

# 2026 BSAI Blackspotted/Rougheye Rockfish Assessment


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# Overall summary

- Update assessment; alternative models not considered
- Continued estimation of unusually large increase in 2011 year class (with high uncertainty), which affects the estimate of $B_{40\%}$, perceived stock depletion, and $F_{abc}$
- We recommend setting the 2011 year class to the next largest value for the purpose of stabilizing $B_{40\%}$ and obtaining the maximum ABC (i.e., same procedure as in 2022 and 2024 assessments)
- Recommended using the 2026 ABC for 2027 and 2028 (a 9.5% reduction from the max ABC) for several reasons:
  - A decrease in the 2026 AI survey biomass estimate, and continued uncertainty in the 2011 year class
  - High uncertainty in estimated spawning stock biomass
  - Multiple risk table categories rates as 2 (“increased concern”)
- Spatially disproportionate harvesting has continued, and the SSC has noted that this is a concern.
- The MSSC, WAI/CAI subarea ABC, and the BSAI ABC have all been exceeded in recent years.
- We recommend replacing the term “MSSC” with “BRD”

# Outline

1) SSC – Plan Team comments
2) Catch information
3) Fishery and survey data
4) Model diagnostics, and sensitivity runs
5) Model fits to data
6) Risk table
7) Rationale for using BRDs to communicate spatial harvest advice
8) Management recommendations

# SSC and Plan Team comments

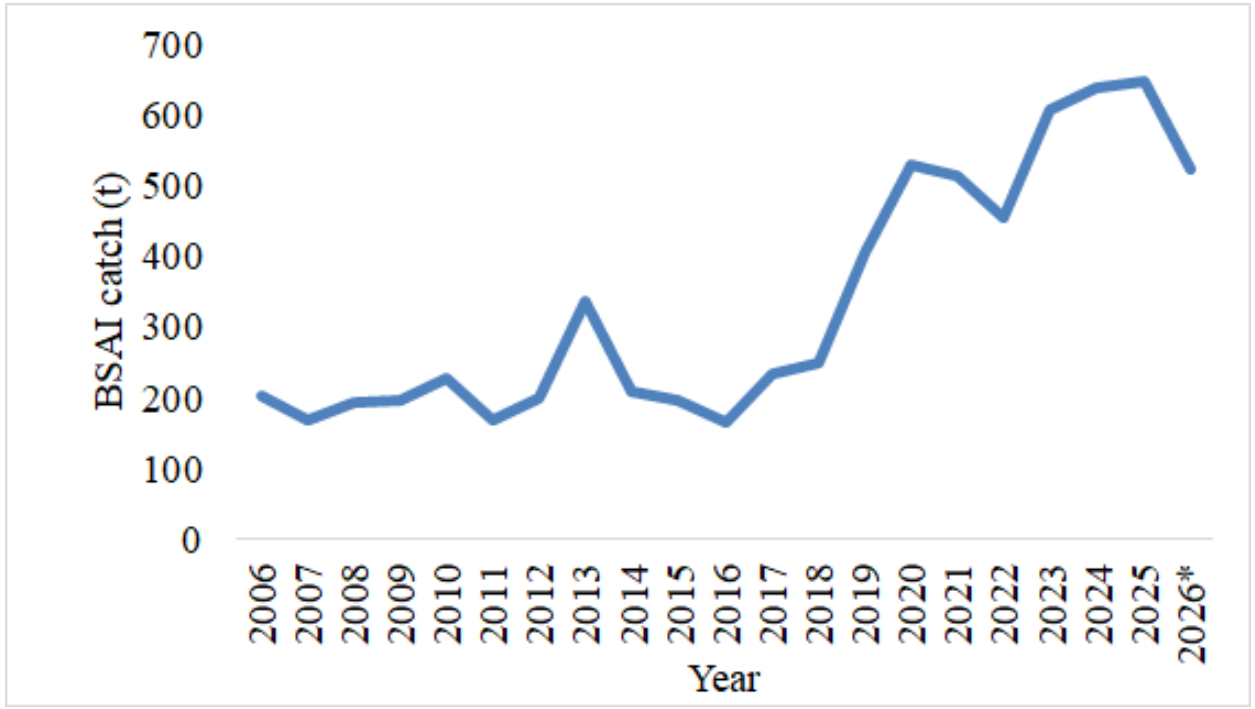
- (SSC, October 2026) *When REMA models are used to estimate BRDs for Tier 3 assessments, the SSC requests that basic documentation be routinely provided, including model configuration, convergence status, parameter estimates, and plots showing fits to survey observations.*

- This information is provided in the assessment

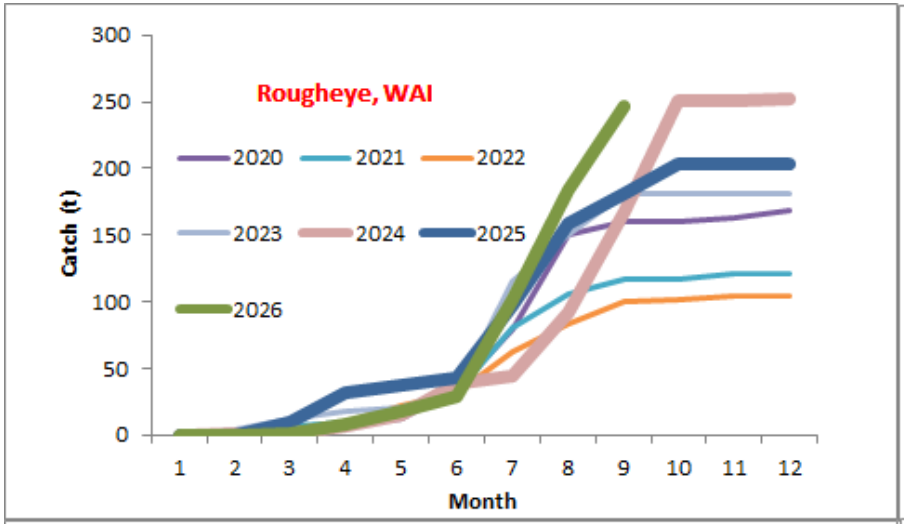
- (SSC, December 2024)"*The SSC is concerned that the MSSC is not meeting its intended objective and that the overall ABC has been exceeded, and recognizes that the MSSC as a spatial management tool needs further examination."*

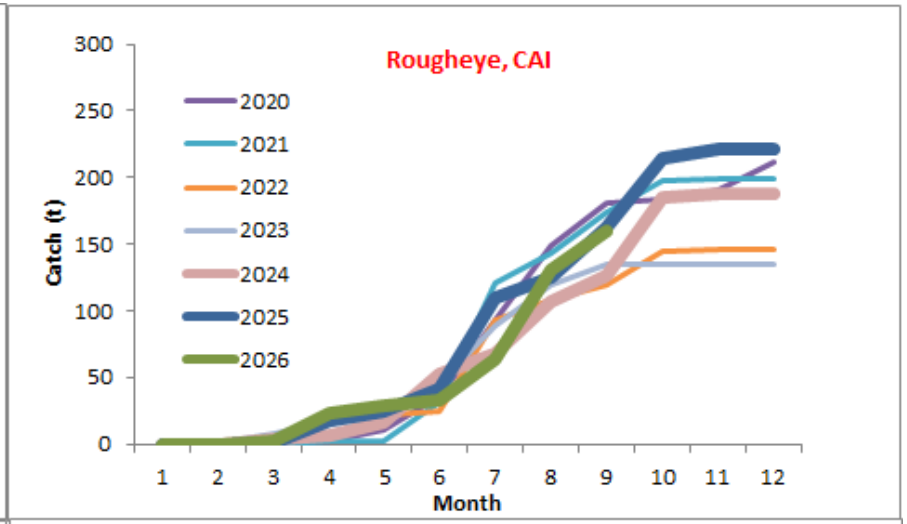
- An evaluation of the consistency of the term "MSSC" with "BRD" is conducted, and we recommend replacing the term MSSC with BRD

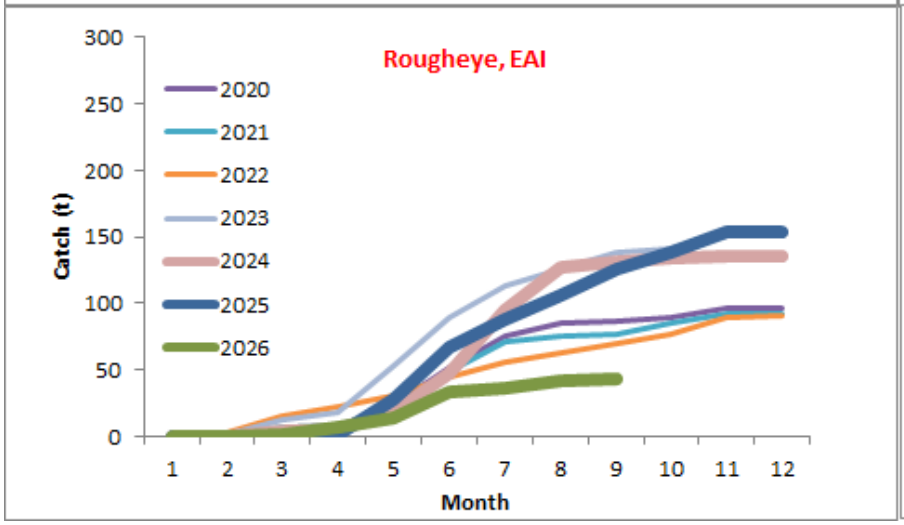
# BSAI catch has increased since 2016 (2026 through Oct 10)

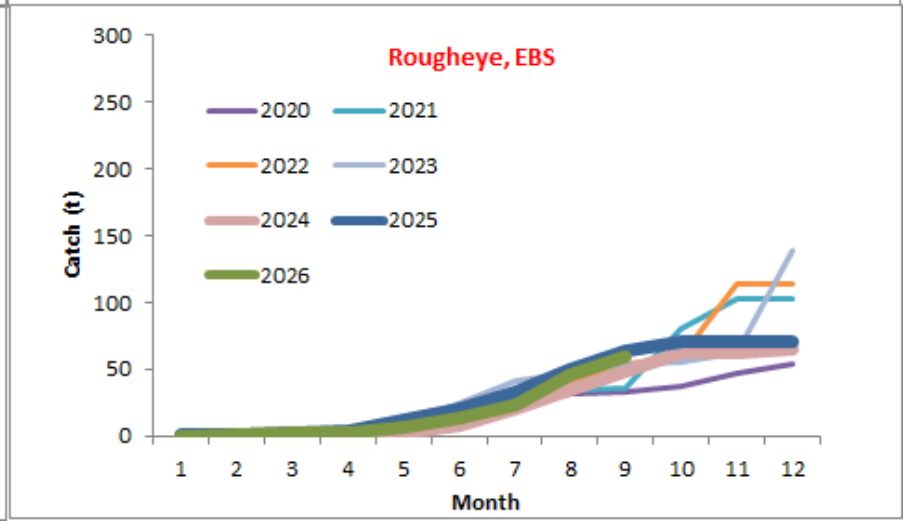


# BSAI Blackspotted/Rougheye catch by month and area, 2020-2026



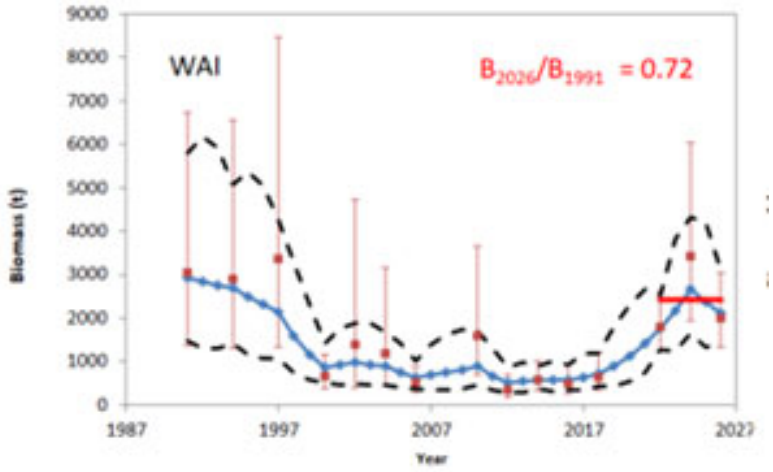



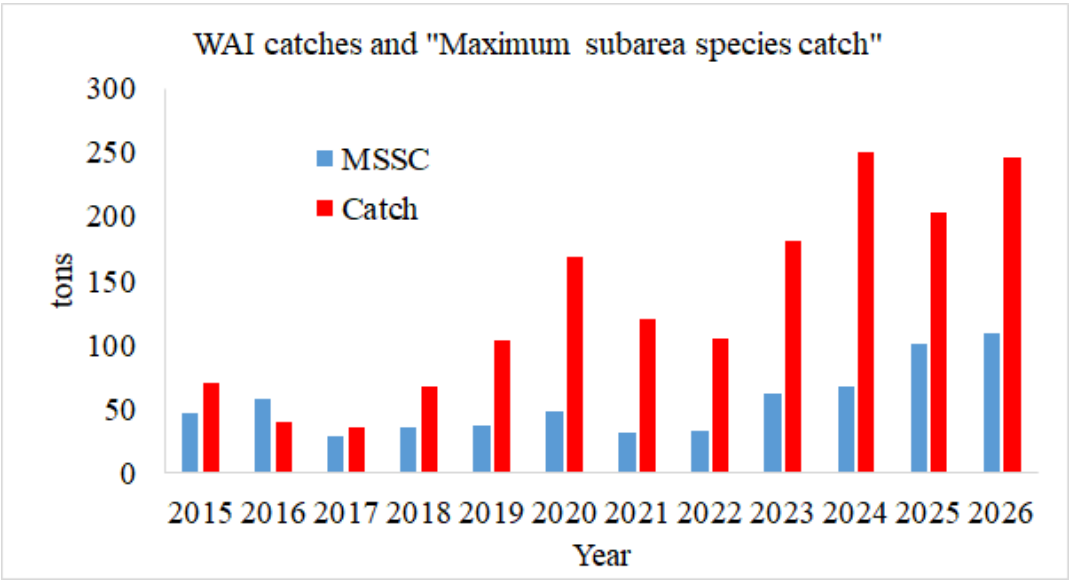



# Monitoring of WAI catch relative to MSSC

Requested by SSC (Oct 2016, Dec 2016)




| Year | MSSC | Catch | Catch/MSSC |
|---|---|---|---|
| 2015 | 46 | 70 | 1.51 |
| 2016 | 58 | 40 | 0.69 |
| 2017 | 29 | 35 | 1.21 |
| 2018 | 35 | 67 | 1.91 |
| 2019 | 37 | 104 | 2.81 |
| 2020 | 48 | 168 | 3.50 |
| 2021 | 31 | 120 | 3.89 |
| 2022 | 32 | 104 | 3.25 |
| 2023 | 61 | 181 | 2.97 |
| 2024 | 67 | 251 | 3.75 |
| 2025 | 100 | 203 | 2.03 |
| 2026 | 109 | 246 | 2.26 |



# MSSC evaluation, BSAI Plan Team

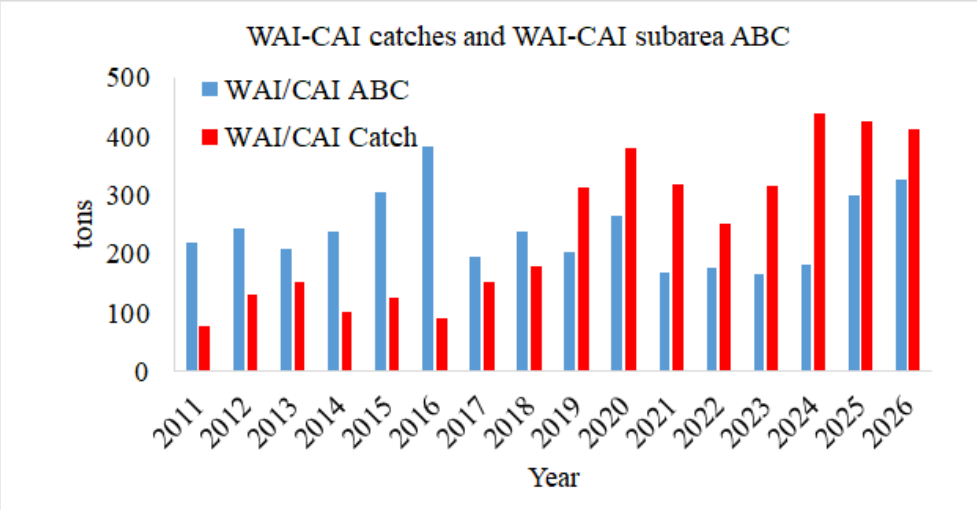
*For blackspotted/rougheye rockfish the Team discussed the continued spatial management concerns with this stock and the lack of sufficient tools (MSSC) to address this.*

BSAI Plan Team, November 2023

The recent catch has also frequently exceeded the WAI/CAI subarea ABC, and the BSAI stock-wide ABC.

# Monitoring of WAI-CAI catch relative to WAI-CAI subarea ABC

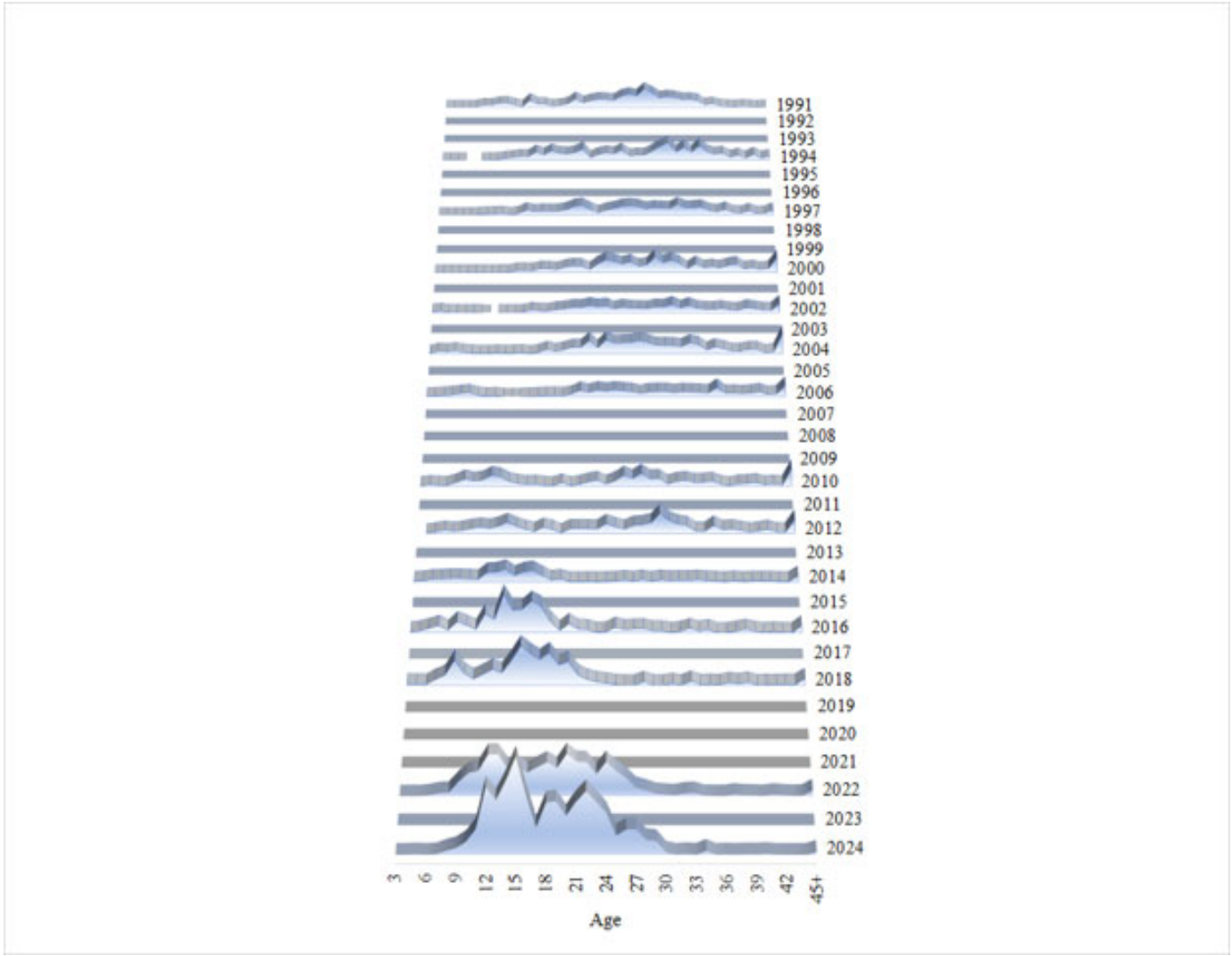
| Year | WAI/CAI ABC | WAI/CAI Catch | Catch/(WAI-CAI ABC) |
|---|---|---|---|
| 2011 | 220 | 77 | 0.35 |
| 2012 | 244 | 130 | 0.53 |
| 2013 | 209 | 152 | 0.73 |
| 2014 | 239 | 101 | 0.42 |
| 2015 | 304 | 125 | 0.41 |
| 2016 | 382 | 89 | 0.23 |
| 2017 | 195 | 153 | 0.78 |
| 2018 | 239 | 180 | 0.75 |
| 2019 | 204 | 311 | 1.53 |
| 2020 | 264 | 380 | 1.44 |
| 2021 | 169 | 319 | 1.89 |
| 2022 | 177 | 250 | 1.41 |
| 2023 | 166 | 316 | 1.90 |
| 2024 | 181 | 438 | 2.42 |
| 2025 | 298 | 424 | 1.42 |
| 2026 | 325 | 411 | 1.26 |



# Data in assessment model

| Source | Data | Years |
|---|---|---|
| AI Survey | Biomass estimates | 1991, 1994, 1997, 2000, 2002, 2004, 2006, 2010, 2012, 2014, 2016, 2018, 2022, 2024, **2026** |
| | Age composition | 1991, 1994, 1997, 2000, 2002, 2004, 2006, 2010, 2012, 2014, 2018, 2022, **2024** |
| | Length composition | **2026** |
| Fishery | Catch | 1977-**2026** |
| | Age composition | 2004-2005, 2007-2009, 2011, 2013, 2015, 2017, 2019-2021, 2023 |
| | Size composition | 1979, 1990, 1992-1993, 2003, 2010, 2012, 2014, 2016, 2018, 2022, **2024-2025** |

# Absence of older fish in recent AI surveys



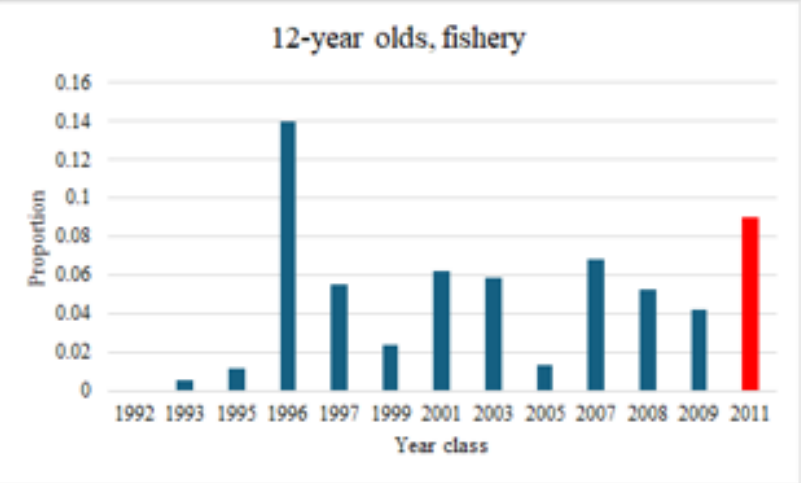
# Strength of 2011 year class



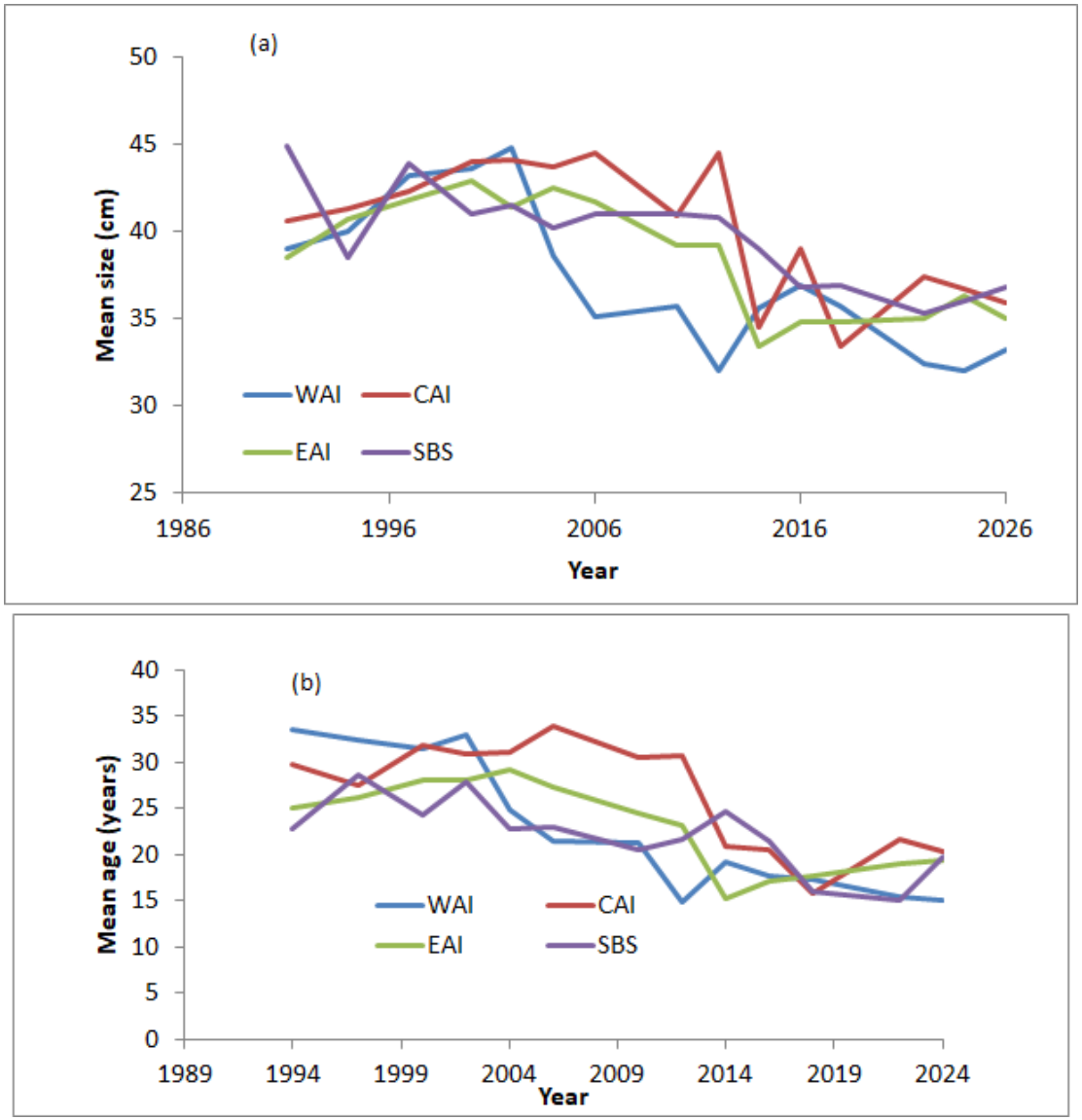




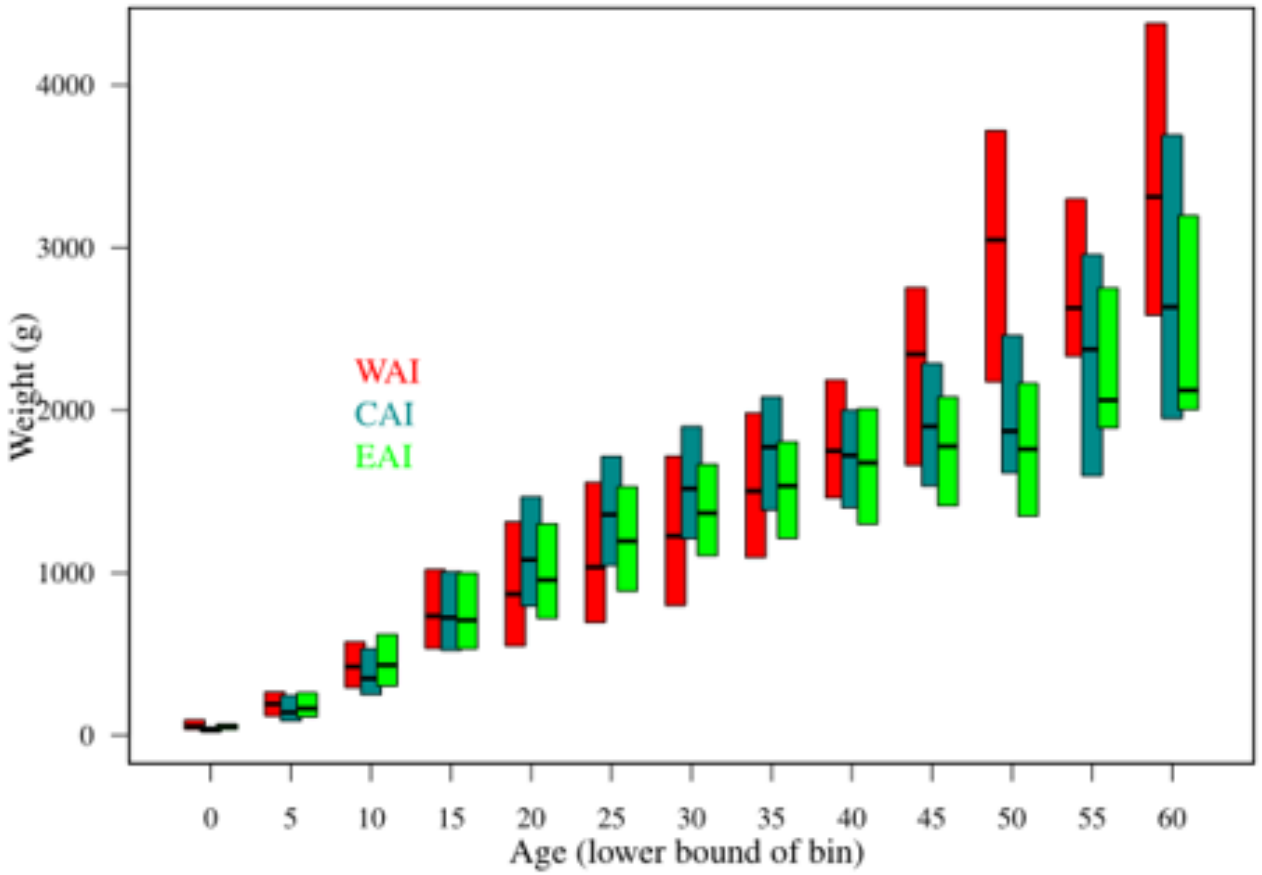


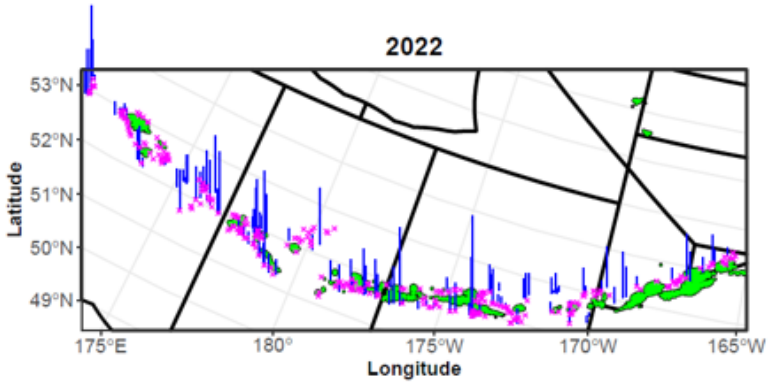
# Reductions in fish size and age in AI survey

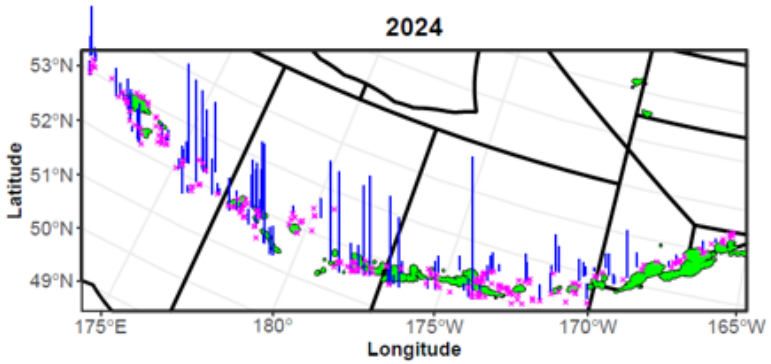


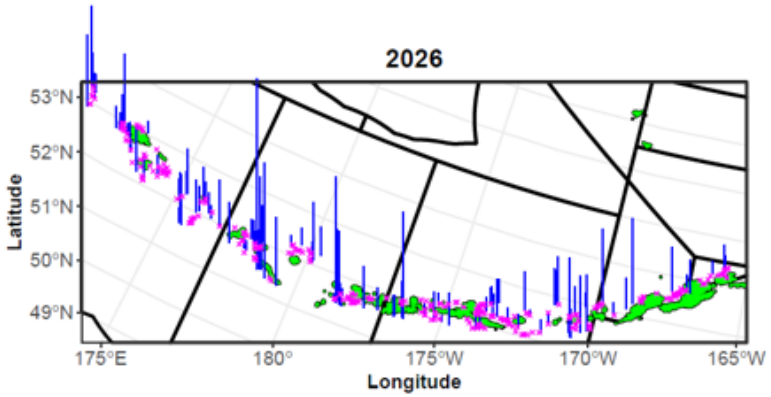
# Spatial differences in weight at age, AI survey



# AI survey CPUE, 2022 – 2026 AI surveys



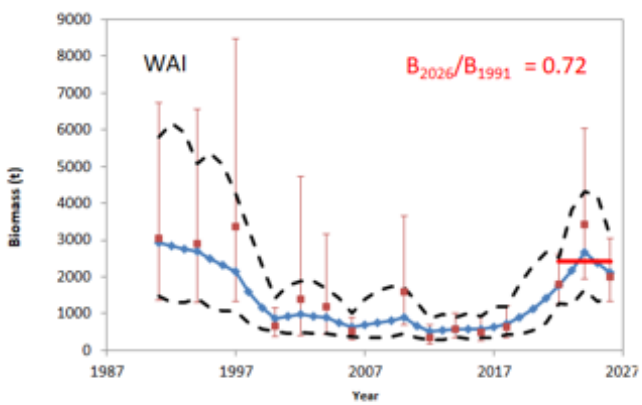



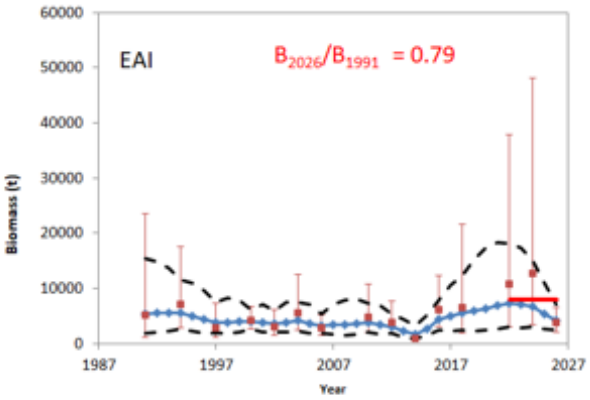



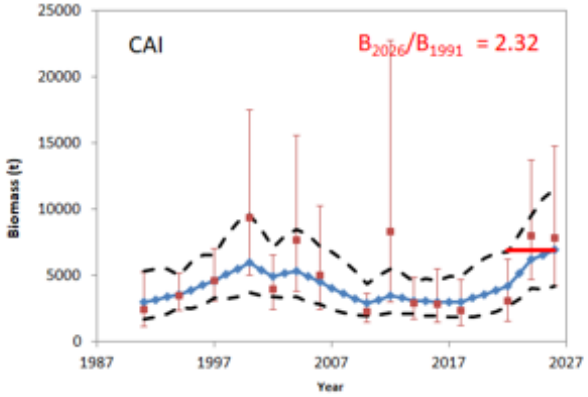

## Survey biomass estimates and CVs

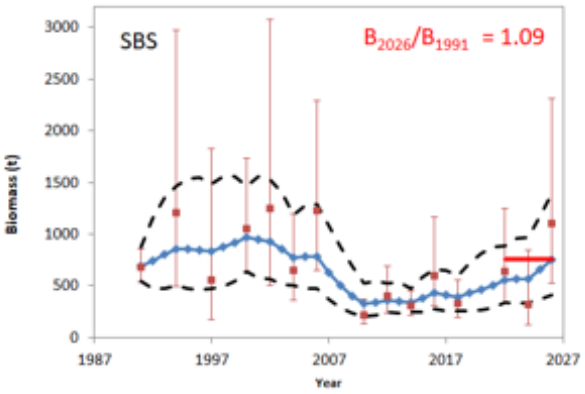
| Year | Western | Central | Eastern | southern BS | Total AI survey |
|---|---|---|---|---|---|
| 2022 | 1,793 (0.19) | 3,056 (0.37) | 10,834 (0.71) | 643 (0.35) | 16,325 (0.48) |
| 2024 | 3,417 (0.30) | 7,972 (0.28) | 12,698 (0.77) | 323 (0.52) | 24,410 (0.41) |
| 2026 | 2,008 (0.22) | 7,828 (0.33) | 3,712 (0.29) | 1,107 (0.39) | 14,655 (0.20) |

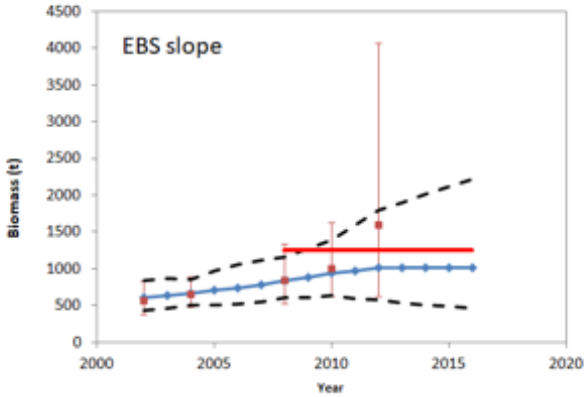
# Smoothed survey biomass estimates



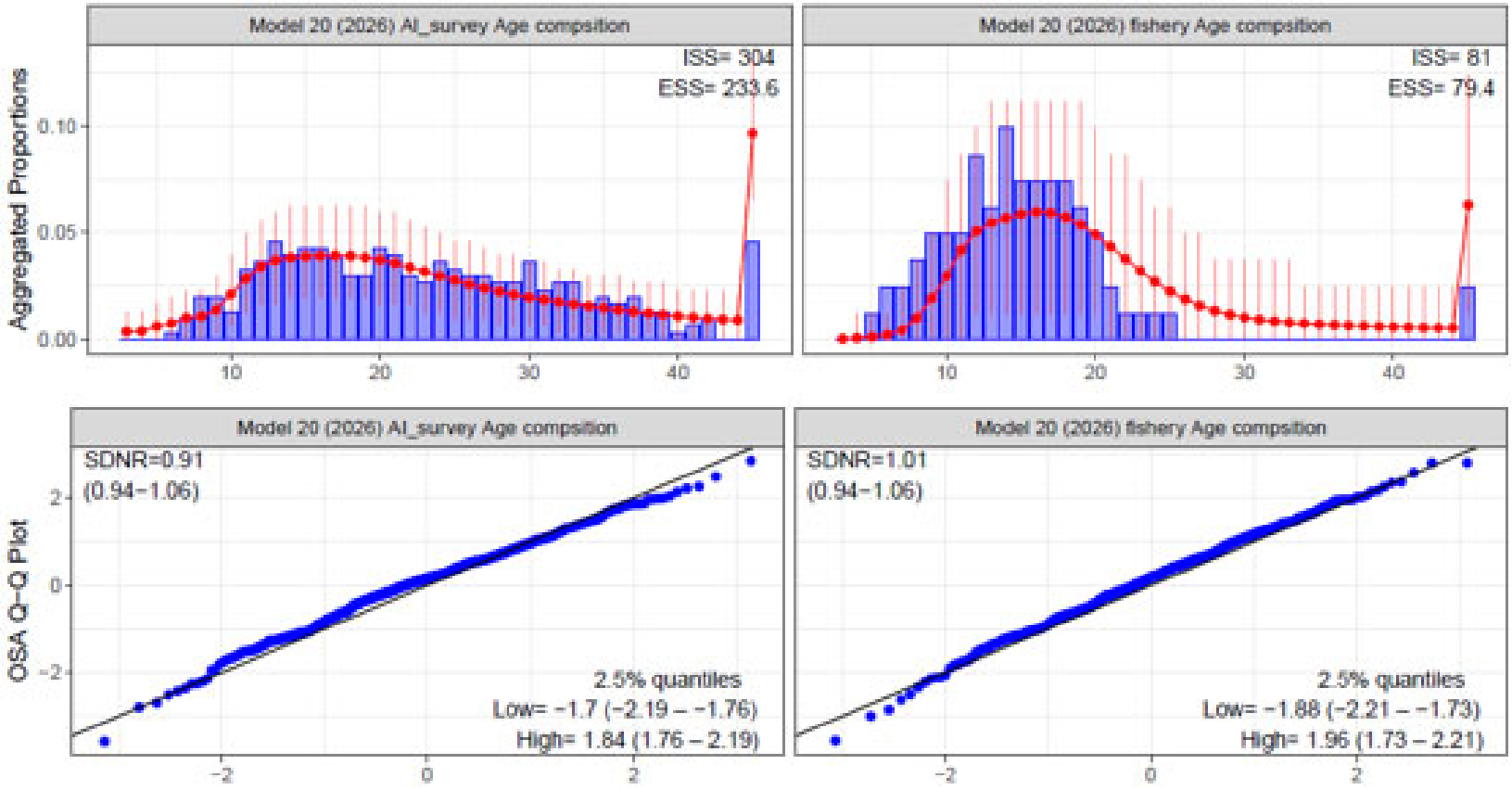



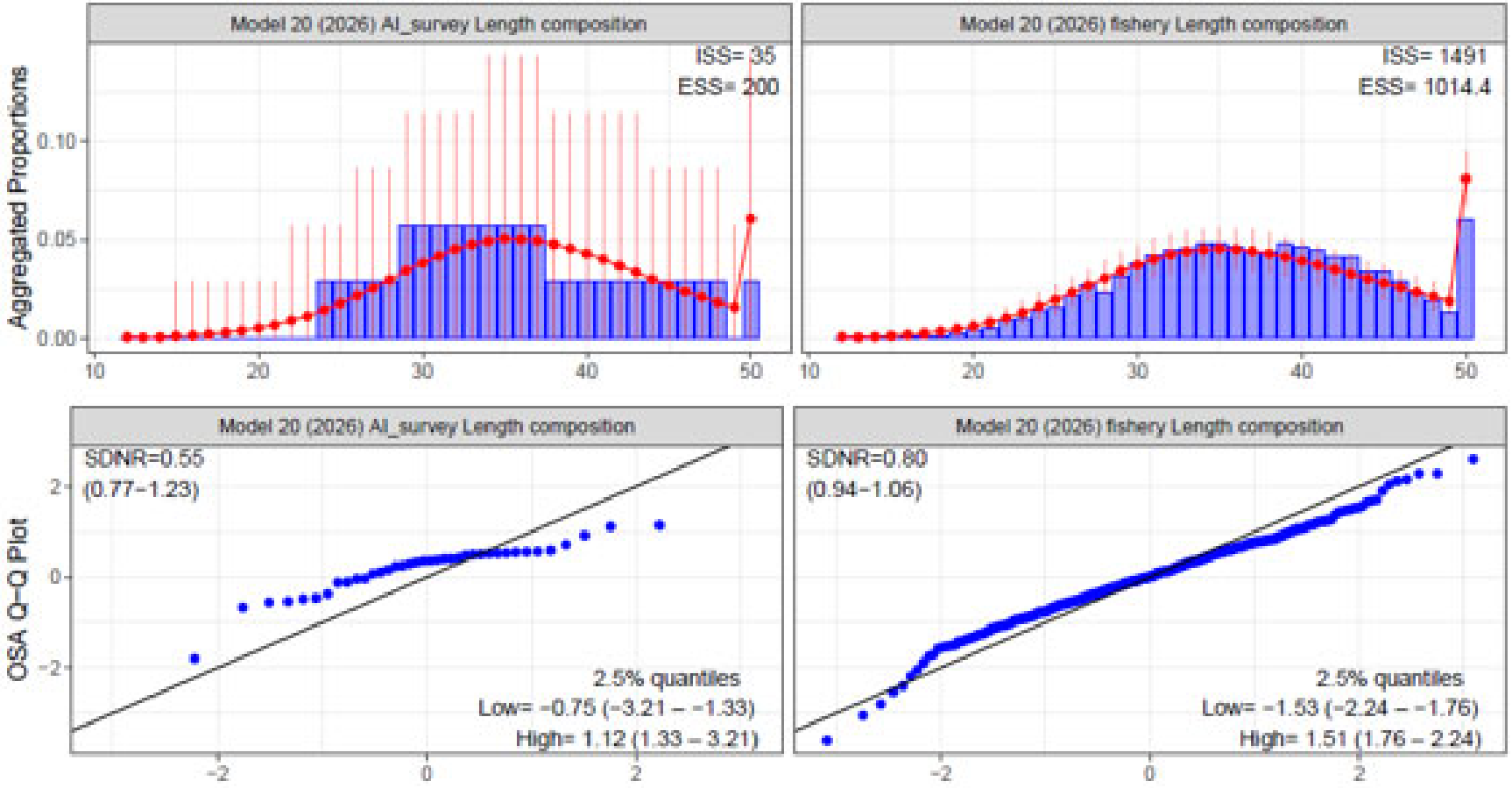



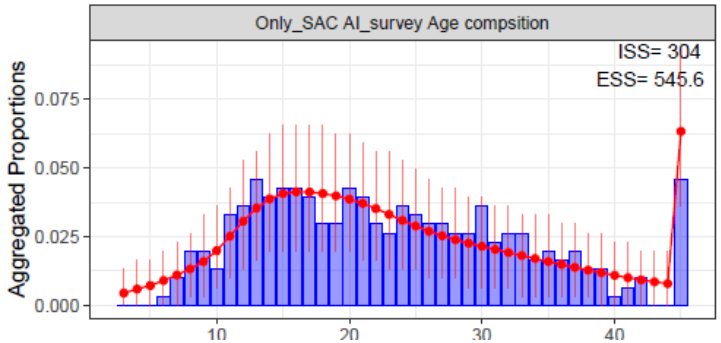
# Aggregate fit to the age comps



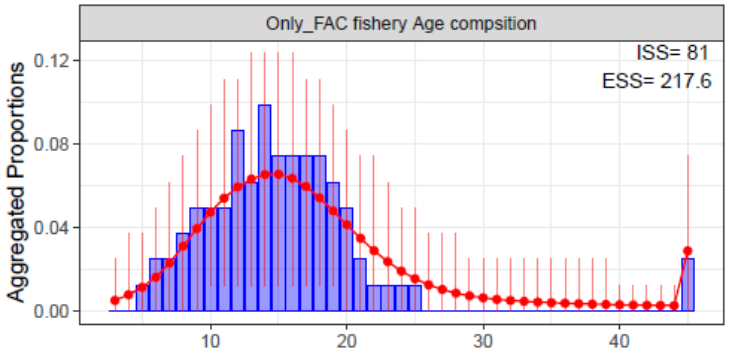
# Aggregate fit to the length comps



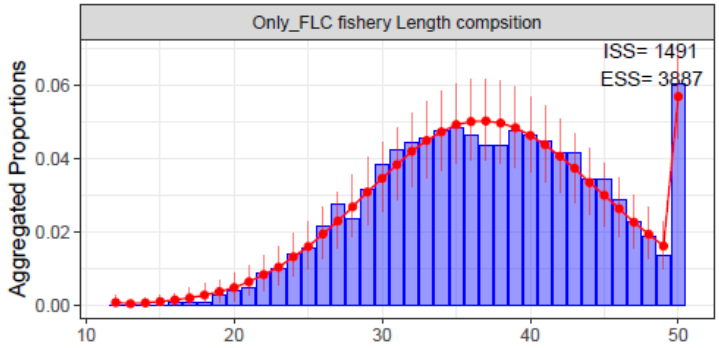
# Sensitivity analyses – only fit a single composition data set




"Only SAC" – only fitting the AI survey age composition



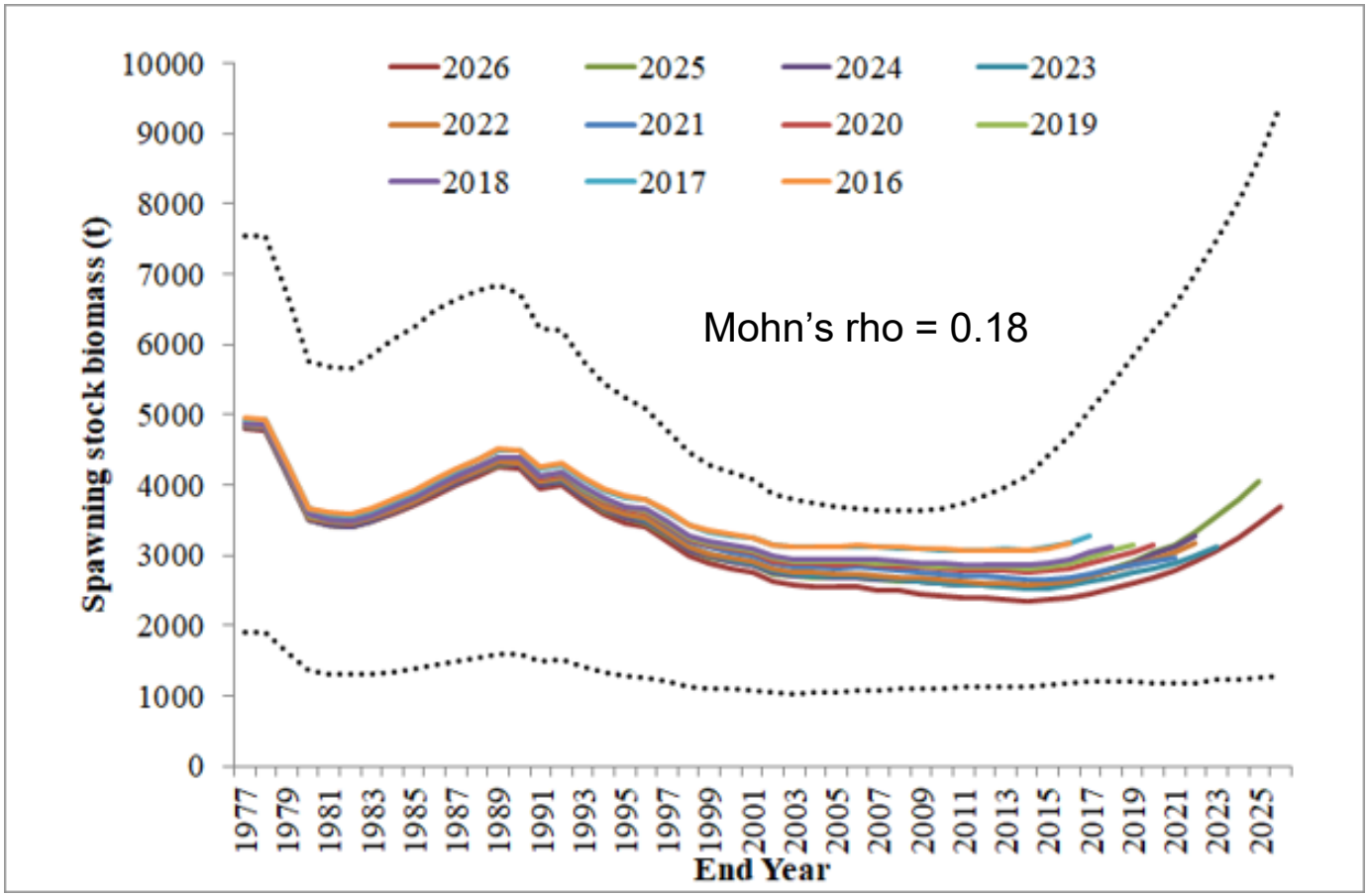

"Only FAC" – only fitting the fishery age composition



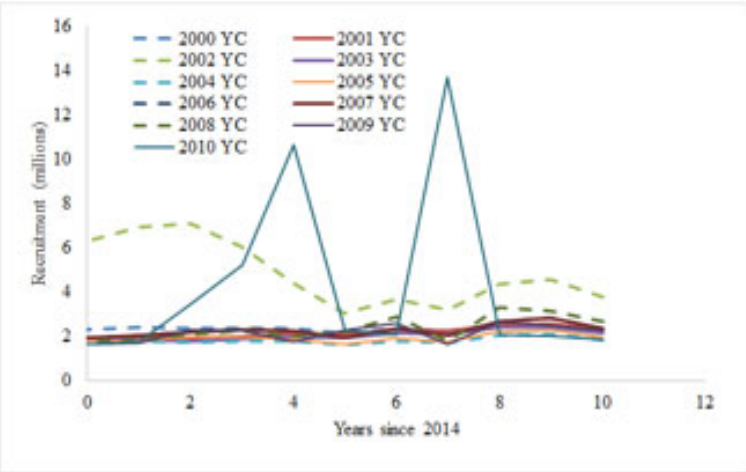

"Only FLC" – only fitting the fishery length composition

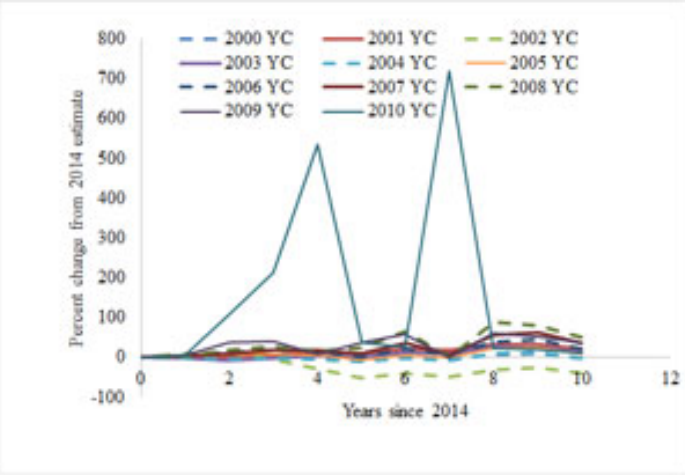
These runs show better fits to the plus group, indicating that the fits to the plus group are influenced by conflicts between data sets

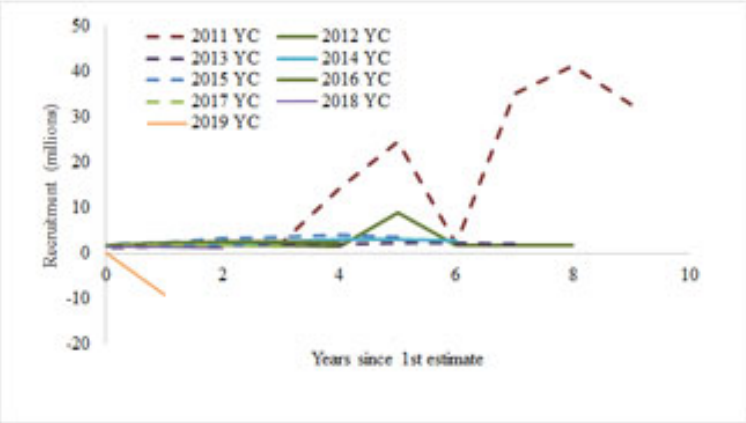
# Retrospective pattern in SSB

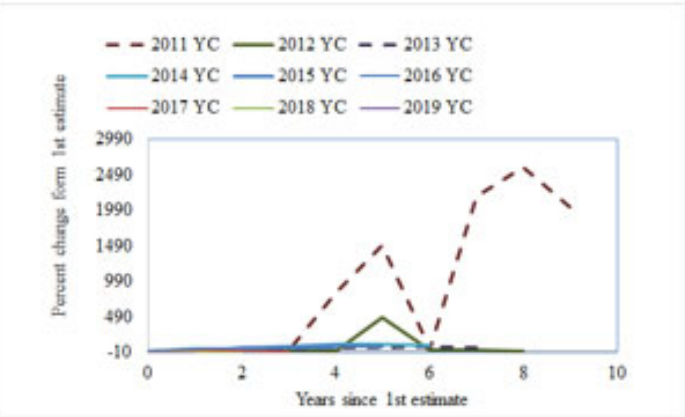


# Retrospective pattern in estimated recruitments

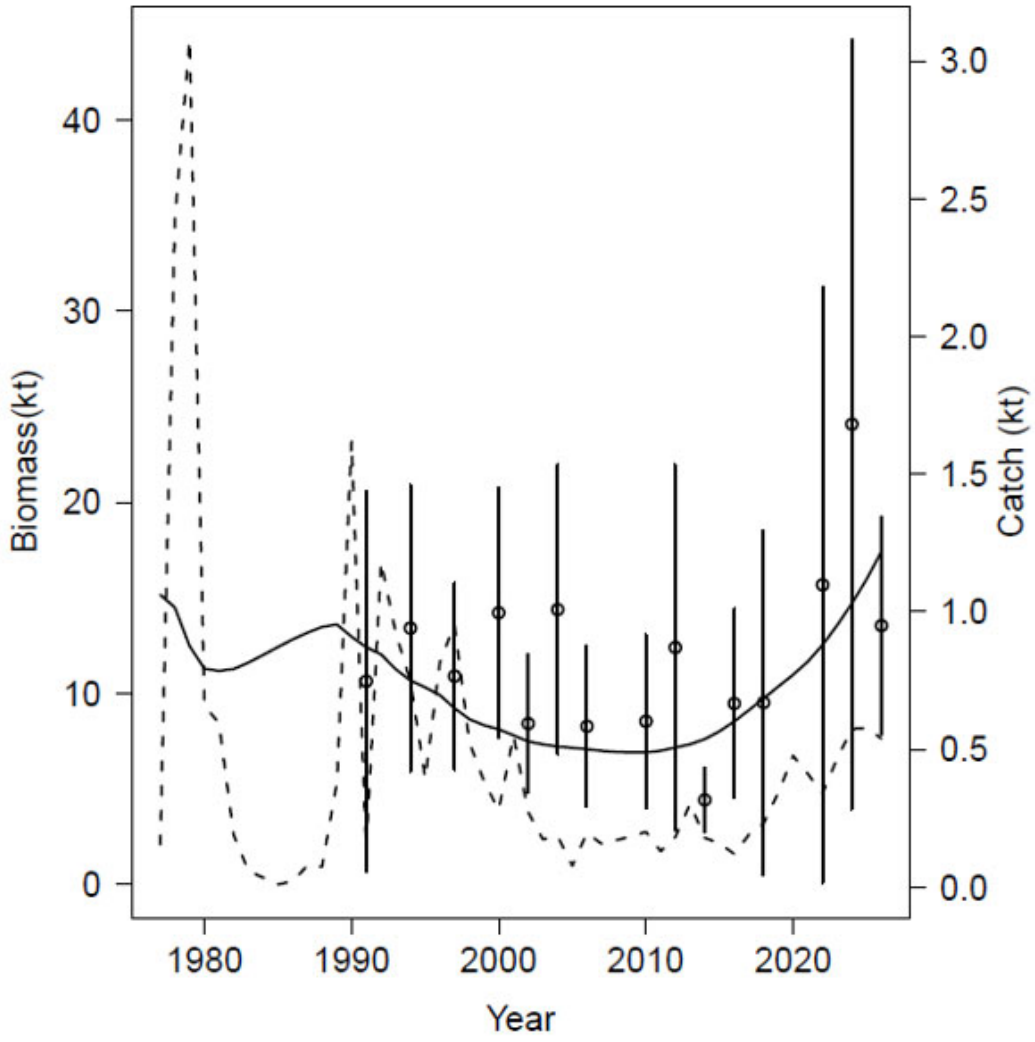


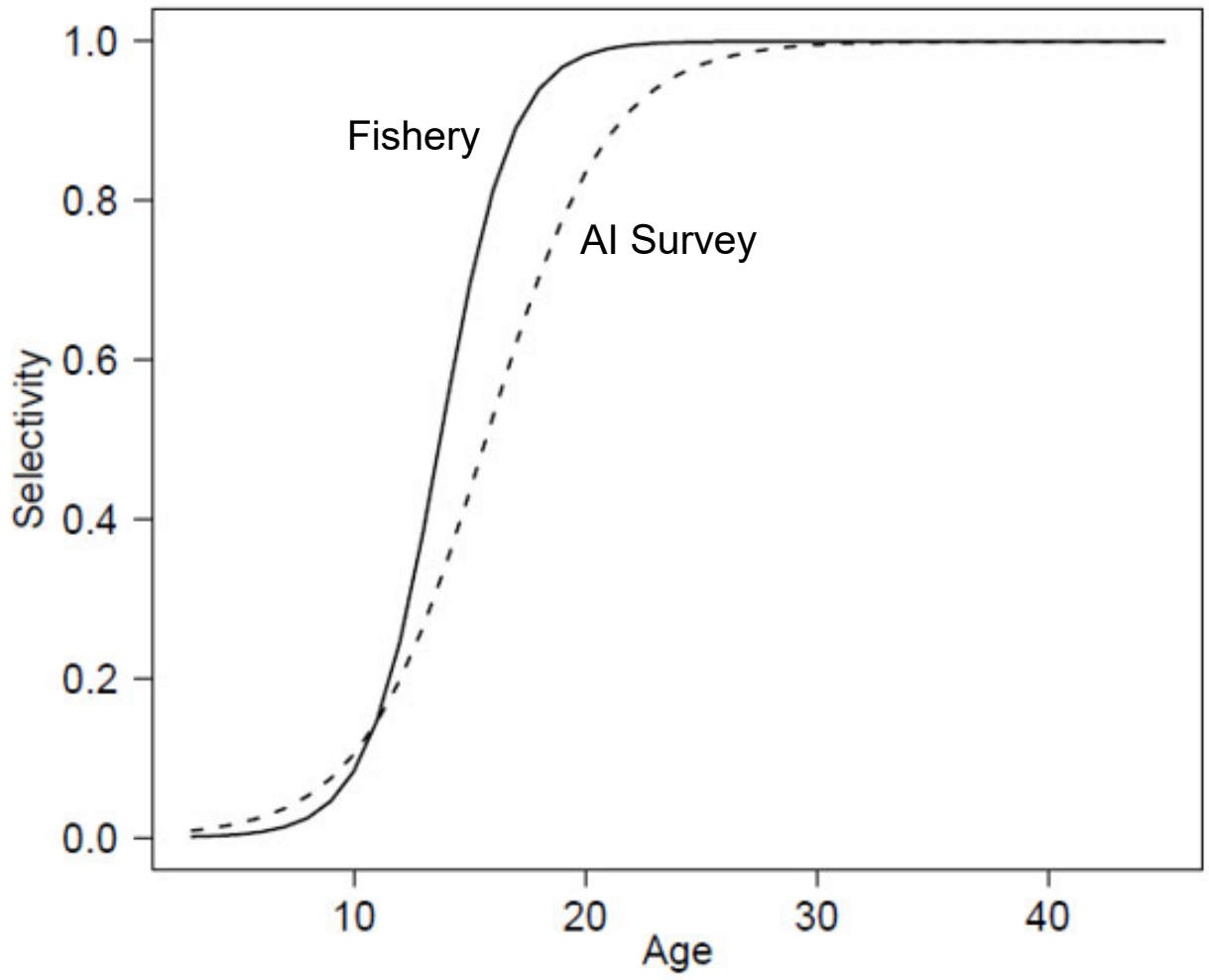



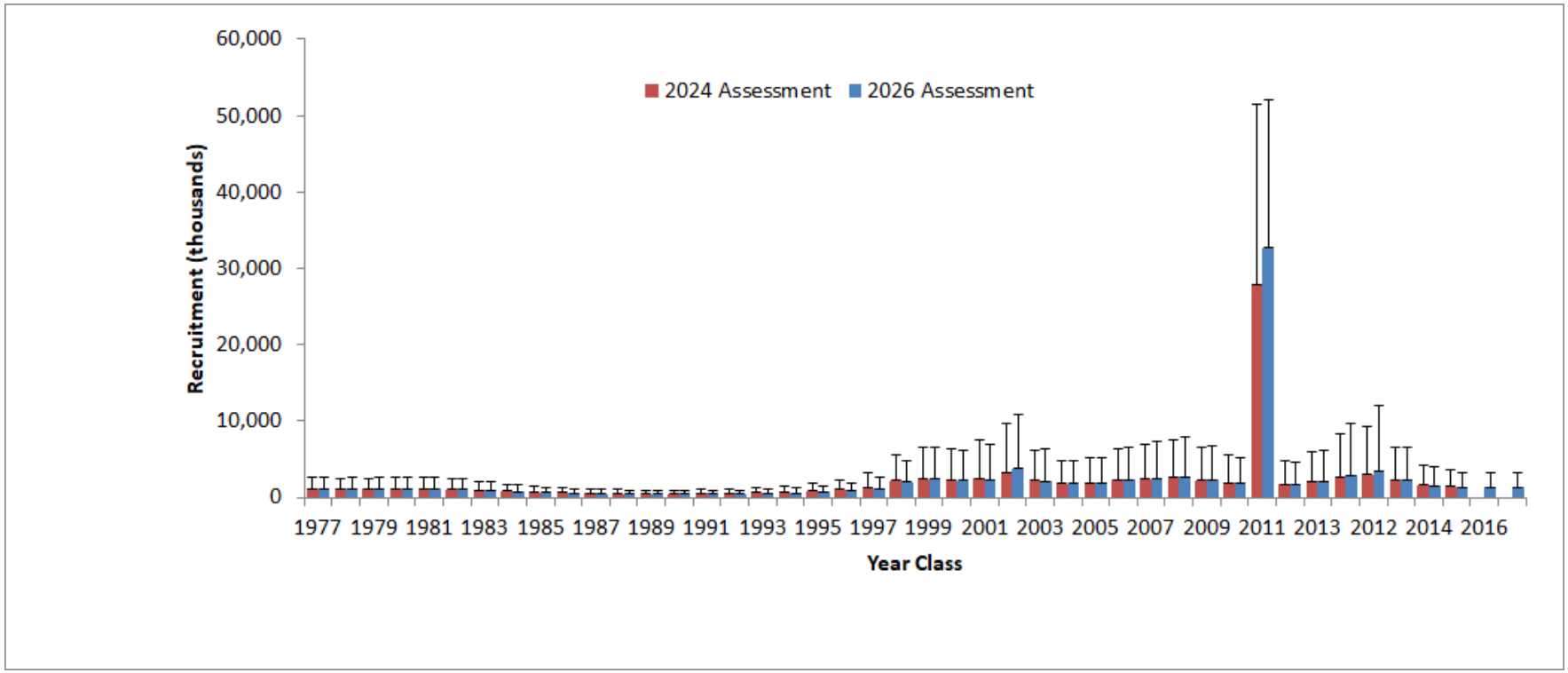
# Fit to the AI survey biomass



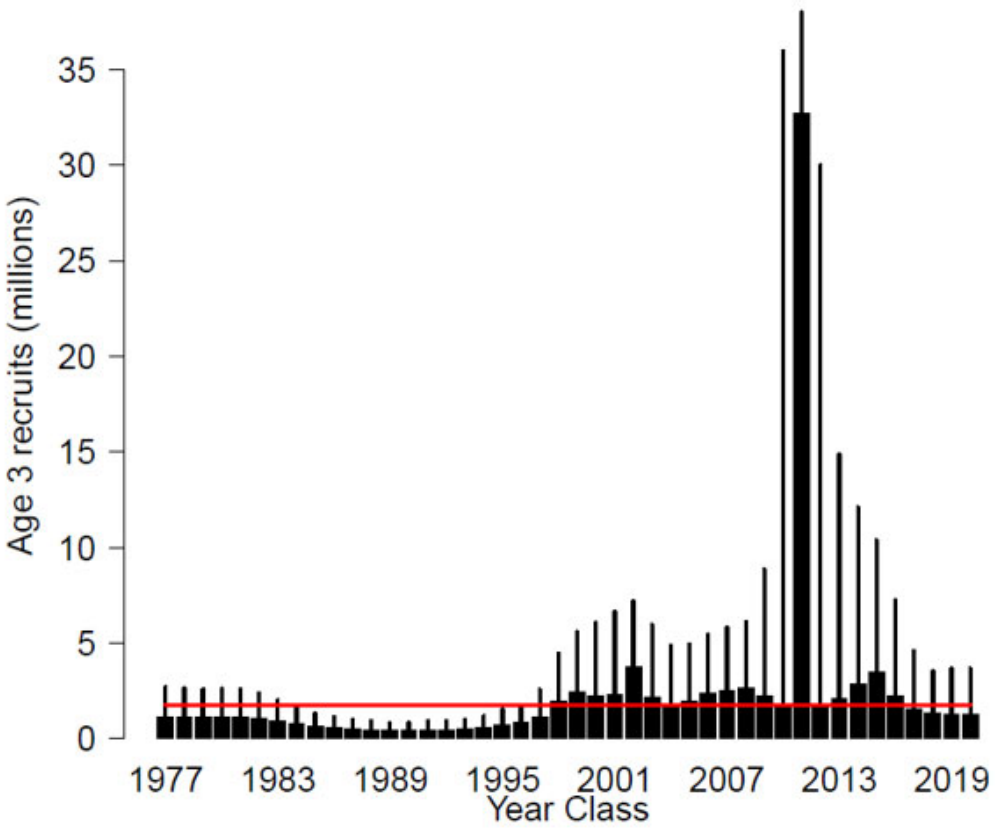
# Selectivity Curves



# Estimation of recruitment – comparison with 2026 model



# Estimation of recruitment




The 2011 year class is 32.7 million (CV of 0.29), which is > 8 times the next largest year class

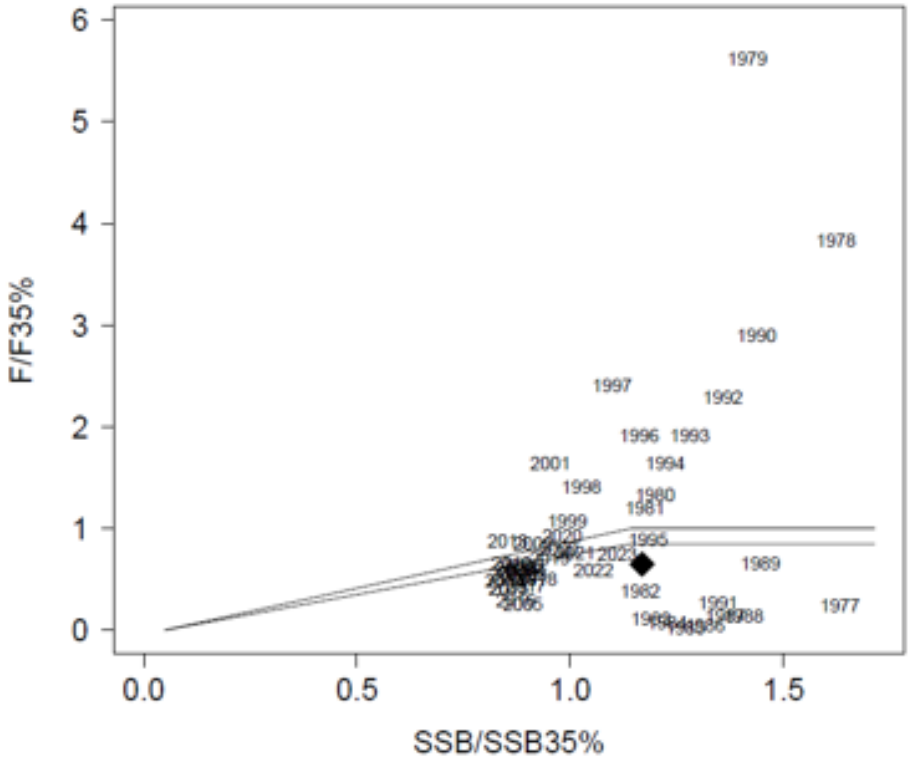
# The effect of this year class on B40% and ABC

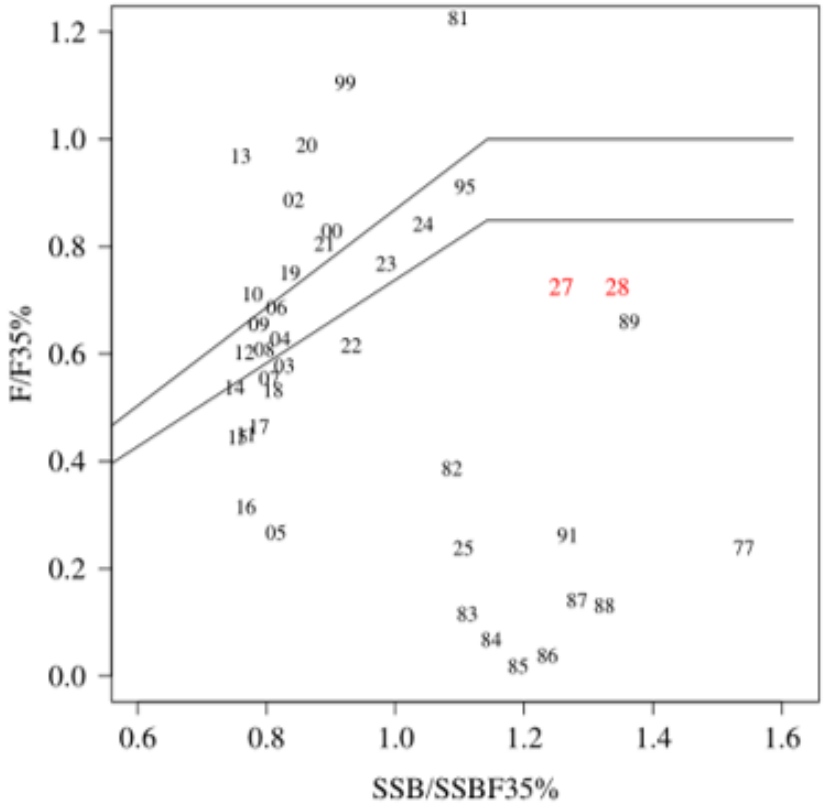
- We propose to set the value of the 2011 year class to the next largest (3.8 million, 2002 year class) for the purpose of stabilizing B40%.
- Similar procedure as 2024 and 2022 assessments

# The effect of this year class on B40% and ABC

| | 2024 projection | 2026 assessment | |
|---|---|---|---|
| | Adjusted 2011 YC used for $B_{40\%}$ | Unadjusted 2011 YC used for $B_{40\%}$ | Adjusted 2011 YC used for $B_{40\%}$ |
| $B_{40\%}$ | 3,525 | | |
| $B_{40\%}$ (2026 assessment) | | 5,265 | 3,565 |
| Percent change in $B_{40\%}$, 2024 to 2026 | | 49.36% | 1.13% |
| | | | |
| 2026 SSB | 3,630 | | |
| 2027 SSB | | 3,921 | 3,921 |
| 2028 SSB | | 4,194 | 4,194 |
| | | | |
| $B_{2026}/B_{40\%}$ | 1.03 | | |
| $B_{2027}/B_{40\%}$ | | 0.74 | 1.10 |
| $B_{2028}/B_{40\%}$ | | 0.80 | 1.18 |
| | | | |
| 2026 Total Biomass | 28,814 | | |
| 2027 Total Biomass | | 29,648 | 29,598 |
| 2028 Total Biomass | | 29,921 | 29,809 |
| | | | |
| 2026 Fabc | 0.035 | | |
| 2027 Fabc | | 0.026 | 0.035 |
| 2028 Fabc | | 0.028 | 0.035 |
| | | | |
| 2026 maximum ABC | 712 | | |
| 2027 maximum ABC | | 573 | 779 |
| (percent change 2026 to 2027) | | -19.52% | 9.41% |
| 2028 maximum ABC | | 648 | 821 |
| (percent change 2027 to 2028) | | 13.09% | 5.39% |

# Phase plane (with adjusted 2011 year class)



# Risk table considerations

- Assessment considerations: “data-inputs: biased ages, missing years of data including skipped surveys, lack of fishery-independent trend data; model fits: poor fits to fits to fishery or survey data, inability to simultaneously fit multiple data inputs; model performance: poor model convergence, multiple minima in the likelihood surface, parameters hitting bounds; estimation uncertainty: poorly-estimated but influential year classes; retrospective bias in biomass estimates.

- Level 2: Increased Concern. Poor fits to data, and high uncertainty in estimated spawning stock biomass; Substantially increased assessment uncertainty/ unresolved issues, such as residual patterns and mortality for older fish; positive retrospective bias that is variable between assessments.

# Risk table considerations

- Population dynamics considerations: “decreasing biomass trend, poor recent recruitment, inability of the stock to rebuild, abrupt increase or decrease in stock abundance.

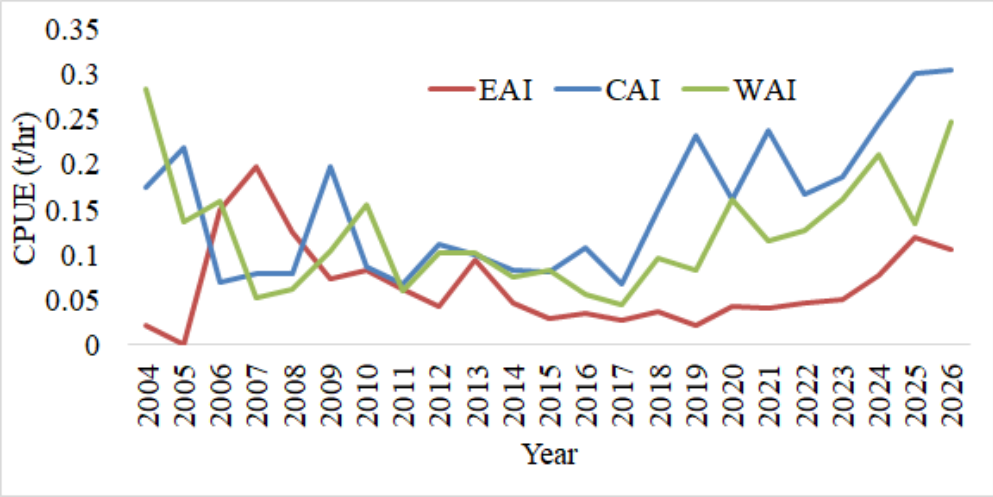
- Level 2: Increased concerns. Stock trends are unusual; trends increasing or decreasing faster than has been seen recently, or patterns are atypical. Also, existing spatial management measures are generally inconsistent with the relatively smaller spatial structure of Pacific rockfish.

# Risk table considerations

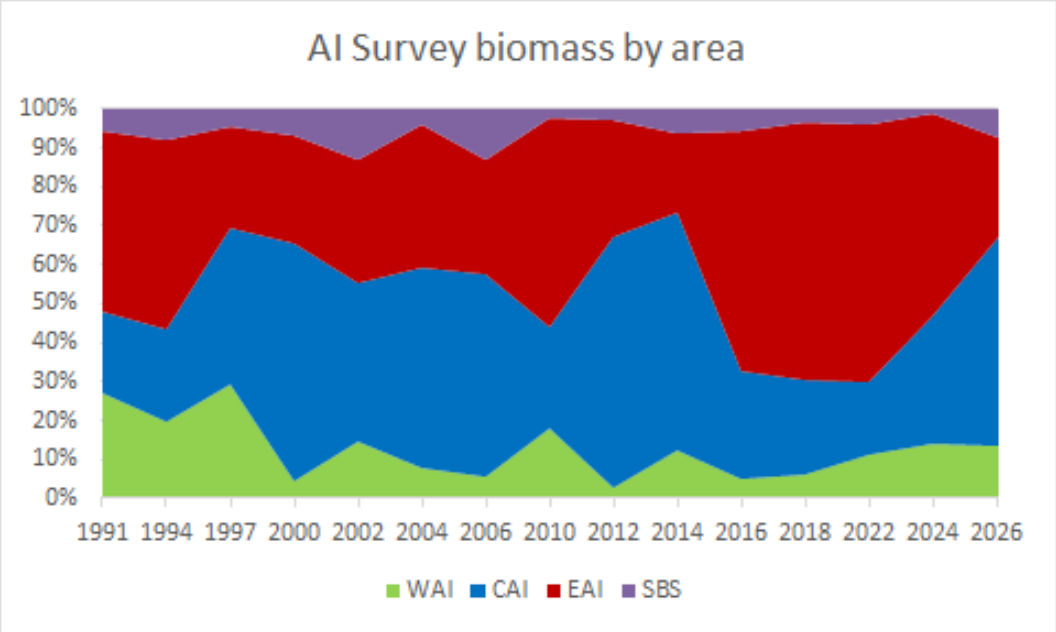
- Environmental/ecosystem considerations: "*adverse trends in environmental/ecosystem indicators, ecosystem model results, decreases in ecosystem productivity, decreases in prey abundance or availability, increases or increases in predator abundance or productivity.*"

- Level 1: Normal (No apparent environmental/ecosystem concerns)

# Fishery CPUE by subarea




Tons/hr, from tows targeting POP based on haul species composition. Source: North Pacific Groundfish Observer Program.




Fishery CPUEs are higher in the WAI than one would expect from the distribution of survey biomass

# Risk table considerations

- Fishery performance considerations: "fishery CPUE is showing a contrasting pattern from the stock biomass trend, unusual spatial pattern of fishing, changes in the percent of TAC taken, changes in the duration of fishery openings."

- Level 2: Increased concerns. Fishery CPUE in the WAI subarea are larger than would be expected based on the spatial distribution of survey biomass estimates.

# We recommend setting the 2027 ABC to the 2026 value (a 9.5% decrease from the maxABC)

1) Continued uncertainty in the 2011 year class
2) High uncertainty in estimated spawning stock biomass
3) Reduction in 2026 AI survey biomass estimate
4) Multiple risk table categories rates as 2 (“increased concern”)

This recommendation recognizes uncertainty in reference points and recent survey biomass trends, while maintaining harvest advice at the previously established level until these uncertainties can be more fully evaluated.

# Harvest spec table, AI subarea

| Quantity | As estimated or *specified* in 2024 for: 2025 | 2026 | As estimated or *recommended* this year for: 2027* | 2028* |
|---|---|---|---|---|
| *M* (natural mortality rate) | 0.050 | 0.050 | 0.051 | 0.051 |
| Tier | 3a | 3a | 3a | 3a |
| Projected total (age 3+) biomass (t) | 28,314 | 28,814 | 29,598 | 29,809 |
| Female spawning biomass (t) | | | | |
| Projected | 3,729 | 3,946 | 3,921 | 4,194 |
| $B_{100\%}$ | 8,813 | 8,813 | 8,912 | 8,912 |
| $B_{40\%}$ | 3,525 | 3,525 | 3,565 | 3,565 |
| $B_{35\%}$ | 3,085 | 3,085 | 3,119 | 3,119 |
| $F_{OFL}$ | 0.041 | 0.041 | 0.041 | 0.041 |
| $maxF_{ABC}$ | 0.035 | 0.035 | 0.035 | 0.035 |
| $F_{ABC}$ | 0.035 | 0.035 | 0.032 | 0.030 |
| OFL (t) | 766 | 830 | 915 | 964 |
| maxABC (t) | 652 | 712 | 779 | 821 |
| ABC (t) | 652 | 712 | 712 | 712 |
| **Status** | As determined *last* year for: 2023 | 2024 | As determined *this* year for: 2025 | 2026 |
| Overfishing | No | n/a | No | n/a |
| Overfished | n/a | No | n/a | No |
| Approaching overfished | n/a | No | n/a | No |

AI ABC: 712 t (identical to 2026 ABC)

AI OFL: 915 t (increase from 2026 OFL of 830 t)

# EBS portion table

| Quantity | As estimated or *recommended* in 2024 for: 2025 | 2026 | As estimated or *recommended* this year for: 2027 | 2028 |
|---|---|---|---|---|
| *M* (natural mortality rate) | 0.050 | 0.050 | 0.051 | 0.051 |
| Tier | 5 | 5 | 5 | 5 |
| Biomass (t) | 1,444 | 1,444 | 1,766 | 1,766 |
| $F_{OFL}$ | 0.050 | 0.050 | 0.051 | 0.051 |
| $maxF_{ABC}$ | 0.037 | 0.037 | 0.038 | 0.038 |
| $F_{ABC}$ | 0.037 | 0.037 | 0.031 | 0.031 |
| OFL (t) | 72 | 72 | 90 | 90 |
| maxABC (t) | 54 | 54 | 67 | 67 |
| ABC (t) | 54 | 54 | 54 | 64 |
| **Status** | As determined last year for: 2023 | 2024 | As determined *this* year for: 2025 | 2026 |
| Overfishing | No | n/a | No | n/a |

EBS ABC: 54 t (identical to 2026 ABC)
EBS OFL: 90 t (increase from 2026 OFL of 72 t)

# Spatial apportionment of ABC

Spatial apportionment from (2024 assessment)

| | Area | | | | |
|---|---|---|---|---|---|
| | WAI | CAI | EAI | SBS | EBS slope |
| Smoothed biomass | 2,913 | 5,788 | 10,366 | 433 | 1,011 |
| percentage (within AI subarea) | 15.3% | 30.4% | 54.4% | | |

Spatial apportionment from (2026 assessment)

| | Area | | | | |
|---|---|---|---|---|---|
| | WAI | CAI | EAI | SBS | EBS slope |
| Smoothed biomass | 2,107 | 6,896 | 4,271 | 755 | 1,011 |
| percentage (within AI subarea) | 15.9% | 51.9% | 32.2% | | |

BRDs

| | Area | | | |
|---|---|---|---|---|
| Year | WAI BRD | CAI BRD | EAI/EBS BRD | Total ABC |
| 2027 | 113 | 370 | 283 | 766 |
| 2028 | 113 | 370 | 283 | 766 |

# Plan Team table

| Area/subarea | Year | Total Biomass (t)[1] | OFL | ABC | subarea ABC | MSSC | BRD | TAC | Catch[2] |
|---|---|---|---|---|---|---|---|---|---|
| BSAI | 2025 | 29,758 | 838 | 706 | | | | 706 | 648 |
| | 2026 | 30,258 | 902 | 766 | | | | 766 | 524 |
| | 2027 | 31,364 | 1005 | 766 | | | | | |
| | 2028 | 31,575 | 1054 | 766 | | | | | |
| Western/Central Aleutian Islands | 2025 | | | | 298 | | | 298 | 424 |
| | 2026 | | | | 325 | | | 325 | 411 |
| | 2027 | | | | | | | | |
| | 2028 | | | | | | | | |
| Western AI | 2025 | | | | | 100 | | | |
| | 2026 | | | | | 109 | | | |
| | 2027 | | | | | | 113 | | |
| | 2028 | | | | | | 113 | | |
| Central AI | 2025 | | | | | 198 | | | |
| | 2026 | | | | | 216 | | | |
| | 2027 | | | | | | 370 | | |
| | 2028 | | | | | | 370 | | |
| Eastern AI/Eastern Bering Sea | 2025 | | | | 408 | | | 408 | 225 |
| | 2026 | | | | 441 | | | 441 | 114 |
| | 2027 | | | | | | 283 | | |
| | 2028 | | | | | | 283 | | |

# BRDs for BSAI blackspotted/rougheye rockfish

- Much of information on “Biologically-informed Recommended Distributions” (BRDs) in the next few slides comes from an October, 2025 presentation by Sara Cleaver to the SSC (Cleaver, 2025)
- The adoption of BRDs achieves two purposes
  - Increased efficiency and transparency (primarily from avoiding similar sounding terms for management advice with different regulatory implications)
  - Clarifying how different types of information (i.e., biological vs socioeconomic and management) are used at various steps of the advice and regulatory process.
- BRDs are required to be adopted in this assessment cycle for advice on subarea apportionment of ABC

# Outline

- Definition of BRDs, and their purpose
- Review of recent spatial harvest advice for BSAI blackspotted/rougheye rockfish, and comparison to BRDs
- Relation between BRDs and TACs
- Potential reasons why BRDs may differ from TACs
- Recommended future BRDs for BSAI blackspotted/rougheye rockfish

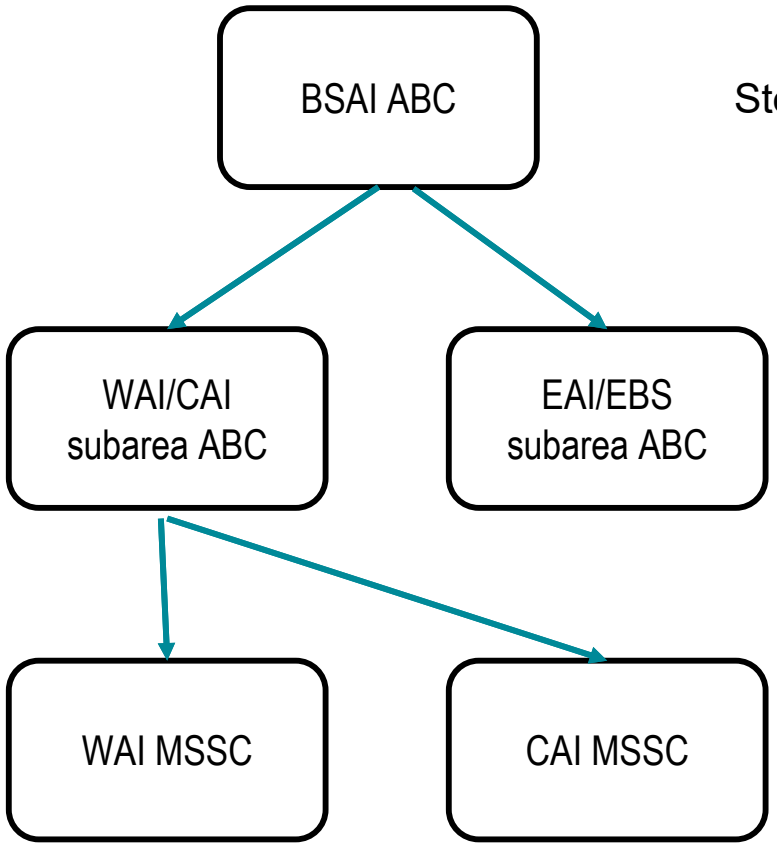
# Definition of BRDs (Cleaver, 2025)

- "A spatial apportionment of a stock or stock complex will be referred to as a **Biologically-informed Recommended Distribution (BRD)**"
- "Based on approved apportionment methods (survey biomass, catch for Tier 6) according to BSIA"
- "Socio-economic factors should **not** be incorporated into the recommendations of BRD nor methods to calculate BRDs"

# Purpose of BRDs (Cleaver, 2025)

- Extra layer of precautionary management to account for uncertainty in stock structure (localized depletion)
- Biologically-informed starting point for TAC recommendations (Information to inform TAC)
- No change; **“subarea ABC” = BRD**
  - The term “subarea ABC” has no associated MSA requirements, and exceedances do not trigger accountability measures

# Current biologically-based spatial harvest advice




Stock level

"Subarea ABC"

"Maximum Sustainable Species Catch"

- The use of multiple terms, and the hierarchical structure, may be incorrectly interpreted as indicative of levels of importance
- The biological basis and methodology for producing this advice is identical for each spatial area and does not recognize hierarchy
- The MSSCs have been interpreted as subarea ABC by stock assessors, and the fishing industry
- BSAI blackspotted/rougheye rockfish are the only stock to use MSSCs

# MSSCs meet the definition of BRDs

- A spatial apportionment of a stock or stock complex
- Based on approved apportionment methods (survey biomass, catch for Tier 6) according to BSIA
- Do not reflect socio-economic factors
- Intended as extra layer of precautionary management to account for stock structure (localized depletion)
- No associated MSA requirements, and exceedances do not trigger accountability measures

# Relation between BRDs and TAC (Cleaver 2025)

- Biologically-informed starting point for TAC recommendations (Information to inform TAC)
- During annual specifications, Council may recommend a subarea TAC that is less than, equal to, or greater than BRD (per NS2)
- Council's TAC recommendations incorporate socioeconomic considerations: seasonal access to fisheries, commercial importance to communities, efficient utilization of resources, or Inseason Management input during Plan Team meetings.

# In this assessment, we express spatial harvest advice with BRDs

- BRDs are now required terminology, and have been vetted by legal and policy experts

- Replaces system of 2 subarea ABCs and two MSSCs with 3 BRDs

  Increased simplicity and transparency from avoiding a complicated hierarchical structure with multiple terms that are not consistently applied

- A “name change” from MSSC to BRD; the methodology remains the same

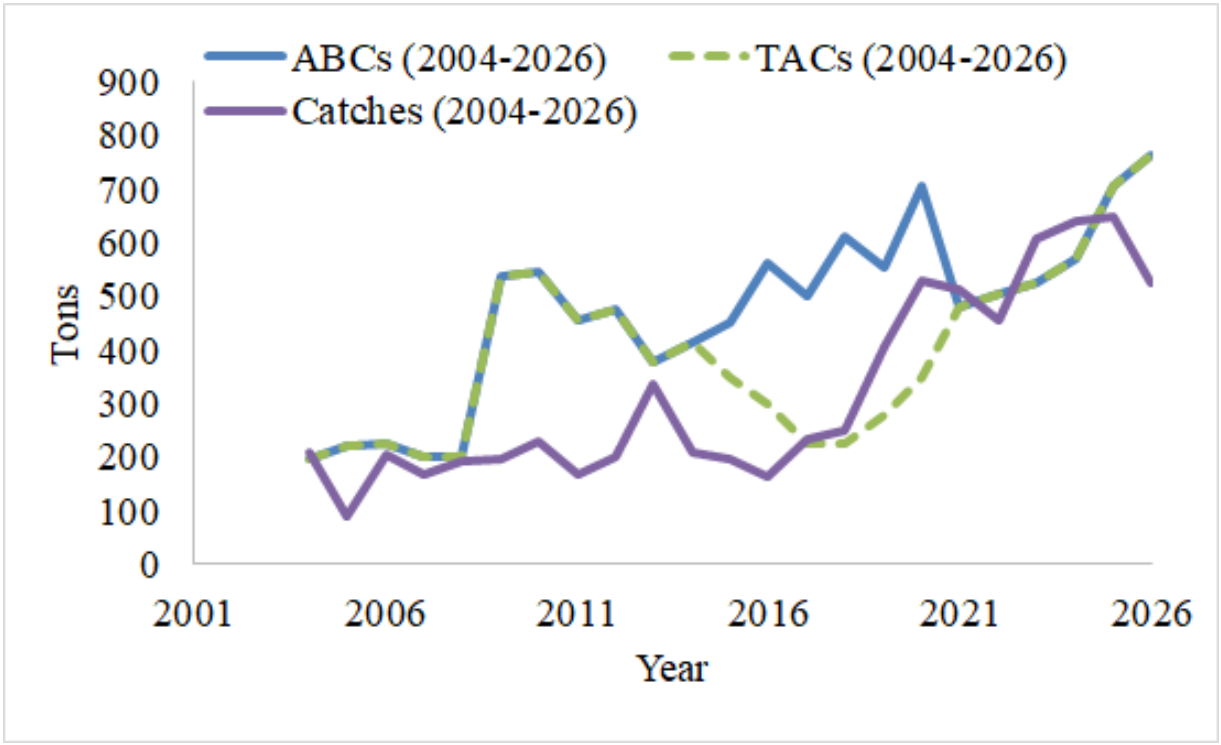
# Stock structure for BSAI blackspotted/rougheye rockfish

- First stock for which the stock structure template was applied (2010), and only stock rated at the highest level of concern.
- A finding of "strong" structure was affirmed by the BSAI Plan Team in 2014, based on spatial patterns in disproportionate harvest, an observed decline in the WAI, and recognition that demographic independence between spatial areas may to hard to infer from genetic data. The assessment also noted spatial differences in size at age and length compositions.
- SSC, Dec 2024) ". . . *the SSC highlights that catch in excess of ABC is always a concern, especially for long-lived, relatively sedentary species with long recovery times and high risk for localized depletion.*"

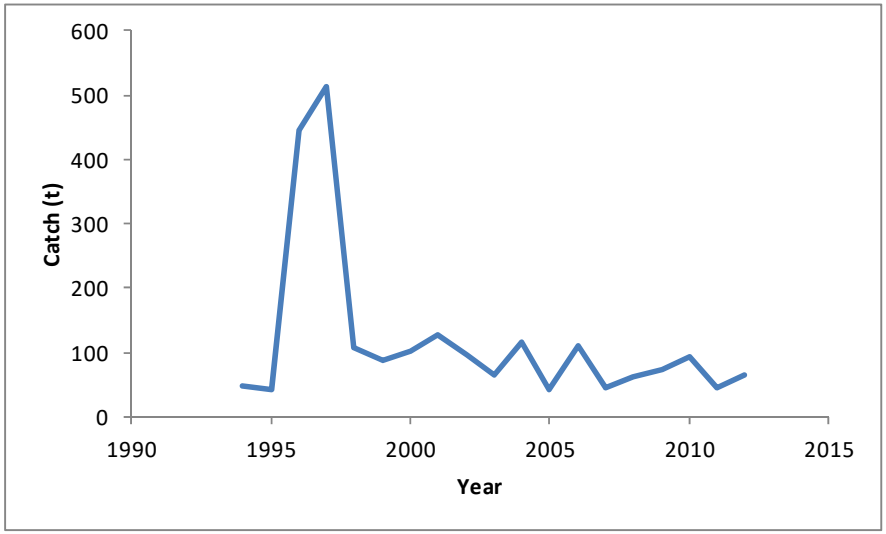
# Conclusions

- Continued issue with estimating recent year classes that are incompletely observed.
- Decrease in 2026 survey biomass estimate, and worse retrospective pattern (relative to 2026 assessment).
- Poor fits to the composition data and the survey biomass estimates are concerning. Research models and simulation experiments may be helpful (i.e., data processing, data weighting, variability in observed data from patchy populations).
- Catch overages at multiple spatial scales (MSSC, WAI/CAI, and BSAI) are also of concern.

# BSAI Catch, TACs, and ABC (back to 2004)



# Harvesting in the western AI




AI Rougheye/Shortraker TAC

1996: 1,125 t

1997: 938 t

Estimated catch

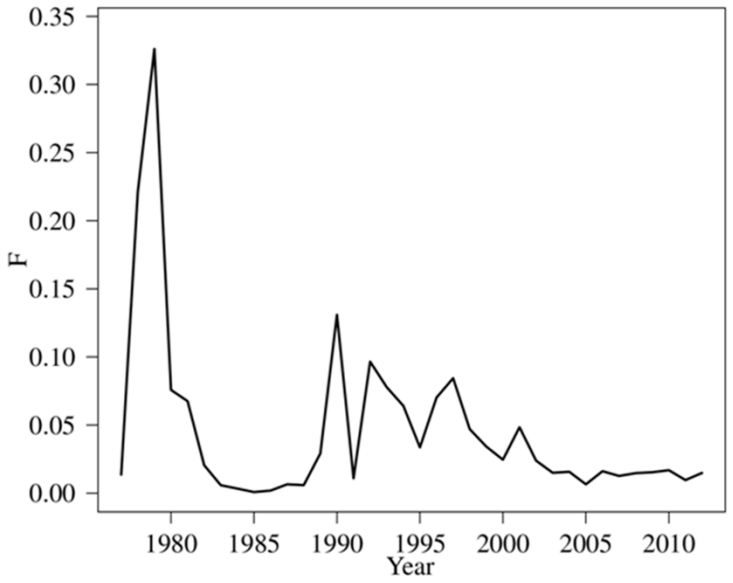
1996: 446 t (40% of TAC)

1997: 513 t (55% of TAC)

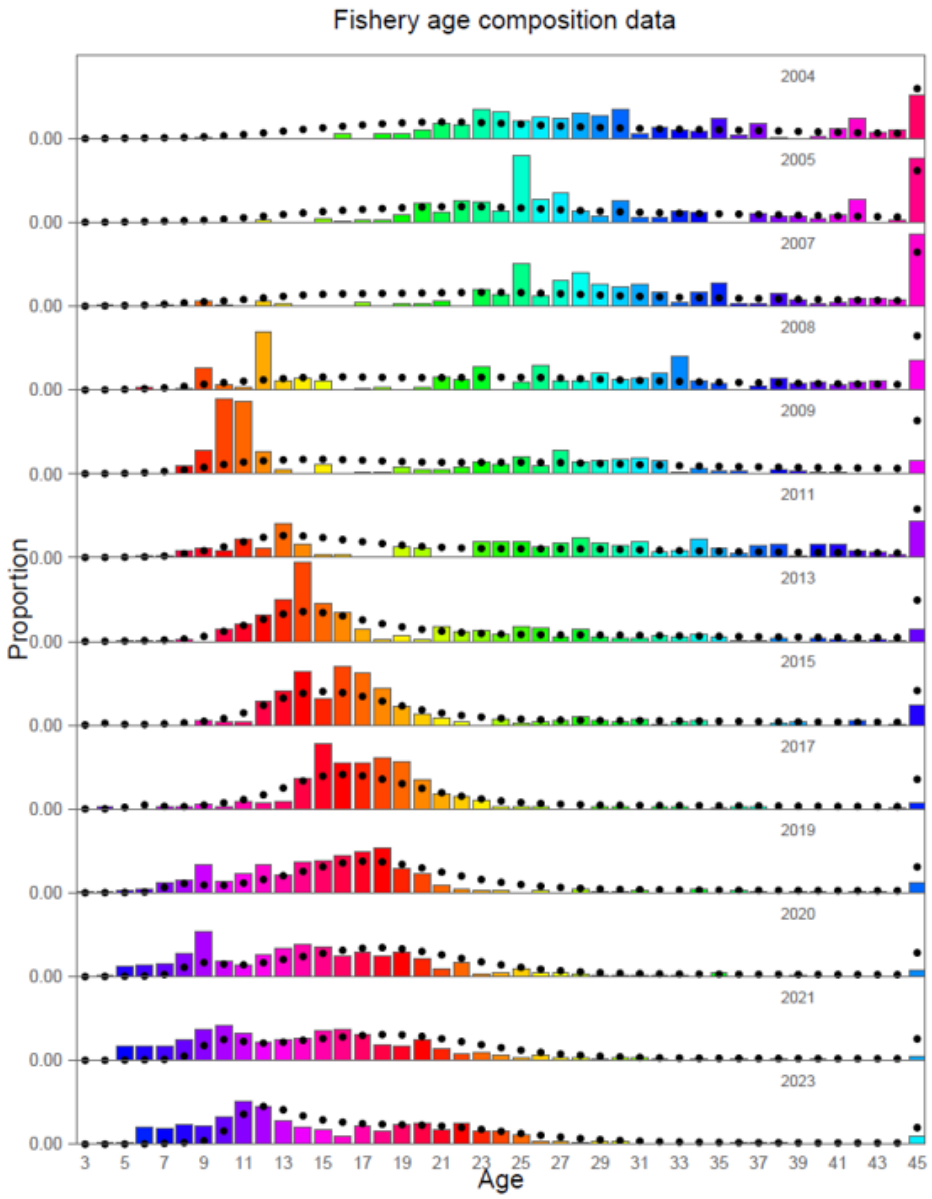
## Observed tows in the western AI

| | Year | |
|---|---|---|
| | 1996 | 1997 |
| Total number of hauls | 185 | 176 |
| POP hauls | 101 | 118 |
| Atka mackerel hauls | 57 | 52 |
| Rougheye rockfish hauls | 4 | 4 |
| | | |
| Total catch (t) | 285.95 | 402.45 |
| Percent in POP hauls | 82.08 | 69.18 |
| Percent in Atka mackerel hauls | 8.21 | 5.79 |
| Percent in rougheye rockfish hauls | 5.02 | 23.45 |

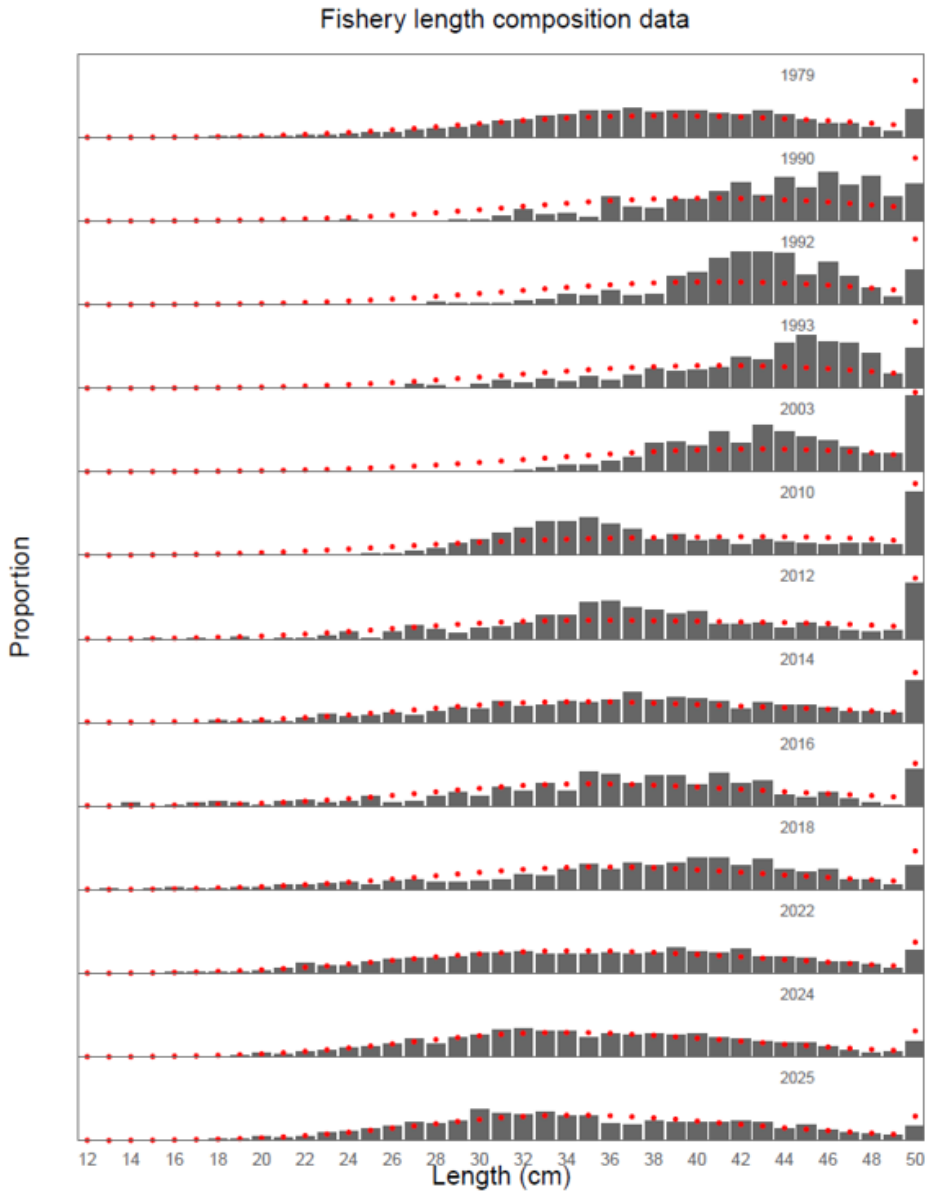
## Estimated *F* from 2012 model



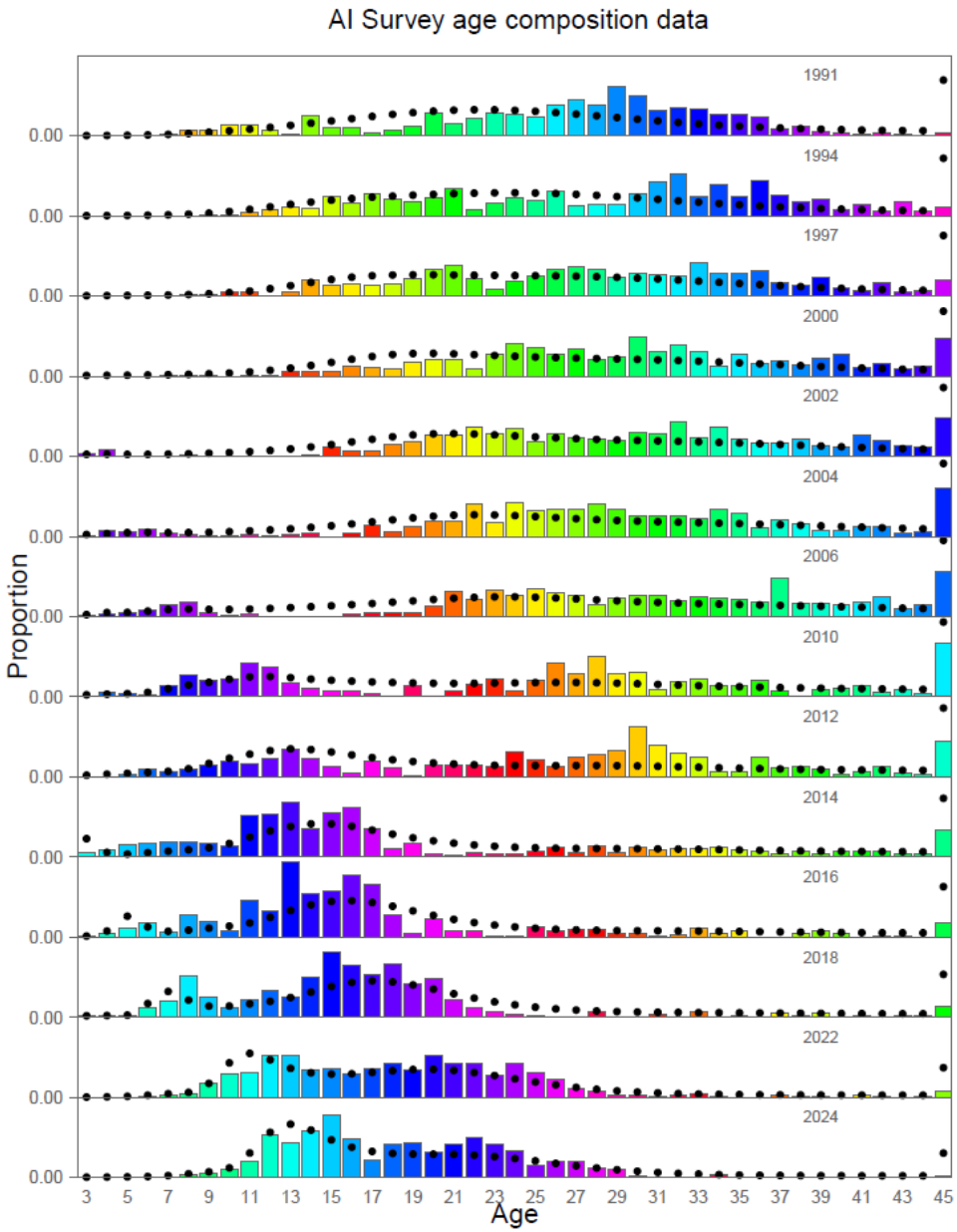
# Fits to fishery age compositions



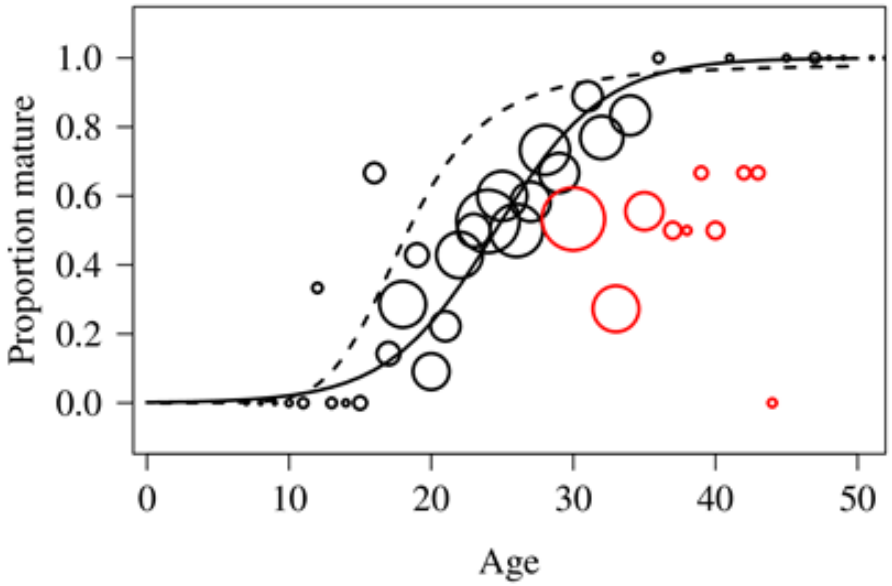
# Fits to fishery length compositions



# Fits to survey age compositions



# Estimated maturity




Estimated age at 50% mature = 24.5 years