Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission

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Bigeye tuna in the eastern Pacific Ocean: 2026 update assessment

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Inter-American Tropical Tuna Commission

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Update assessment for bigeye tuna in the EPO

- The most recent benchmark assessment was conducted in 2024
- The JPN longline index of relative abundance has been updated up to the third quarter of 2025
- New purse-seine and longline catch data for 2024 and 2025
- New purse-seine length composition data for 2024 and 2025
- New longline length composition data for 2023 and 2024 (one-year lag in longline data reporting)
- Except for including new or updated data, no other modifications were made for this update assessment

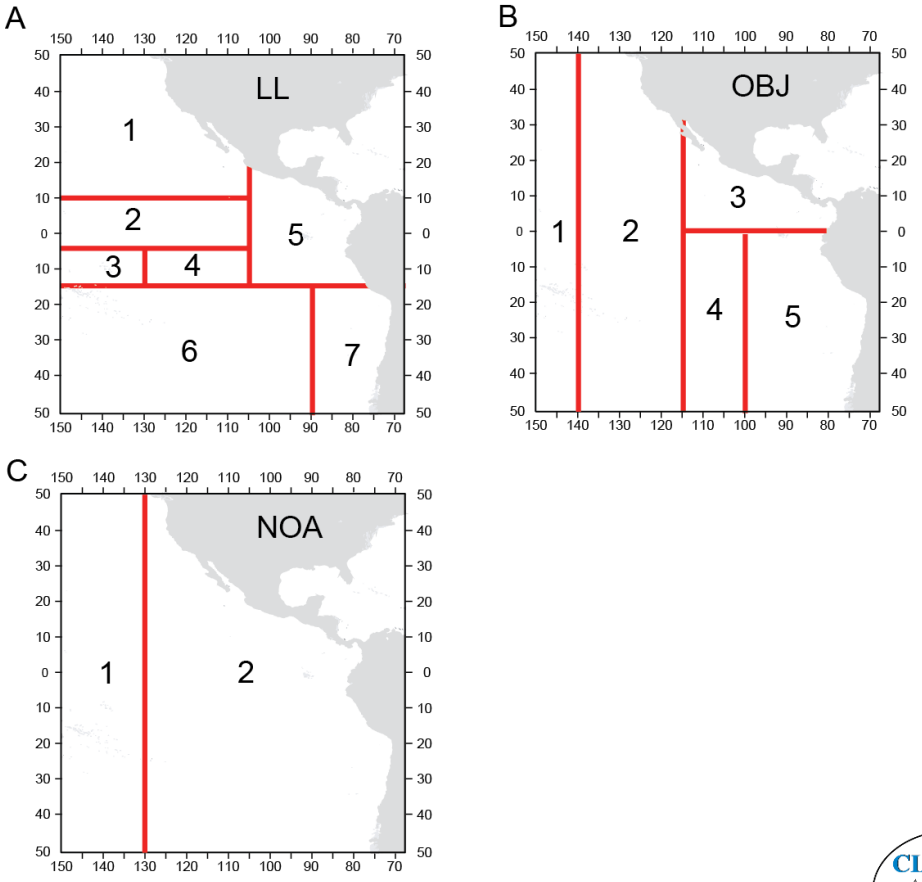
Stock assessment models

- The stock assessment models for bigeye are the 36 reference models included in the 2024 benchmark assessment and risk analysis.
- The 36 (4 x 3 x 3) reference models address three axes of uncertainties within a hierarchical framework:
  1. **The misfit to the composition data for the longline fishery that is assumed to have asymptotic selectivity**: ignore the issue (Fix); estimate the growth curve (Gro); use a dome-shaped selectivity curve (Sel); estimate natural mortality (Mrt)
  2. **The degree of effort creep in the longline fishery**: 0%, 1%, and 2% annual increases in longline catchability
  3. **The steepness of the Beverton-Holt stock-recruitment relationship**: 1.0, 0.9, and 0.8

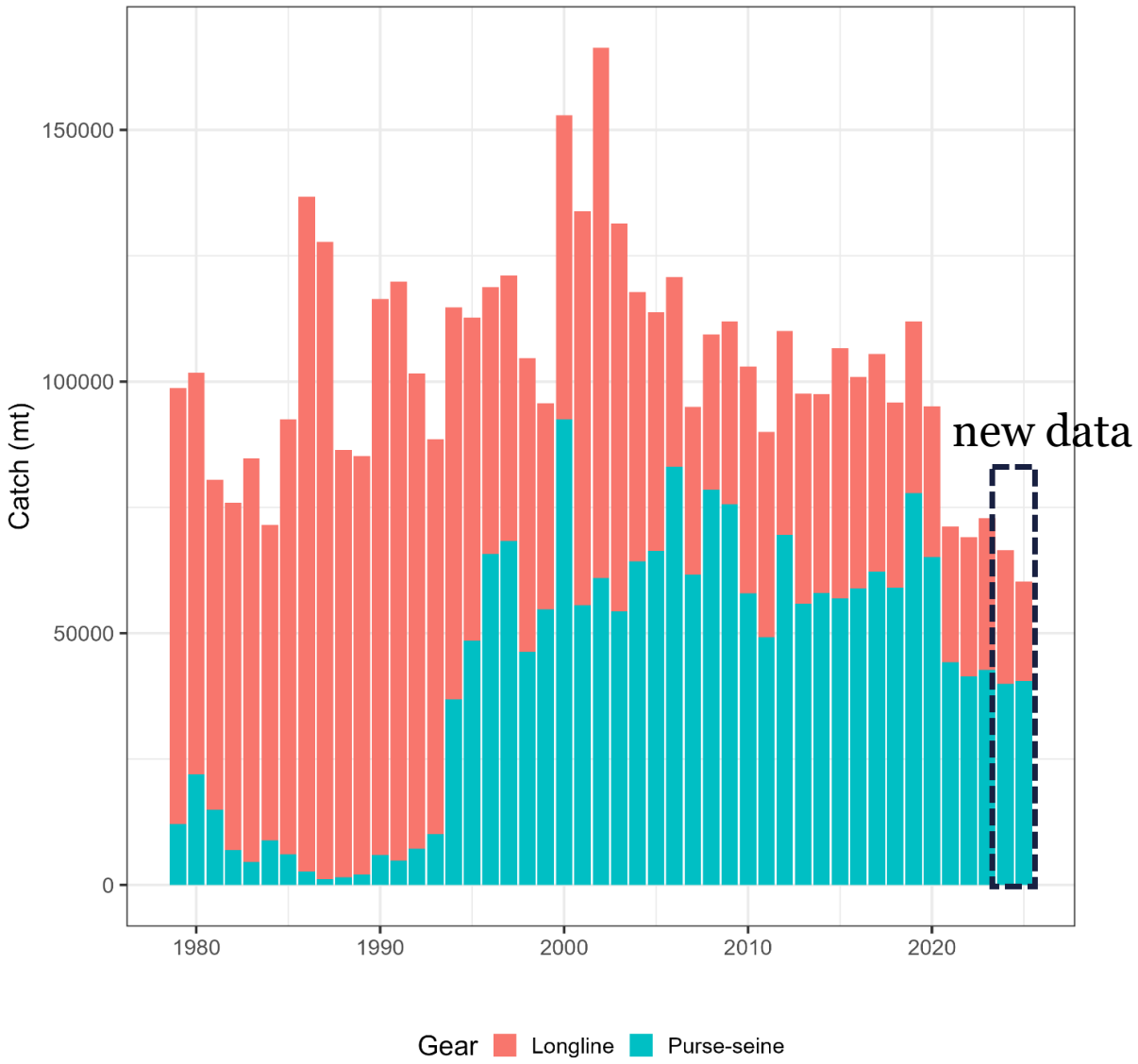
Fishery definitions

Fisheries are defined by fitting a regression tree to length compositions

Fleet Number	Fleet type	Fleet name	Gear	Set type	Area	Catch data	Unit
1	Fishery	LL-n-A1	LL	-	1	Retained catch only	1,000s
2		LL-n-A2			2		
3		LL-n-A3			3		
4		LL-n-A4			4		
5		LL-n-A5			5		
6		LL-n-A6			6		
7		LL-n-A7			7		
8	Fishery	LL-w-A1	LL	-	1	Retained catch only	tons
9		LL-w-A2			2		
10		LL-w-A3			3		
11		LL-w-A4			4		
12		LL-w-A5			5		
13		LL-w-A6			6		
14		LL-w-A7			7		
15	Fishery	OBJ-A1	PS	OBJ	1	Retained catch + discards (inefficiency)	tons
16		OBJ-A2			2		
17		OBJ-A3			3		
18		OBJ-A4			4		
19		OBJ-A5			5		
20		OBJ-disc-EPO			1-5	Discards (size-sorting)	tons
21	Fishery	NOADEL-A1	PS	NOA+DEL	1	Retained catch + discards (all)	tons
22		NOADEL-A2			2		

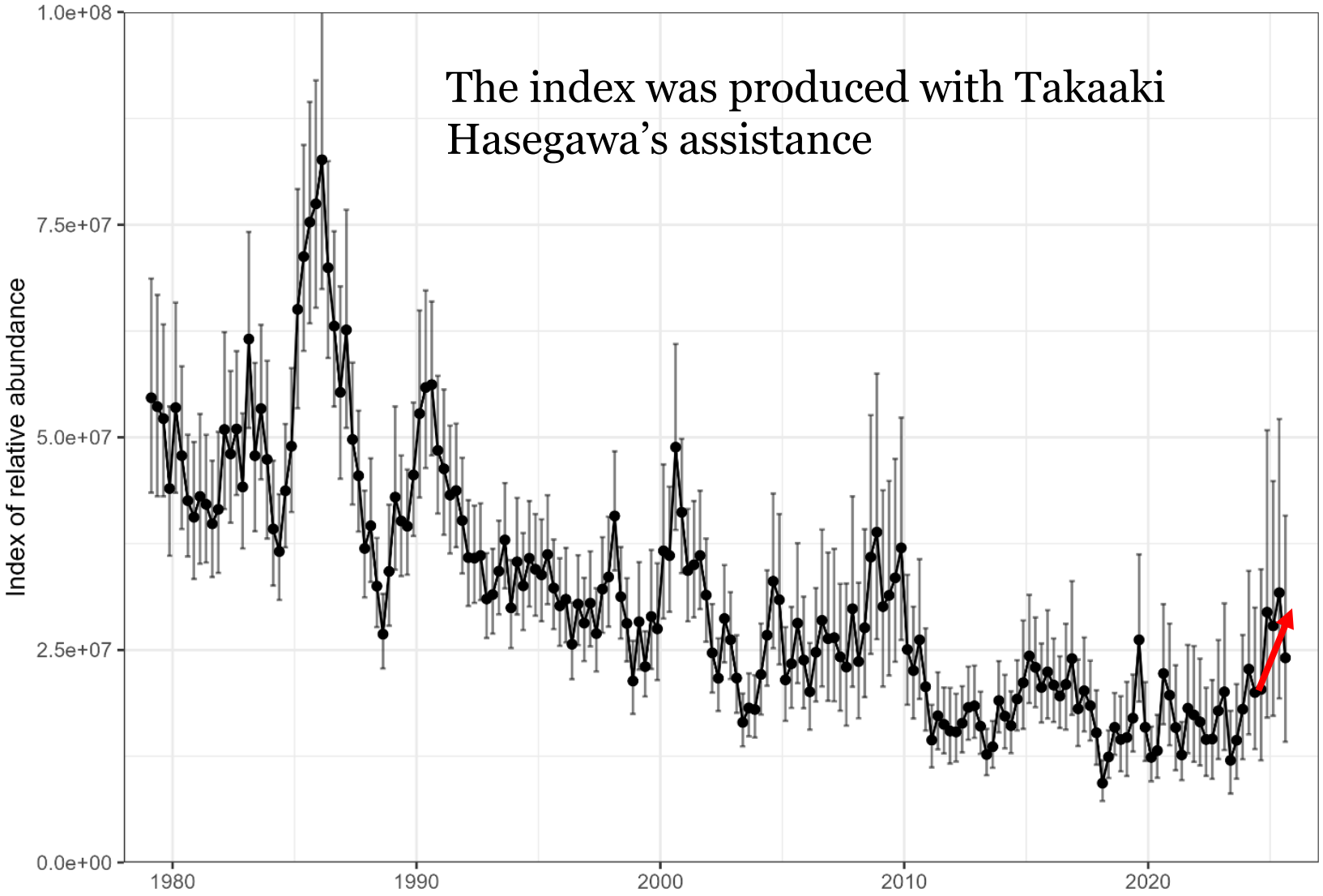


Data: annual bigeye catch by gear type



- Purse-seine catch has reduced significantly since the implementation of the IVT measure in 2022
- Longline catch has reduced slightly during that period

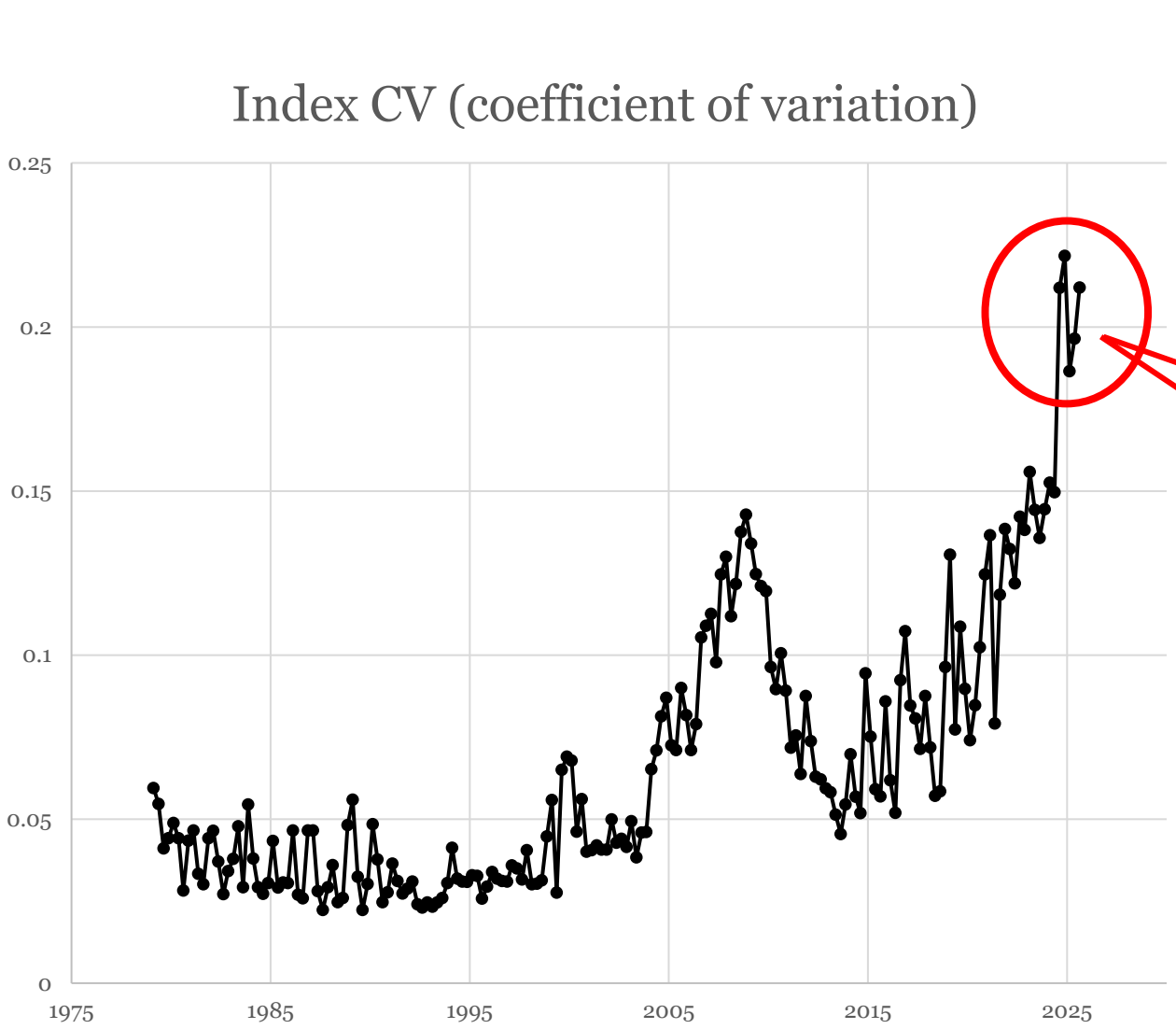
Data: JPN longline index of abundance

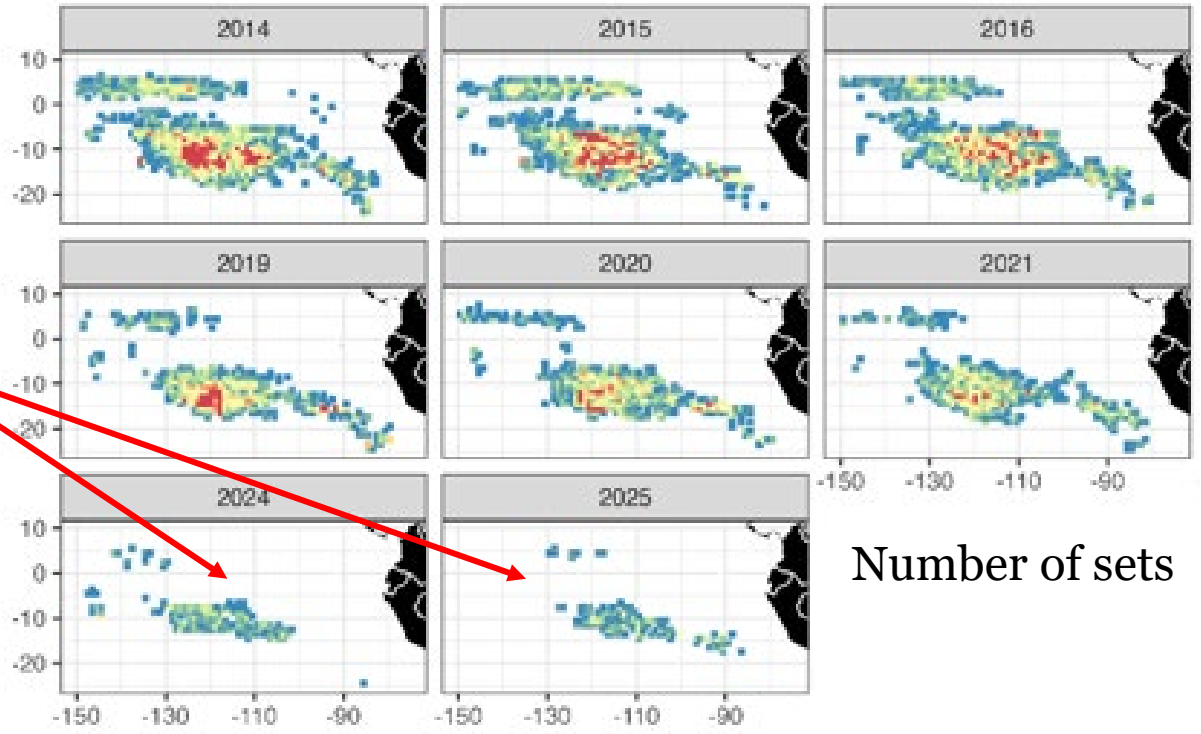


The longline index of relative abundance shows a rapid increase in 2025, suggesting a strong recovery of the spawning biomass

The IVT measure has been implemented since 2022, and its positive impact on longline CPUE started to be seen in 2024 (longline catches age 3+ bigeye)

Data: JPN longline index of abundance





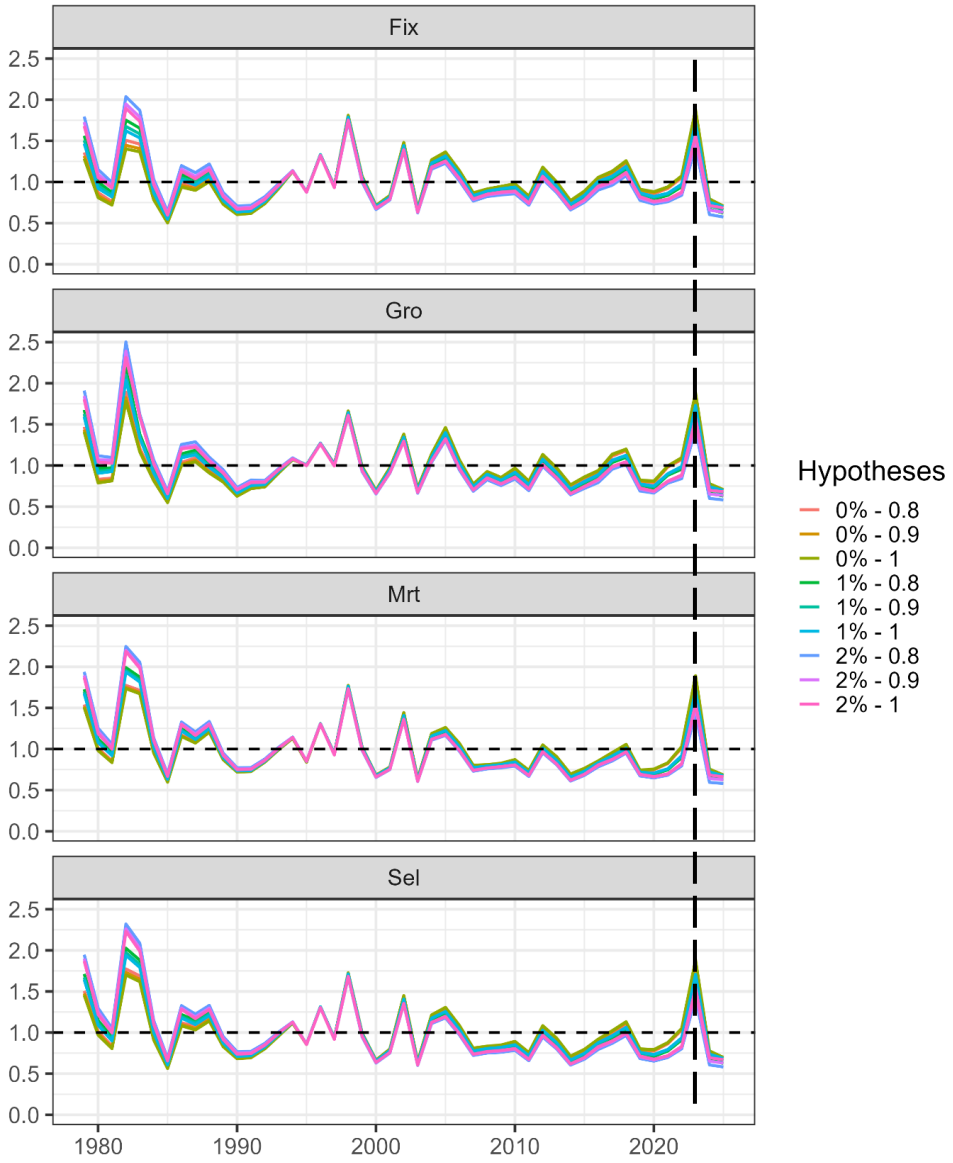
Number of sets

High index CV for recent years due to reduced spatial coverage of the Japanese longline fishery

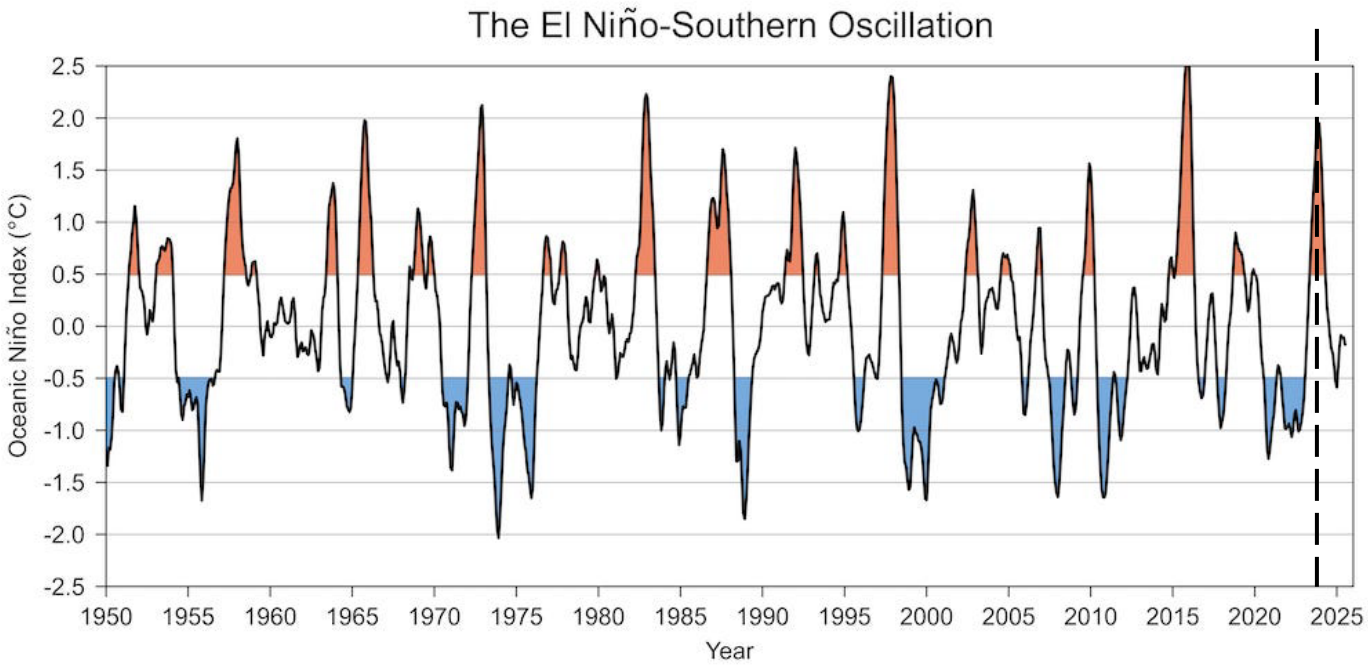
Result: model convergence

- All thirty-six reference models examined in this update assessment have positive-definite Hessians
- A small number of reference models exhibit large (>0.01) gradients
- However, they all pass the jitter diagnostics with a limited number of runs feasible given time constraints
- All 36 reference models are considered to have attained convergence in this update assessment
- The large-gradient issue should be further investigated in the next benchmark assessment

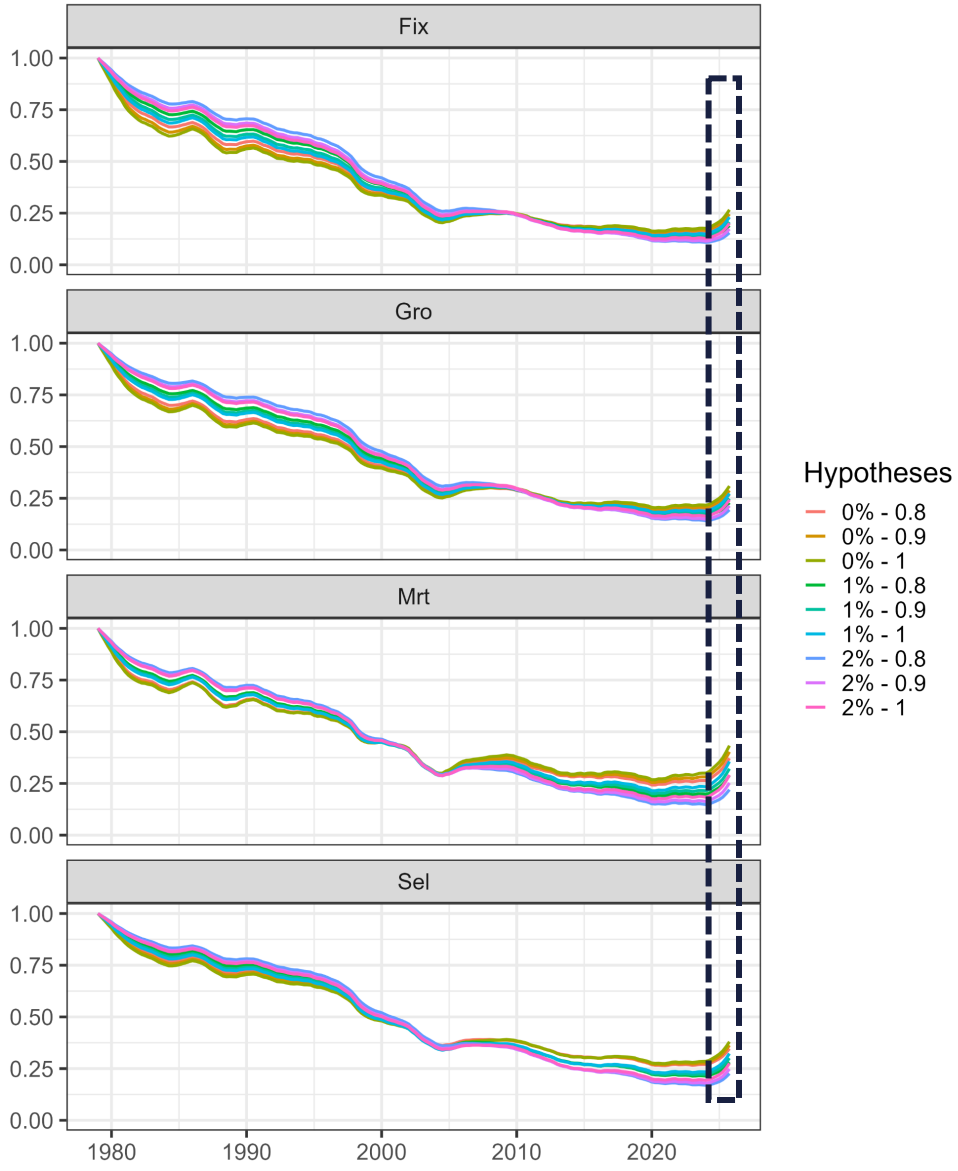
Result: relative annual recruitment



- No pronounced regime shift in recruitment coincides with the expansion of the floating-object fishery
- Recruitment is estimated to be markedly high in 2023, coinciding with a strong El Niño event



Result: dynamic spawning biomass ratio

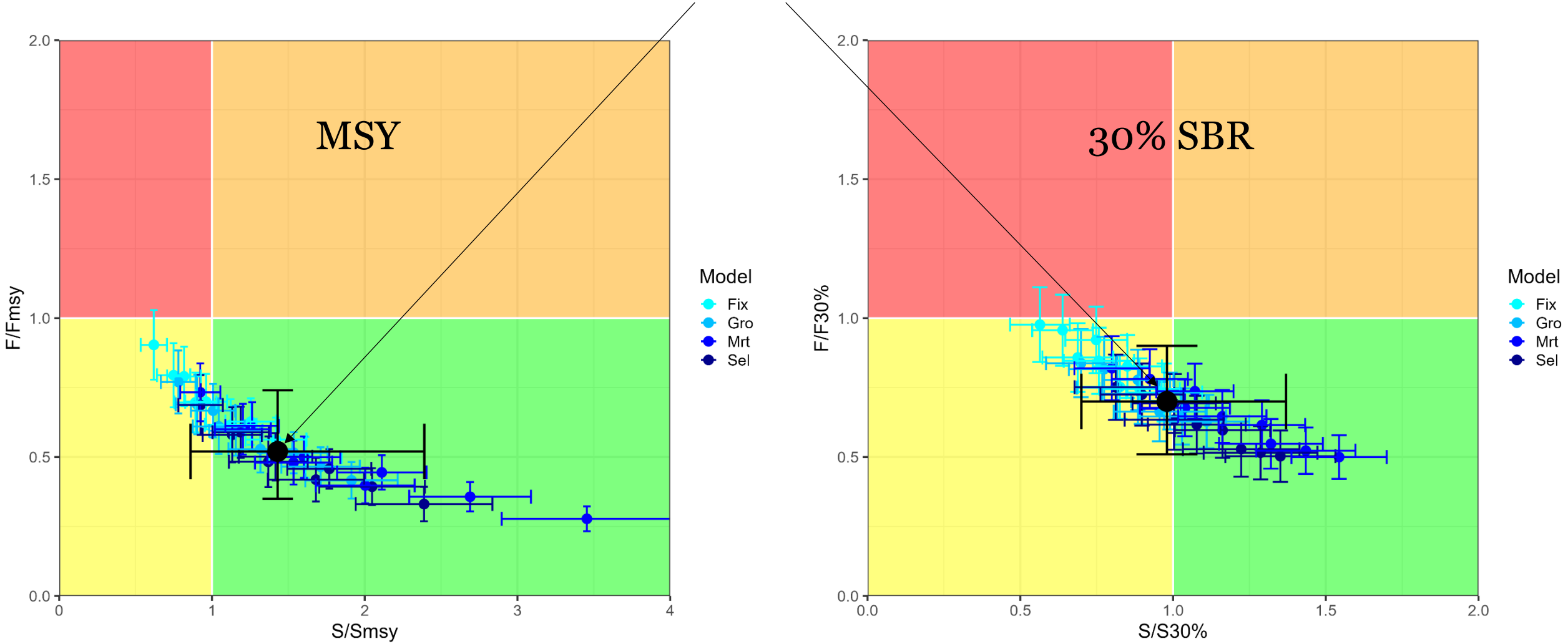


- Dynamic spawning biomass ratio (spawning biomass / spawning biomass under no fishing) displays a pronounced positive trend in 2025, likely attributable mainly to IVT-induced reductions in juvenile fishing mortality rates since 2022

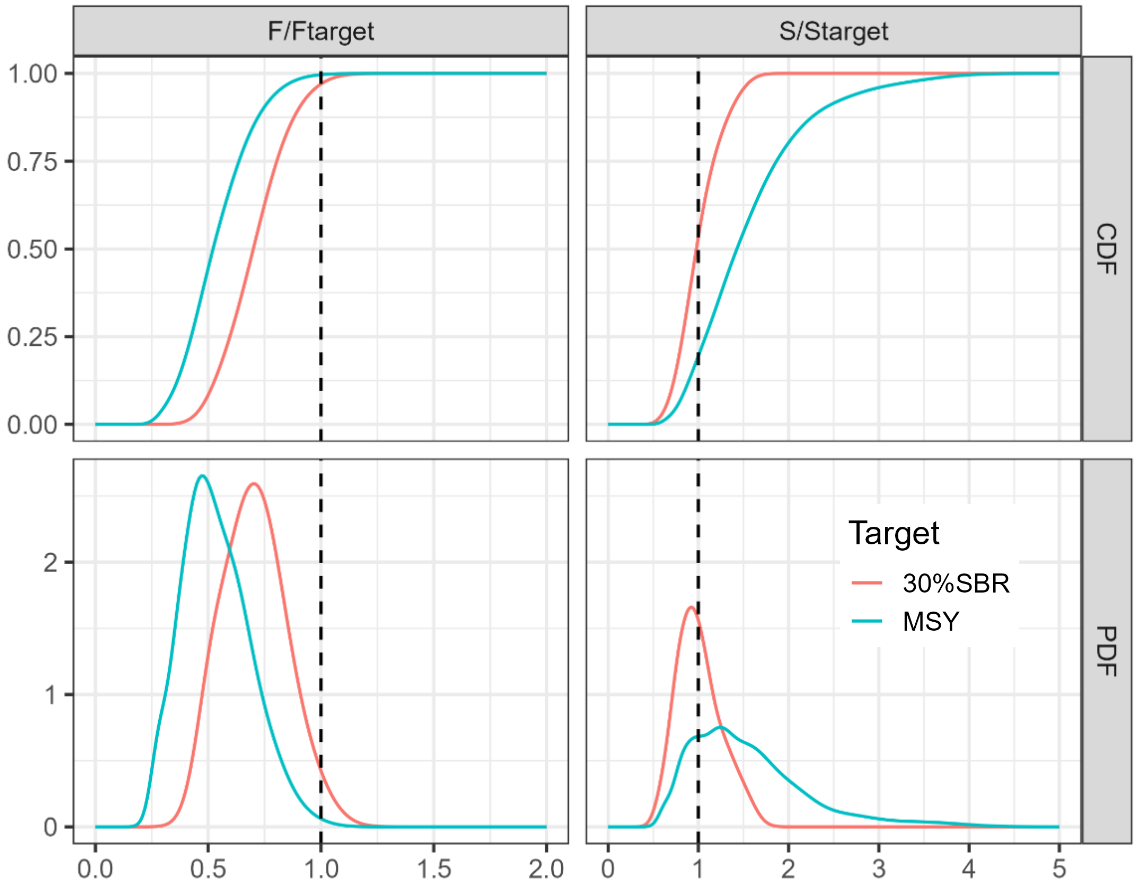
- Due to the strong 2023 recruitment, spawning biomass is projected to increase even more rapidly in 2026 as that cohort progressively reaches maturity.

Kobe plot: MSY (left) and 30% SBR (right)

combined values



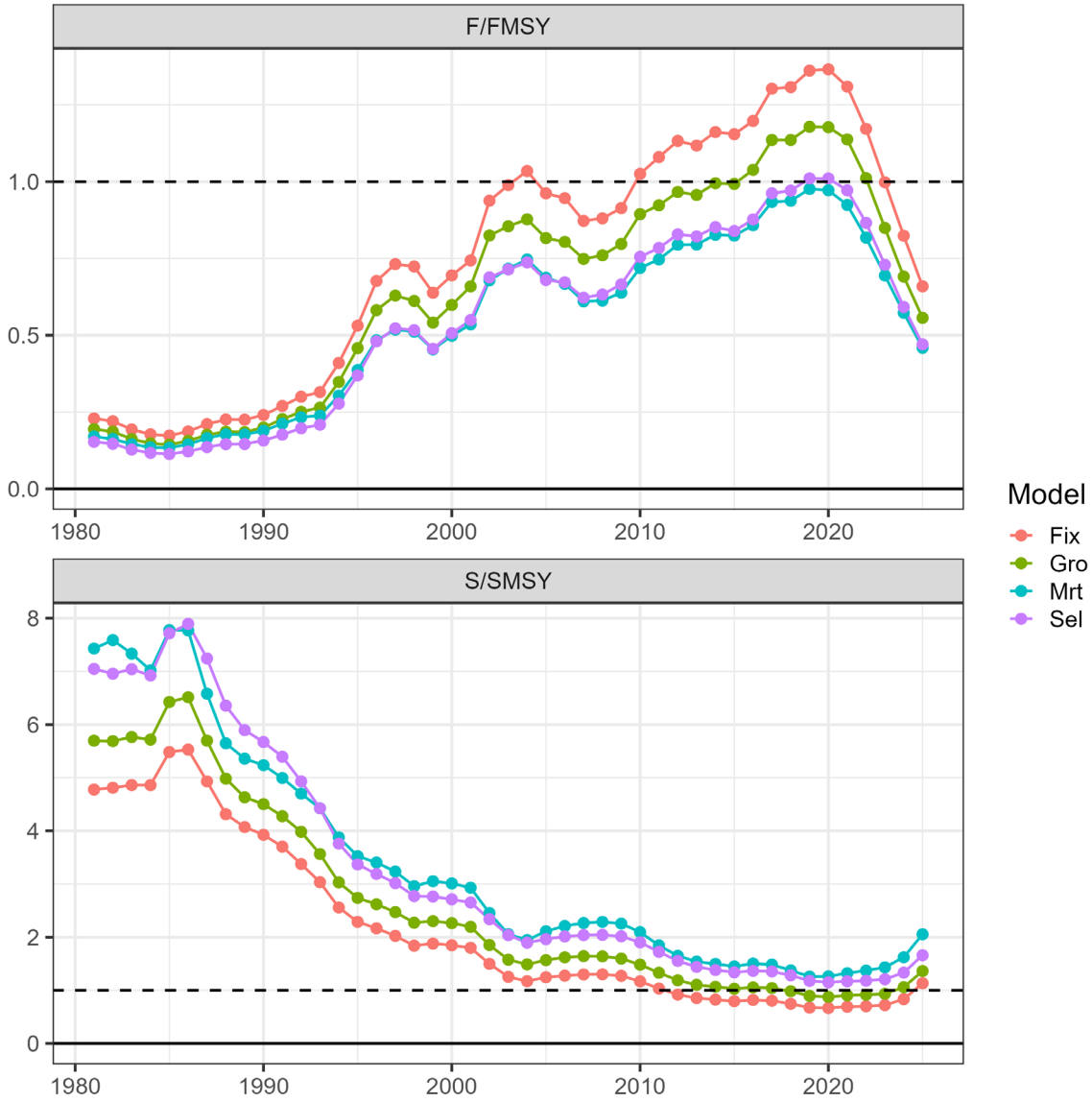
Distributions: target reference points



The overall results of the risk analysis, summarized across the 36 reference models, indicate that:

- **19.5%** probability that the spawning biomass at the beginning of 2026 falls below the target reference point associated with the MSY (median $S_{current}/S_{MSY\_d} = 1.43$)
- **0.3%** probability that the fishing mortality in 2023-2025 exceeds the target reference point associated with the MSY (median $F_{current}/F_{MSY} = 0.52$)
- **53.4%** probability that the spawning biomass at the beginning of 2026 falls below the target reference point associated with 30% dynamic SBR (median $S_{current}/S_{30\%} = 0.98$)
- **3.0%** probability that the fishing mortality in 2023-2025 exceeds the target reference point associated with 30% dynamic SBR (median $F_{current}/F_{30\%} = 0.70$)

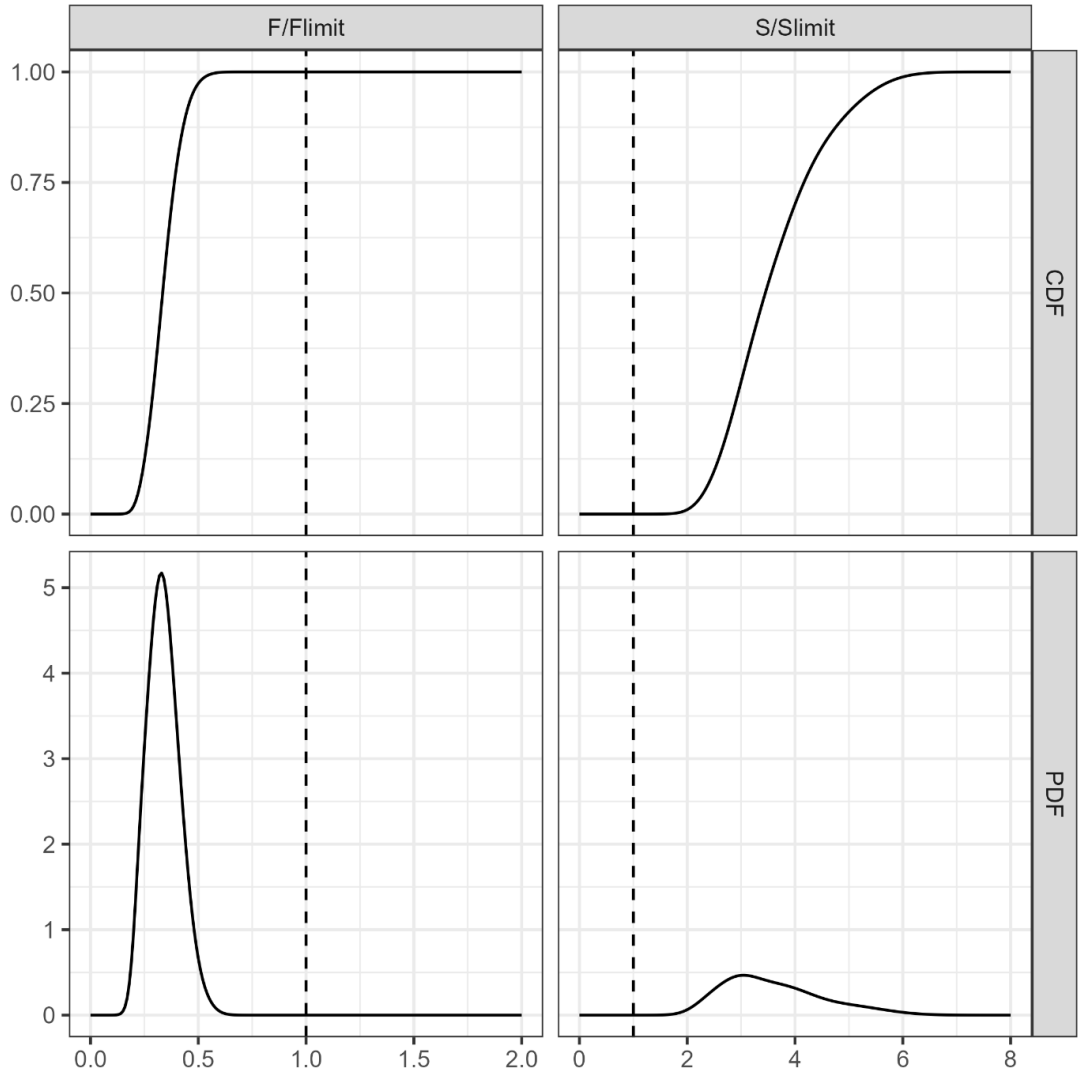
Distributions: target reference points



- F/F_{MSY} reached the high level in 2020 and has decreased rapidly since 2022
- Even the most pessimistic model suggests that $F_{current}$ is much lower than F_{MSY}

- S/S_{MSY} has increased pronouncedly in 2025
- Even the most pessimistic model suggests that $S_{current}$ is higher than S_{MSY}

Distributions: limit reference points



The overall results of the risk analysis, summarized across the 36 reference models, indicate that:

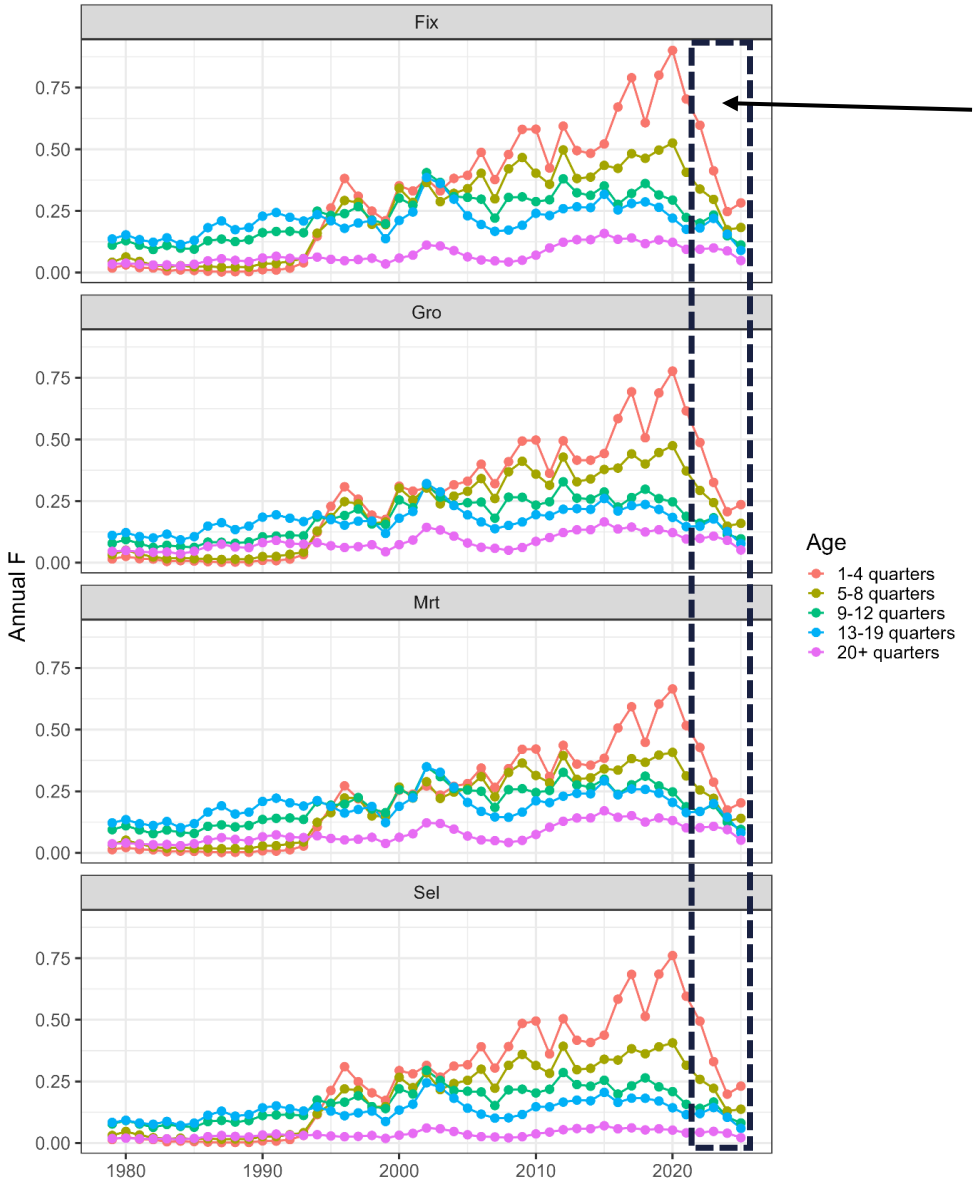
- **0.0%** probability that the spawning biomass at the beginning of 2026 falls below the limit reference point associated with 7.7% SBR (median $S_{\text{current}}/S_{limit} = 3.45$)
- **0.0%** probability that the fishing mortality in 2023-2025 exceeds the limit reference point associated with 7.7% SBR (median $F_{\text{current}}/F_{limit} = 0.33$)

Summary

- The 2024 benchmark assessment was updated in 2026 with two additional years (2024 and 2025) of data
- All 36 reference models achieved convergence
- Fishing mortality has dropped rapidly since 2022 and spawning biomass increased rapidly in 2025
- The overall results of the risk analysis indicate the following:
  - **19.5%** probability that $S_{current} < S_{MSY}$ (median $S_{current}/S_{MSY} = 1.43$)
  - **0.3%** probability that $F_{current} > F_{MSY}$ (median $F_{current}/F_{MSY} = 0.52$)
  - **53.4%** probability that $S_{current} < S_{30\%}$ (median $S_{current}/S_{30\%} = 0.98$)
  - **3.0%** probability that $F_{current} > F_{30\%}$ (median $F_{current}/F_{30\%} = 0.70$)
  - **0.0%** probability that the $S_{current} < S_{limit}$ (median $S_{current}/S_{limit} = 3.45$)
  - **0.0%** probability that the $F_{current} > F_{limit}$ (median $F_{current}/F_{limit} = 0.33$)


Questions

Result: annual fishing mortality by age group

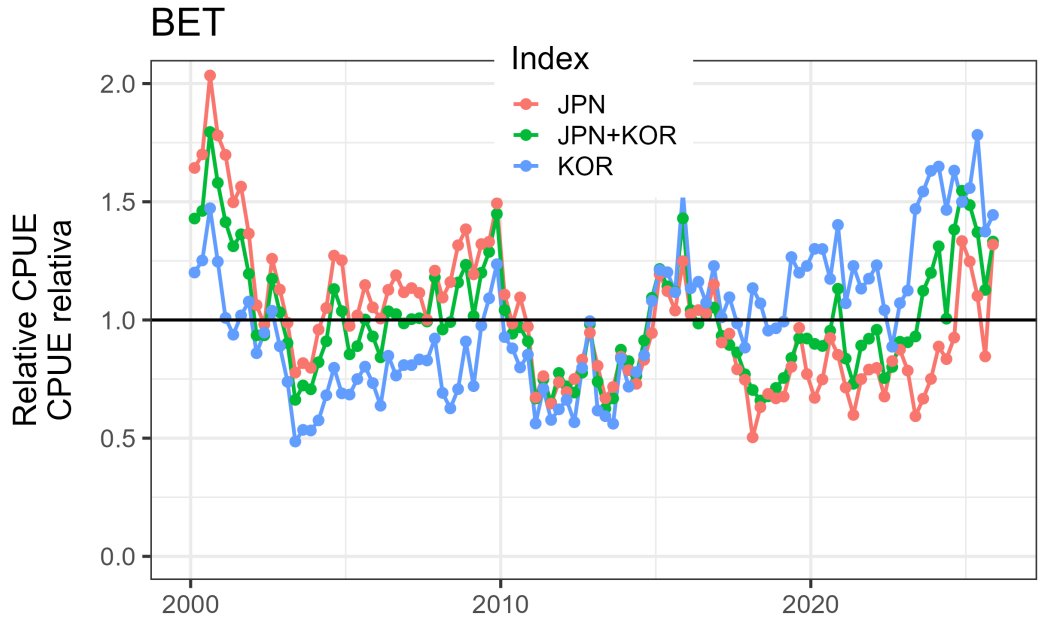


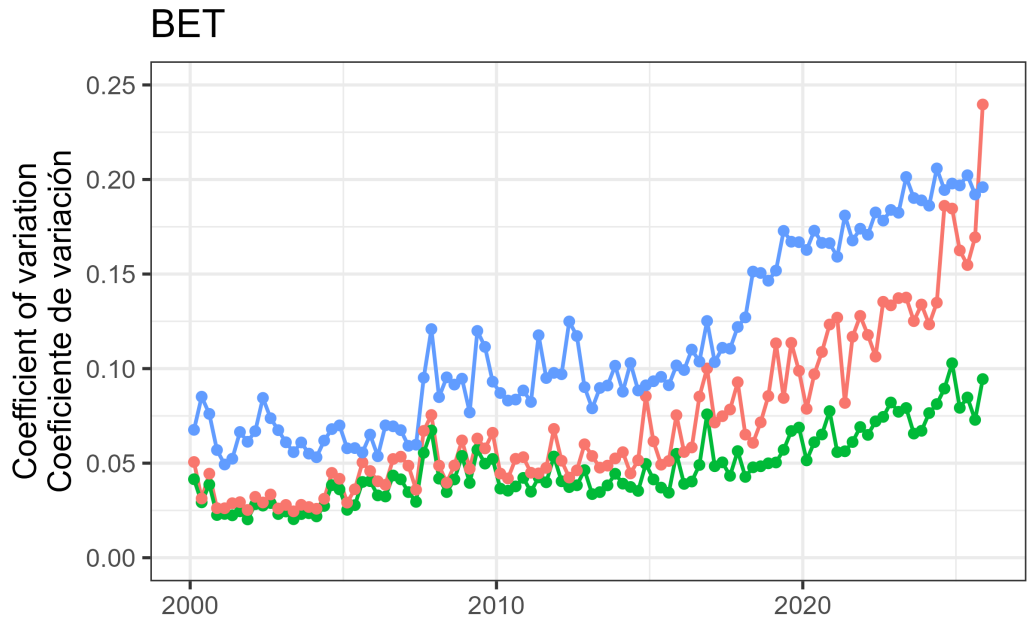
IVT years

- The fishing mortality for juvenile bigeye increased substantially from near-zero levels prior to 1993 to historically high values in 2020, followed by a rapid decline thereafter
- The fishing mortality for adult bigeye has remained relatively stable since 1993, with a declining trend observable from approximately 2015 onward.

Background

- The longline index in the current stock assessment and MSE is based on Japanese longline CPUE
- It shows increasingly larger CV in recent years due to reduced spatial coverage and fishing effort (# of sets)





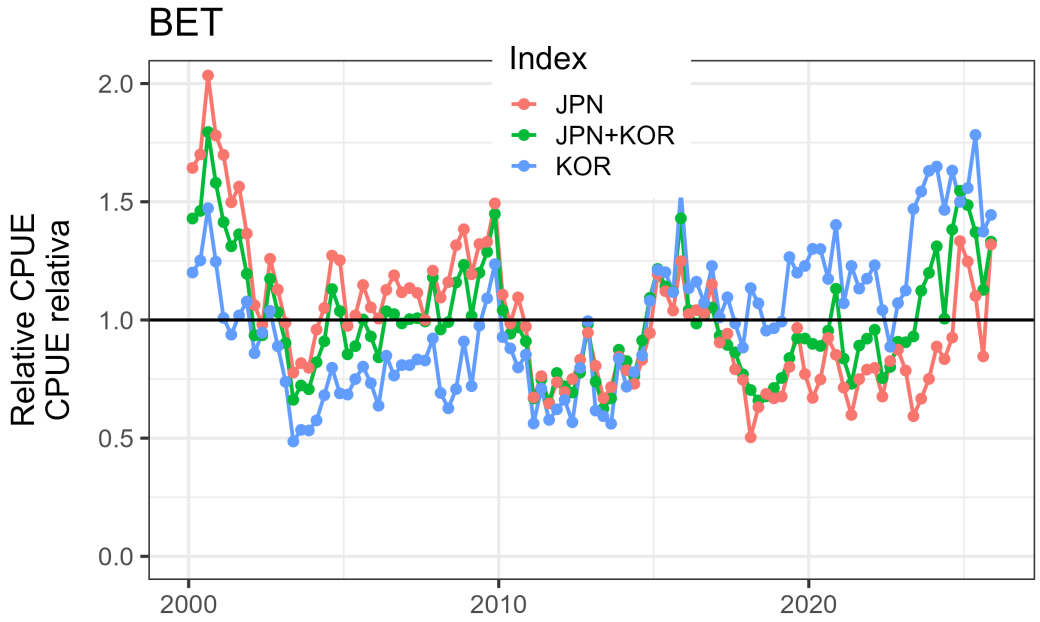
Background

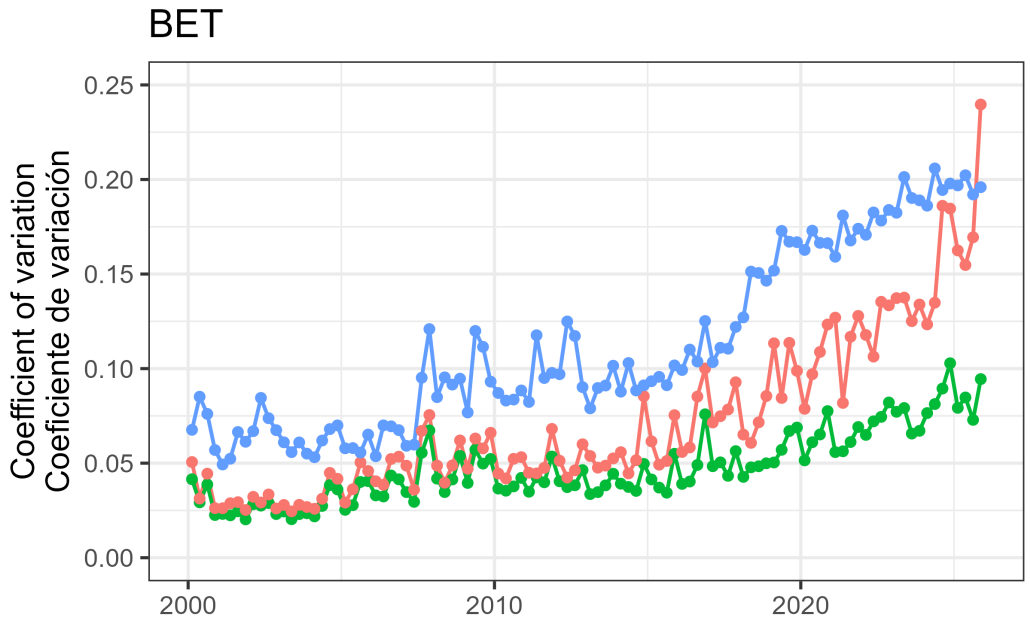
Uncertainty:

- Time-varying CV is included in the current stock assessment and MSE to account for increasingly uncertain index

Bias:

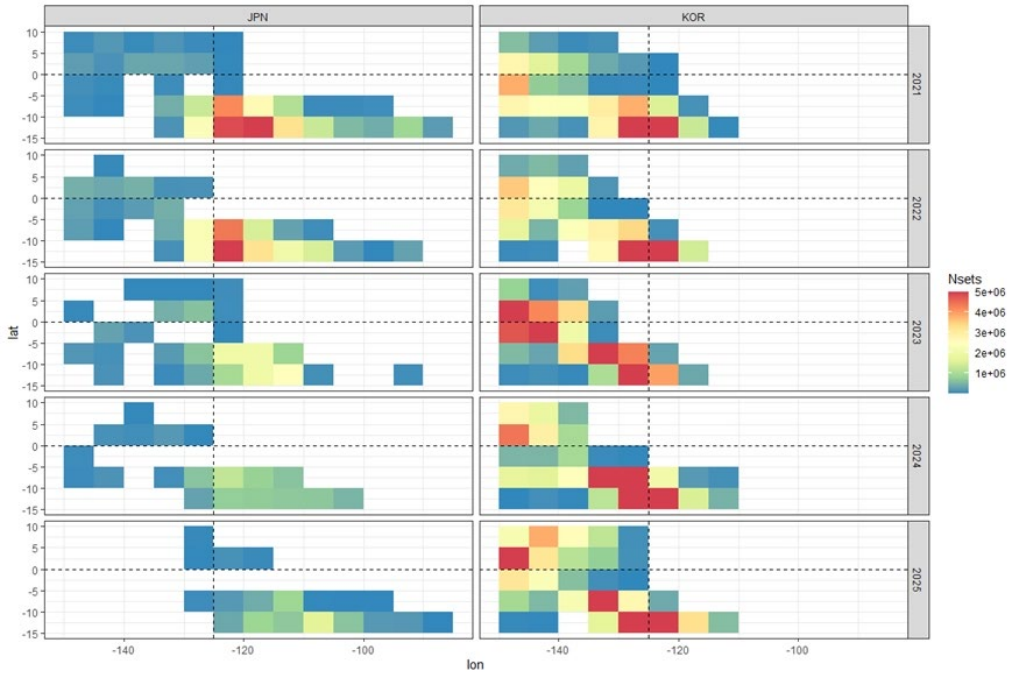
- The index accounts for increased catchability due to vessel turnover in the standardization process and an additional catchability increase as an axis of uncertainty in the risk analysis and MSE

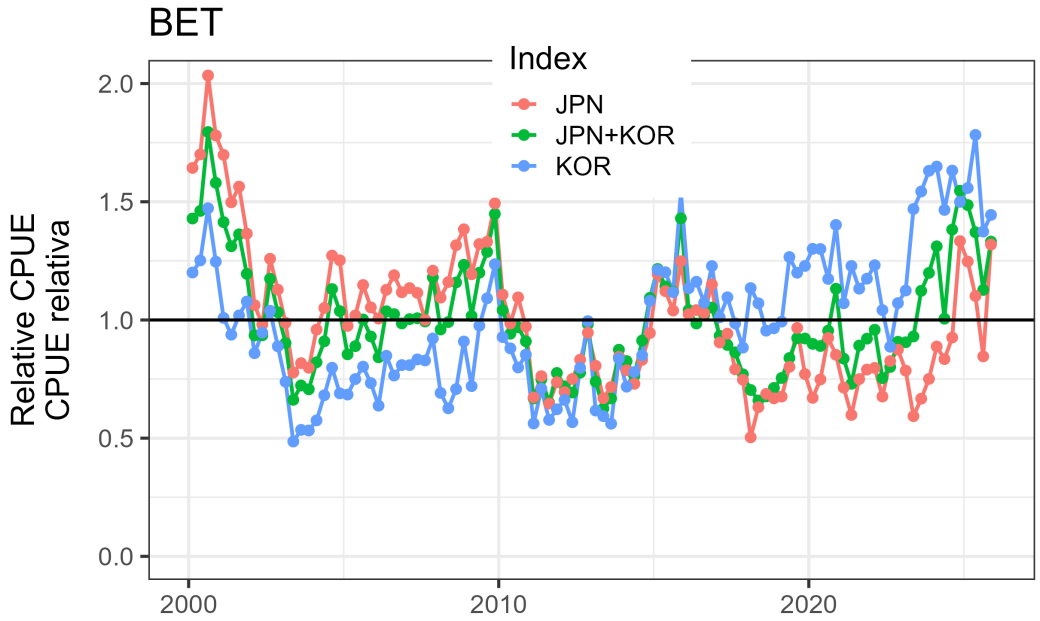


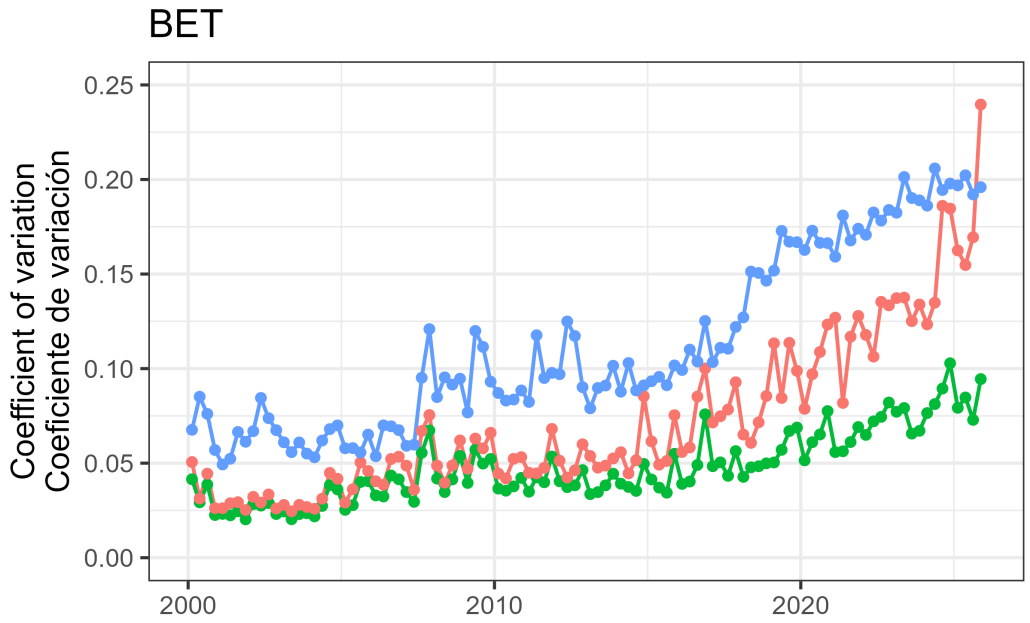


Background

- The Korean longline fleet operates in different parts of the EPO, so the joint index has significantly reduced CV

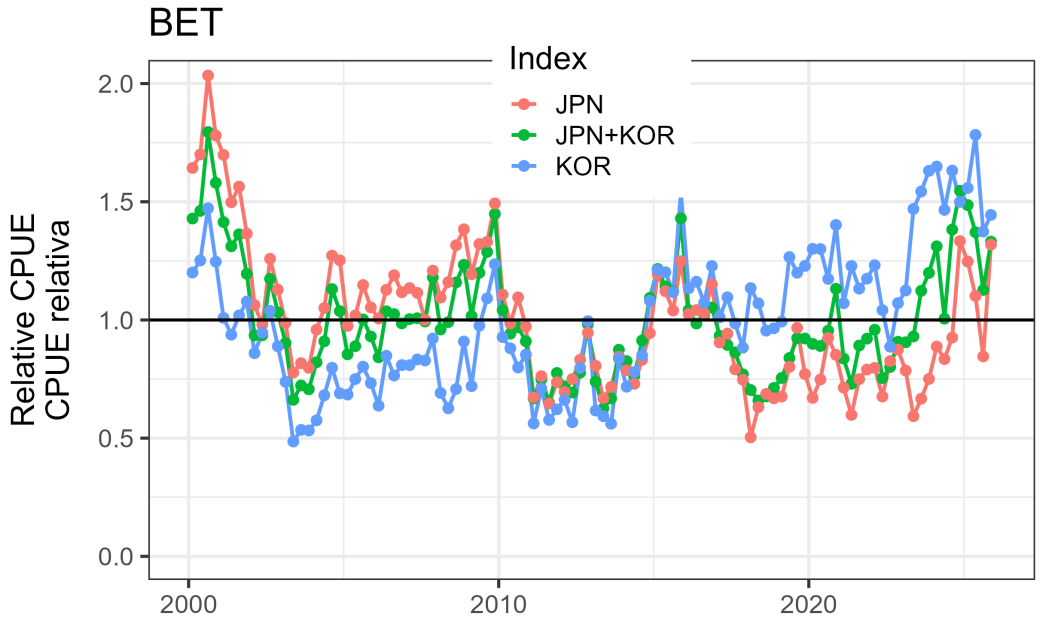


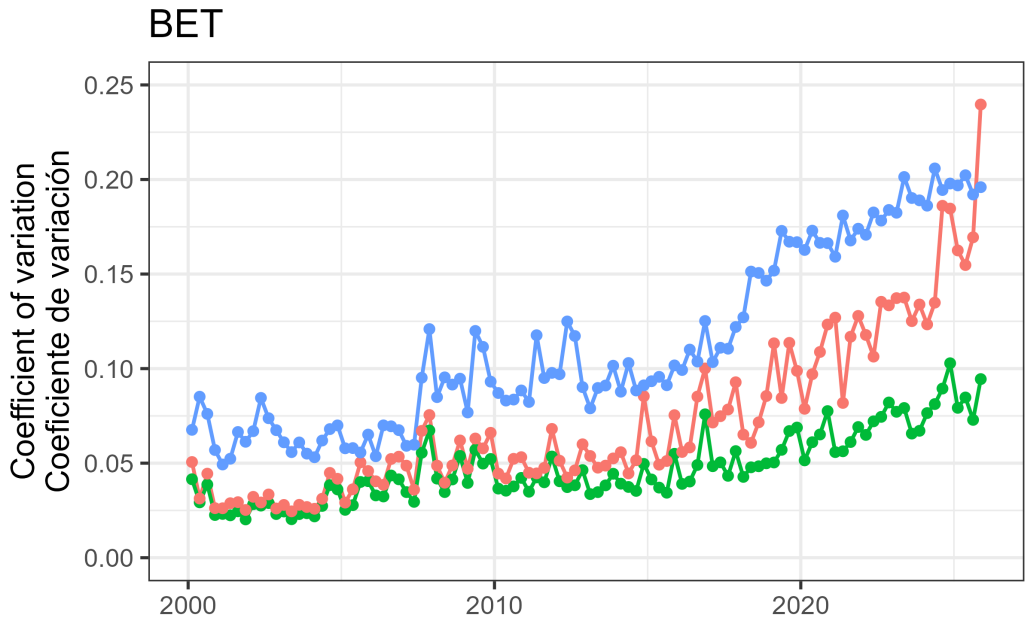




Background

- The Korean longline fleet operates in different parts of the EPO, so the joint index has significantly reduced CV
- The joint index shows a notably more optimistic trend, suggesting a more optimistic population trajectory if the Japanese index is replaced by the joint index





MSY and 30% SBR: trajectory