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Agenda 8.1

Review of the domestic stock assessment of the Pacific stock of Japanese sardine in FY 2025 by Japan

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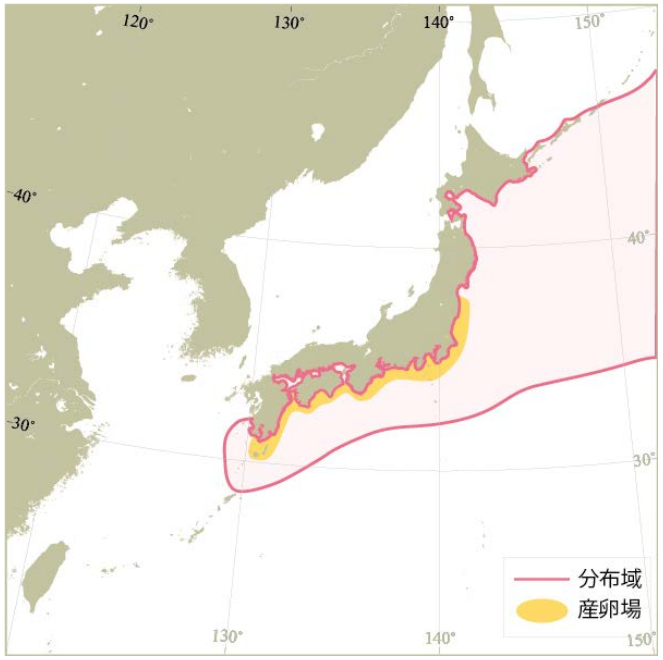
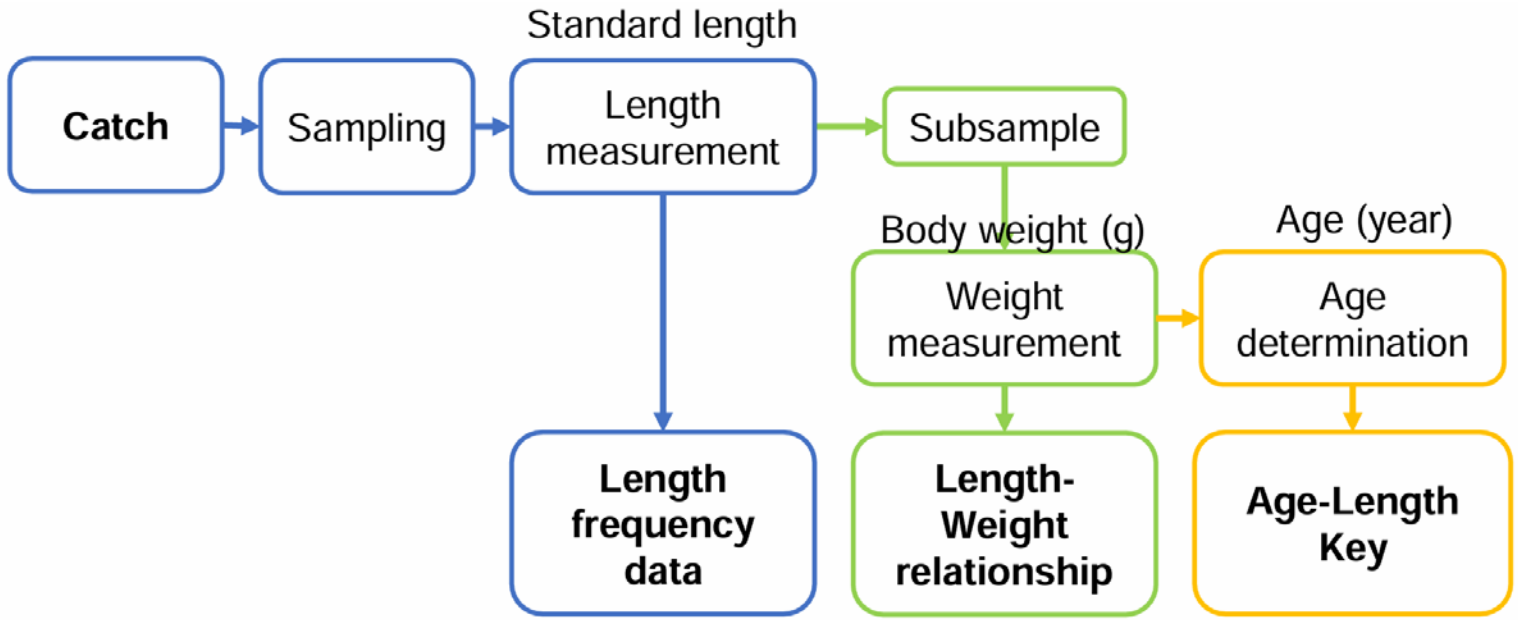


Distribution range

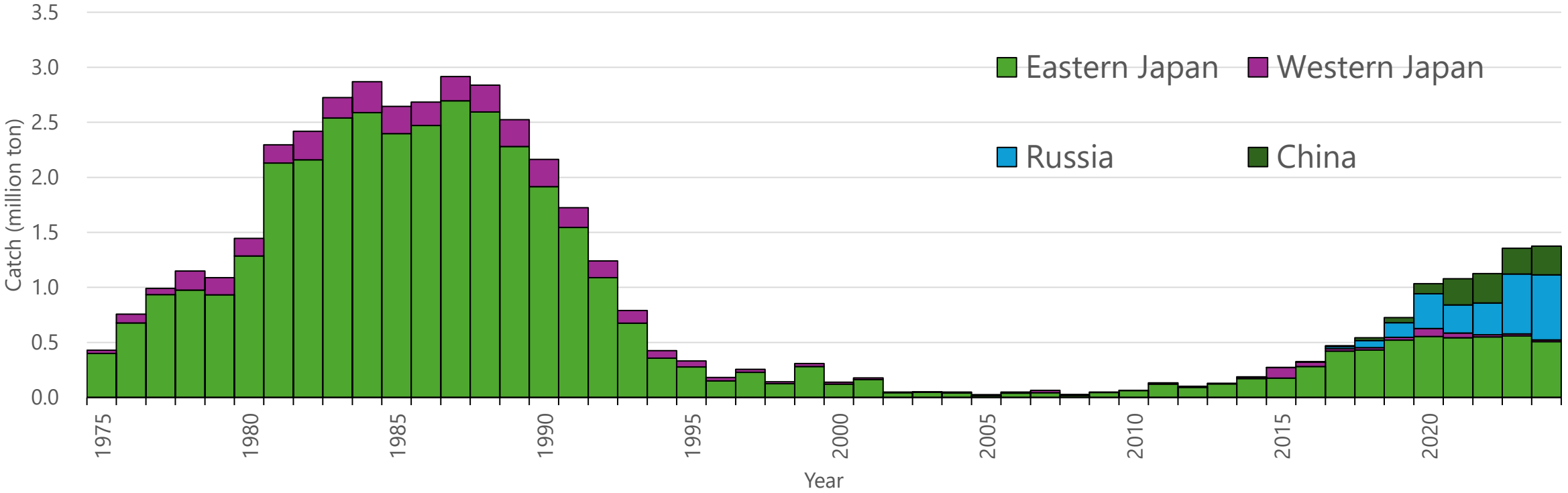
Spawning ground

Input data

- Measurement data collected from 18 prefectures along the Pacific coast
- Data are treated by month and by fishing gear (purse seine, others)
- Age is estimated by scale or otolith reading (~3000+ samples/year)

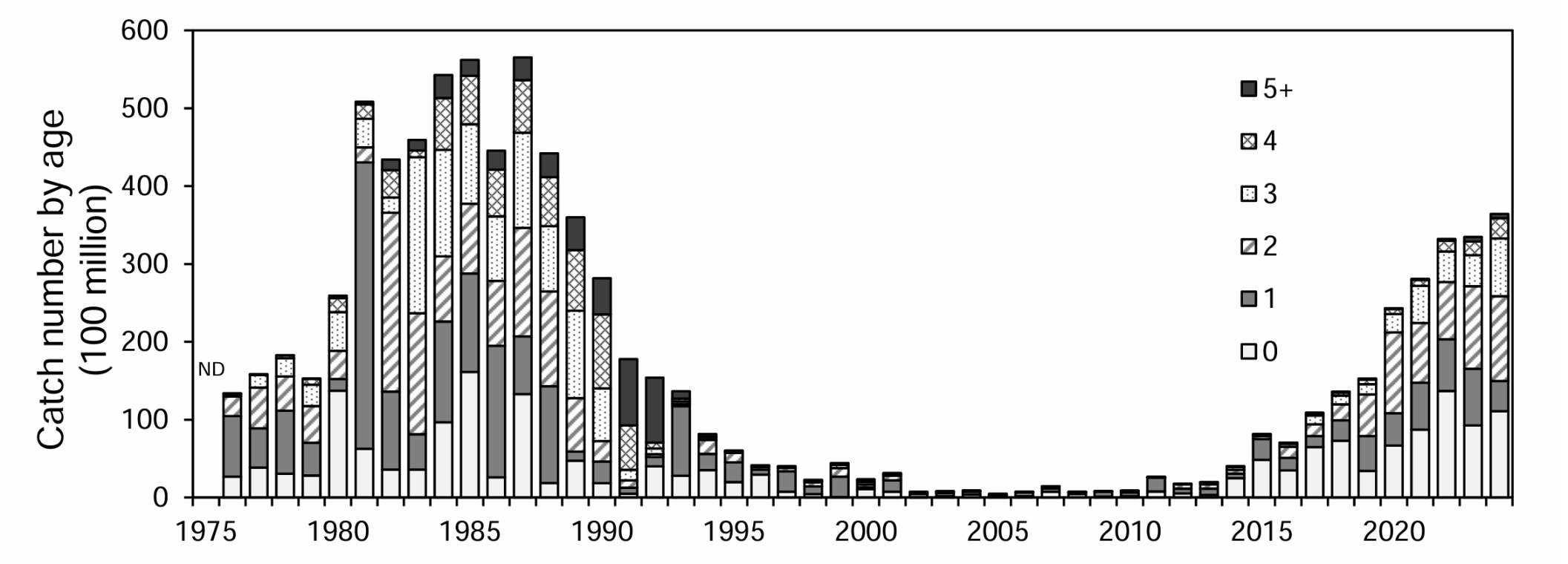


Catch



- Japanese domestic stock assessment in Fiscal Year 2025 conducted assessment up to CY2024
- Catch of JS increased since 2012 and increased dramatically since 2020

Catch at age



- Dynamic pattern of catch at age
- Recent catch consist of variety of ages (Age 2 + consists nearly half) with increasing trend of age 0 catch after 2019

Stock assessment model

- Ridge VPA (type of tuned VPA, adding penalties to terminal F to minimize retrospective bias)
- Age classes : age 0 – age 5+
- Natural mortality = 0.4 across all ages, all years

$$(1-\lambda)\sum_{k=1}^{4}\sum_{y}\left[\ln(I_{k,y})-\ln\left(q_k X_{k,y}^{b_k}\right)\right]^2+\lambda\sum_{a=1}^{4}\left(F_{a,2024}-\frac{1}{3}\sum_{y=2021}^{2023}F_{a,y}\right)^2$$

Select λ so that a retrospective bias is minimized

Pose a penalty for squared F to avoid divergence of F

$I_{k,y}$: Index values
$X_{k,y}$: Corresponding abundance estimate (SSB, N at age 0, or N at age 1)
q_k: Proportional constant
b_k: Nonlinear coefficient

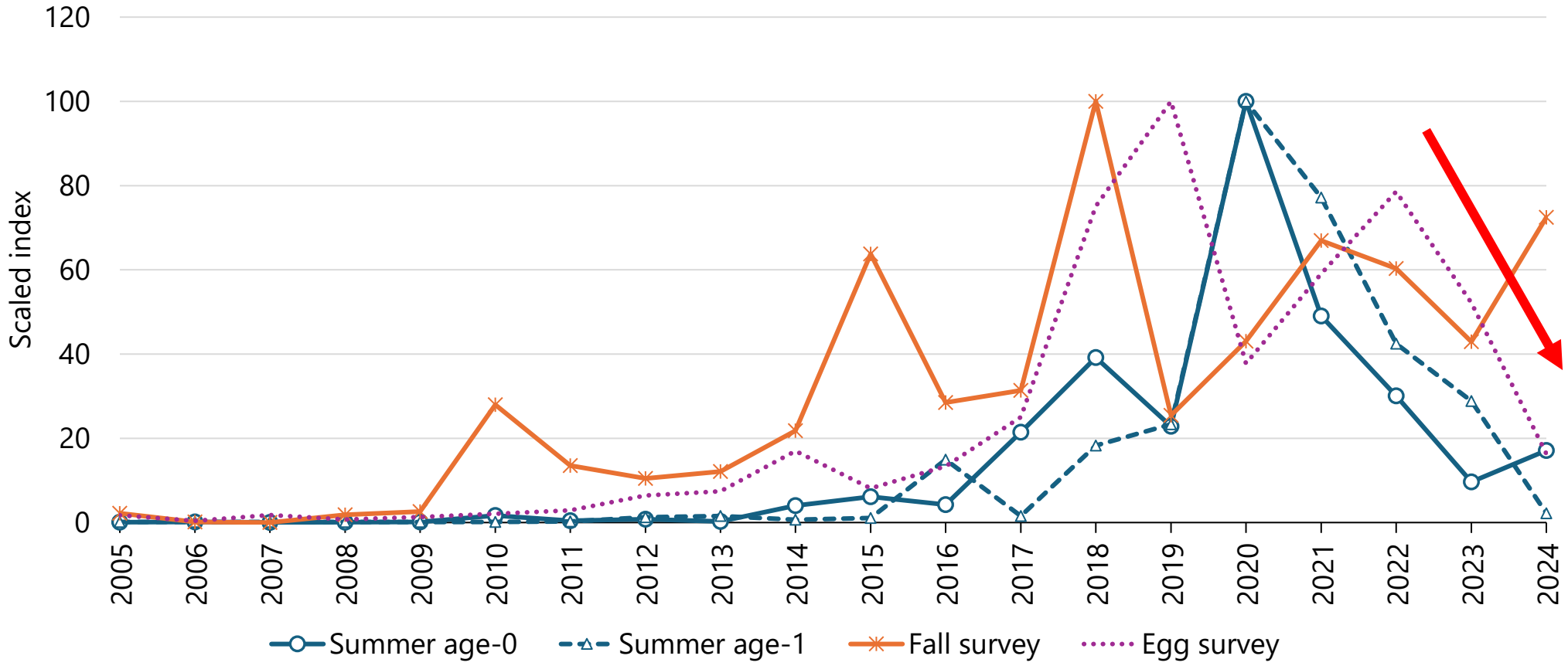
Okamura et al. (2017) ICESJMS 74:9 2427–2436

Abundance indices

- Egg survey **SSB**
- Autumn acoustic survey **Age-0**
- Summer trawling survey **Age-0**, **Age-1**

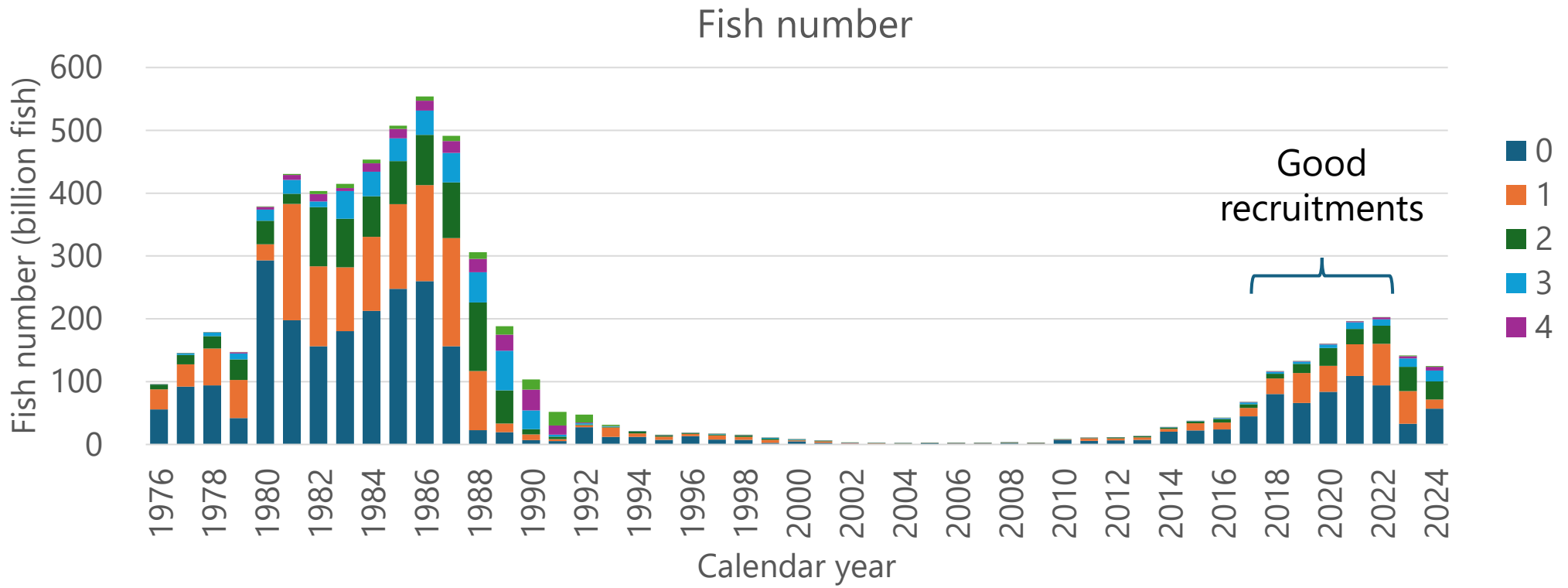
- No fishery-dependent index is used in the stock assessment model

Indices



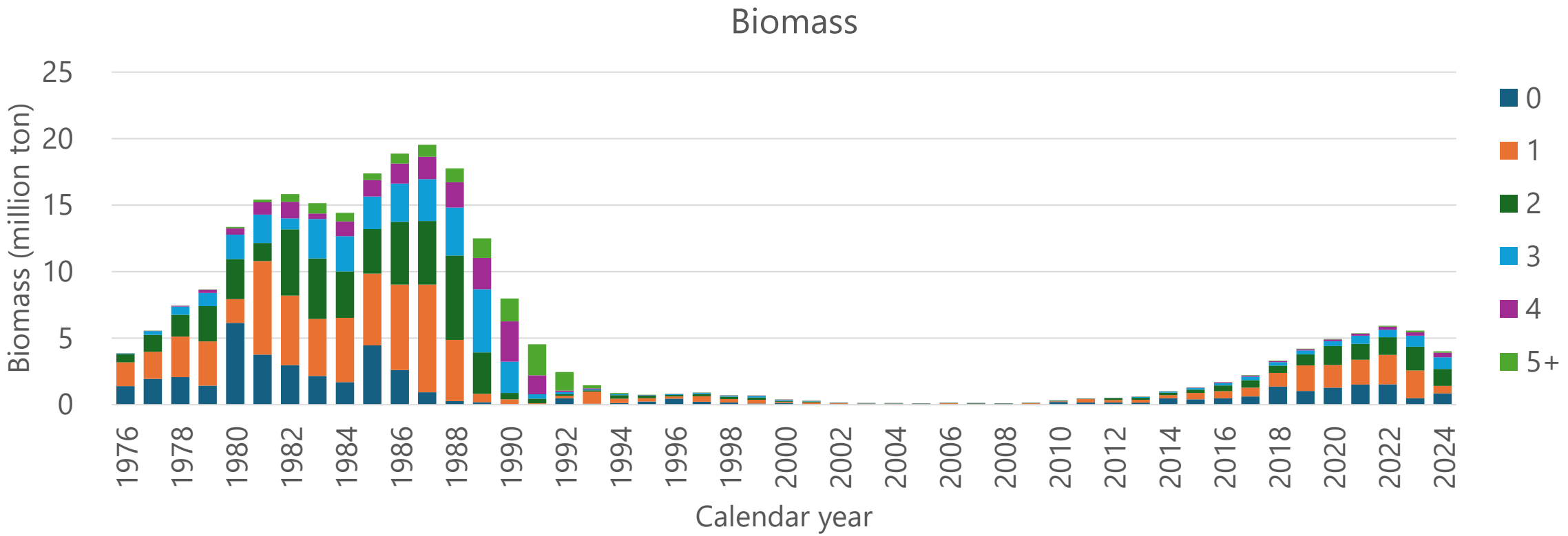
- All abundance indices increased from mid-2010s to early-2020s
- Summer- and egg-survey showed sharp declines from 2022 to 2024 but fall survey increased sharply from 2023-2024

Estimated number at age



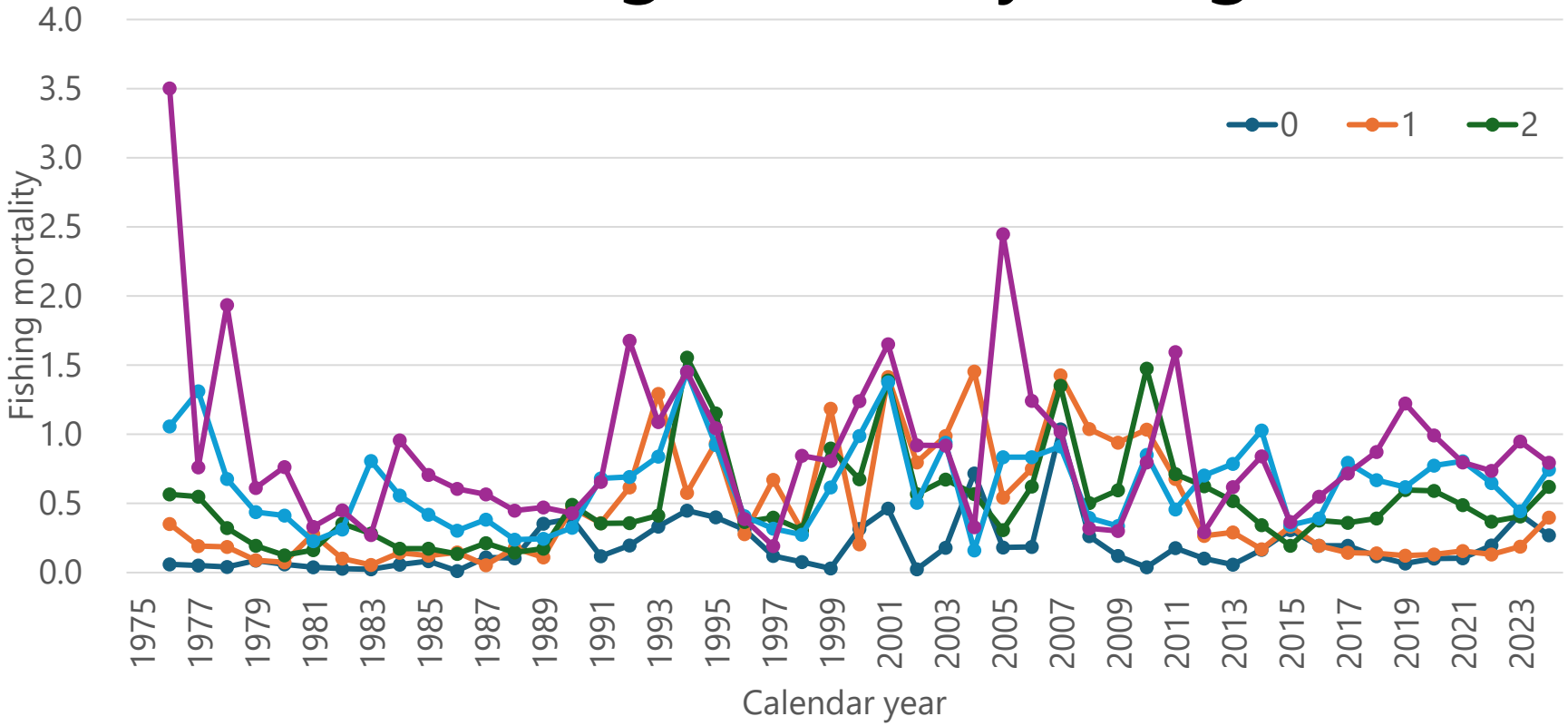
- Strong recruitment in 2018-2022 increased stock abundance
- Stock number decreased rapidly after 2023 with considerably low recruitment in 2023-year class

Estimated biomass at age



- Biomass began to decrease after 2023
- 2021 and 2022-year class (age 2 and 3) supports the biomass in 2024

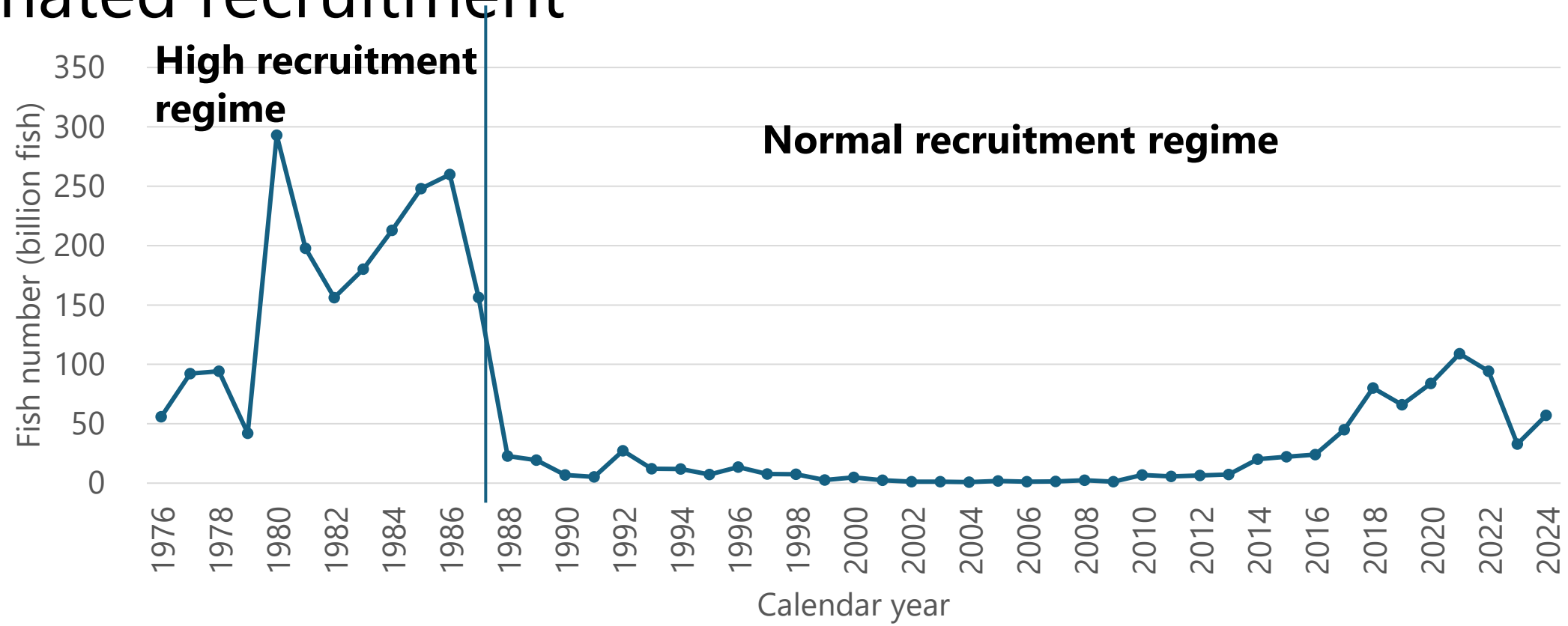
Estimated fishing mortality at age



Age	F2024
0	0.27
1	0.39
2	0.62
3	0.75
4+	0.83
meanF	0.62
%SPR	24.3

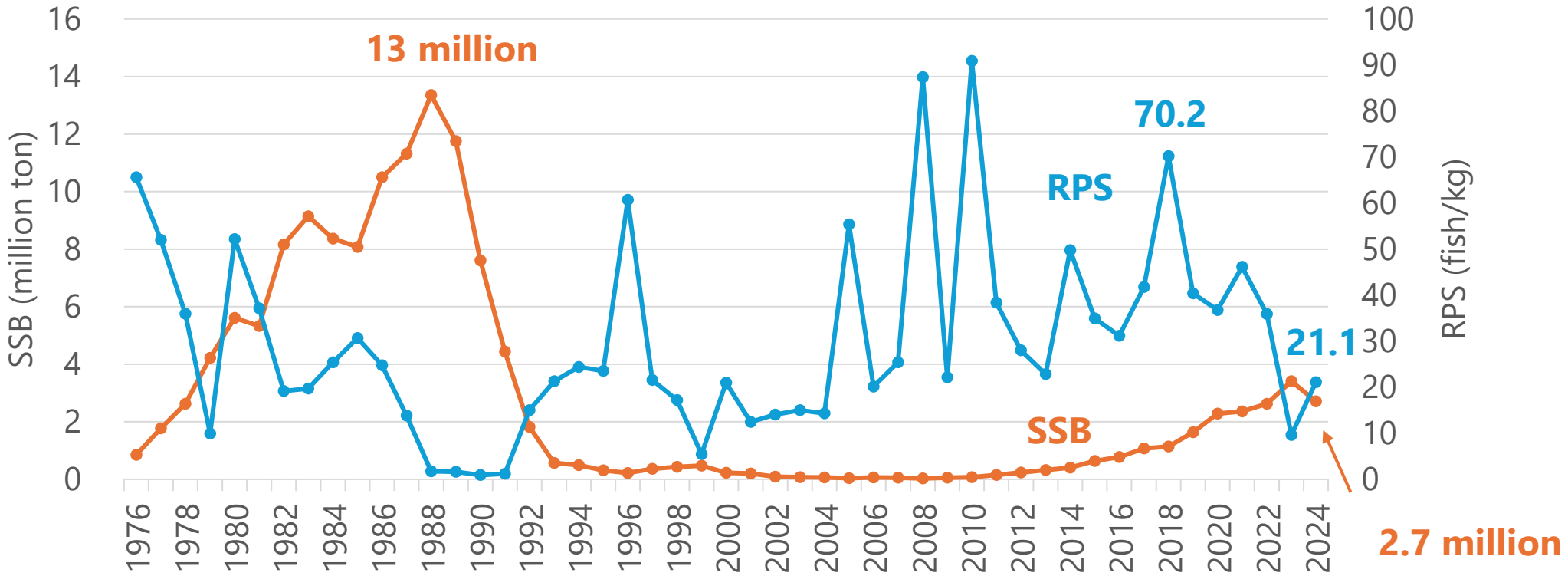
- F4 and F5+ are assumed to be equal for VPA calculation
- F0 and F1 stayed low since 2012 but increased since 2021
- F in 2024 is relatively high with meanF = 0.62, %SPR = 24.3

Estimated recruitment



- Recruitments in 1976-1987 are considered as “high recruitment regime”
- Recent recruitments in 2018-2022 abundant but did not reach high level
- Recruitment in 2023 was relatively low

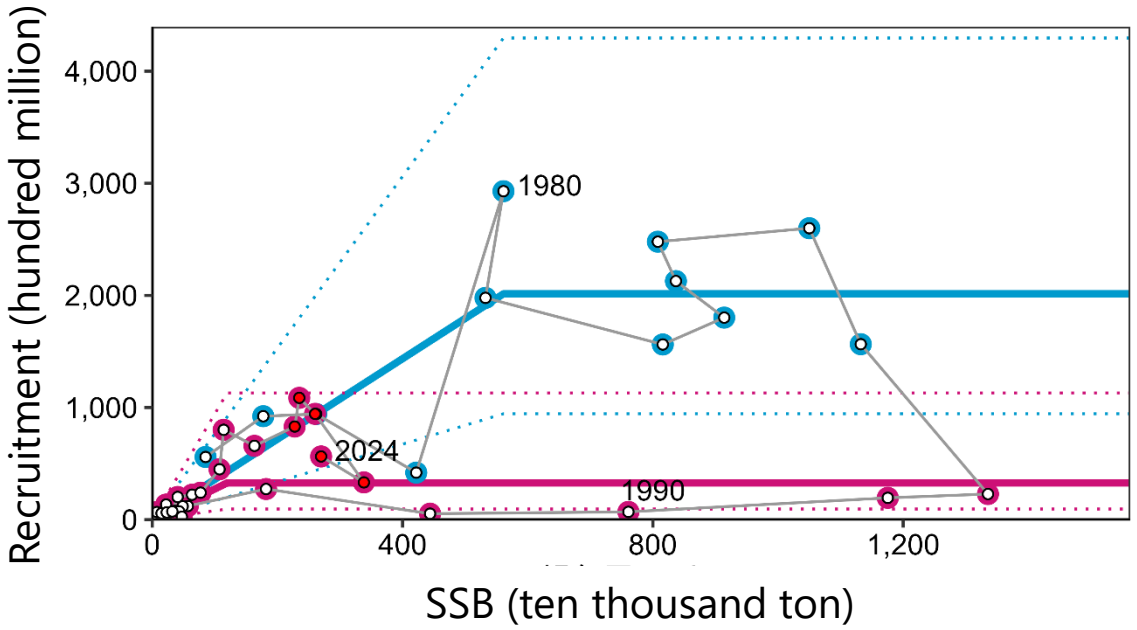
Estimated SSB and RPS



- SSB during the “high-regime” increased above 10 million tons
- Recent SSB trend is increasing with peak in 2023 with 3.4 million tons
- RPS is declining despite SSB is gradually increasing

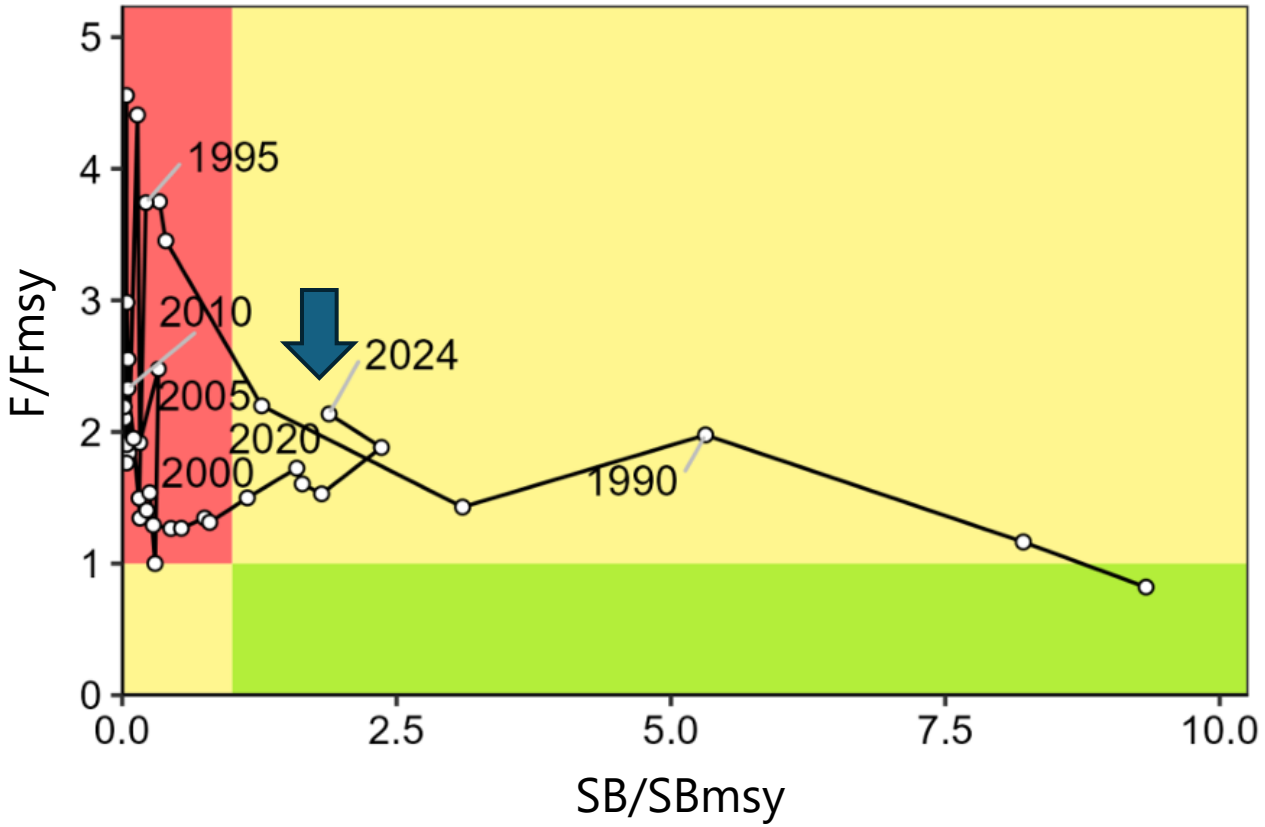
Stock-Recruitment relationship

- Two hockey-stick stock recruitment relationship considering “regime-shift”
  - **High recruitment regime (1976-1987)**
  - **Normal recruitment regime (1988-2024)**



Reference points and Kobe plot

- SBmsy 1,432 thousand ton
- SBlimit 530 thousand ton
- Fmsy 0.33 (F43%SPR)
- MSY 470 thousand ton



Overview of Japanese domestic stock assessment

- Stock assessment using ridge-VPA with four indices
- Biomass increased until 2022 and started decreasing since 2023
- Reference points based on Hockey-Stick SRR with two regimes
- SSB2024 is 2.7 million tons and above SBmsy (1.4 million)
- F2024 is above Fmsy