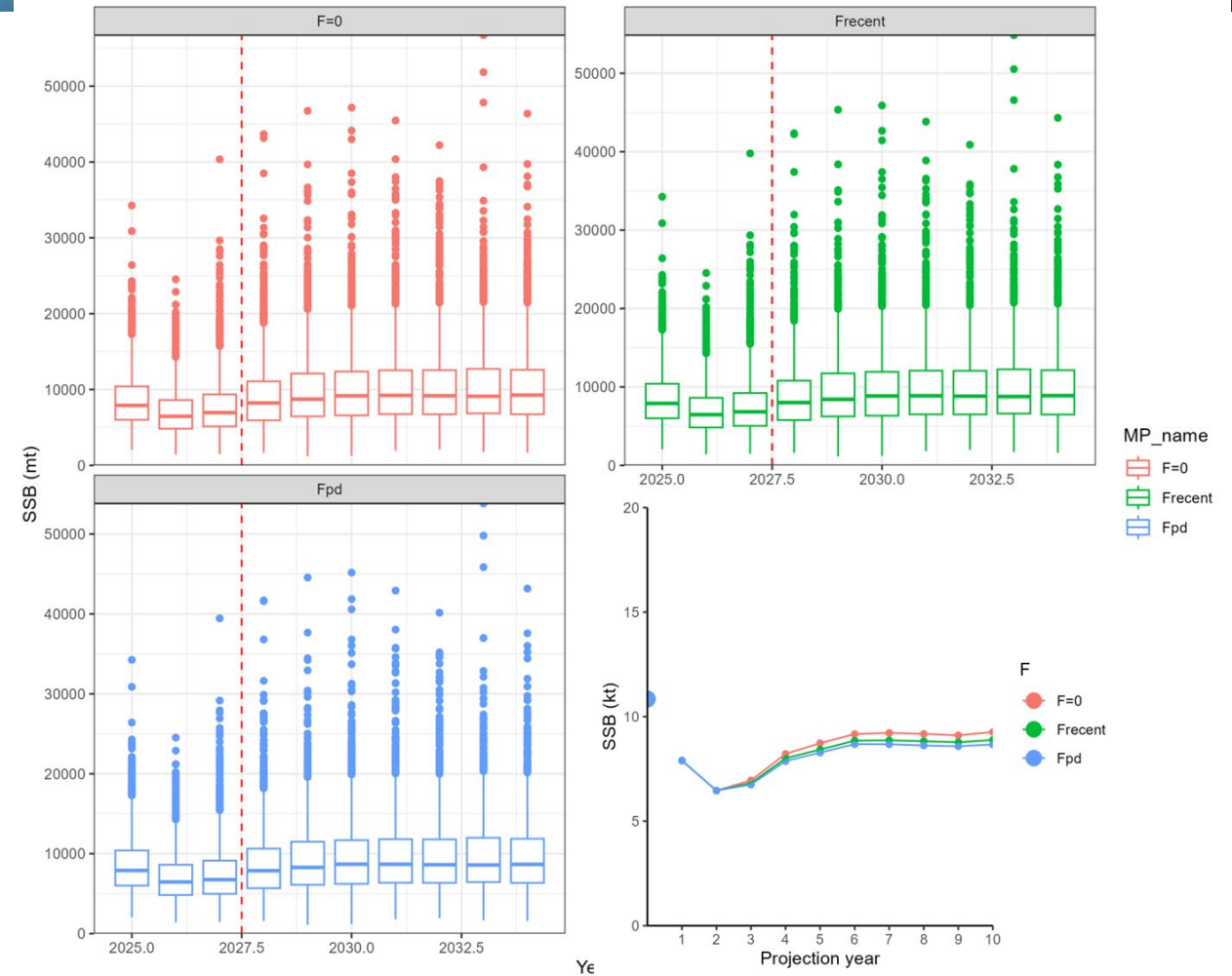
- 2024 SSB (10.9kt) is below the LRP, placing the stock in the Critical Zone with a very high probability (>98%; (B)).
- Fishing mortality has remained below 0.05 since 2017; 2024 estimate is 0.03 (C).
- Higher recent recruitments (2020, 2021) at low biomass levels have resulted in highest Recruits per SSB since 1978. Unfortunately, this is not resulting in sustained increases in number of fish at ages 3+ (D and E).
- Loss of ages 4+ fish continues to be high, with Natural Mortality inferred to be the primary cause (F).





Projections

- Conditions in the terminal six years expected to persist in future (Weight at Age, Recruitment, Natural Mortality & Process Error).
- Projected under three fishing scenarios (Fpd, Frecent and F0) for 2025+.
 - Fpd: Maximum F associated with a very low probability (<5%) of preventable decline (decline relative to F=0 scenario) within two generations.
 - Frecent: average F over terminal six years.





Projection Outputs and Advice

- High number of adult fish are disappearing from this stock, and this disappearance is attributed primarily to natural mortality. Projections assume rate of disappearance observed in terminal six years persists in the future. This disappearance of fish appears to be the main factor limiting the productivity of the stock.
- Long-term projections indicate that stock status is unlikely to improve under current productivity dynamics, even in the absence of fishing.
- Stock outlook is not expected to change in the future unless productivity improves.
- Advice provided as F_{pd} ($F_{preventable}$ decline), with F_{recent} and $F=0$ as context.

F Scenario	SSB (mt) 2026	Catch (mt) 2026	F 2026	SSB (mt) 2027	Probability of Preventable Decline (after 2 gen)
F_{pd}	6,462	473	0.052	6,749	4.95%
F_{recent}	6,462	300	0.031	6,830	4.75%
No Fishing	6,462	0	0.000	6,949	0%

Technical Science Coordination Meeting

EGB and GB Cod Models – Key Outputs

Model	Parameter	2024 Value	2025 Value	2026 Value
DFO EGB Cod Model Values (terminal year of data = 2024)	SSB (mt)	10,900	7,899	6,462
	F	<i>0.030</i>	<i>0.041</i>	0.052
	Catch (mt)	<i>378</i>	<i>452</i>	473
NMFS GB Cod 2024 Model Values (terminal year of data = 2023)	SSB (mt)	2,486 (929 – 6,653)	2,089 (499 – 8,739)	1,658 (277 – 9,937)
	F	<i>0.152</i>	0.233	0.233
	Catch (mt)	<i>417</i>	518	419
	Apportioned catch (mt) in EGB for 2026			419

Technical Science Coordination Meeting

EGB and GB Cod Models - Comparison

- Spatial footprint
 - DFO explored similarly structured EGB and exploratory GB cod models
 - In both models, the bulk of cod biomass was in EGB but fishing pressure was different in GB
 - SSB for EGB was greater than SSB for GB in those similarly structured models
 - Differences in scale between EGB and GB models likely influenced by footprint
- Scaling
 - Spatial footprint effects
 - Differences in M assumptions
 - Differences in model structure in terms of addressing data gaps

Technical Science Coordination Meeting

EGB and GB Cod Models - Comparison

- Projections
 - Different projection assumptions layer on top of model scaling differences
 - Different recruitment stanzas
 - Differences in random effect implementation and propagation into projections
- Catch outputs reported
 - EGB catch estimated based on the F of preventable decline (F with <5% probability of decline relative to F=0 scenario within 2 generations)
 - GB catch estimated based on F_{msy} , and then apportioned to EGB

Technical Science Coordination Meeting

EGB and GB Cod Models – Key Differences

- Spatial footprints
 - Different dynamics being modeled
 - Evidence of directional difference in scale of SSB between EGB (higher) and GB (lower) models based on Canadian exploratory models
- Catch outputs reported
 - EGB catch output based on F of preventable decline (lower F)
 - GB catch output based on F of maximum sustainable yield (higher F)

Q&A