

Sablefish Model Changes and CIE Review Summary

2026 October SSC

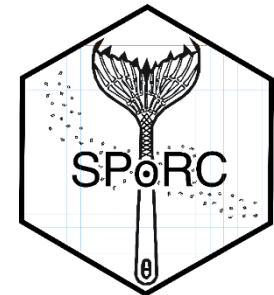
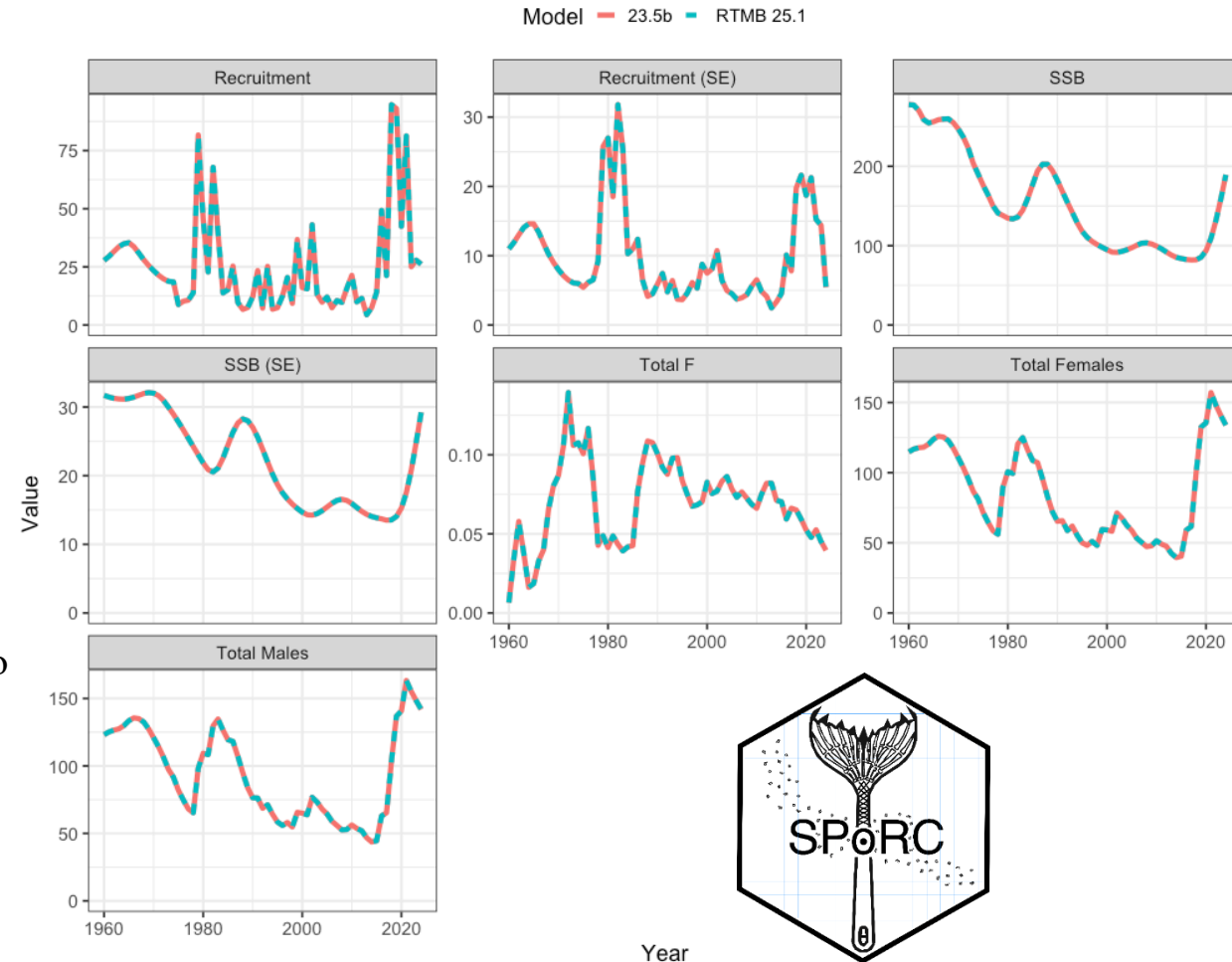
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October 2026



Background

- Last operational sablefish assessment used to set catch advice was in 2024 using bespoke ADMB Model 23.5
- New model reviewed and approved by JPT and SSC in 2025 using SPoRC platform (RTMB; Model 25.12), but not implemented due to shutdown
 - Provided a 1:1 ADMB to SPoRC bridge
 - **NOTE:** Model 25.12 recommended 2025/2026 quotas of ~39 kt (~8 kt and 17% decrease from those implemented in the 2025/2026 harvest specifications)
- Documents for 2026 (September):
 - Off-cycle *draft* SAFE report with data through 2025 for two new models with 5 appendices describing model development
 - CIE reviewer reports
 - September JPT document summarizing results and CIE review



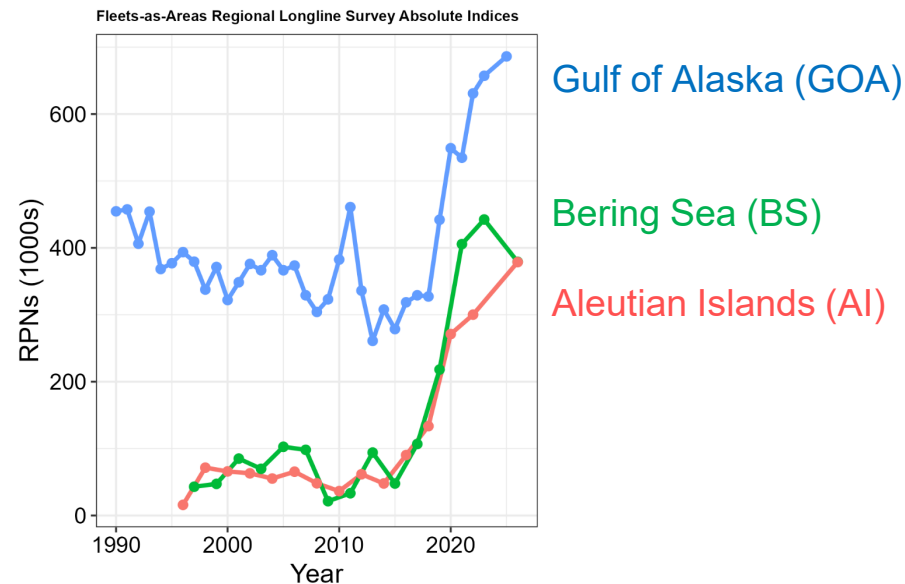
Year

<https://chengmatt.github.io/SPoRC/>

NOAA Longline Survey (LLS) Design Changes (2025)

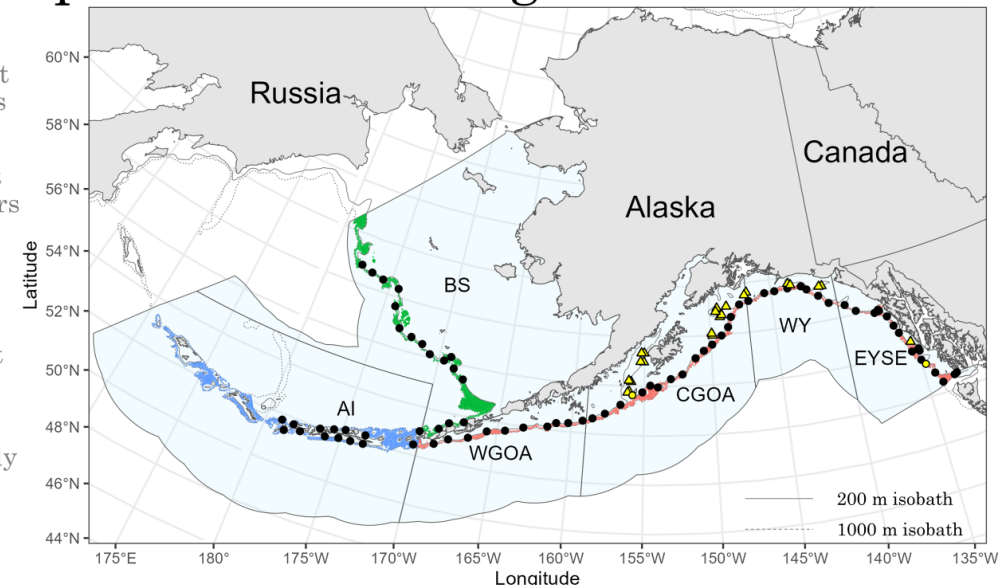
- Change in NOAA longline survey design/footprint starting in 2025
 - Historically sampled GOA annually and BS in odd years and AI in even years (~75+% of stock sampled annually)
 - Starting in 2025 sample GOA in odd years and BS+AI in even years (~50% of stock sampled annually)
- Assessment issue:** Need to impute LLS index for non-surveyed regions in *single region* model, where the scale of imputation increases (**50% of index imputed**)

LLS Relative Population Numbers (RPNs)



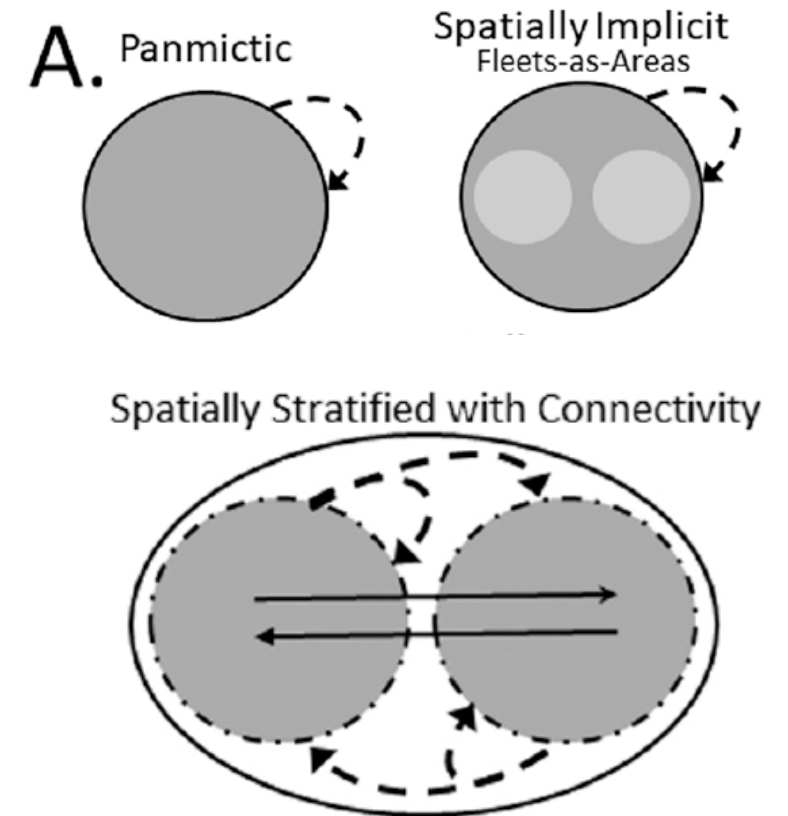
Survey footprint recent changes

- Red GOA footprint sampled odd years
- Green (BS) and blue (AI) footprint sampled even years
- Black circles are current stations
- Yellow circles are index stations lost in 2025
- Yellow triangles are non-index gully stations lost in 2025



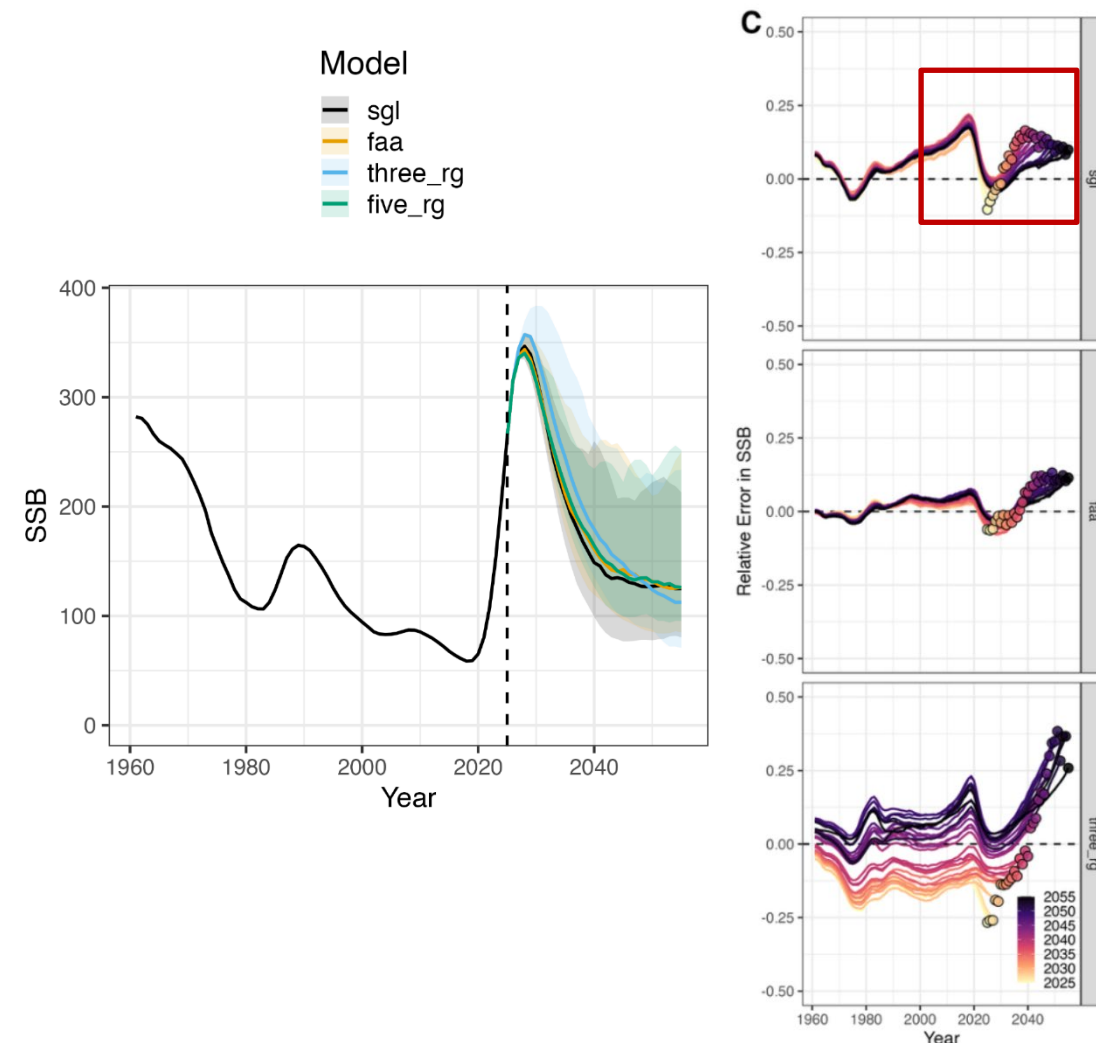
Spatially Implicit Assessment Models

- Spatially implicit fleets-as-areas (FAA) models disaggregate survey/fishery fleets to implicitly account for spatial structure in population or data
 - Benefits:
 - No data imputation necessary
 - Implicitly accounts for regional heterogeneity, availability, and movement through fleet structure
 - Limited complexity (e.g., don't need to estimate movement)
 - Limitations
 - Need to adjust how dynamics (e.g., selectivity) are interpreted
 - Partitioning data regionally may lead to low sample sizes
- A spatially implicit model for sablefish would allow fitting the LLS indices and compositions at the regional scale and avoid fitting imputed index values



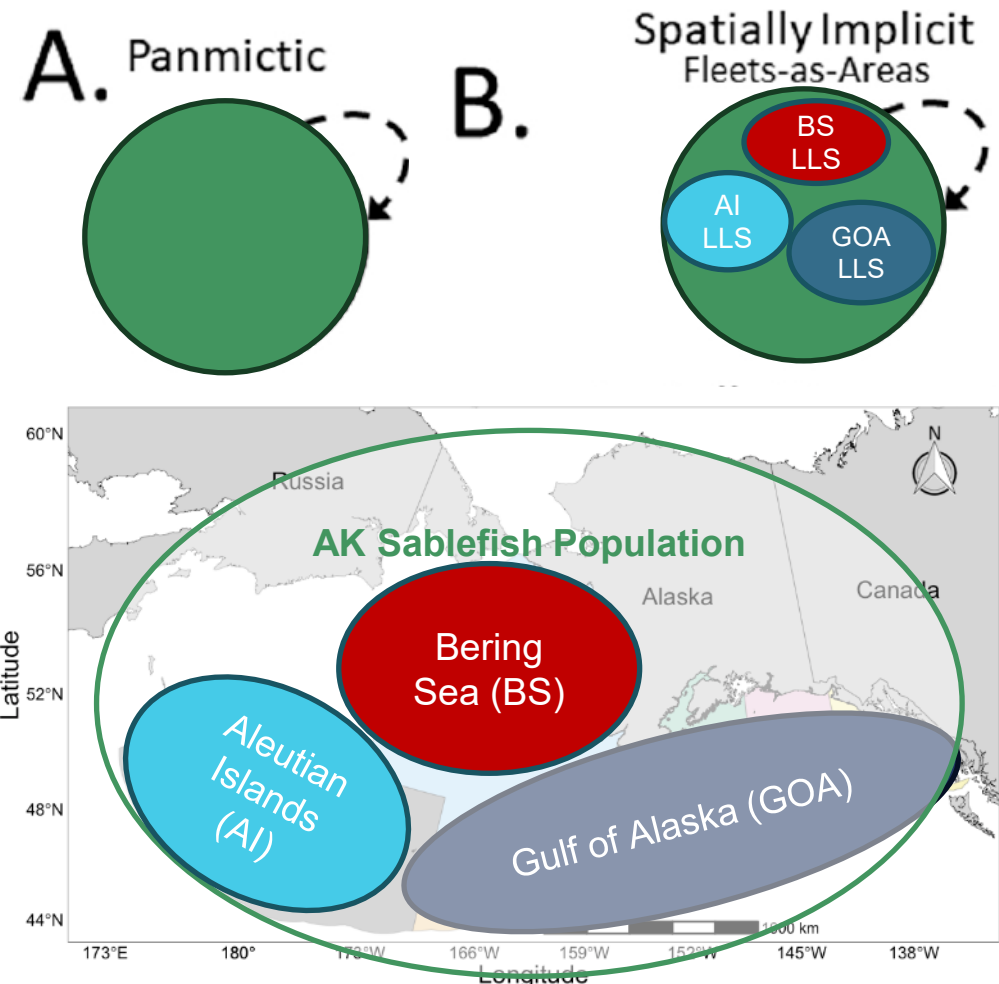
FAA Model Development

- FAA development started with minimum necessary complexity (3 LLS fleets)
 - Explored disaggregating fishery fleets and alternative selectivity parametrizations (dome shaped to account for availability/movement)
- FAA development was undertaken in 3 stages:
 - Spatially explicit simulations to identify robust FAA models
 - FAA models (>100) fit to real-world data
 - Spatially-explicit closed loop simulation to identify relative performance
- Assess **stability, parsimony, and performance** across stages to identify final FAA model
 - Concluded that the most parsimonious parametrization (3 LLS fleets only) was likely the most robust and most stable



Model Options for 2026

- 2 model versions (reviewed by the CIE):
 - *26.1_1Reg*:
 - Updated single region model
 - Refines data inputs, improves parametrization, and better aligns with best practices
 - Uses ‘carryover’ NOAA Longline Survey (LLS) index values
 - **26.2_FAA (Recommended Model):**
 - New spatially-implicit model (building from *26.1_1Reg*)
 - Disaggregates the LLS into regional fleets (separate indices, age compositions, catchability, and selectivity)
 - All other data sources aggregated to a single region (same as *26.1_1Reg*; i.e., fishery fleets)
 - Explicitly handles survey design change (no imputed values)



CIE Reviewer Feedback

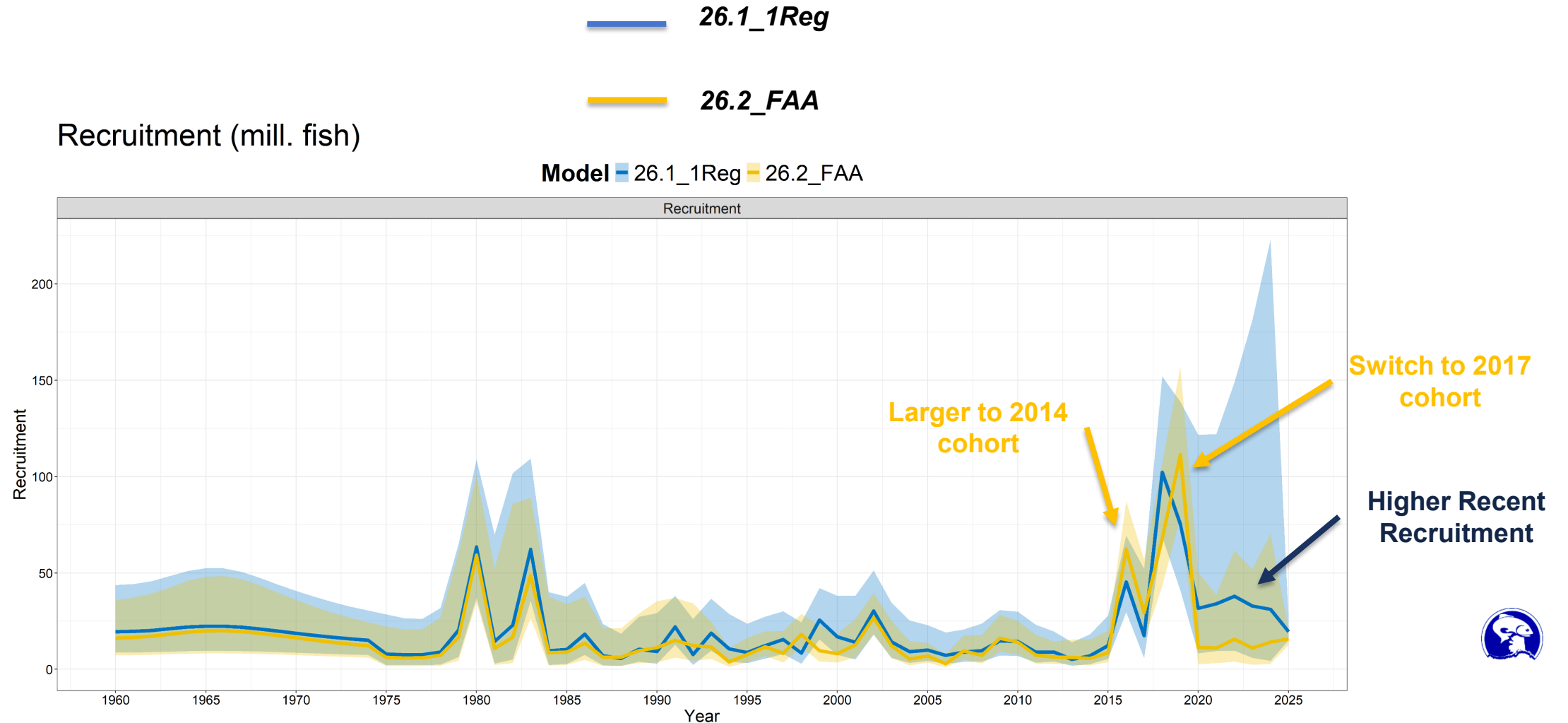
- “The review concludes that the **FAA [Model 26.2_FAA] assessment** provides an appropriate and scientifically defensible basis for operational management... and represents the **Best Scientific Information Available (BSIA)**.”
- “A brief review of the [SPoRC] codebase indicated that good software engineering practices have been adopted.”
- “*The **data** available for the assessment model is likely to be the **limiting factor** for the assessment, rather than the model structure and approach.*”
- “**More otoliths need to read to improve the information on age structure.**”
- “The scientific survey is well designed but limited in spatial extent...an expansion back to the previous level would improve model robustness.”

Table 6. -- Average, minimum, and maximum numbers of production-species otoliths aged per year by the Alaska Fisheries Science Center Age and Growth Program from 2005-2024.

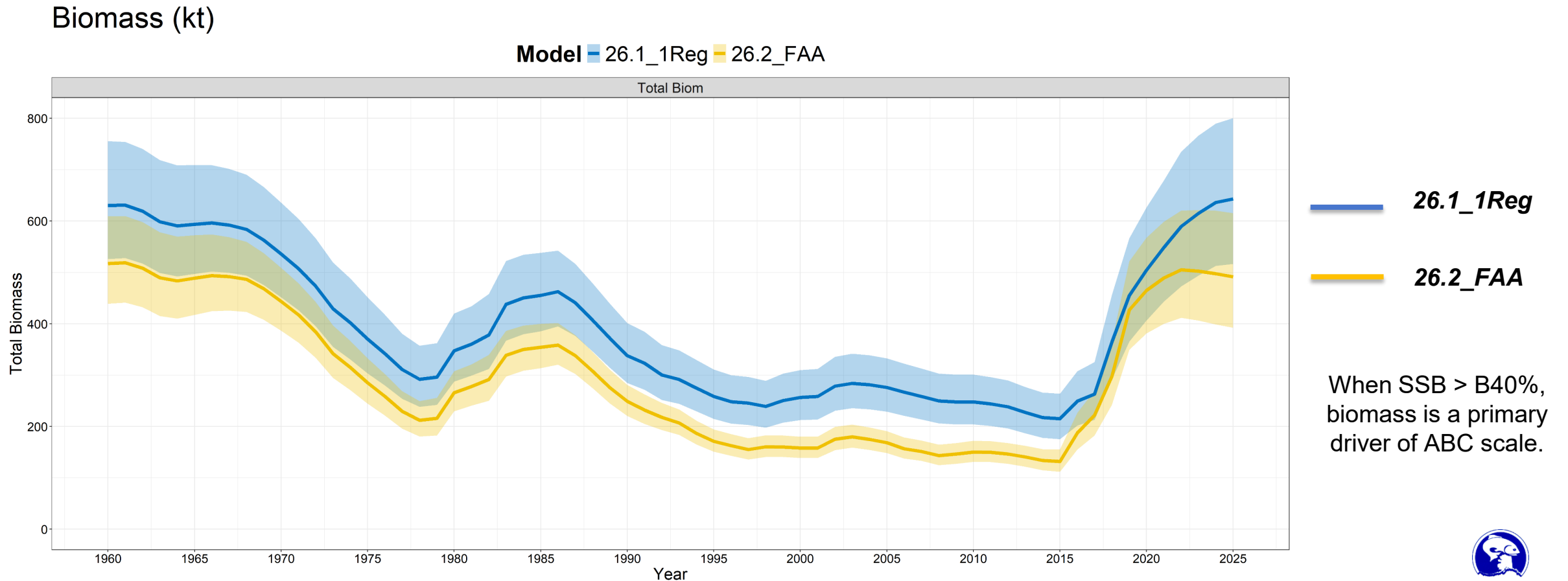
Species	Average	Minimum	Maximum
ALASKA PLAICE	482	258	885
ARROWTOOTH FLOUNDER	1,318	173	2,526
ATKA MACKEREL	1,936	988	4,423
DOVER SOLE	430	161	839
DUSKY ROCKFISH	660	47	1,306
FLATHEAD SOLE	1,828	250	4,128
GREENLAND TURBOT	688	92	2,048
KAMCHATKA FLOUNDER	879	24	2,121
NORTHERN ROCKFISH	1,117	535	1,755
PACIFIC COD	4,036	868	10,146
PACIFIC OCEAN PERCH	2,248	880	3,204
REX SOLE	1,024	119	2,219
ROCK SOLES	1,698	526	6,224
ROUGHEYE/BLACKSPOTTED ROCKFISH	1,287	300	4,738
SABLEFISH (BLACK COD)	2,434	2,177	2,993
WALLEYE POLLOCK	11,141	8,408	14,441
YELLOWFIN SOLE	1,376	490	2,029



Time Series Trends: Recruitment

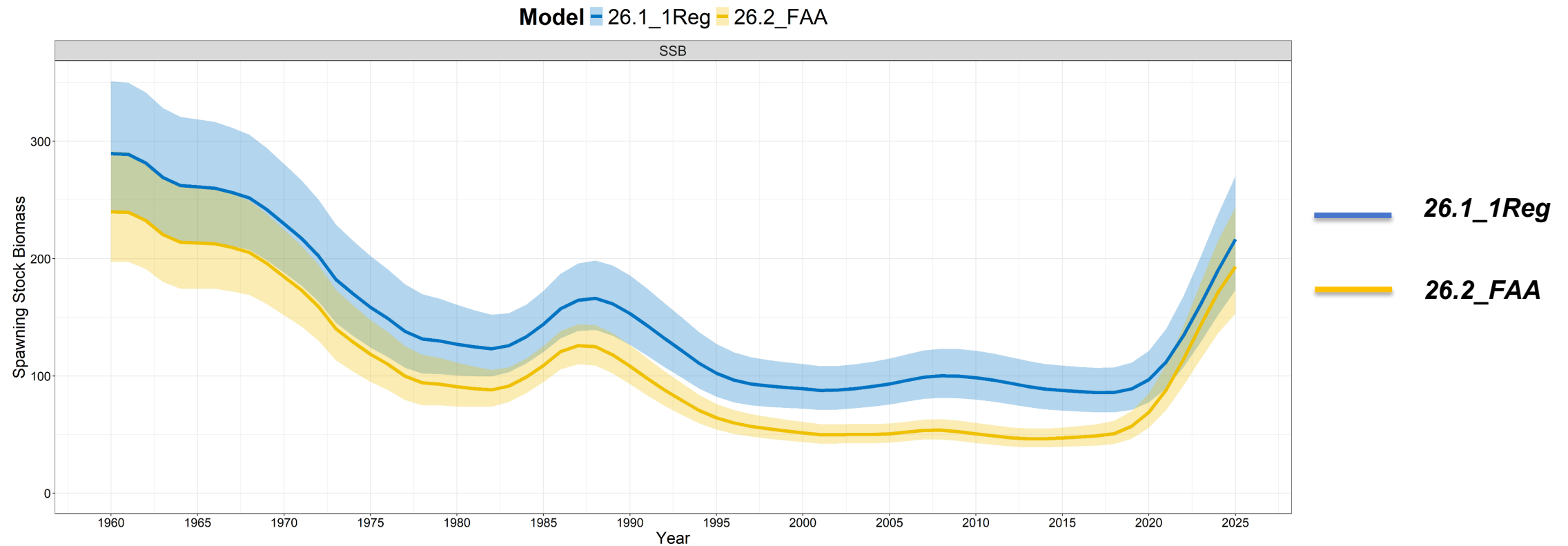


Time Series Trends: Biomass



Time Series Trends: SSB

Spawning Stock Biomass (kt)

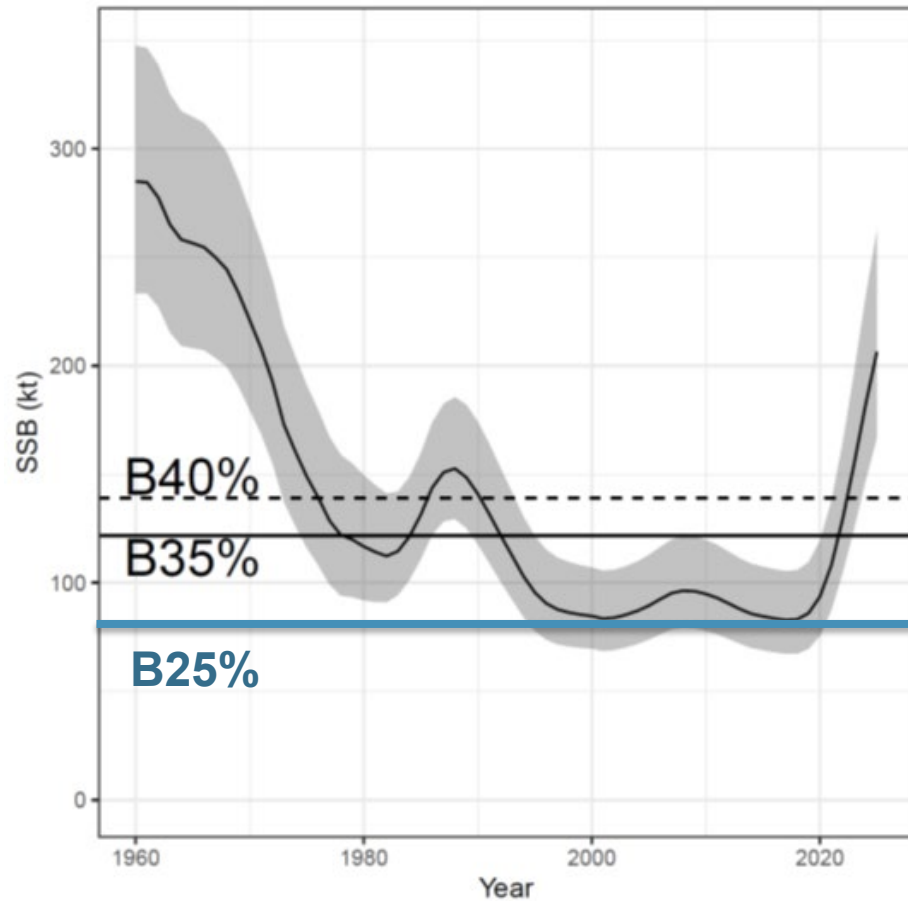


Model	Region	Terminal_SSB	Terminal_SSB0	Terminal_F	Catch_Advice	B_Ref_Pt	F_Ref_Pt
26.1_1Reg	1	216.4521	369.6689	0.04642913	40.85173	139.0172	0.07903
26.2_FAA	1	193.1500	358.1881	0.05874255	31.69570	122.4267	0.08054

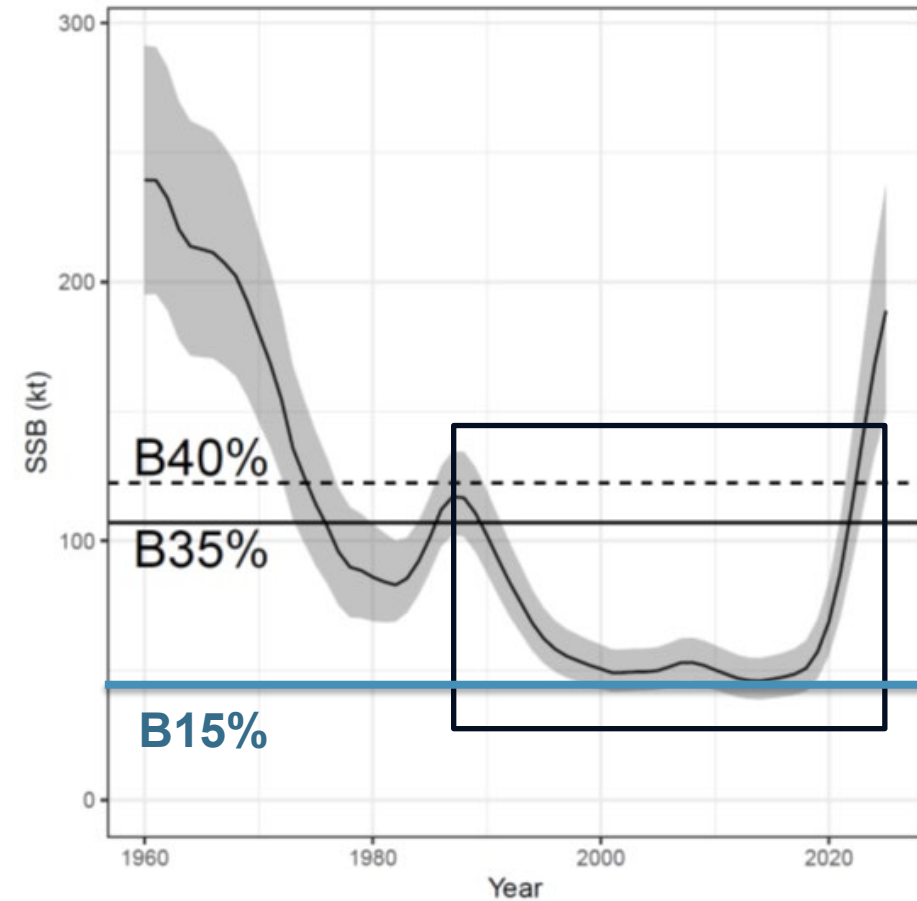


Management Trajectory

1 Region

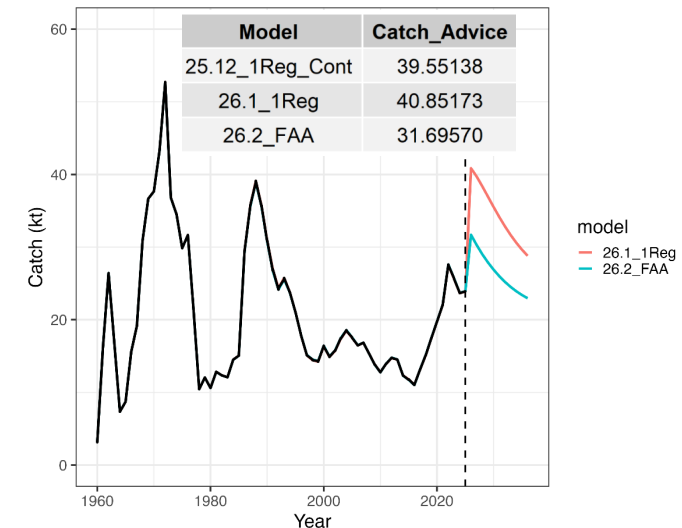
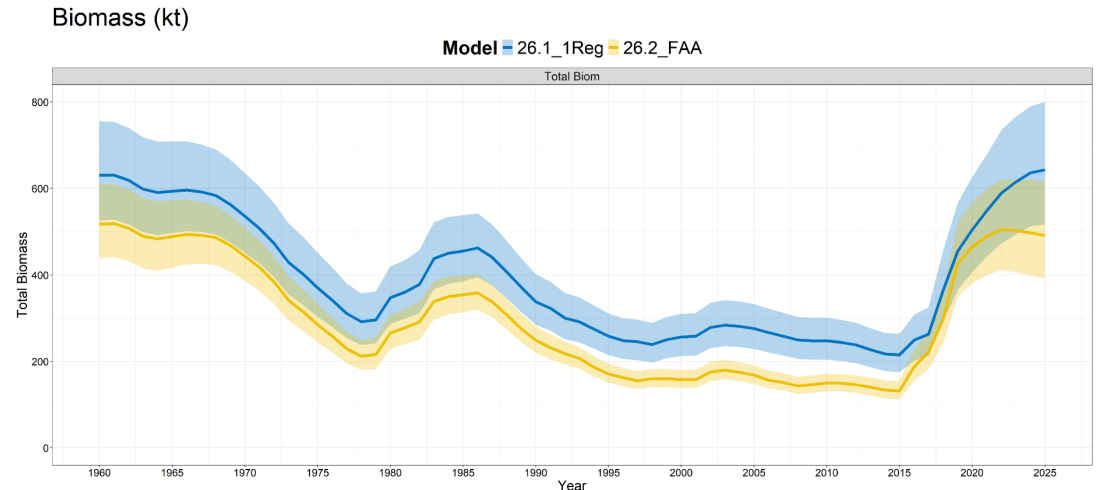


FAA



Conclusions: Model Choice

- **Model 26.2_FAA is the recommended model for 2026**
 - Does not rely on imputed survey data
 - Provides best balance of parsimony, complexity, stability, and performance
 - Endorsed as Best Scientific Information Available by CIE
- Beware lags/inertia in Model 26.1_1Reg (imputation effect)
 - Over-/under-estimation following peaks/valleys (less responsive during transitions)



Conclusions: Model Impact

- The change in scale across models is structural
 - Does not imply a sudden change in population trajectory
 - Reflects an inherent difference in how each model handles and interprets data inputs (better regional representation in Model 26.2_FAA)
 - 32% decline in ABC from 2026 harvest specifications (47 kt) and 18% decline from Model 25.12 (39.5 kt)
 - *Model 26.2_FAA predicts a faster and larger increase in SSB/biomass
- 2026 assessment will have first data on 2020—2022 cohorts due to 1 year lag in age comps and no 2024 survey

Sablefish Data Changes

Year	Fishery Age Comps	LLS Survey Age Comps	LLS Index	CPUE
2021	1183	963	GOA+BS	Yes
2022	1174	972	GOA+AI	Yes
2023	991	993	GOA+BS	N/A
2024	1180	N/A	N/A	N/A
2025	598*	1194	GOA	N/A
2026	--	--	BS+AI	N/A

*No sampling from AI due to limited fishing effort



Apportionment

- **Need:** Determine Biologically-informed Regional Distributions, BRDs from AK-wide ABC
- **Goal:** Avoid localized depletion and/or disproportionate harvest of only large, mature fish OR only small, new recruits
 - *Distribute harvest across age structure/regions*
- **Rationale:** “Our best scientific advice is that *catch distribution should not deviate too far from survey-estimated biomass proportions*” – 2020 SAFE



Apportionment

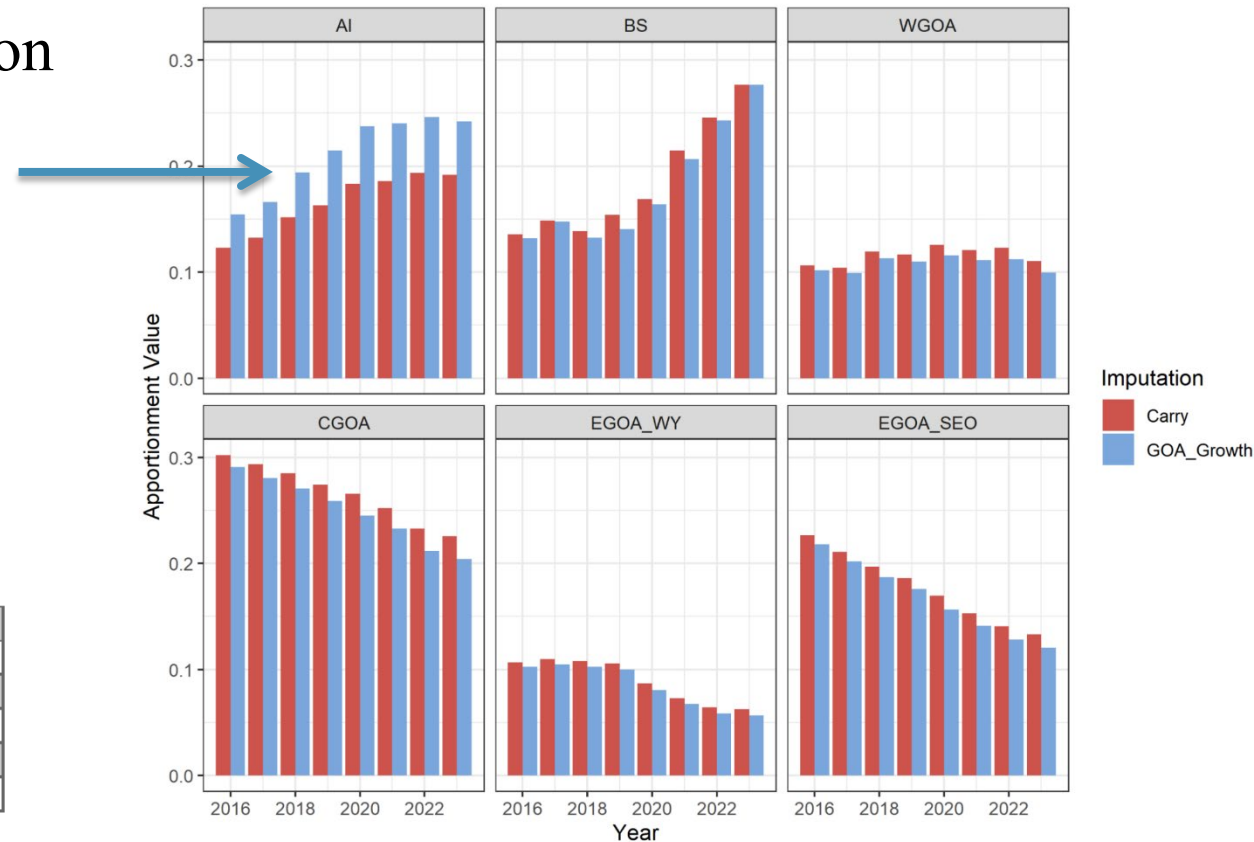
- **Issue:** Apportionment requires synoptic regional survey indices in a given year
 - Historically utilized GOA year-over-year change to impute values for BS/AI
 - Same as single region index construction for models 25.12 and earlier
 - No longer feasible (GOA not surveyed annually)
- **Recommendation:** switch to carryover values for non-surveyed regions (fixed at last regional index value)
 - Same as single region index construction for Model 26.1_1Reg
 - Removes western AI extrapolated stations (largest impact on apportionment)



Apportionment

- Impacts of updated apportionment are moderate in terms of proportions by region
 - Largest change is reduction in AI apportionment
 - All regions of GOA undergo slightly increased apportionment
 - BS apportionment is net neutral (for 2023)

Region	2023 Apportionment Previous Approach (GOA Extrapolation)	2023 Apportionment Revised Approach (Carryover Values)	Percent Change from Old to New Apportionment for 2023	2025 Apportionment Revised Approach (Carryover Values)
BS	0.28	0.28	-1%	0.28
AI	0.24	0.19	-21%	0.20
WGOA	0.10	0.11	10%	0.11
CGOA	0.20	0.23	15%	0.23
WY	0.06	0.06	10%	0.06
SEO	0.12	0.13	11%	0.12



Apportionment

- When apportionment combined with new model ABC (32 kt) resulting BRDs undergo strong declines from 2026 harvest specifications
 - 32% decline in AK-wide ABC from 2026 harvest specifications**
 - Partially offset for GOA by new apportionment (~25% declines)
 - AI undergoes strong decline (~50%)

Model	Catch_Advice
25.12_1Reg_Cont	39.55138
26.1_1Reg	40.85173
26.2_FAA	31.69570

Region	2025 Catch	2026 Catch [#]	2026 BRDs (Harvest Specs)	2026 BRDs Model 26.2_FAA (Carryover)	% Change in 2026 BRDs (Harvest Specs to FAA Carryover)
BS	3.9	3.2	13.0	8.9	-32%
AI	1.0	0.6	11.4	6.1	-47%
BSAI	4.9	3.8	24.4	14.9	-39%
WGOA	3.1	3.2	4.7	3.5	-25%
CGOA	7.7	7.0	9.6	7.4	-23%
WY	2.3	2.2	2.7	2.0	-26%
SEO	5.2	4.2	5.6	4.3	-24%
GOA	18.3	16.6	22.6	17.1	-24%
ABC (AK-Wide)	23	20	47	32	-32%

[#] As of Sept 22



Apportionment – Alternatives (If Warranted...)

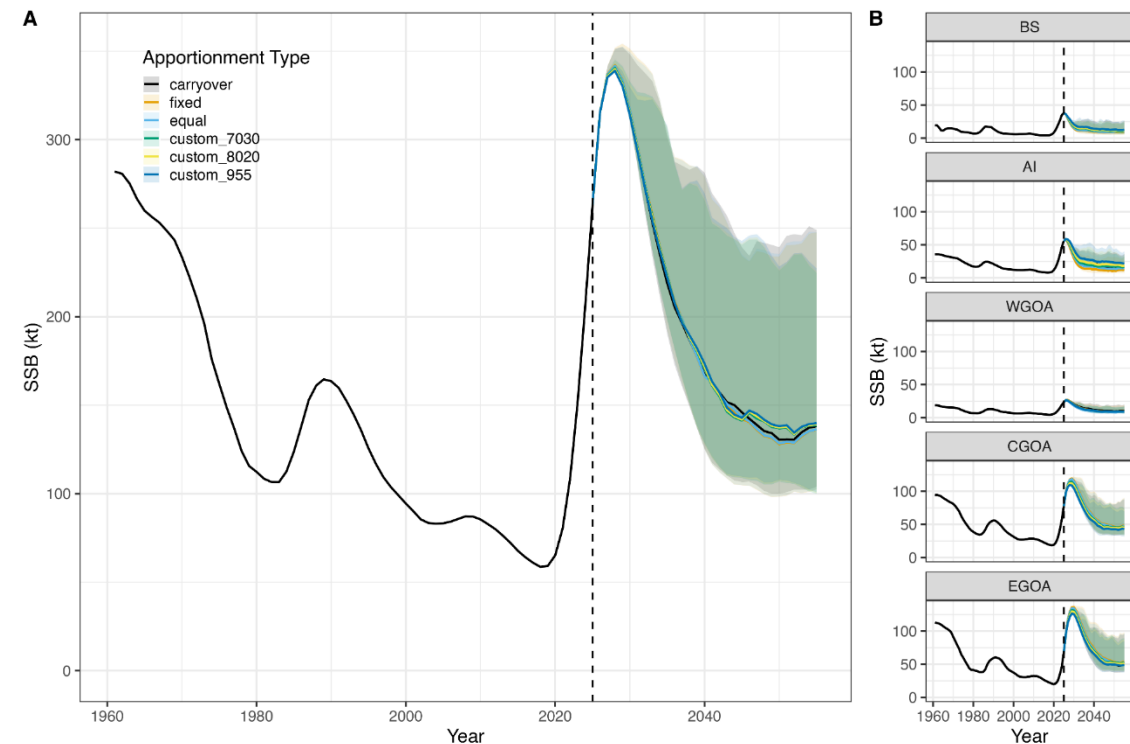
- IF NPFMC wanted to pursue *short-term* alternative regional TACs to alleviate sudden quota reductions
 - Recommend using the ABC from the chosen model, then adjust regional TACs
 - Noting that:
 - Simulations indicate that moderate deviations from survey-based apportionment are not likely to have short-term biological impacts
 - Localized depletion and age truncation remain concerns if unbalanced harvest across regions/age classes is sustained over time
 - Maximum BS and AI catches since 1980 are 6 kt and 4kt, respectively
 - Identifying potential options now (for authors to have ready for December) would avoid last minute analyses!—but note that 2027 *max_ABCs* are likely to be higher given population growth and new data on recent recruitment

These alternative are not recommendations, just potential options to consider.

Region	2025 Catch	2026 BRDs 2026 Harvest Specs	2026 BRDs Model 26.1_1Reg	% Change from 2026 Harvest Specs (26.1)	2026 BRDs Model 26.2_FAA	% Change from 2026 Harvest Specs (26.2)	2026 Alt. Maintain Status Quo GOA Harvest Specs	% Change from 2026 Harvest Specs (Status Quo GOA)	2026 Alt 26.2_FAA ABC But Use GOA BRDs from 26.1_1Reg	% Change from 2026 Harvest Specs (26.1 GOA BRDs)
BS	3.9	13.0	11.3	-13%	8.9	-32%	5.6	-57%	5.9	-54%
AI	1.0	11.4	7.8	-32%	6.1	-47%	3.8	-67%	4.1	-64%
BSAI	4.9	24.4	19.1	-22%	14.9	-39%	9.4	-61%	10.0	-59%
WGOA	3.1	4.7	4.5	-4%	3.5	-25%	4.7	0%	4.5	-4%
CGOA	7.7	9.6	9.4	-2%	7.4	-23%	9.6	0%	9.4	-2%
WY	2.3	2.7	2.6	-5%	2.0	-26%	2.7	0%	2.6	-5%
SEO	5.2	5.6	5.5	-2%	4.3	-24%	5.6	0%	5.5	-2%
GOA	18.3	22.6	22.0	-3%	17.1	-24%	22.6	0%	22.0	-3%
ABC (AK-Wide)	23	47	41	-13%	32	-32%	32	-32%	32	-32%

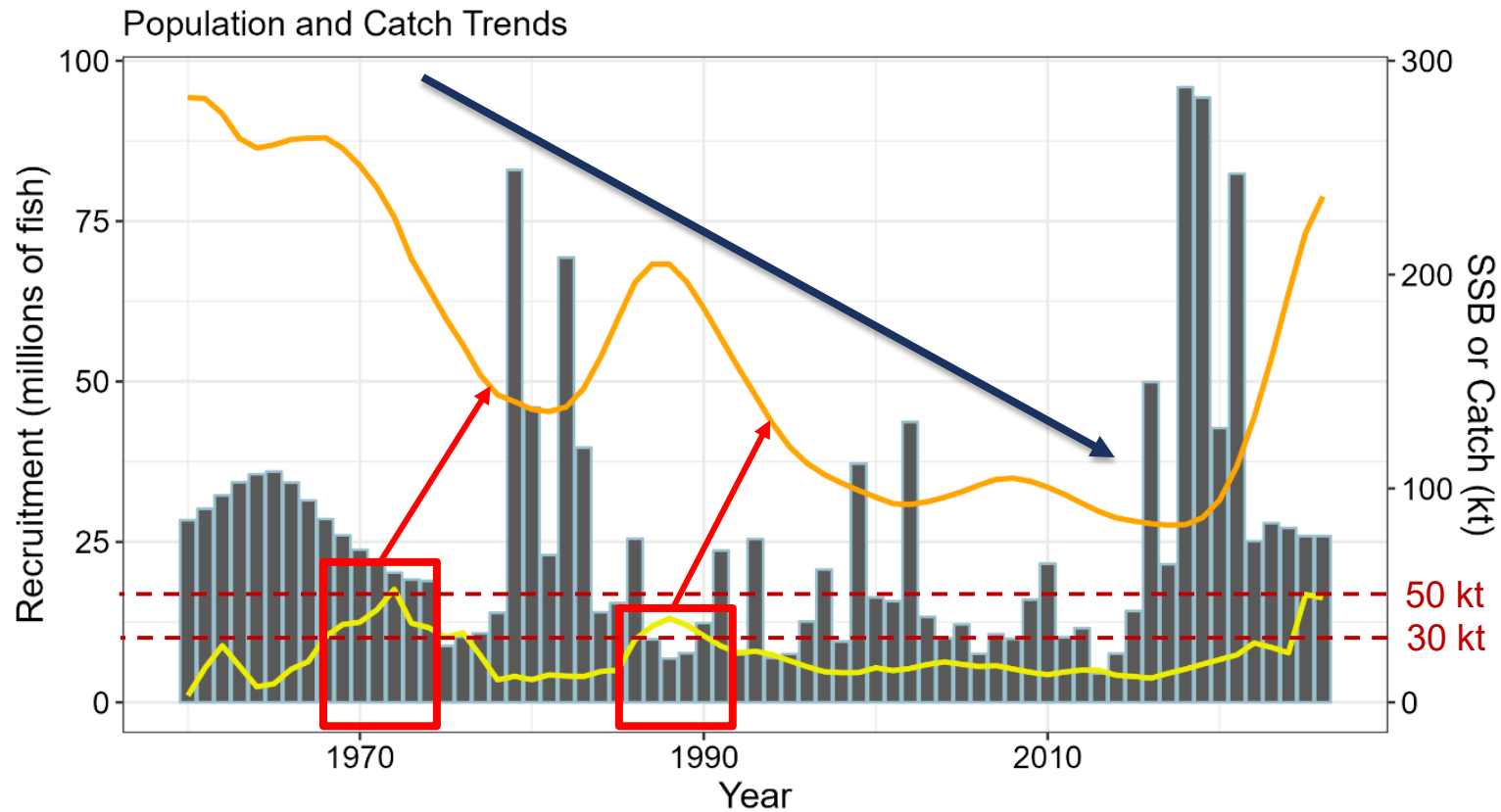
Apportionment – Updated Closed Loop Analysis

- Updated closed loop analysis (with 5 region OM) supports findings of Fenske et al. (2022)
 - **Carryover** represents the new proposed apportionment
 - **Equal** assumes 20% of ABC is harvested from each region
 - **70/30 and 80/20** allows 70% or 80% of ABC to be harvested from the GOA (akin to ‘GOA Status Quo’ apportionment approaches)
- Caveats:
 - No EM (use true regional biomass in HCR)
 - No stock recruit relationship (no density-dependence)
 - Does not account for connectivity between GOA SSB and BS/AI age-2 recruitment (no larval dispersal or movement of age-1 fish)
 - Assumes spatial dynamics are correct (high-interregional movement)



Similar Outcomes Across Apportionment Approaches.
NOTE: Limitations to Simulation-based Approaches!

Long-term Trends



From **2024** SAFE

— Catch ■ Recruitment — SSB

Periods of sustained catch > 30 kt have been followed by strong population declines.

Concerns over the F40% HCR leading to high ABC recommendations was the impetus for the sablefish Management Strategy Evaluation (MSE) project.

Results indicate that a **harvest cap** (e.g., at 20 – 25 kt) would provide improved catch stability, avoid quota creep, and likely improve market value through increased long-term catch of larger fish.

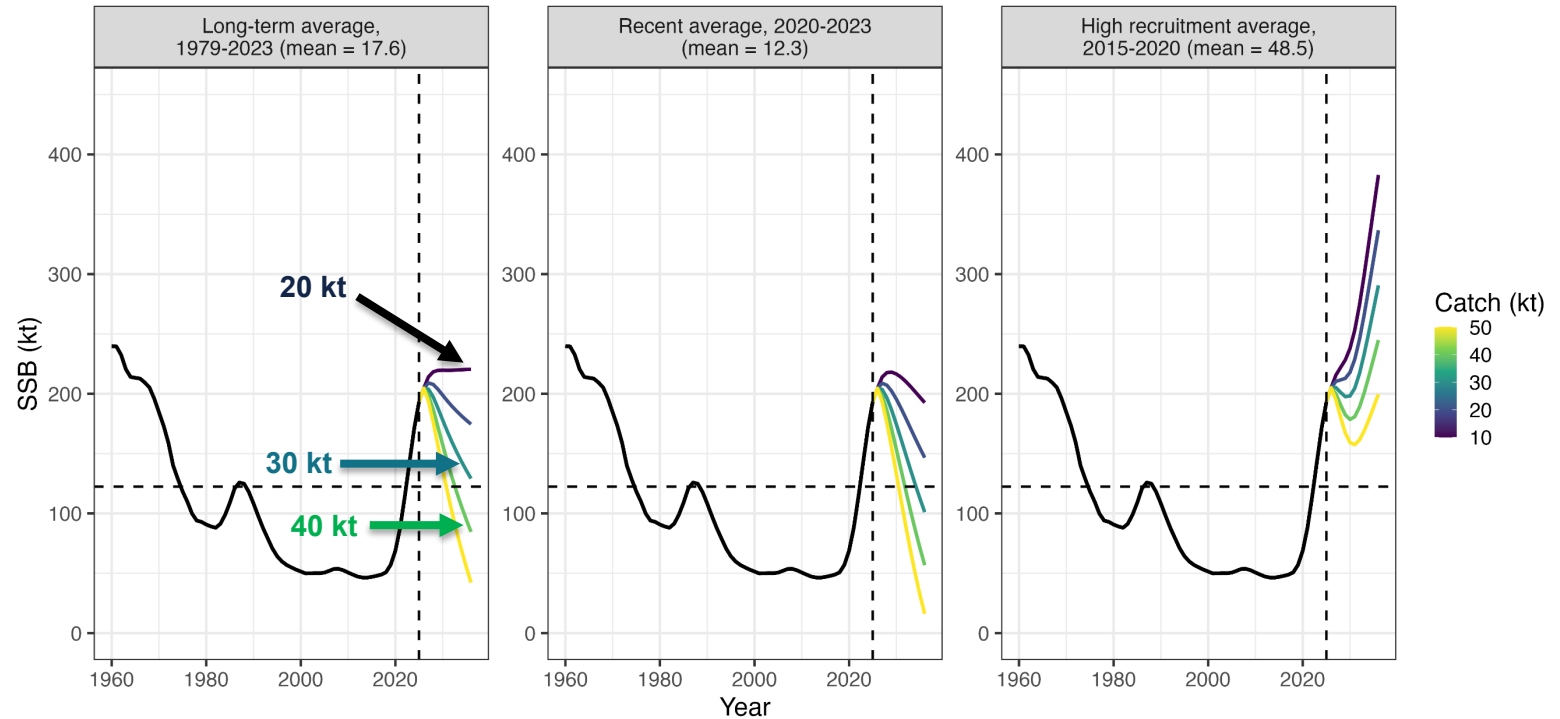
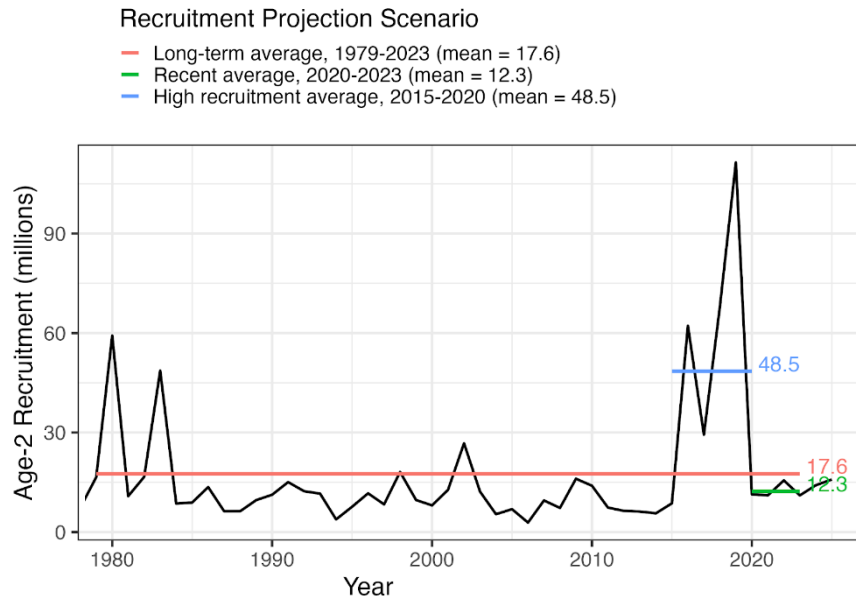


Alternate Projections

What if... Assume constant catch (no ramped HCR) at 10 – 50 kt for the next decade under different recruitment scenarios.

- Under continued high recruitment, the sablefish population is likely to continue growing regardless of catch (< 50 kt).
- Under more realistic future recruitment scenarios, removals > 30 kt will lead to the population declining below B40% in ~10 years.
- **In reality, we are likely to see continued short-term projected ABC increases (within a given model, not from 2026 harvest specifications) followed by long-term declines when/if recruitment returns to more normal conditions**

These catch scenarios are informational only and do not necessarily reflect expected future conditions.



Summary

- Model 26.2_ *FAA* is the recommended model for 2026
 - Similar population trends as previous models, but change in data structure results in moderate rescaling
 - More rapid population growth since 2018
- New apportionment (carryover index) increases proportion to GOA, but reduces proportion to AI
- Alternative *short-term* apportionment approaches are unlikely to have major detrimental biological impacts
- 2026 assessment will include BS (-14%) and AI (+26%) LLS indices and 2025 GOA LLS age compositions (first indications of 2020—2022 cohort strength)

