Preliminary assessment of BSAI Greenland turbot

Meaghan D. Bryan and Alberto Rovellini
September 2025

Outline

- Reminder of last year's model assumptions and data inputs and where we left off in 2024
- Describe data and model changes based on SSC/PT comments and good practices
- Model with a later start year (PT and SSC request)
- BRDs (SSC request)

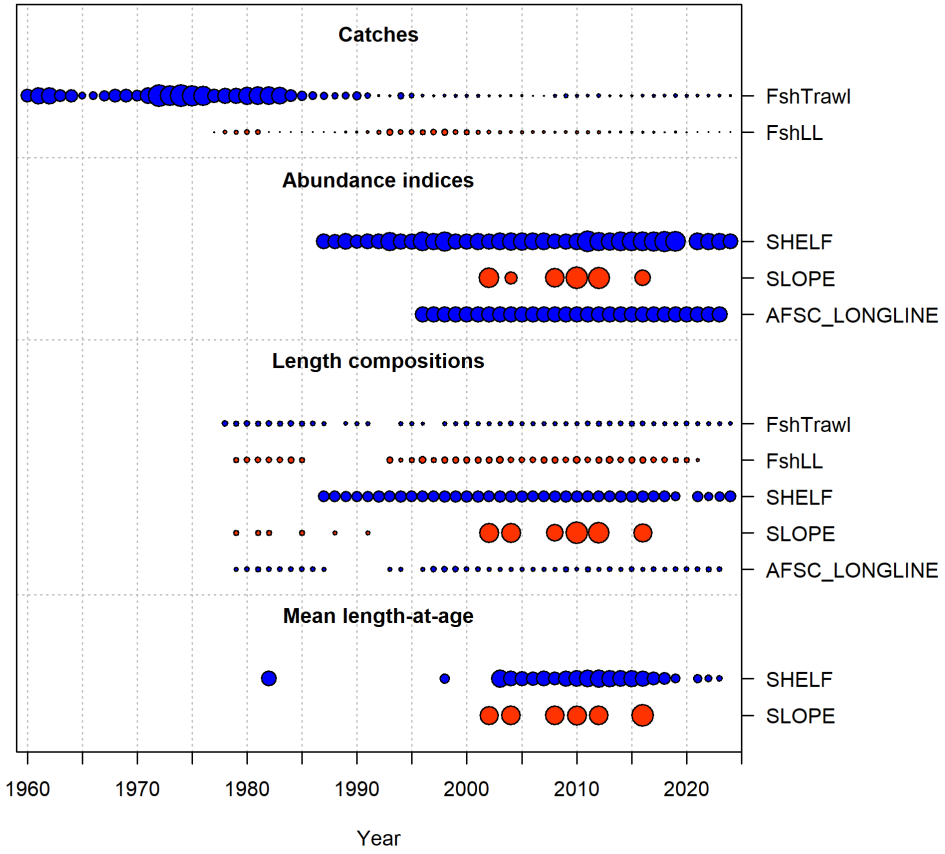
2024 model

- Sex-specific model
- Start year: 1945
- von Bertalanffy growth estimated
  - CV associated with young and old fish fixed (15% and 9%)
- Natural mortality fixed and assumed the same for females and males (Cooper et al. 2007)
- Maturity at age externally estimated (D'yakov 1982)
- Stock-recruitment relationship (Beverton – Holt)
  - sigmaR – 0.6
  - Steepness (h) – 0.79 (Myers et al. 1999)
  - R0 and autocorrelation estimated
    - SS3 developers recommend not estimating autocorrelation
  - Recruitment deviations estimated
    - Early (1945-1970)
    - Main (1970 – 2018)
    - Late (2019-2022)

General model setup

- Survey catchability
  - EBS bottom trawl surveys - catchability not estimated
    - Fixed estimates from a 2015 model run
      - Did not include the bottom trawl survey data from 2007-2015
    - Concern that approach is using the data twice (CIE review)
  - AFSC longline survey estimated
- Selectivity
  - AFSC longline survey
    - Logistic
    - Not sex-specific – prior to 2021 sex not identified when measuring lengths
  - All other fleets
    - Double normal pattern
    - Sex - specific
    - Time blocks

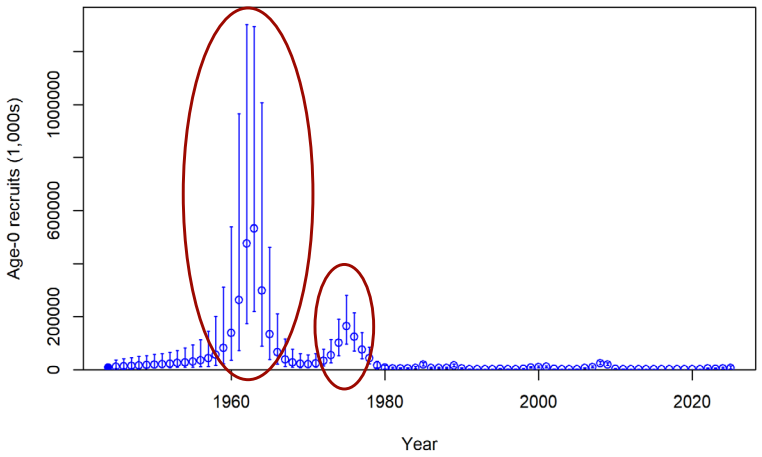
Data

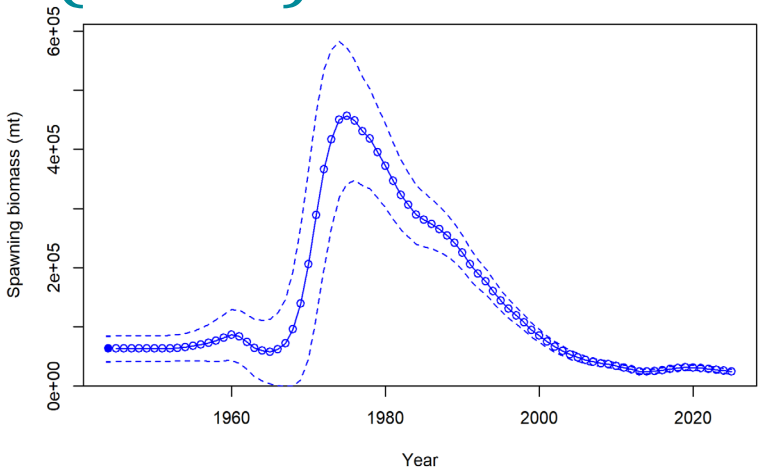


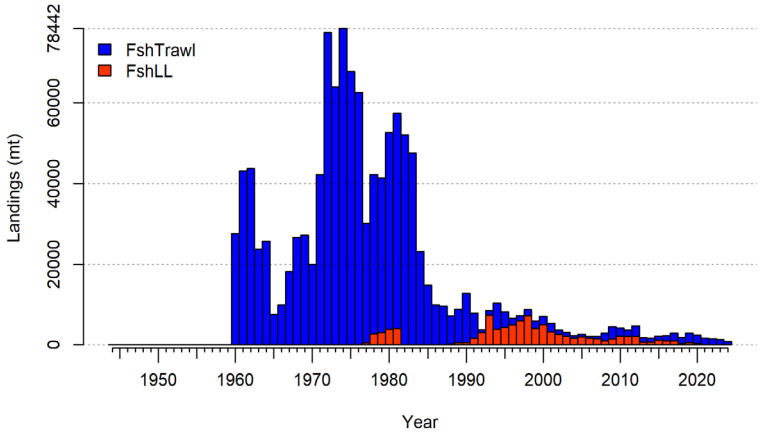
- Length comp ISS
  - 50 fishery fleets
  - 200 EBS shelf survey
  - 25 (pre-2002) and 400 (2002-) EBS slope survey
  - 60 AFSC longline
- Variance adjustment
  - 0.25 for Trawl fleet and shelf survey
  - 0.5 for Longline fleet, slope and AFSC longline survey

NOAA FISHERIES

Where we left off in 2024 (16.4c)







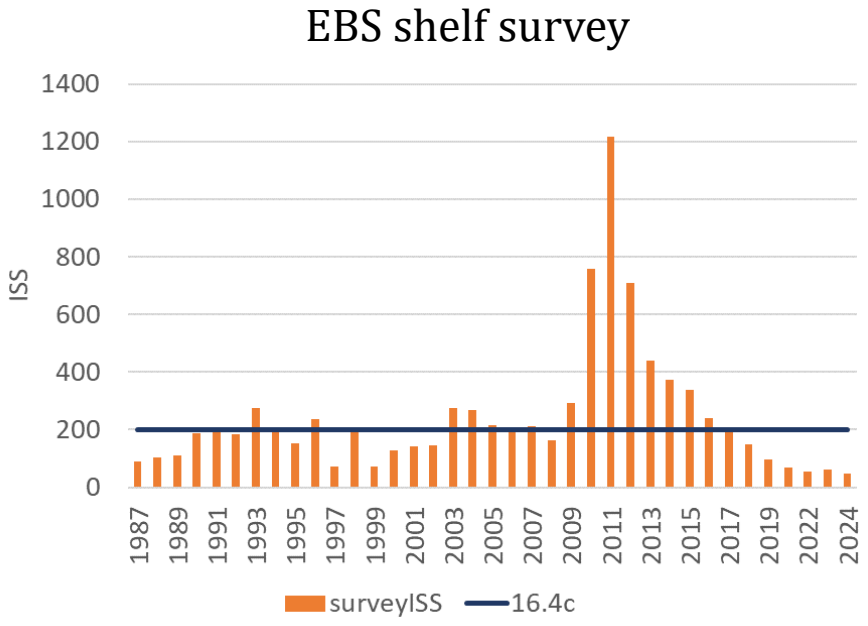
- Early recruitment estimates are much larger than what has been observed in years we have data
  - Model needs to create biomass to support large catches in 1970s and 1980s
- Represents a initially small, productive stock
- Can the data discriminate between this hypothesis and one where population is larger and less productive?

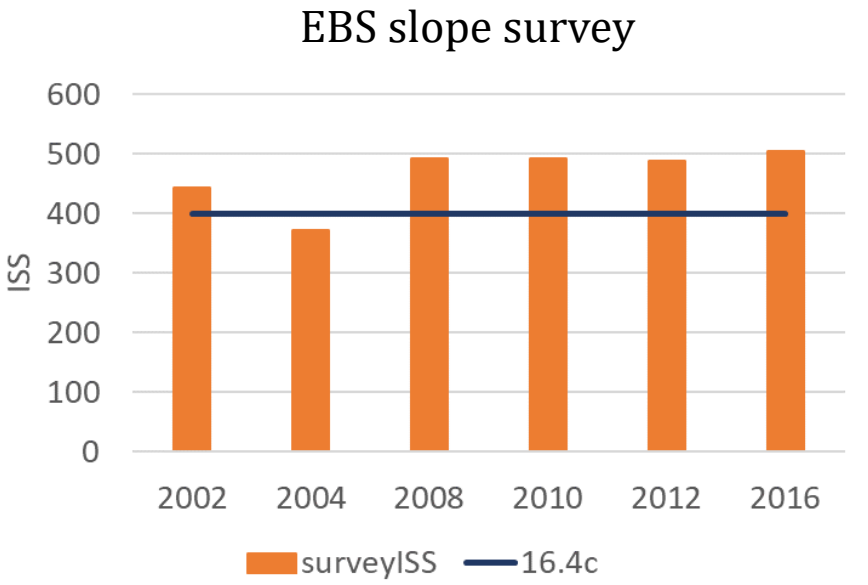
Data and model updates

- Data updates had a negligible influence on the assessment outcomes (in report)
  - Includes the linear interpolated AFSC longline RPNs (SSC and PT recommendation)
- Several cumulative changes to the model were made following good practices:
  1. Bottom trawl input sample size (surveyISS package) (25.1)
  2. Fixing the stock-recruitment autocorrelation parameter (25.2)
  3. Analytical solution in SS3 for survey catchability (25.3)
- Building off the above
  - Model start year (25.4 and 25.5)

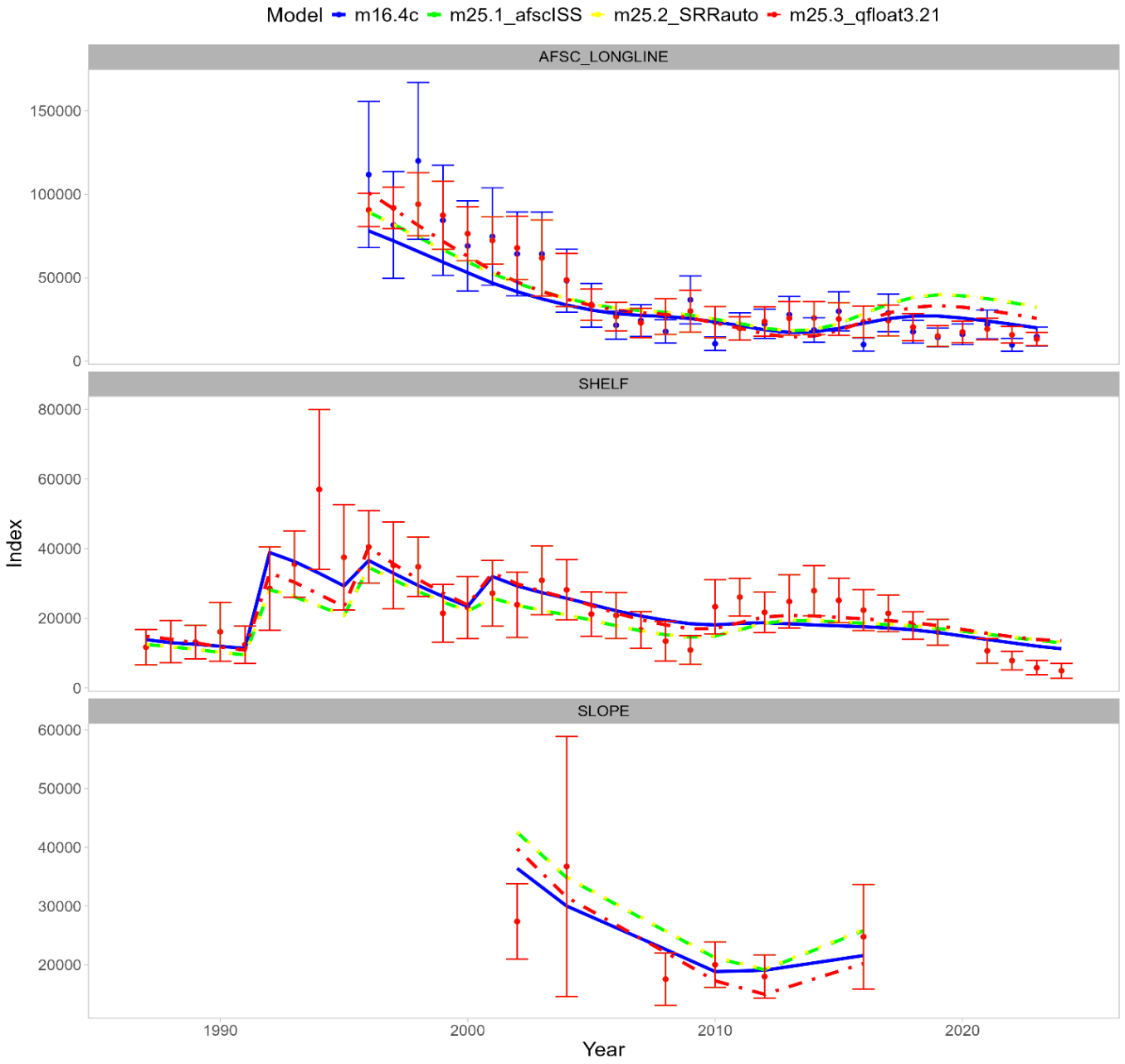
Data and model updates

- Length comp ISS in 16.4c
  - 50 fishery fleets
  - 200 EBS shelf survey
  - 25 (pre-2002) and 400 (2002-) EBS slope survey
  - 60 AFSC longline
- Bottom trawl input sample size (25.1)
  - surveyISS Rpackage (Williams and Hulson)
    - Average of 240 for shelf survey
    - Average 470 for slope survey





Models 25.1 – 25.3: Fits to indices



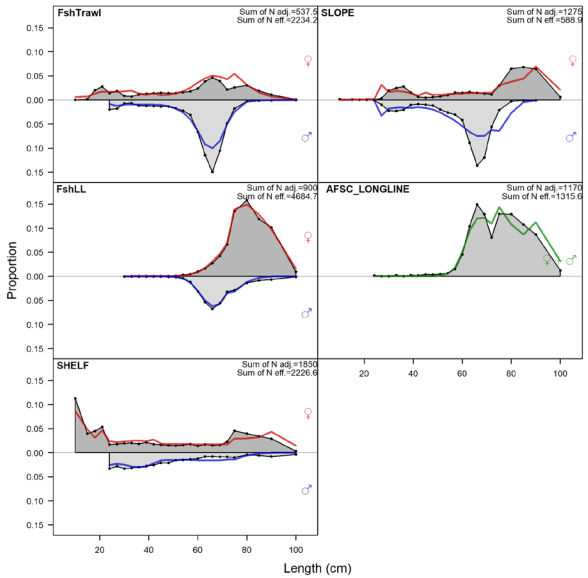
Models

- 16.4c
- 25.1
- 25.2
- 25.3

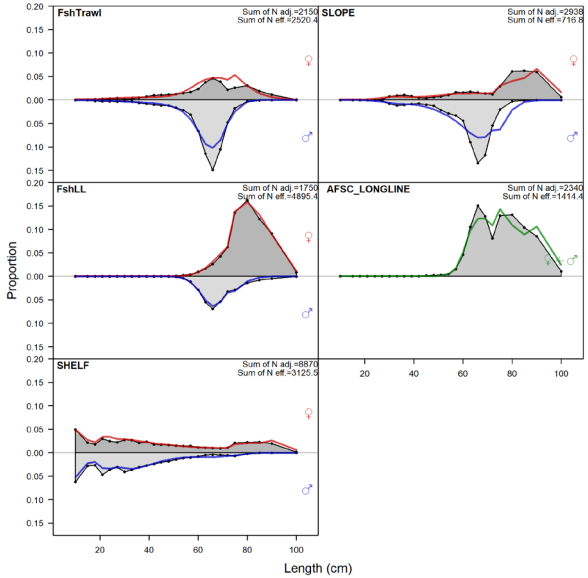
NOAA FISHERIES

Models 25.1 – 25.3: Aggregate fits to length comp

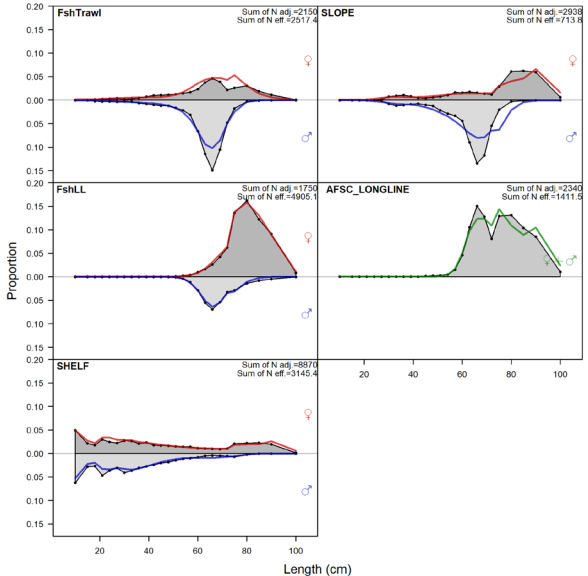
16.4c



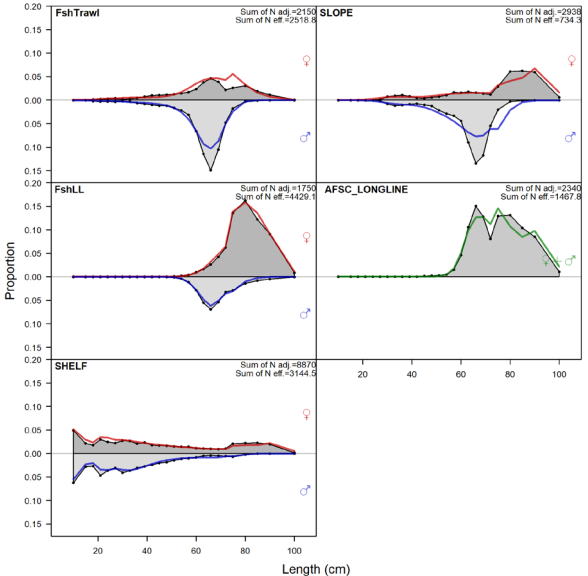
25.1



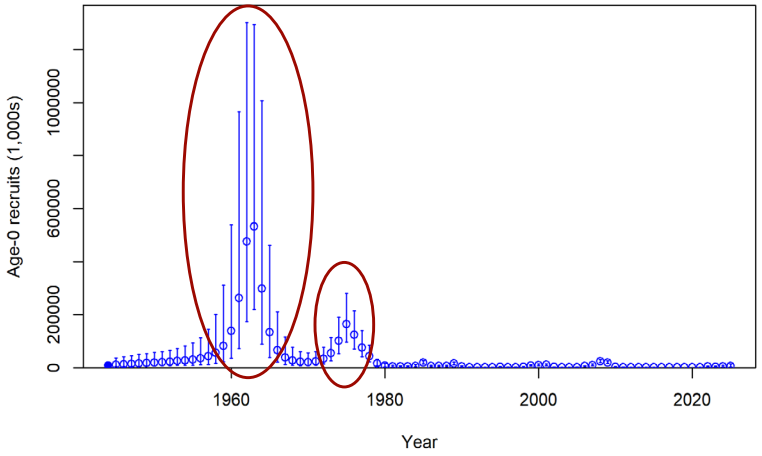
25.2

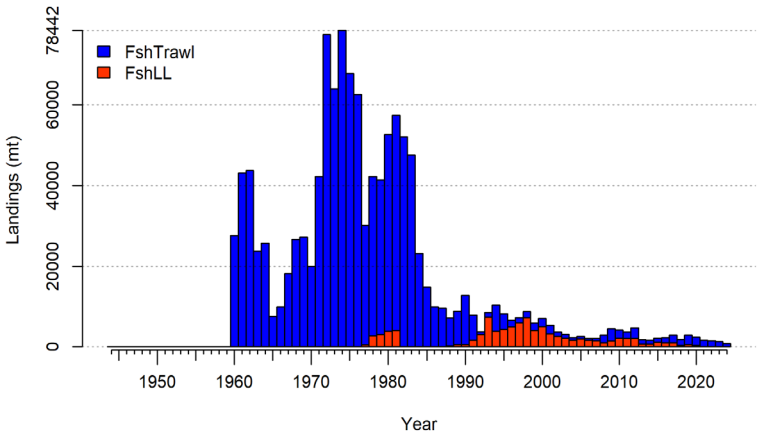


25.3



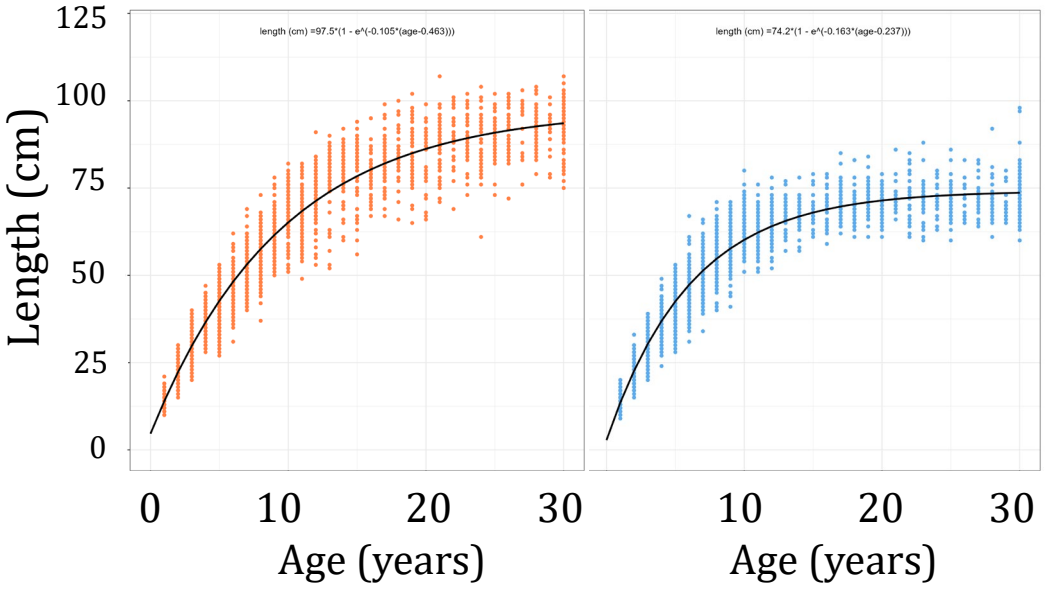
What is informing early recruitment estimates?

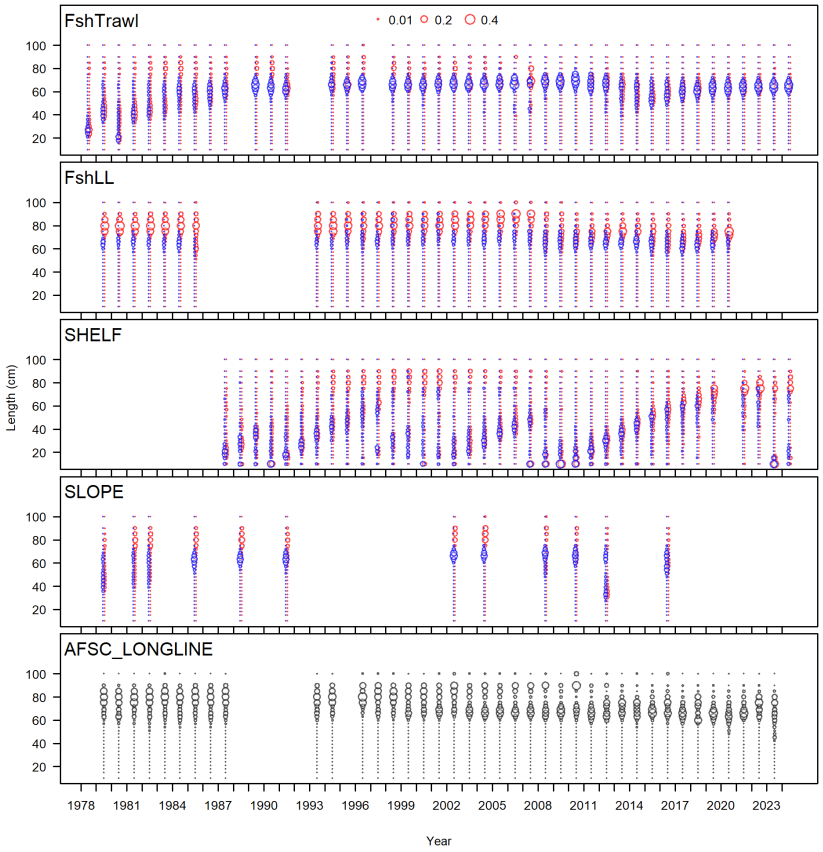




Source	Data	Years
NMFS bottom trawl surveys	Shelf lengths	1987-2024
	Slope survey lengths	1979, 1981-1982, 1985, 1988, 1991, 2002, 2004, 2008, 210, 2012, 2016
AFSC longline survey	Lengths	1979-1987, 1993-1994, 1996-2023
Fishery	Trawl lengths	1978-1991, 1994-1996,1998-2024
	Fixed gear lengths	1979-1985, 1993-2021

What is informing early recruitment?

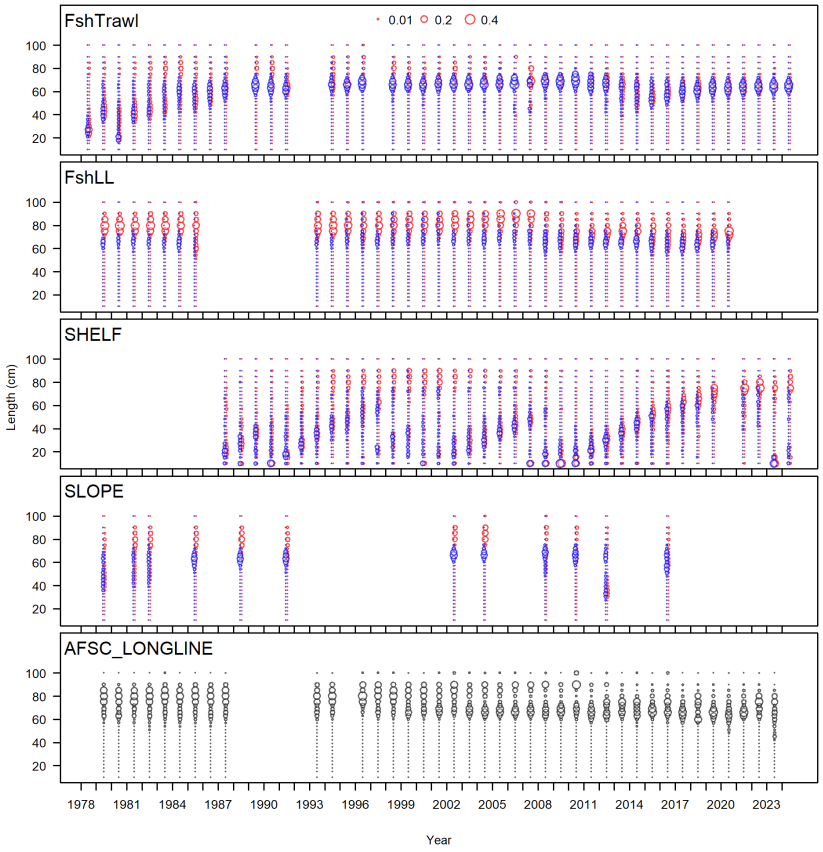




- Length data has limitations given:
  - Where growth curves asymptote and variability in length-at-age
  - Earliest years of data availability and the length classes the different sources of data capture

NOAA FISHERIES

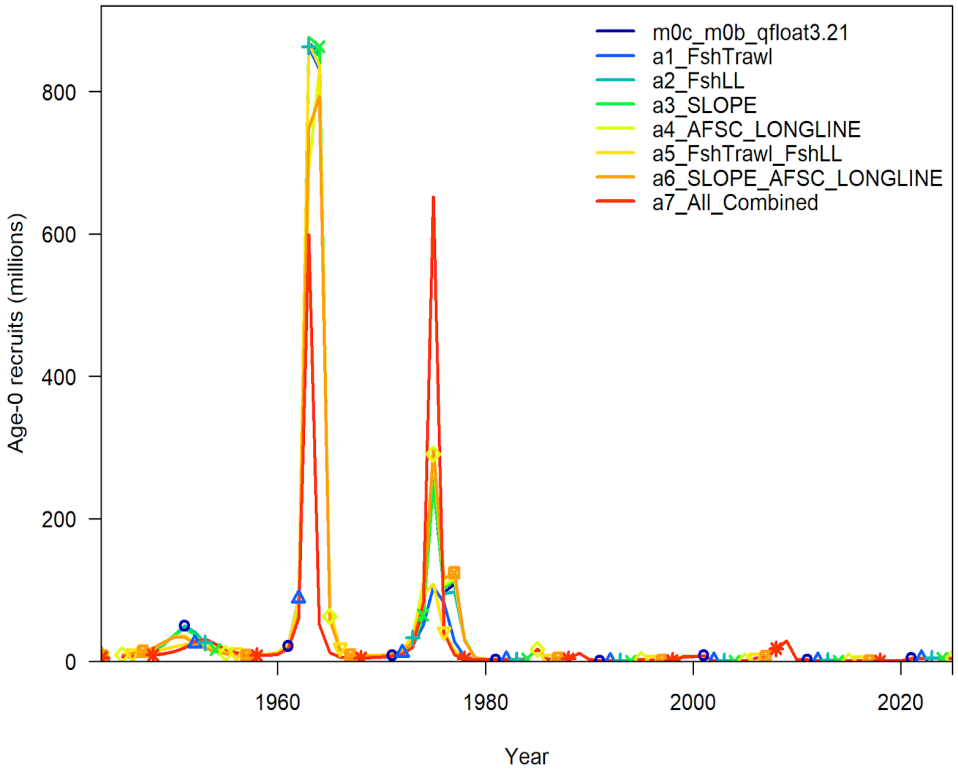
Iterative removal of length data



- Iteratively removed length composition data of individual sources and several combinations
  - Removed data from the first time block for each data source
    - ~pre-1990 for fisheries
    - Pre-2002 data for slope survey

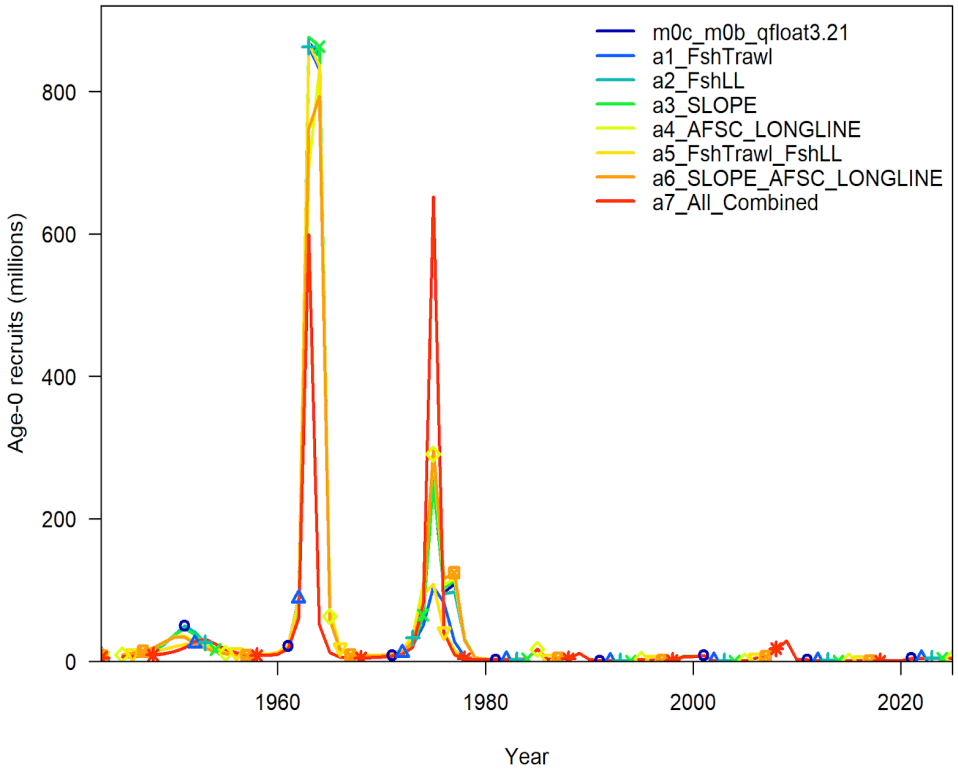
NOAA FISHERIES

Iterative removal of length data



- Iteratively removed length composition data of individual sources and several combinations
  - Removed data from the first time block for each data source
    - ~pre-1990 for fisheries
    - Pre-2002 data for slope survey
- 1960s peak: little movement with data removal
- 1970s peak: see some difference in estimate when data are removed

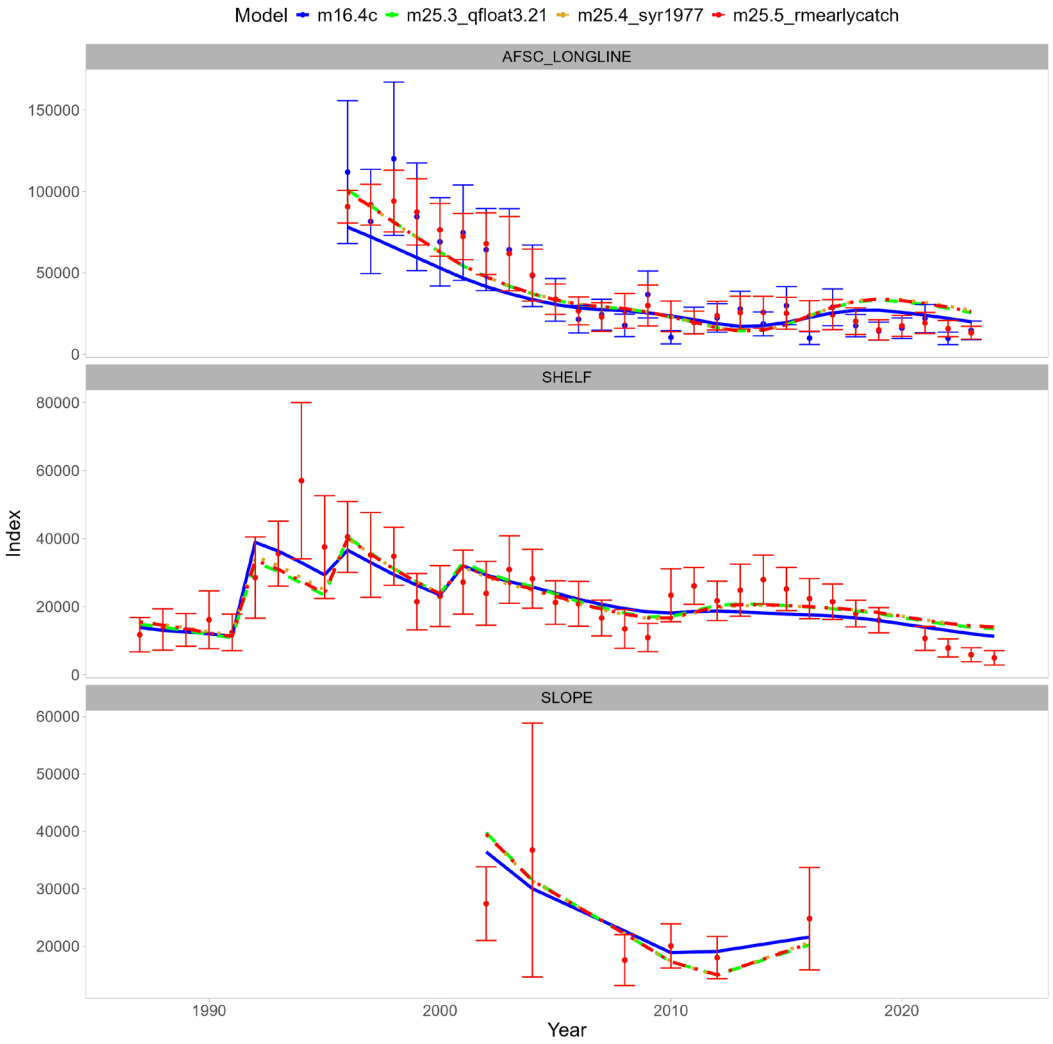
Models with later start year



- Start year in 1977
  - Given the results from the iterative removal of length comp, data should provide information about recruitment
  - Many models start in 1977 because of the regime shift
- Model 25.4
  - Equilibrium catch: average of 1960 – 1976 catch
  - Estimates initial F
- Model 25.5
  - Ignores equilibrium catch and fishing mortality
  - Assumes we are managing under a new regime

NOAA FISHERIES

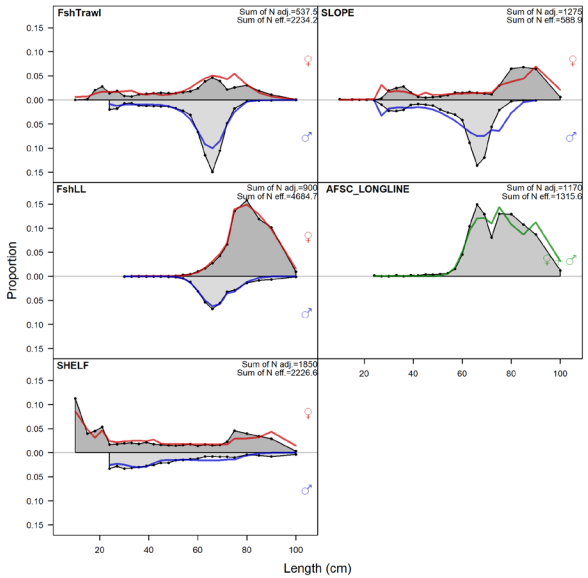
Fits to indices



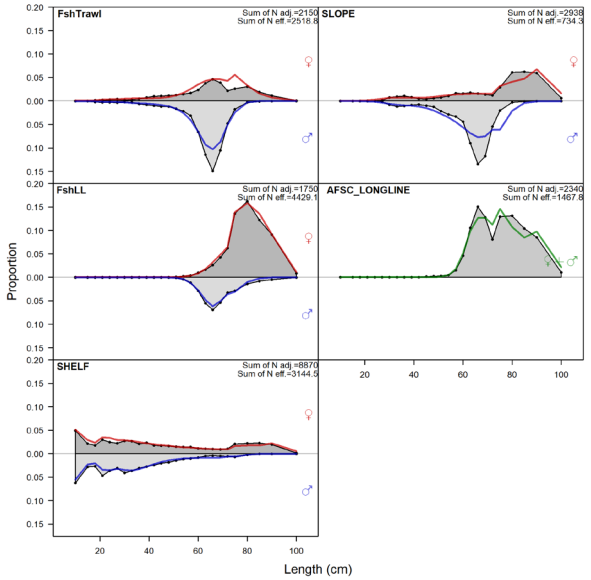
Model	Shelf q	Slope q	AFSC LL q
16.4c	0.62	0.57	2.4
25.3	1.22	0.70	3.29
25.4	1.20	0.76	3.77
25.5	1.20	0.70	3.47

Aggregate fits to length comp

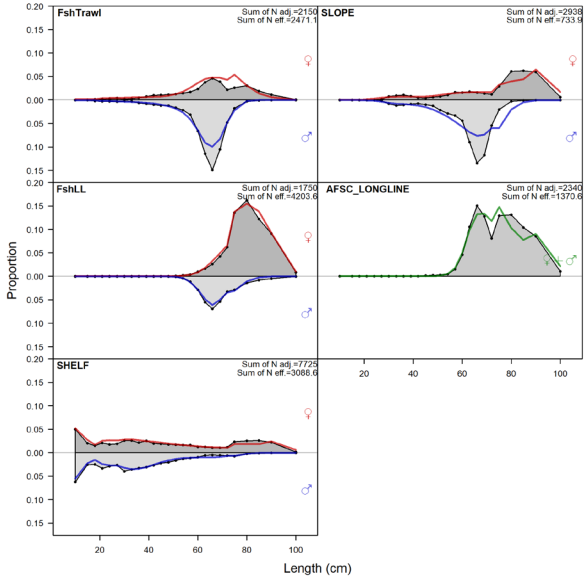
16.4c



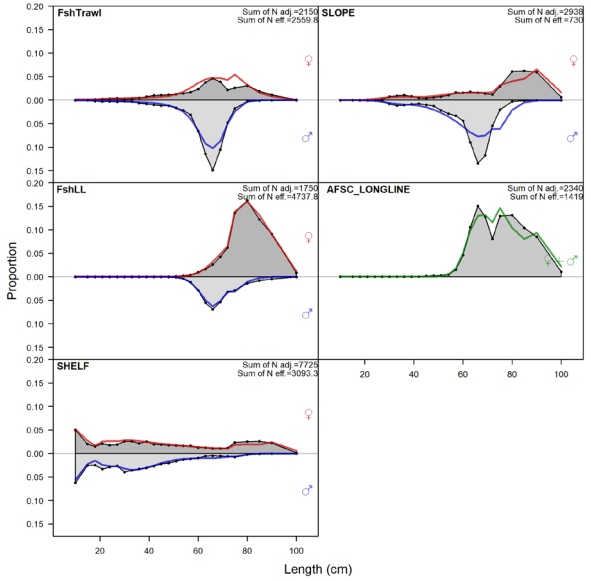
25.3



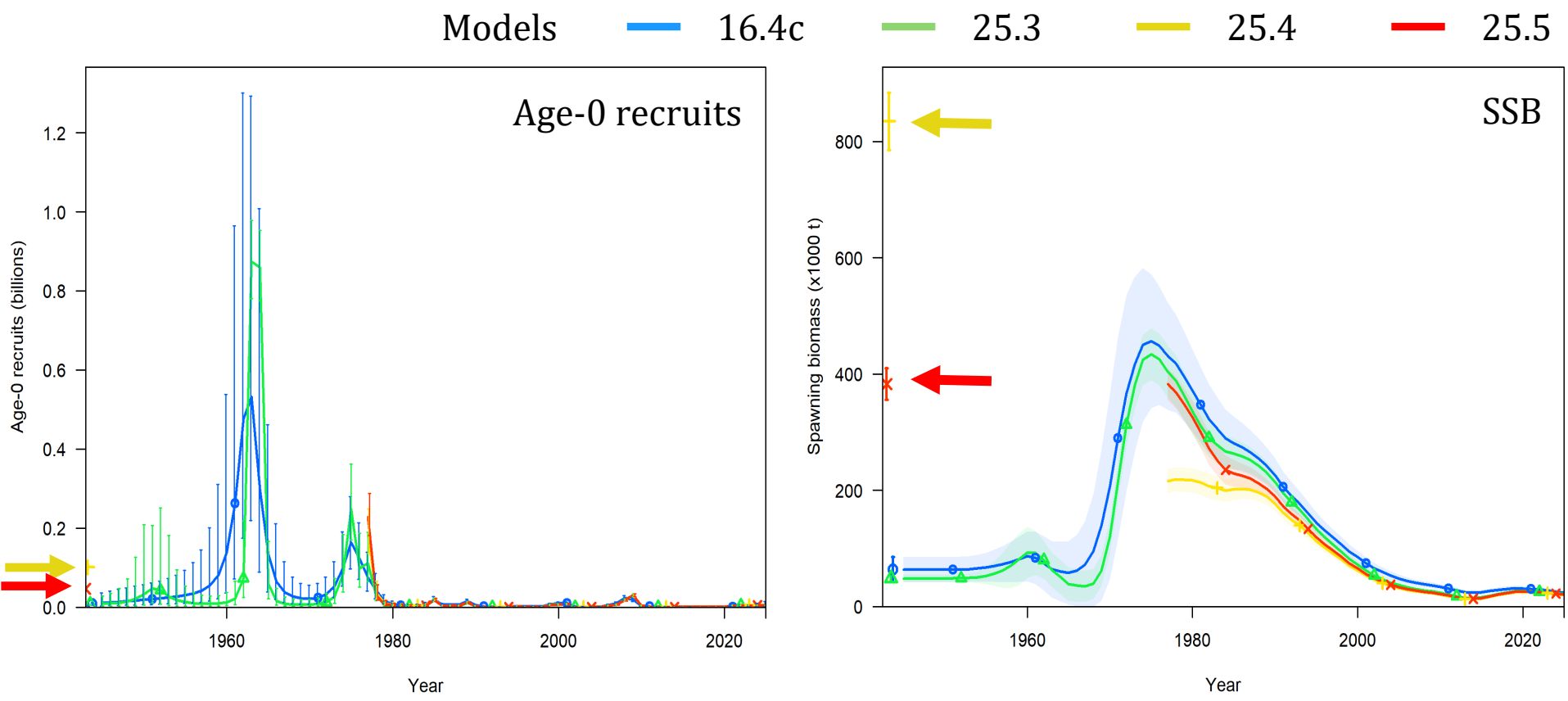
25.4



25.5

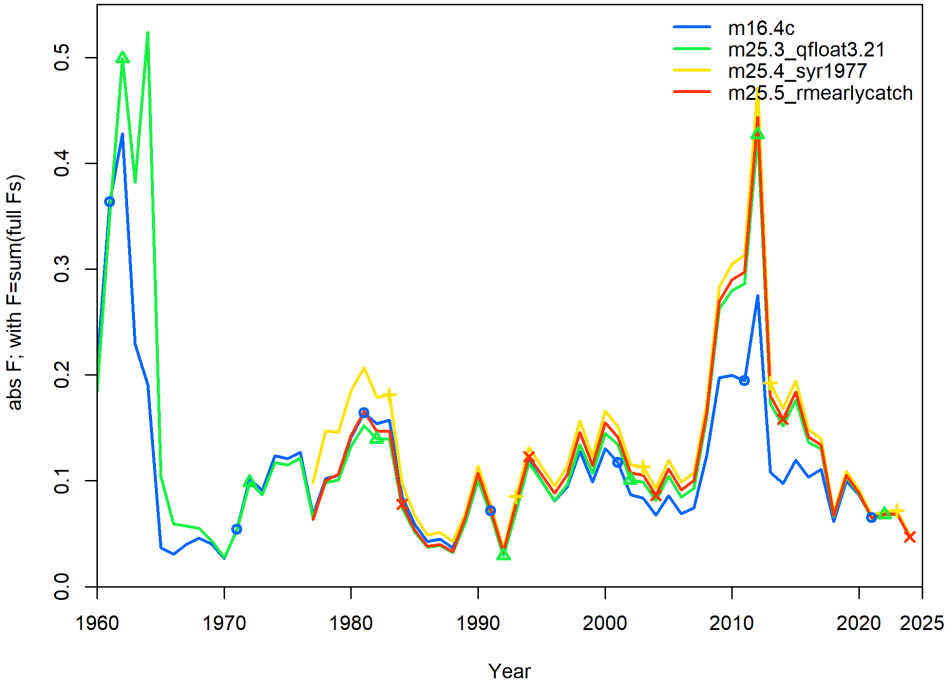


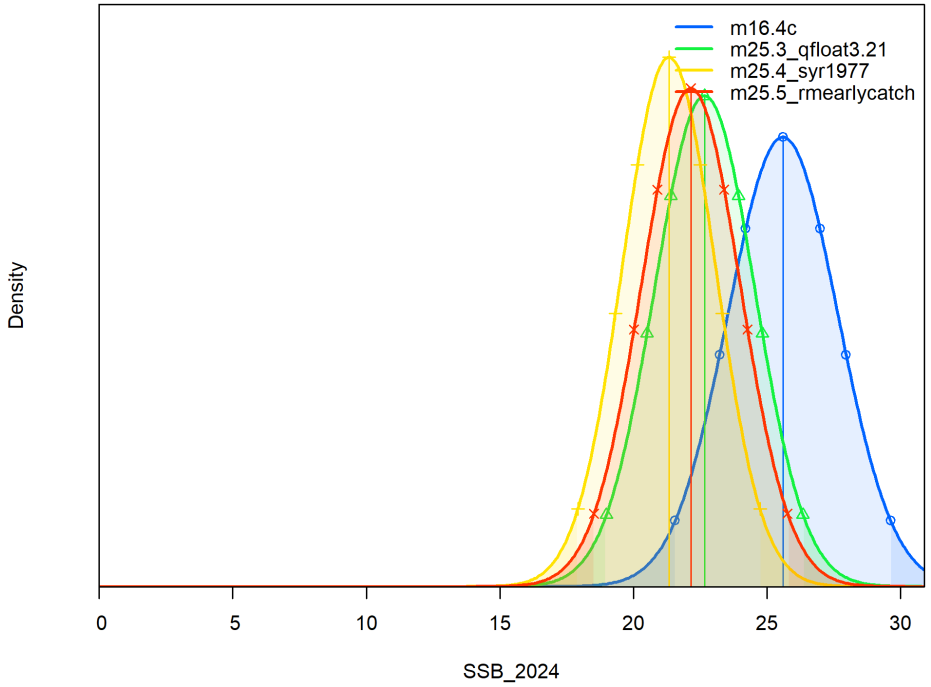
Derived quantities



Derived quantities

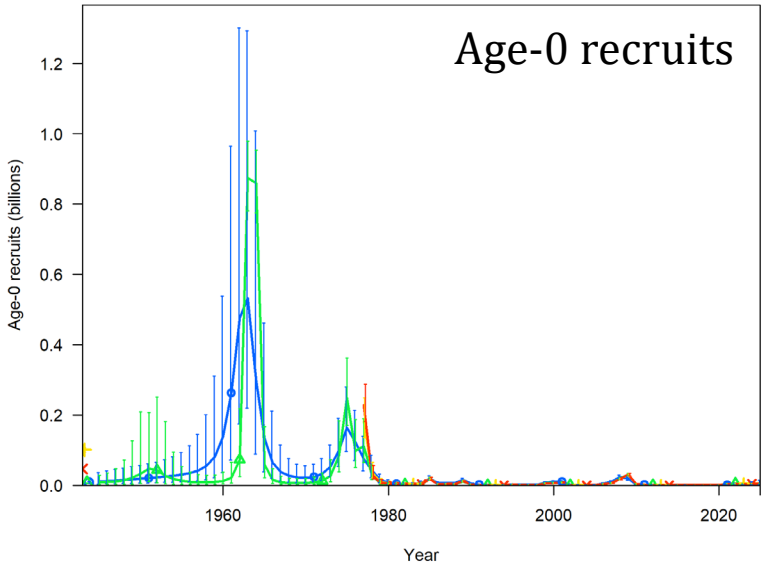
Models 16.4c 25.3 25.4 25.5

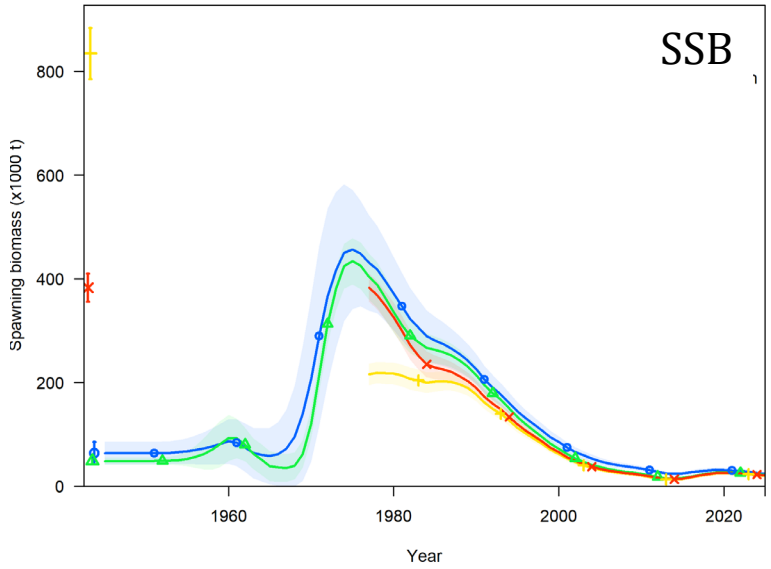


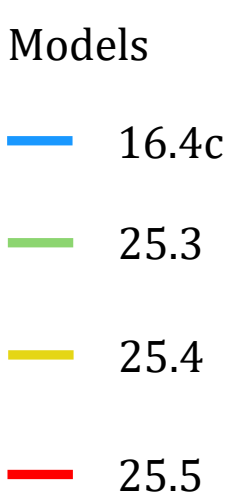


Hypotheses about stock size

- Hypotheses
  - Models 16.4c and 25.3 support the hypothesis that the stock was initially small but highly productive
  - Starting the model later supports a hypothesis that the stock was initially much larger and less productive
- Models have similar trends during period with data
- Data cannot discriminate between the two hypotheses



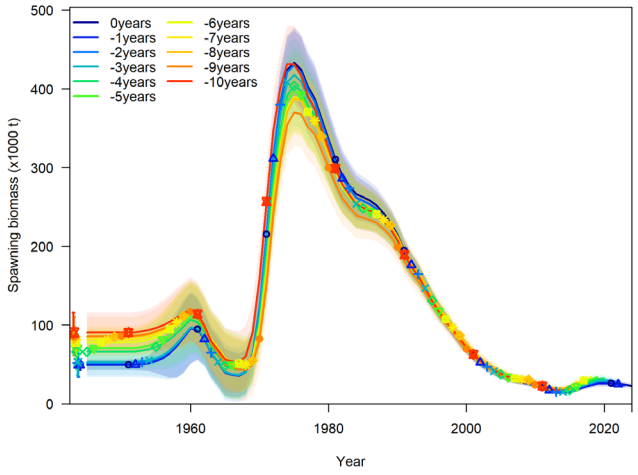


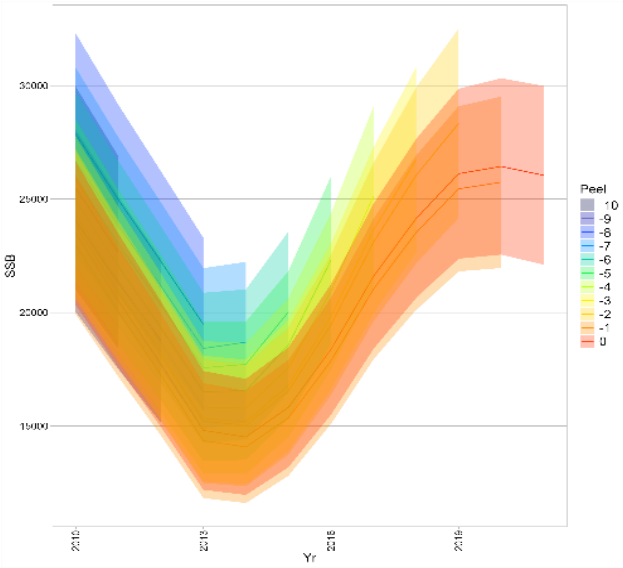


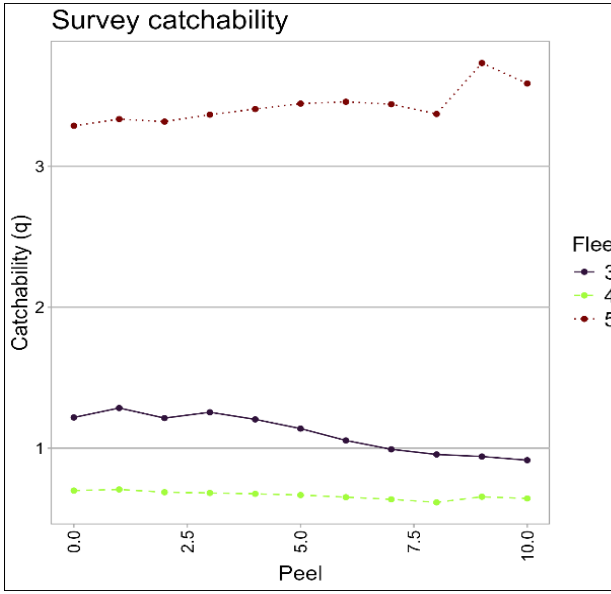
Retrospectives

model	AFSC_Hurtado_SSB	AFSC_Hurtado_Rec	AFSC_Hurtado_F
16.4c	0.142	11.489	-0.200
25.3	0.259	3.891	-0.223
25.4	0.377	7.147	-0.276
25.5	0.345	5.980	-0.264

Model 25.3

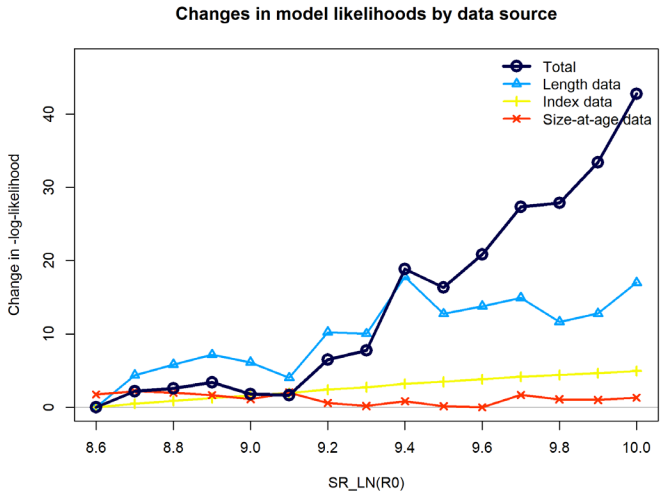


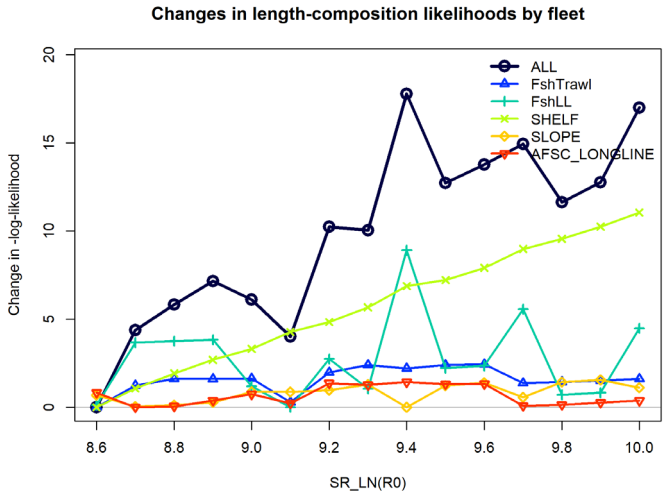




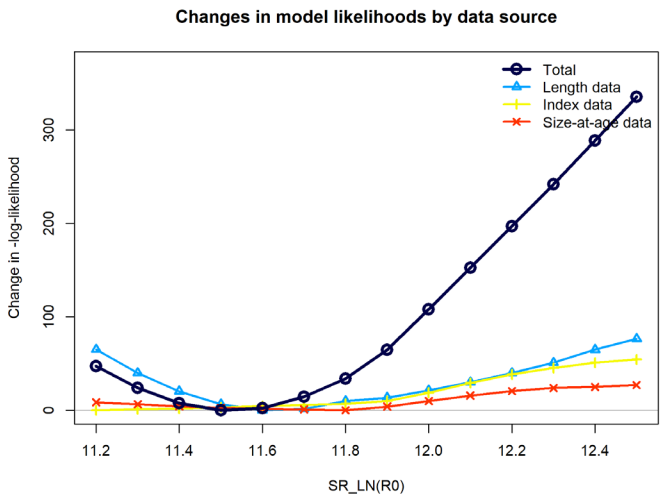
Likeihood profile on R0

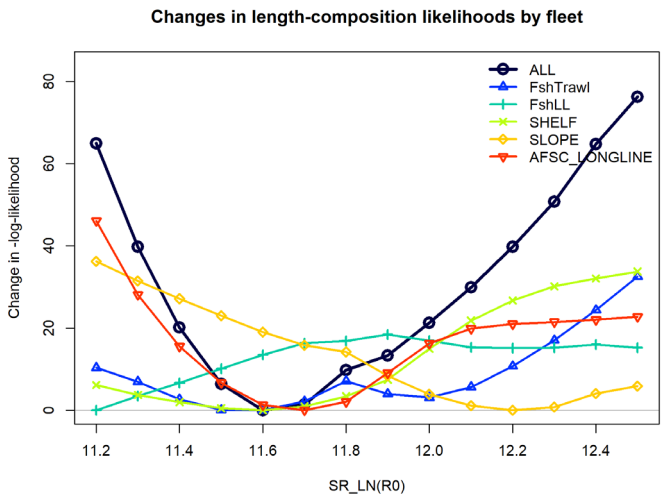
Model 25.3





Model 25.4





Recommendation for November

- We recommend bringing forward models 25.3 and 25.4 in addition to the last accepted model 16.4c
  - Model 25.3 incorporates changes based on good practices and fits to the data were similar to model 16.4c
  - Model 25.4 is a more stable model

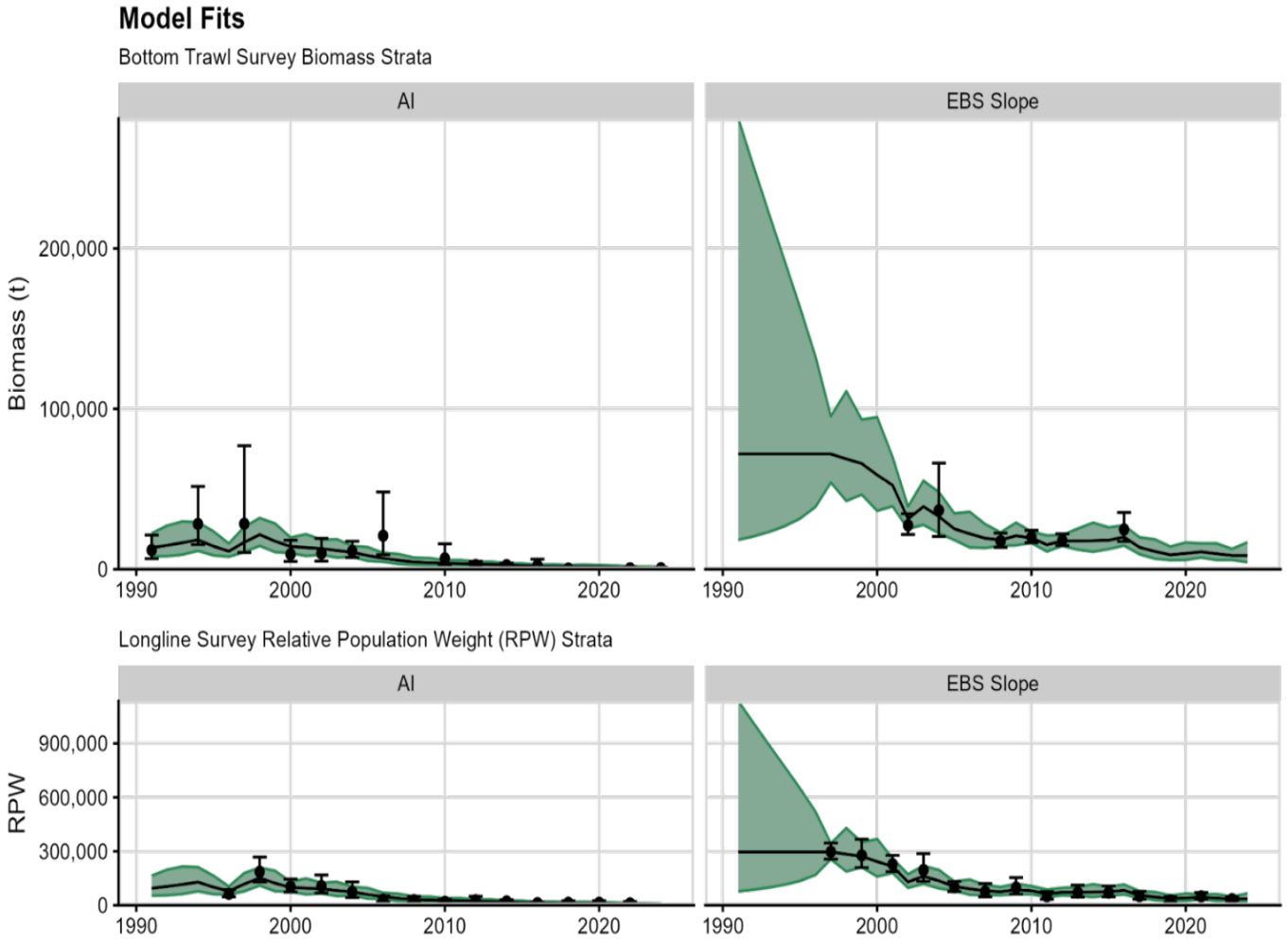
Recommendations for future

- There is a catalog of unaged otoliths from the fishery
  - Starting in 1982
  - Will consider the utility of this data source for the assessment
  - Early trawl fishery caught small fish – might inform recruitment estimates
- Further analysis of most appropriate start year for this assessment
- Evaluate using the regime parameter in SS3

Biologically Informed Recommended Distributions

- SSC requested that we evaluate a new approach for allocating ABC to Bering Sea and Aleutian Islands
- BRD in 2024 (and previous years) was based on Greenland turbot biomass from bottom trawl data from the EBS slope and the AI from three overlapping years (2010, 2012, 2016).
  - Estimated 15.7% of the stock's biomass in the AI region
- Developed a REMA model using bottom trawl data and the longline survey data
  - Estimated a single process error
  - Estimated scaling parameters for each strata

Biologically Informed Recommended Distributions



- Average over the last 10 years
- 11.2% in AI