

INTERNATIONAL PACIFIC



HALIBUT COMMISSION
Celebrating 100 Years
1924-2024

Data overview and stock assessment at the end of 2023

Agenda Item 5.2

IPHC-2024-IM099-10 Rev_1

(I. Stewart, A. Hicks, R. Webster, & D. Wilson)



Outline

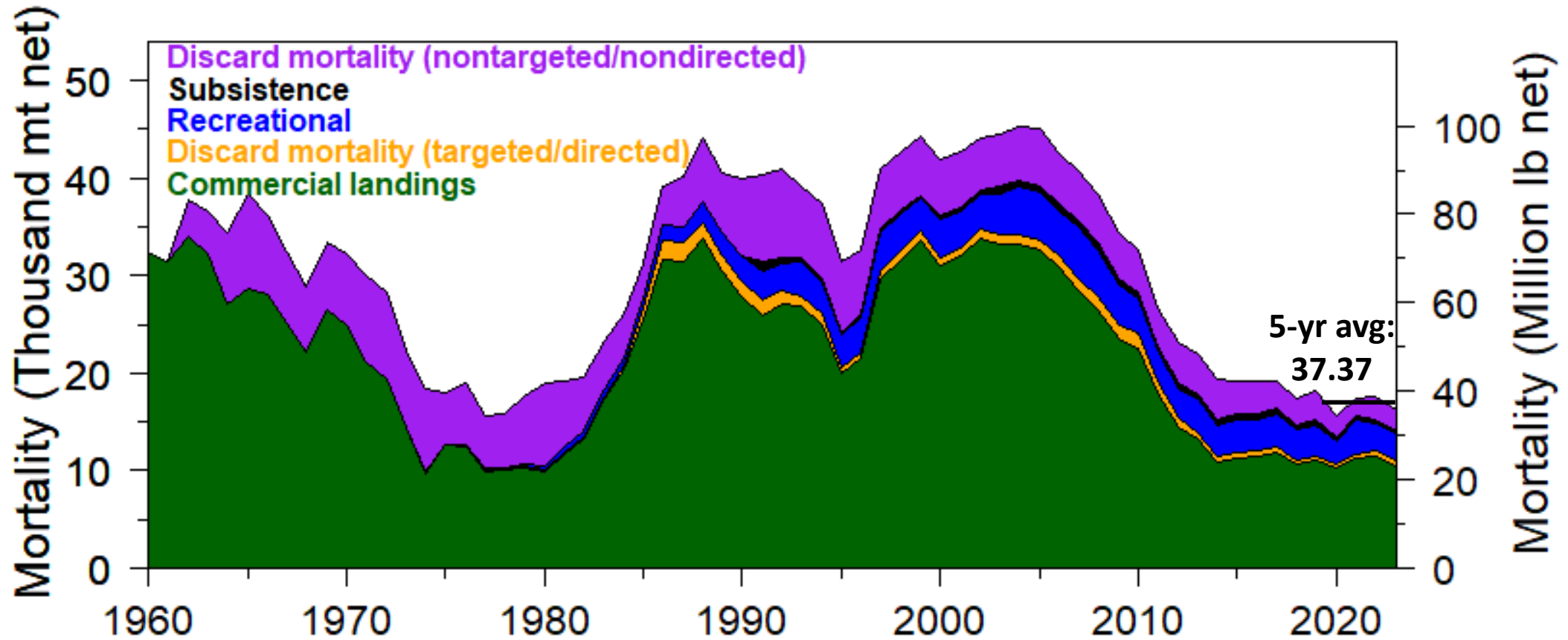
- Data sources
 - Fisheries
 - FISS
 - Other sources
- Modelling
 - Review of process
 - Results in 2023



Summary

- Fishing mortality: down slightly in 2023
- Trends: FISS down 2-4% (numbers/pounds), fishery down 12%
- Existing age classes:
 - 2012 and 2014 moderately large – not large enough to support a fishery increase at current biomass levels
 - Weight-at-age: mixed flat or increasing trends
- Upcoming age classes: possible 2017-2018 year-classes
- Biomass: spawning biomass trend is nearly flat, at 42% of the unfished level
- Fishing intensity: 2023 lowest in recent years

Historical mortality



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2023 Mortality

Projected from AM099 based on adopted mortality limits

Year	Commercial Landings	Commercial discards	Recreational	Subsistence	Non-directed discards	Total
2023	24.90	1.39	6.59	0.96	4.50	38.34

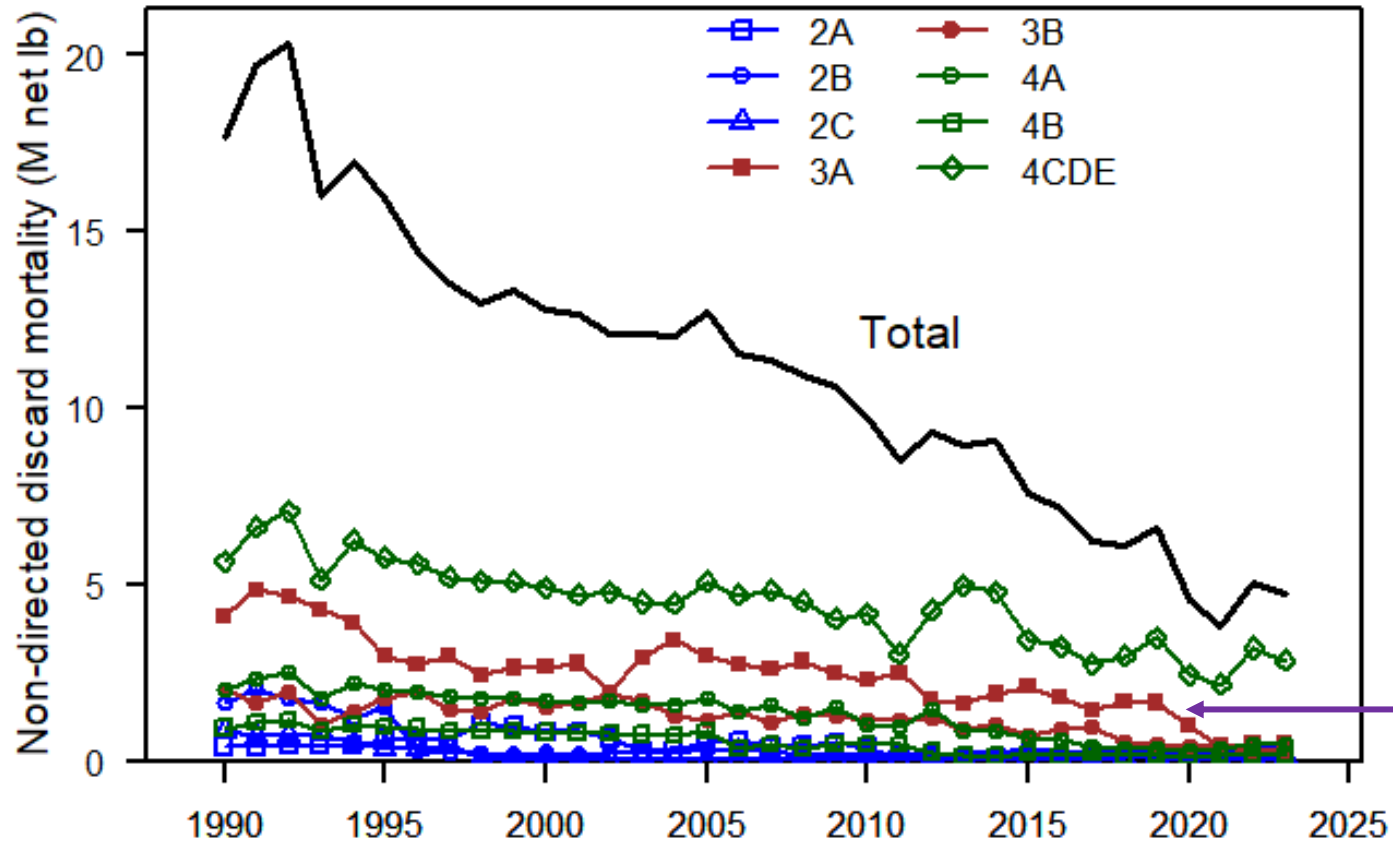
Estimated for this year's stock assessment analysis

Year	Commercial Landings	Commercial discards	Recreational	Subsistence	Non-directed discards	Total
2023	22.97	1.31	6.01	0.83	4.76	35.87

3-yr avg: **4.56**

- Down 7% from 2022
- 1.64 Mlbs above 2020
- 83% utilized

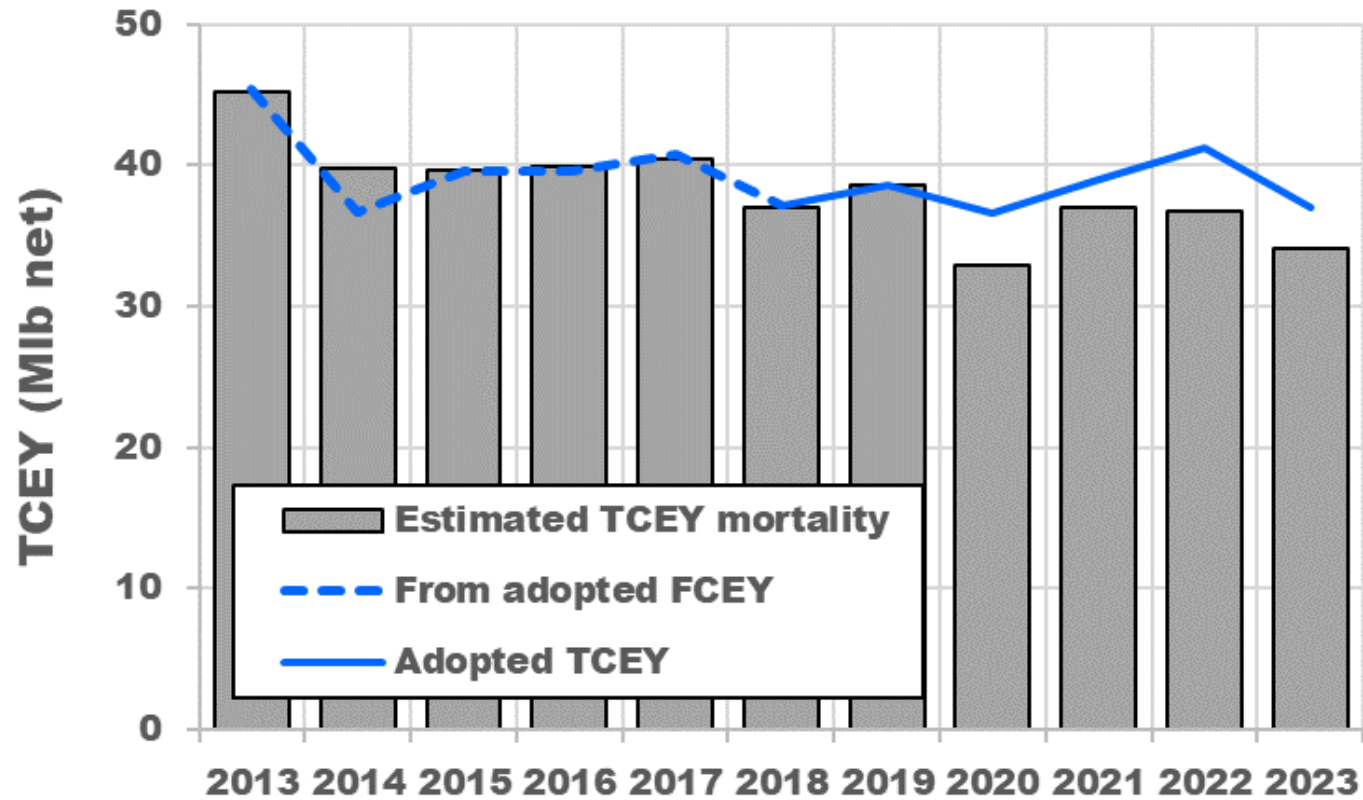
Recent non-directed discard mortality



Reductions in fisheries for other shelf species in 3A



Recent TCEYs

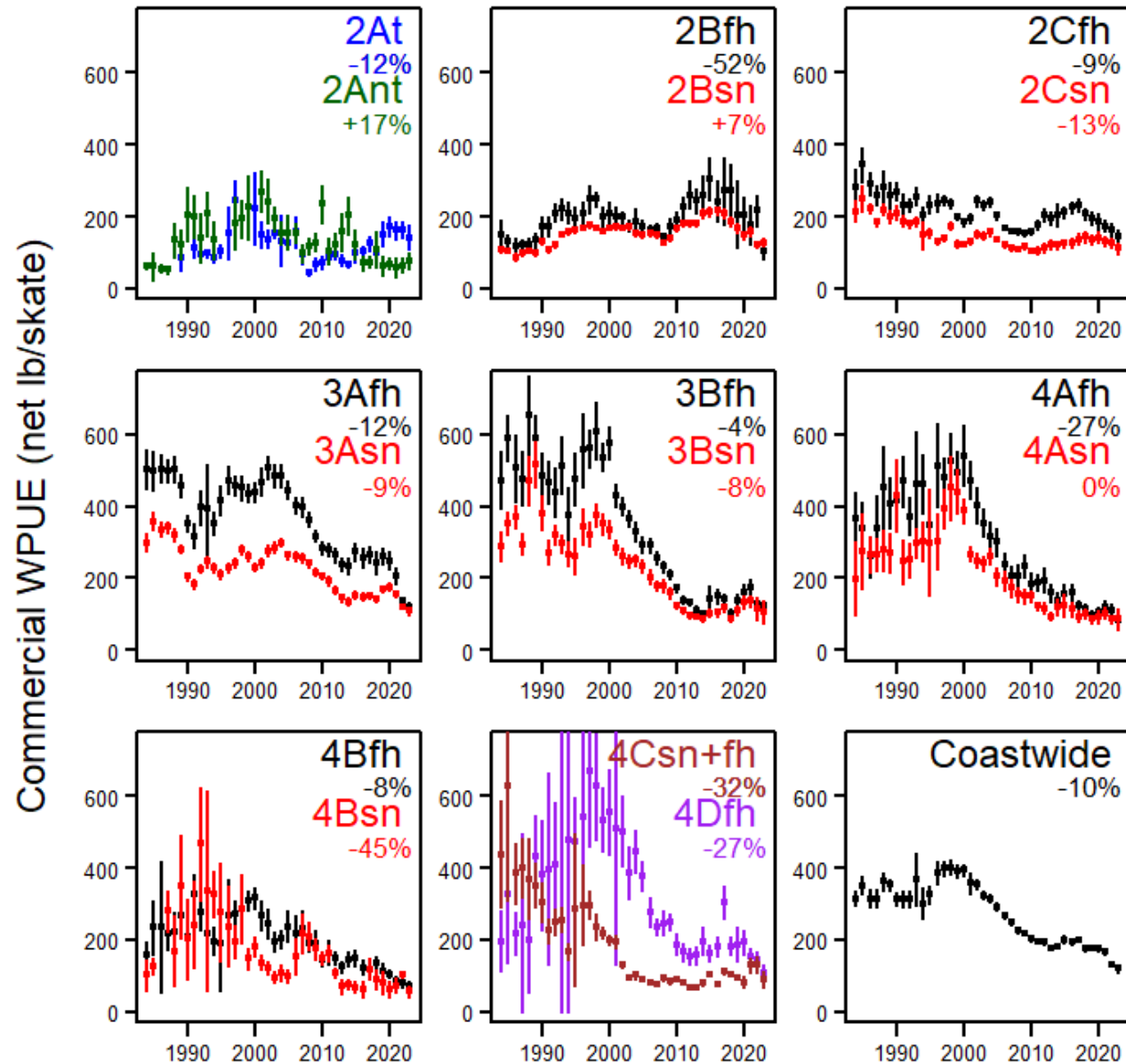


Fishery trends: O32

2A Tribal
2A non-Tribal

Fixed hook
Snap

4C
4D

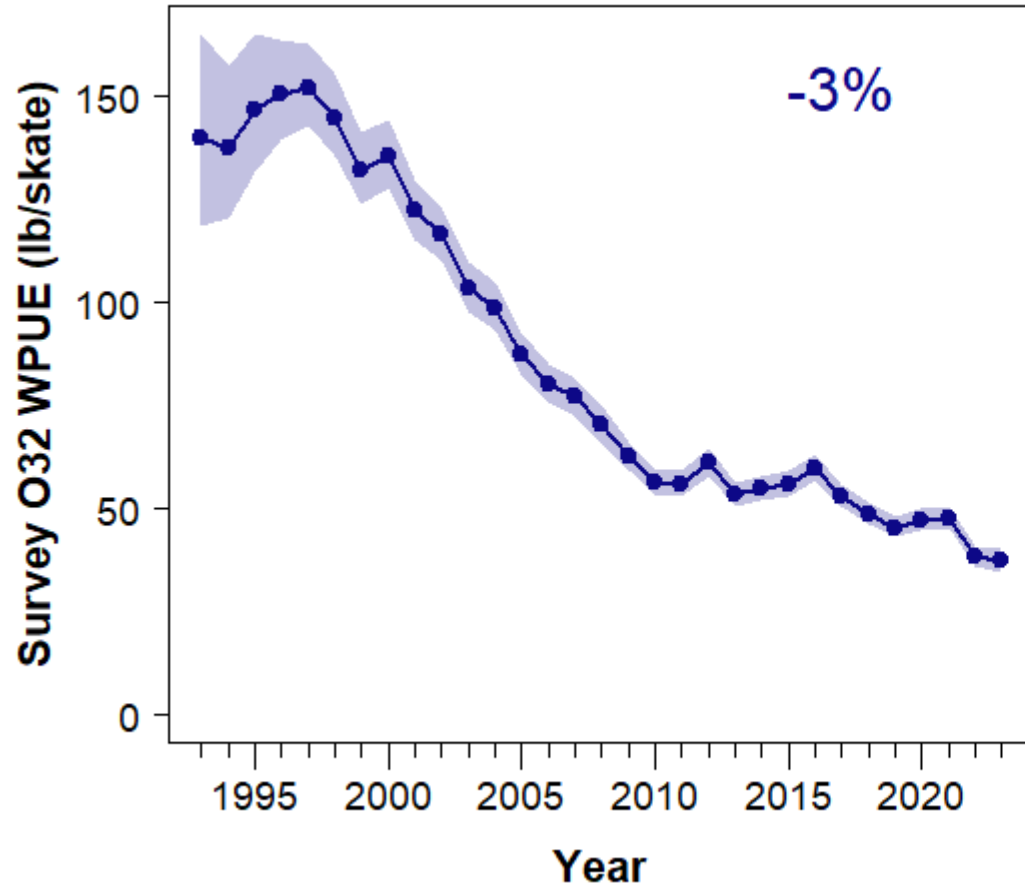


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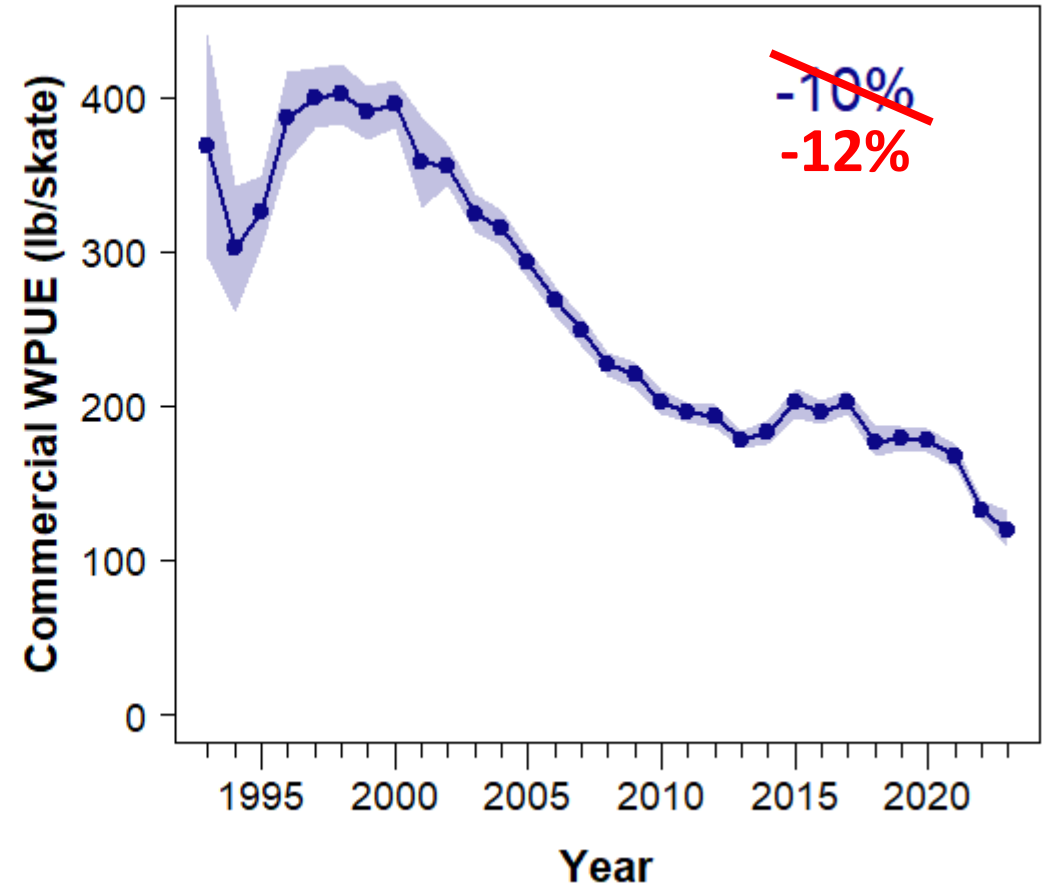
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Fishery and FISS trends

Coastwide survey

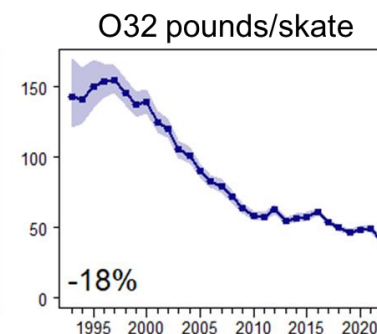
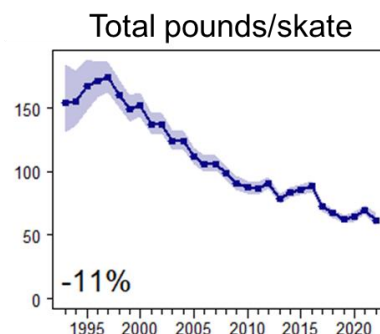
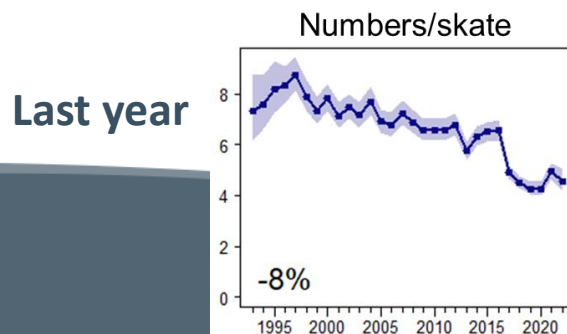
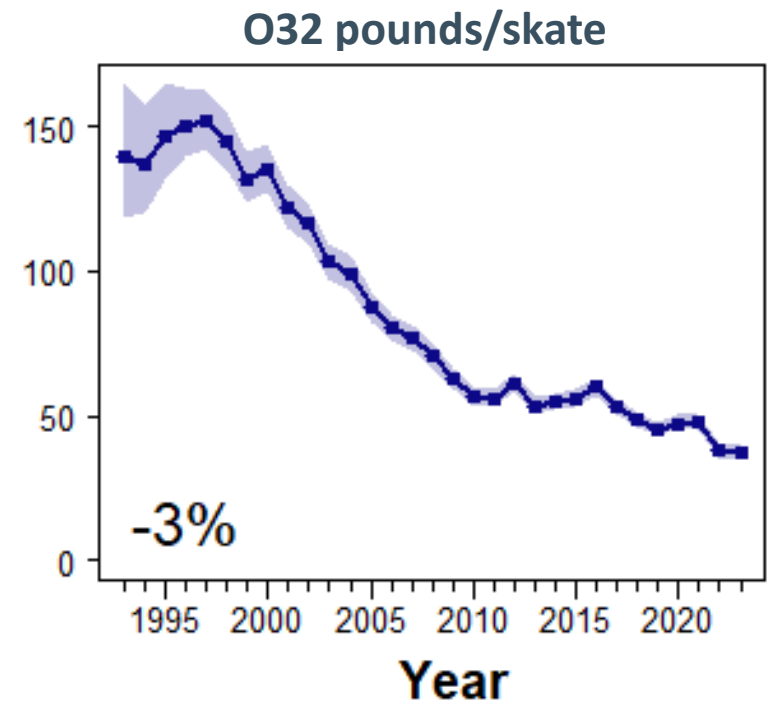
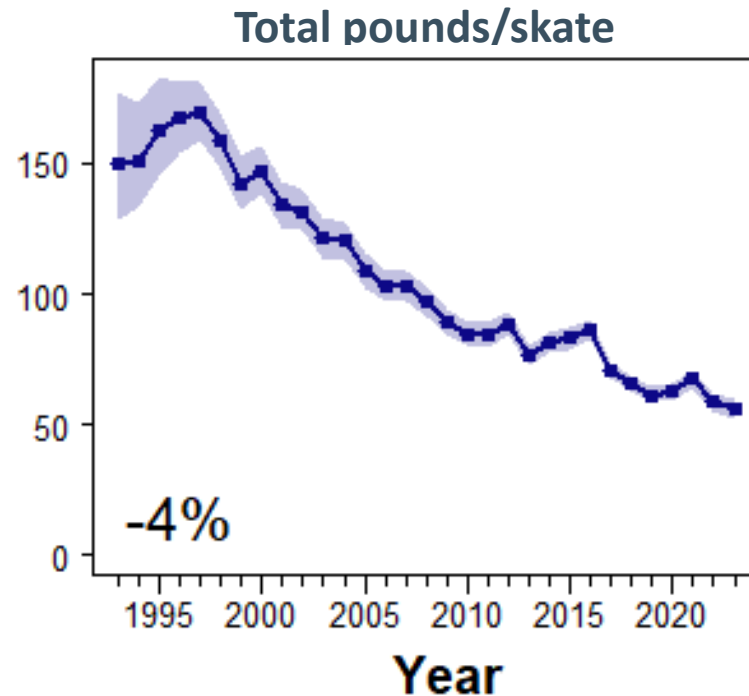
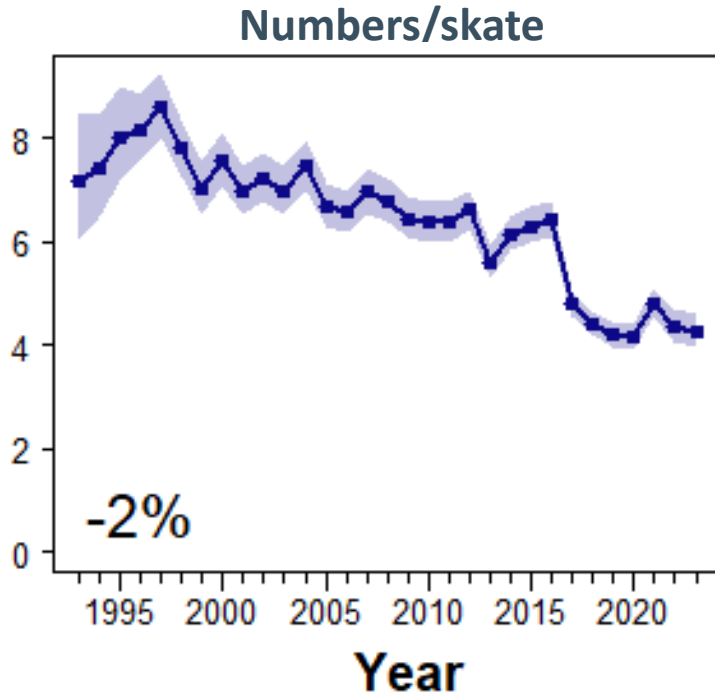


Coastwide commercial

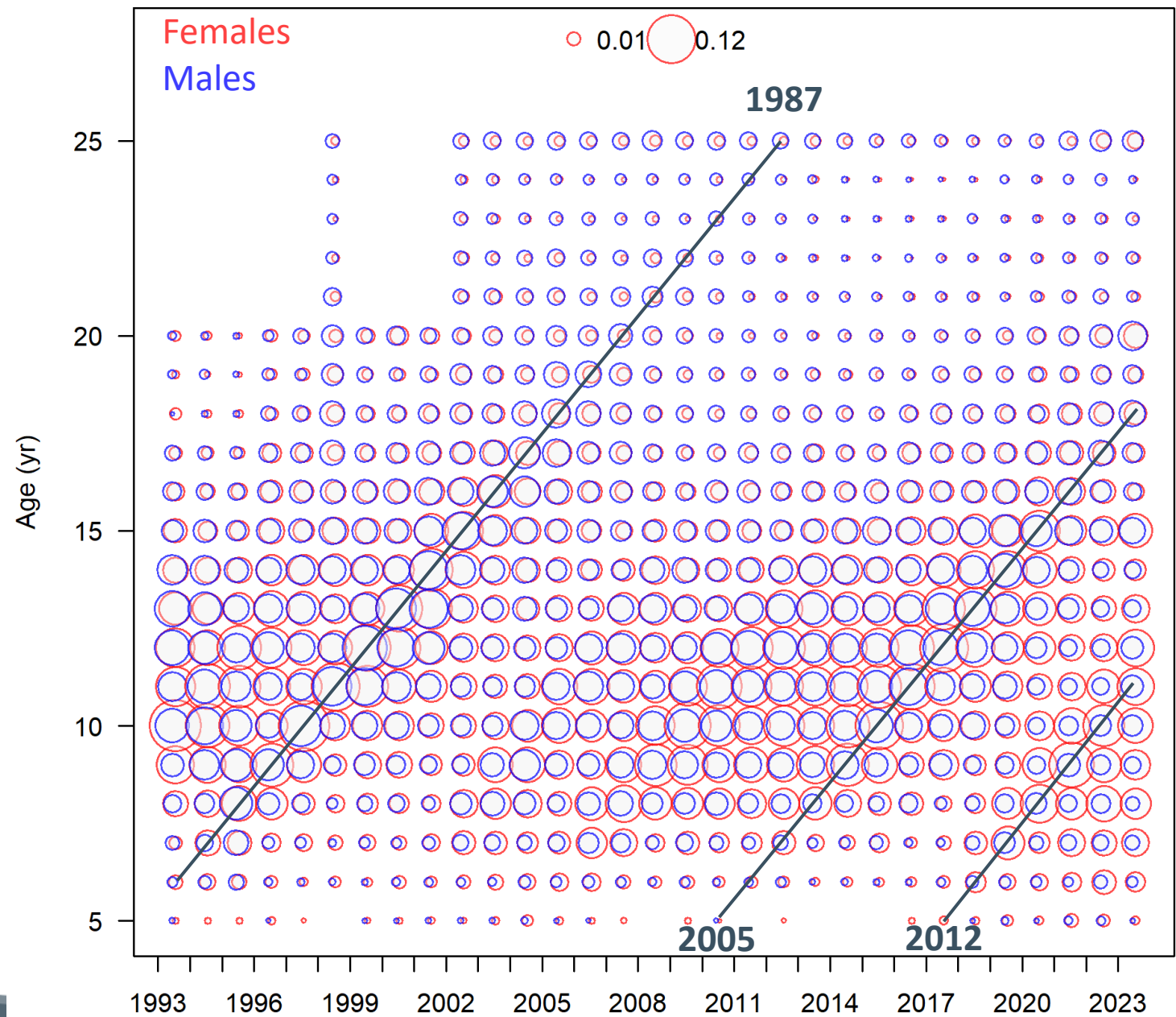


Accounting
for
pending
logbooks

Coastwide FISS trends



FISS ages



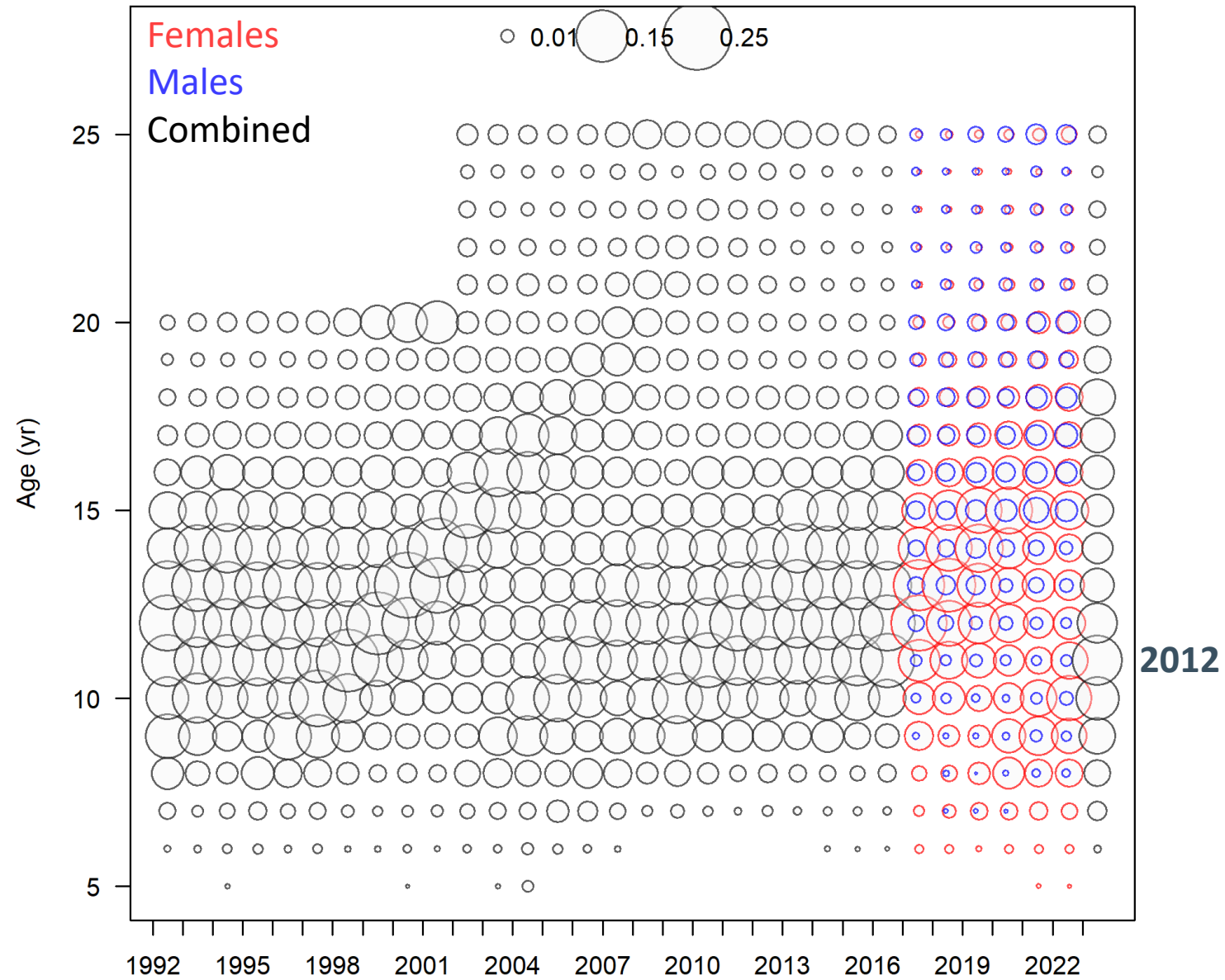
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1924

100 years

2024

Recent fishery ages



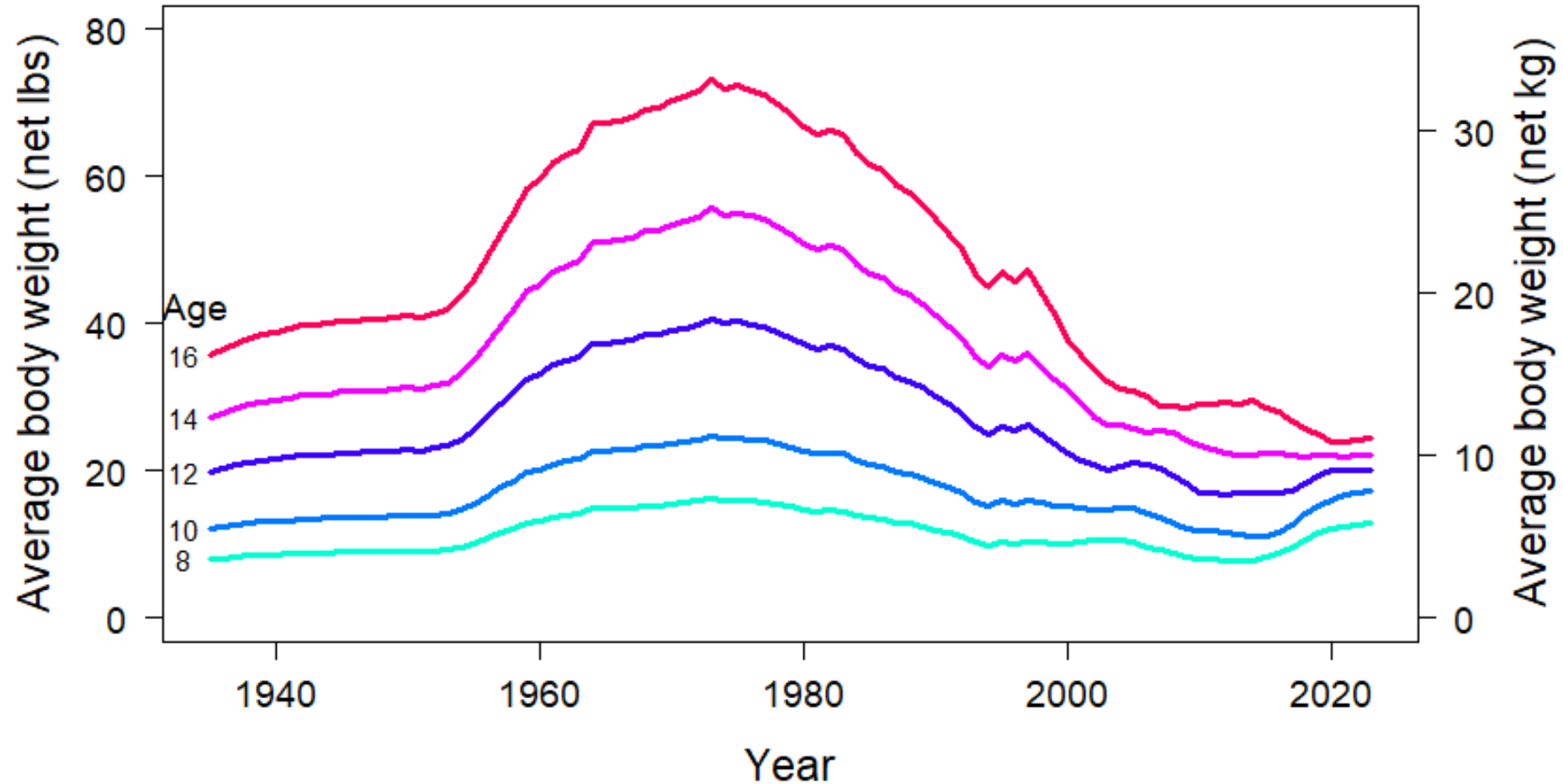
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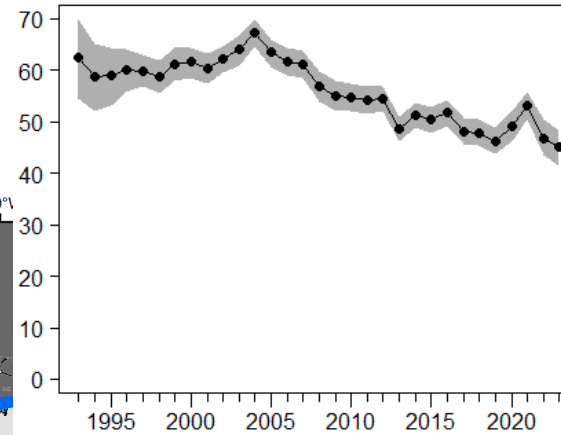
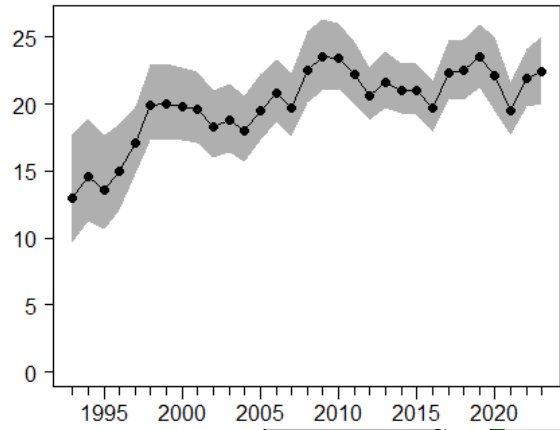
Female coastwide weight-at-age



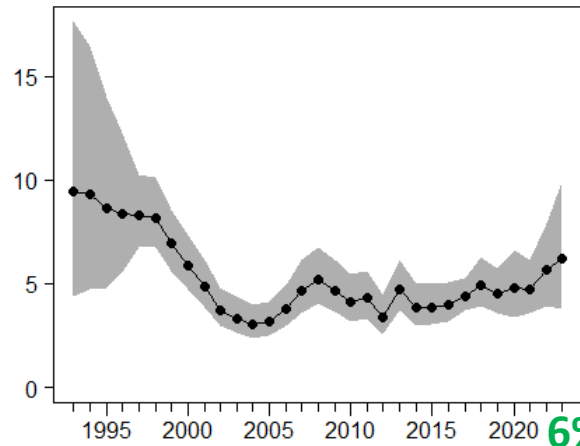
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Stock distribution (all sizes)

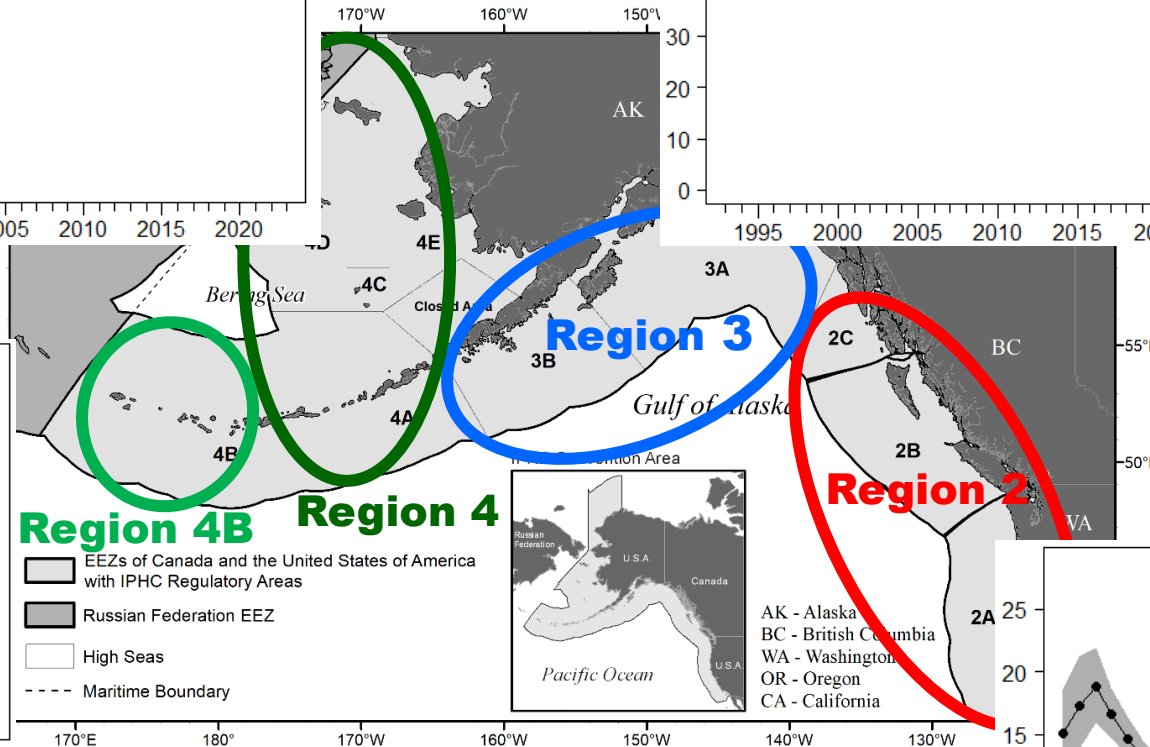


45% - Lowest observed



6%

But with high uncertainty



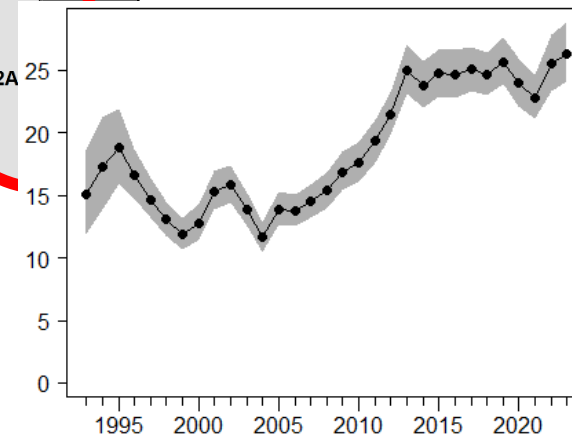
AK - Alaska
BC - British Columbia
WA - Washington
OR - Oregon
CA - California

Region 2

Region 3

Region 4B Region 4

EEZs of Canada and the United States of America with IPHC Regulatory Areas
Russian Federation EEZ
High Seas
Maritime Boundary



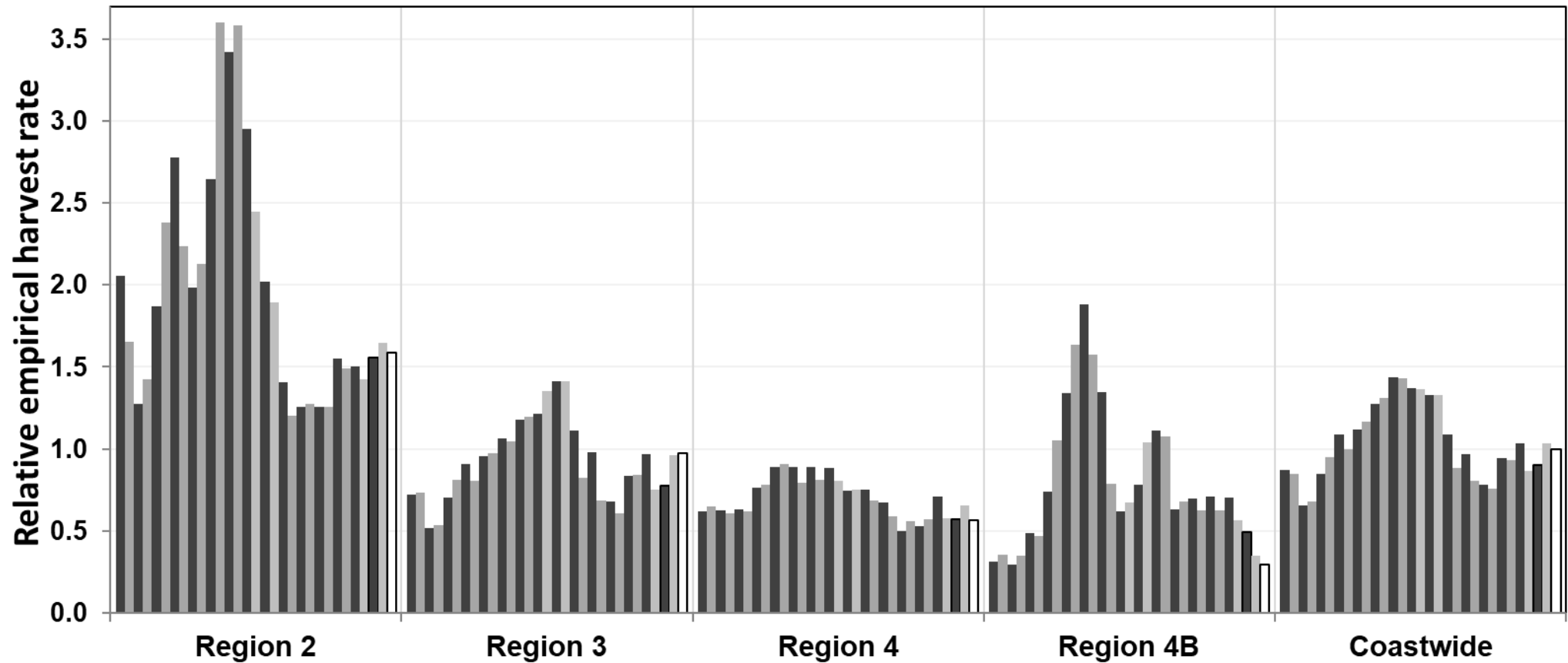
26% - highest observed



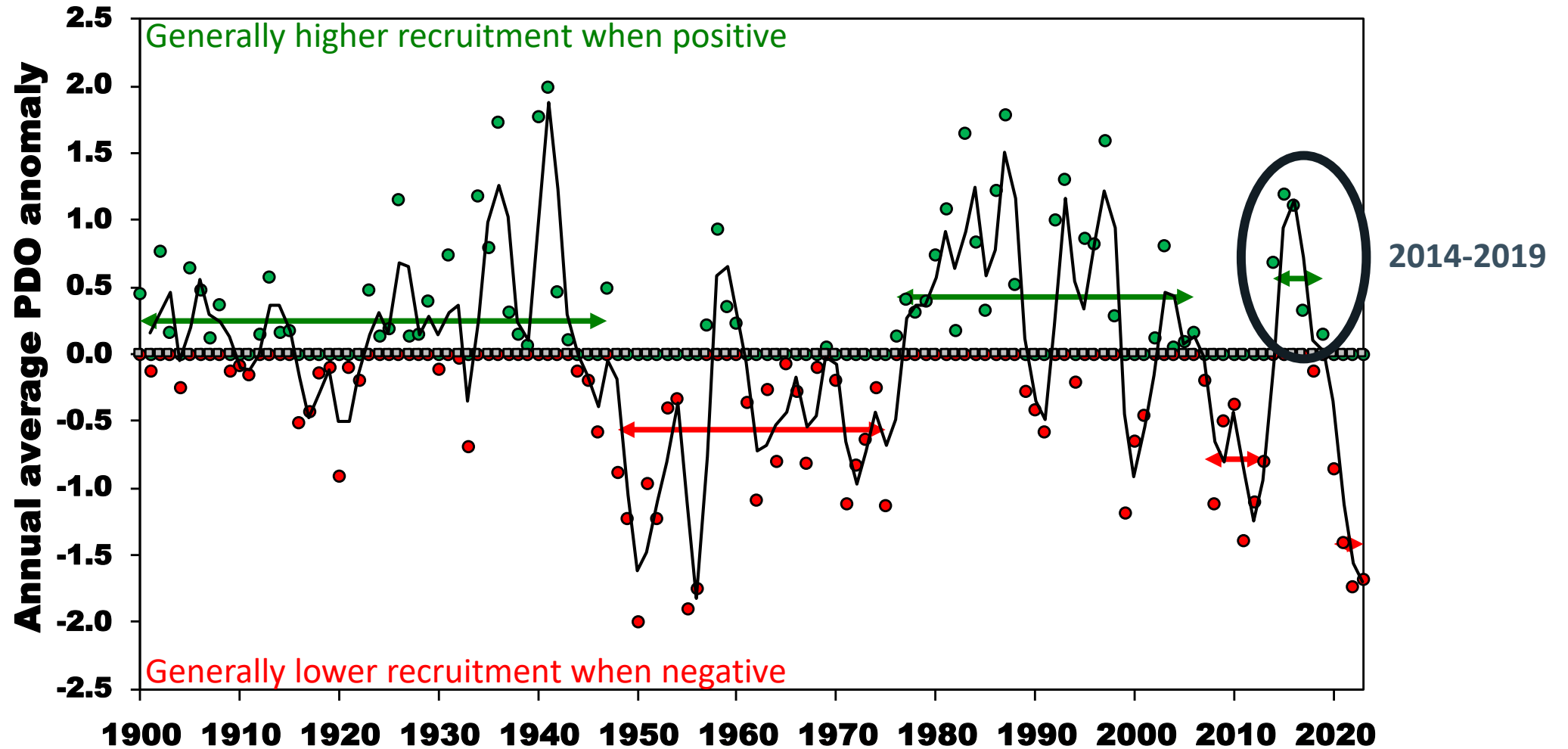
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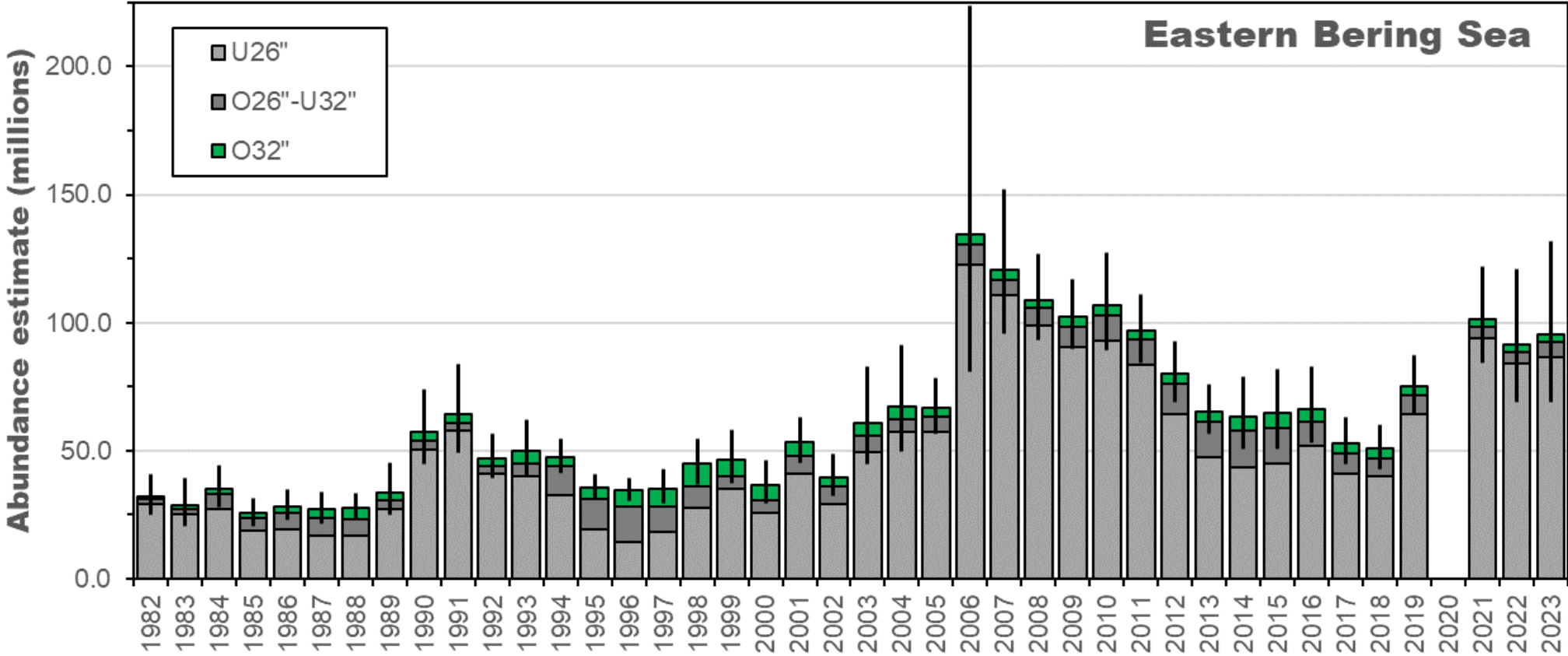
Empirical harvest rates (1993-2023): Mortality/survey index



Ecosystem conditions: Pacific Decadal Oscillation (PDO)



NOAA Fisheries trawl survey - Bering Sea

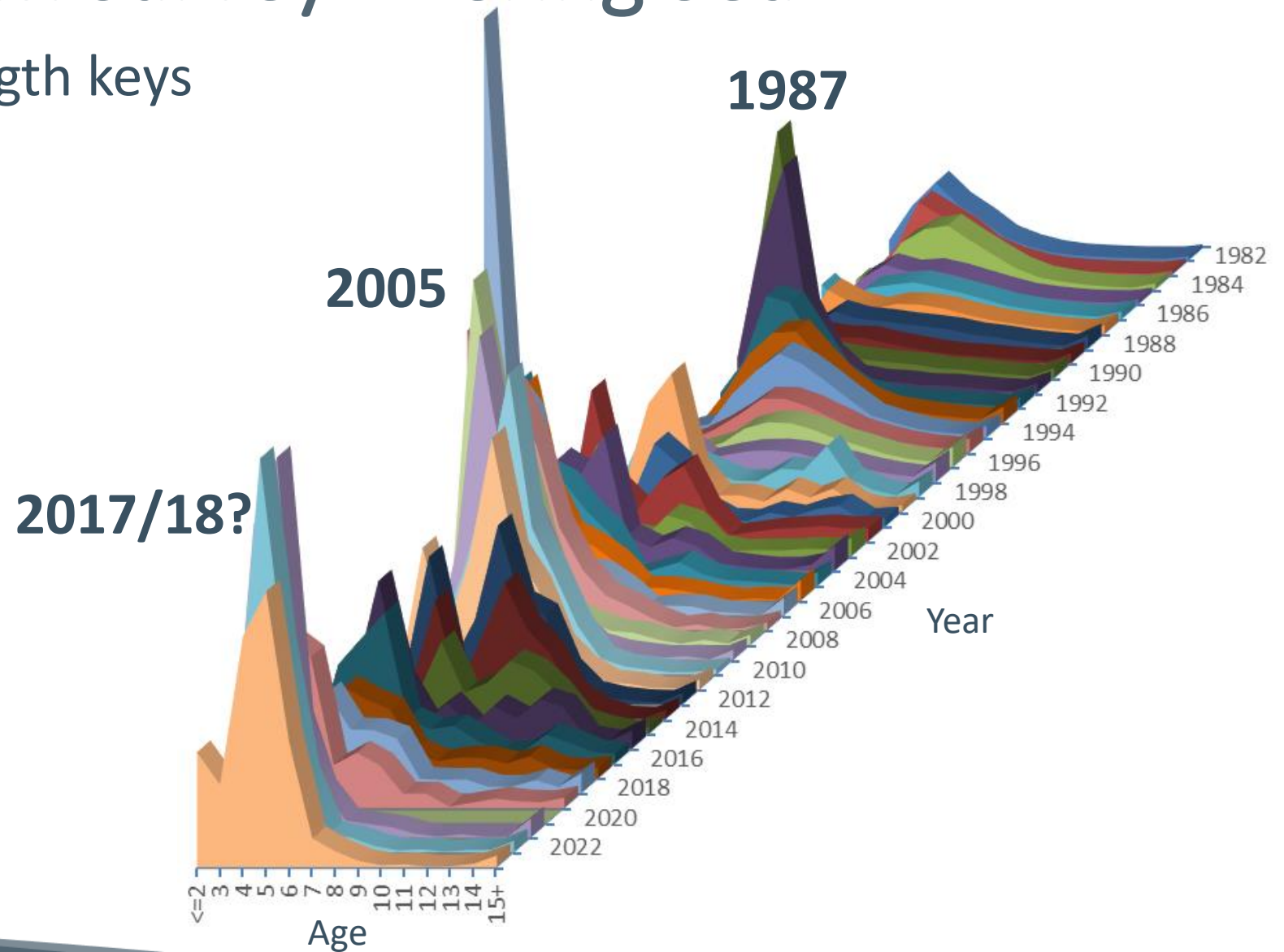


NOAA Fisheries trawl survey - Bering Sea

Numbers at age from age-length keys

Caveats:

- 1987 was a much larger recruitment coastwide than 2005
- It will be 2-4 years before we get direct estimates of the 2017/18 cohorts in the FISS and commercial fisheries



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Recent ecosystem conditions

- Bering Sea (2023): Oceanography (e.g., temperature, ice cover) near-normal, but biology/species distributions remain in transition, crab stocks low
- Aleutian Islands (2023): Continued warm water (10+ years), changing relationships between key indicators (e.g., temperature and PDO)
- GOA (2023): No clear indicators, good or bad, for Pacific halibut
- B.C. (2022): Reduced upwelling, warmer waters than usual with negative PDO
- California current (2022/23): Marine heatwave, mixed productivity across species

- Take-away: Continued change, low predictability

References (most recent reports): [Bering Sea](#), [Gulf of Alaska](#), [Aleutian Islands](#), [B.C.](#), [California current](#)

Outline

- Data sources
 - Fisheries
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- Modelling
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 - Results in 2023



Stock assessment development history

- 2015: Full assessment – formalized 4-model ensemble methods
- 2016-2018: Updates
- 2019: Full assessment – included new commercial fishery sex-ratio data
- 2020-2021: Updates
- 2022: Full assessment – improved treatment of natural mortality, data weighting
- 2023: Update
 - SRB review of development in June (SRB022)
 - Final recommendations in September (SRB023)
- *2024: Update planned*
- *2025: Full assessment planned*

2023 Stock assessment development

- 2023: Update
 - SRB review of development options in June (SRB022)
 - Model weighting
 - Continue using equal weighting
 - Frequency of commercial sex-ratio processing
 - Estimation of natural mortality
 - Whale depredation – estimates from logbooks
 - Spatial population structure

2023 Stock assessment development

- 2023: Update
 - Final recommendations in September (SRB023)
 - Whale depredation (including observer data) affect on stock assessment
 - Don't include for 2023
 - Model weighting
 - Frequency of commercial sex-ratio processing
 - Continue annual analyses while stock is declining
 - Investigate approaches to quantifying uncertainty via simulation testing
 - Including simulation testing with alternative FISS designs

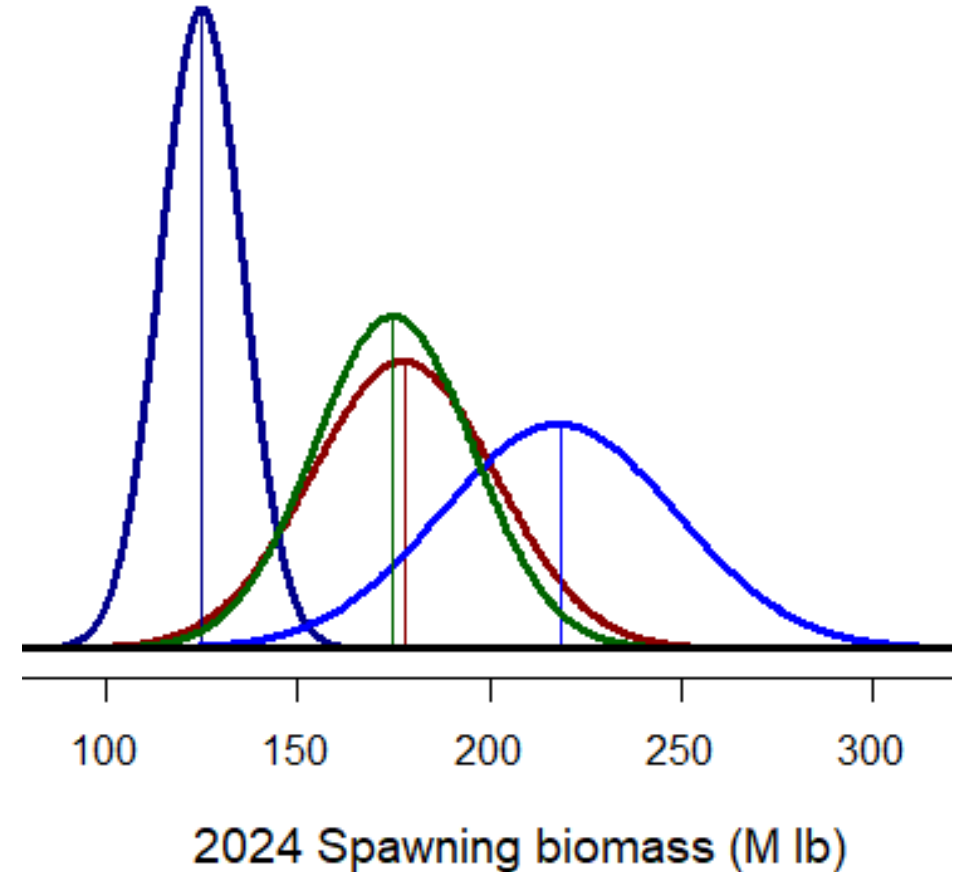


Whale depredation summary

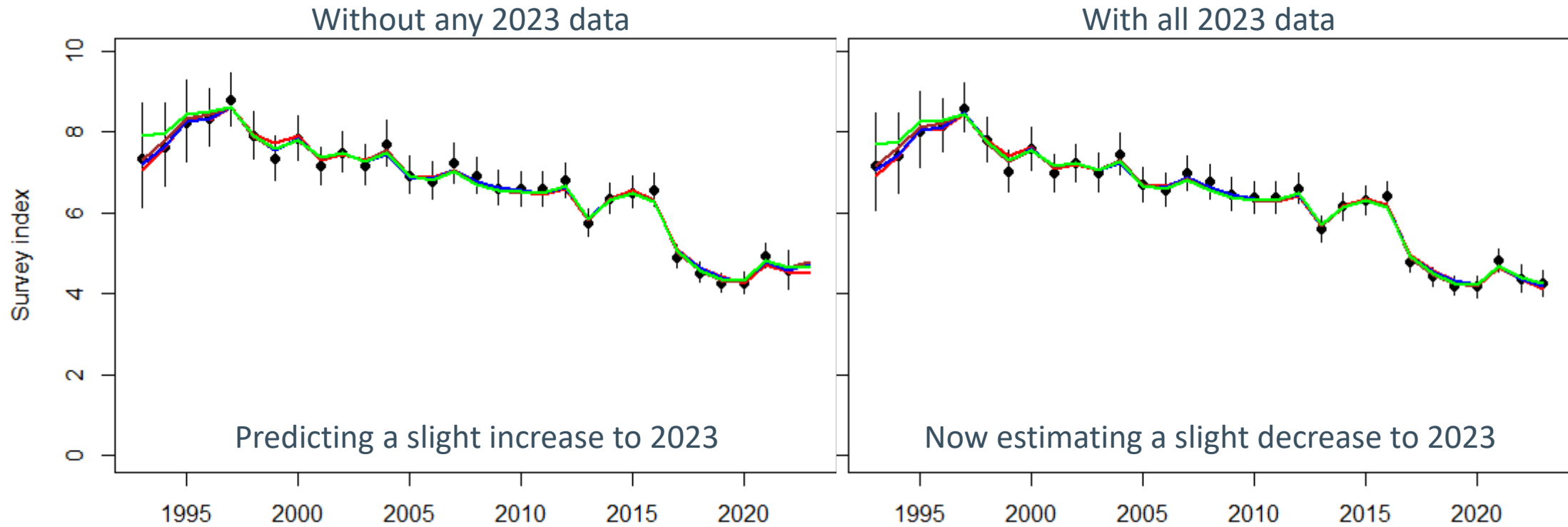
- Area 4 experiences the highest Orca depredation rates
- Areas 2C and 3A experience the highest Sperm whale depredation rates
- Based on logbook-reported depredation rates and survey-estimated magnitude:
 - At least 1.4 Mlbs of lost yield since 1995
 - Assessment model spawning biomass scales upward slightly (1-3%)
 - 0.20 Mlbs would have been projected for 2023 (deducted from the directed commercial landings and discard mortality)
 - The two effects nearly cancel: mortality limits to achieve the same SPR result in nearly identical net fishery limits (+0.02Mlbs)

2023 stock assessment ensemble

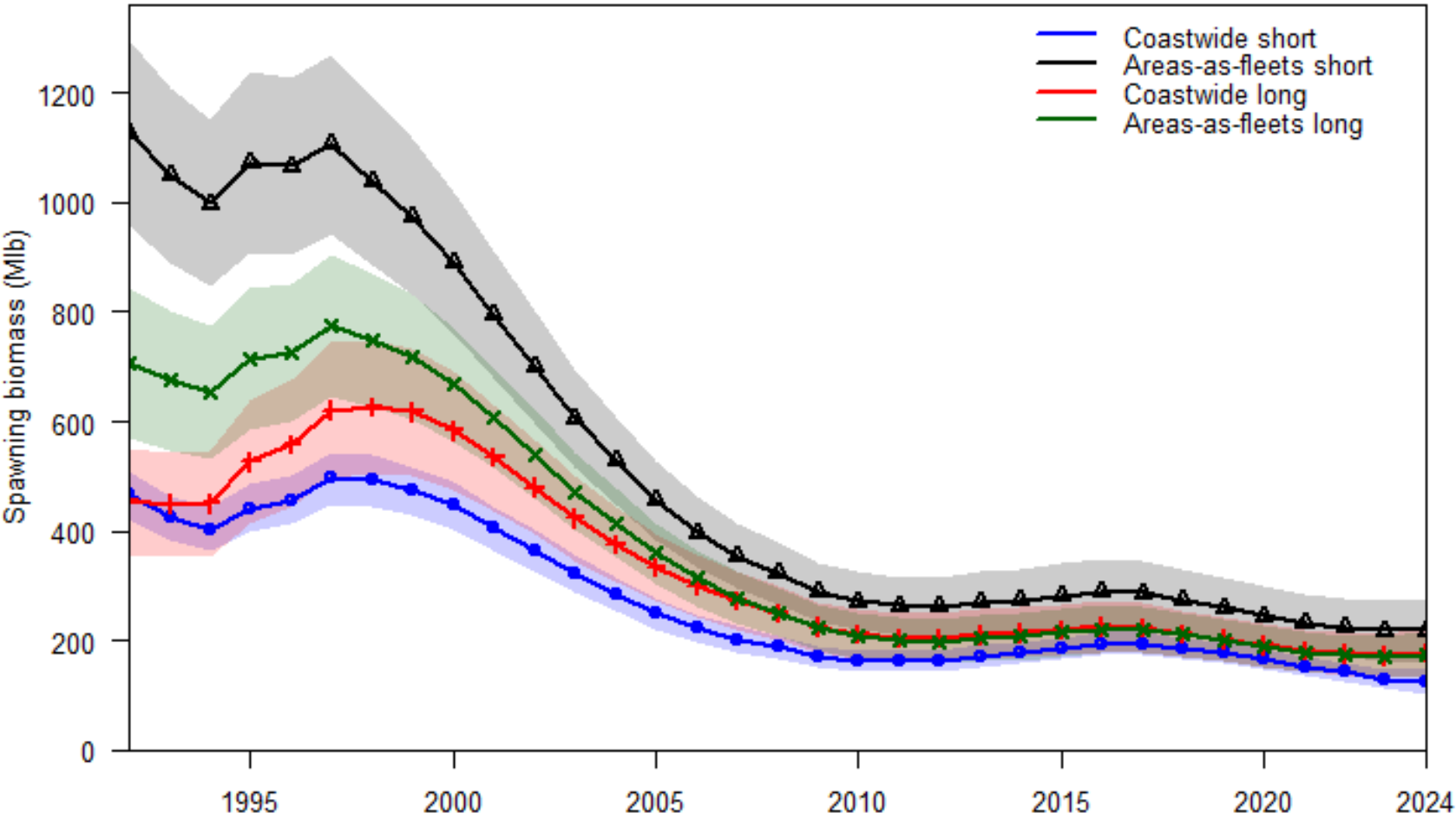
- Same 4 models as in recent assessments:
 - Long and short time-series
 - Aggregated, separate data by Region
- Equally weighted
- No changes to assessment or individual model structure for 2023



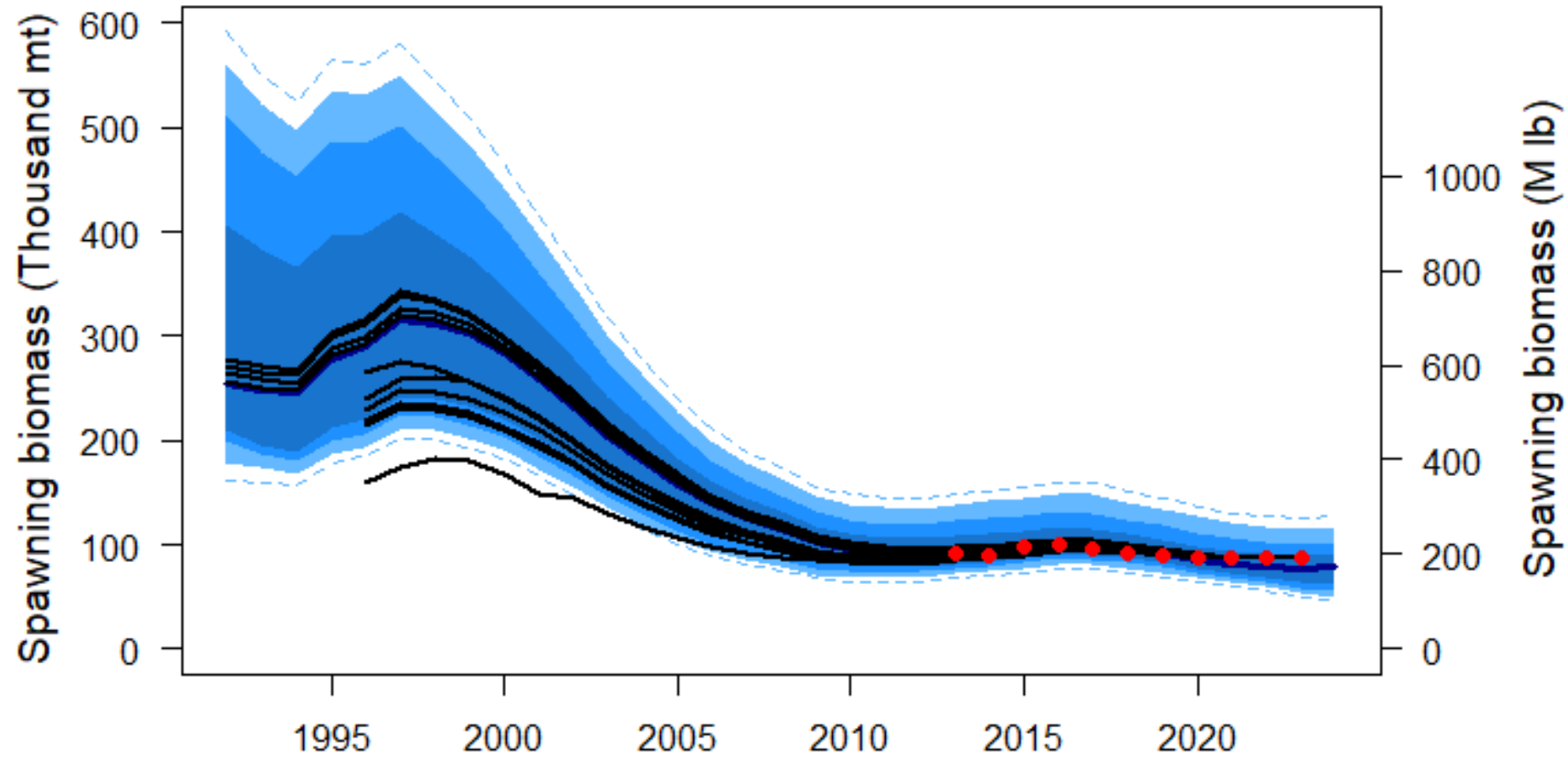
Fit to FISS index



Summary of four individual models



Comparison to previous assessments



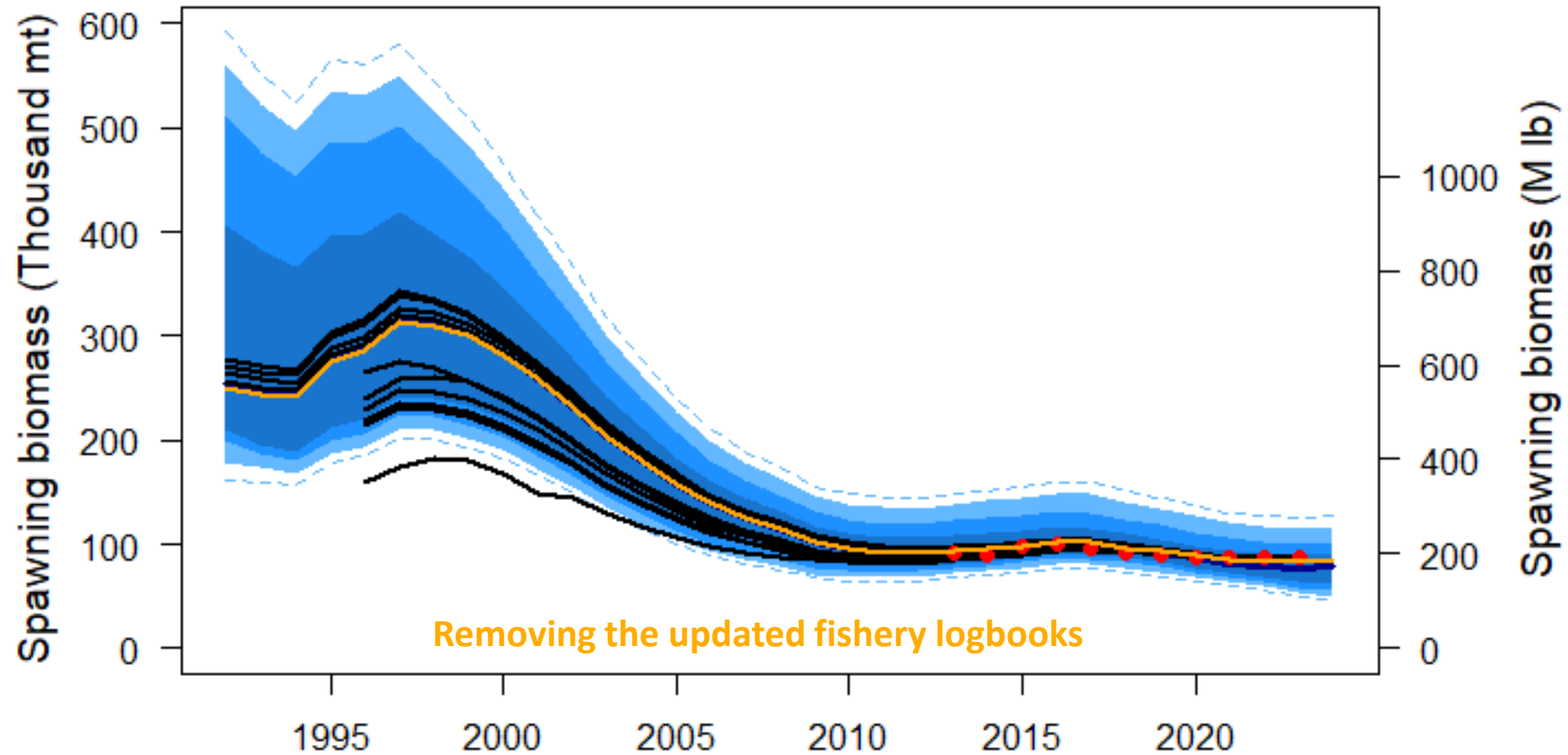
2023 SB estimate is 11% lower than it was last year



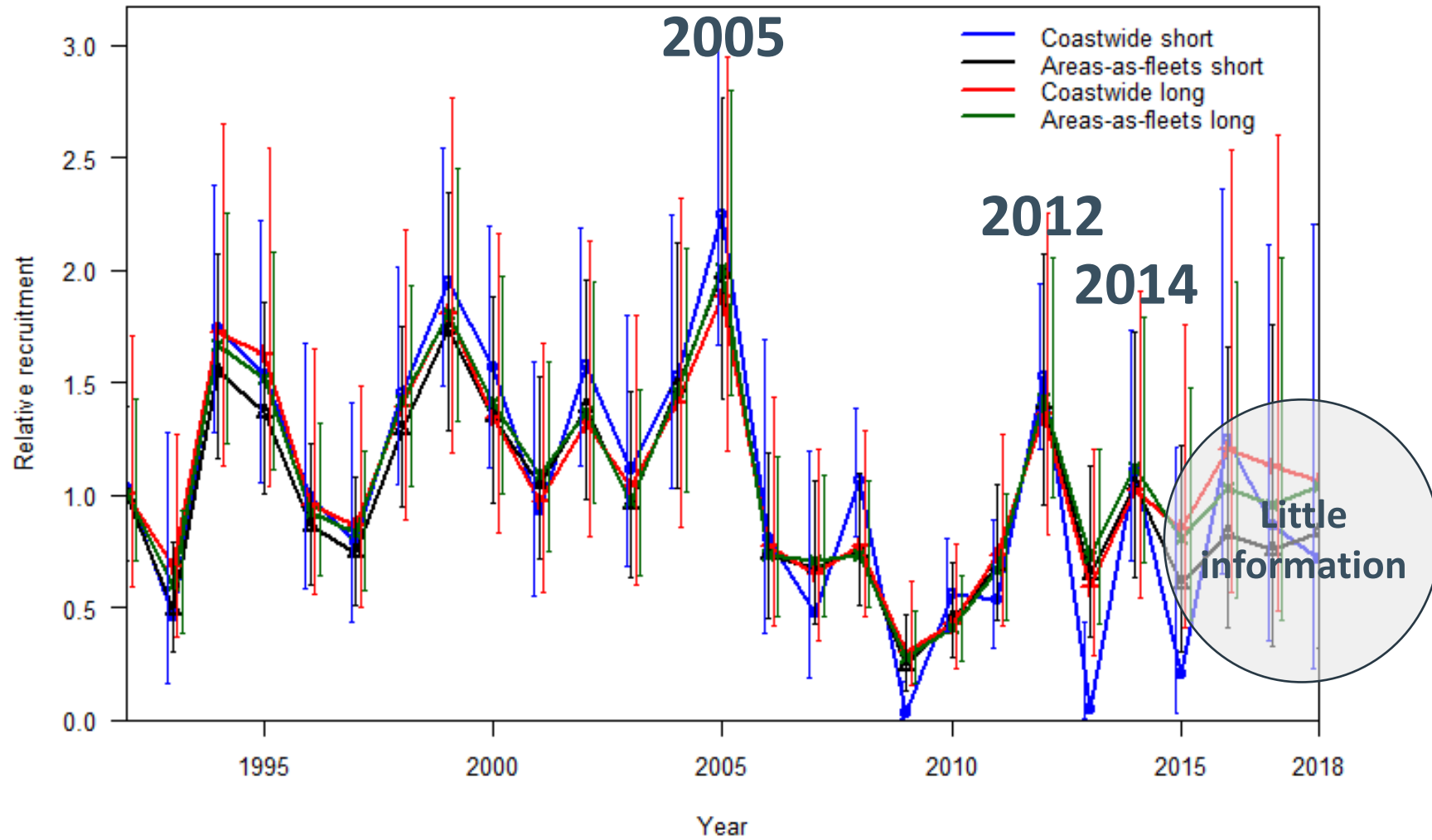
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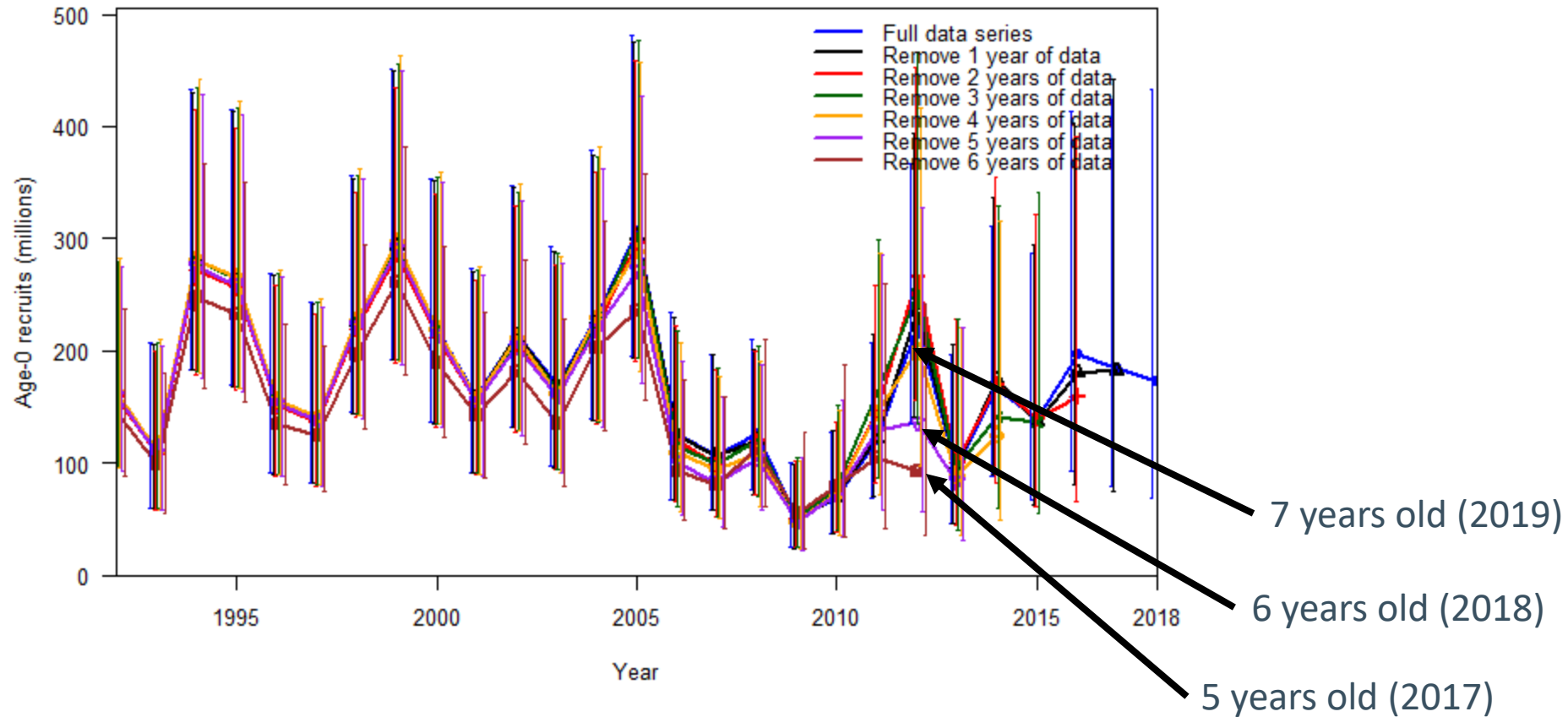
Effect of updated 2022 and 2023 fishery CPUE



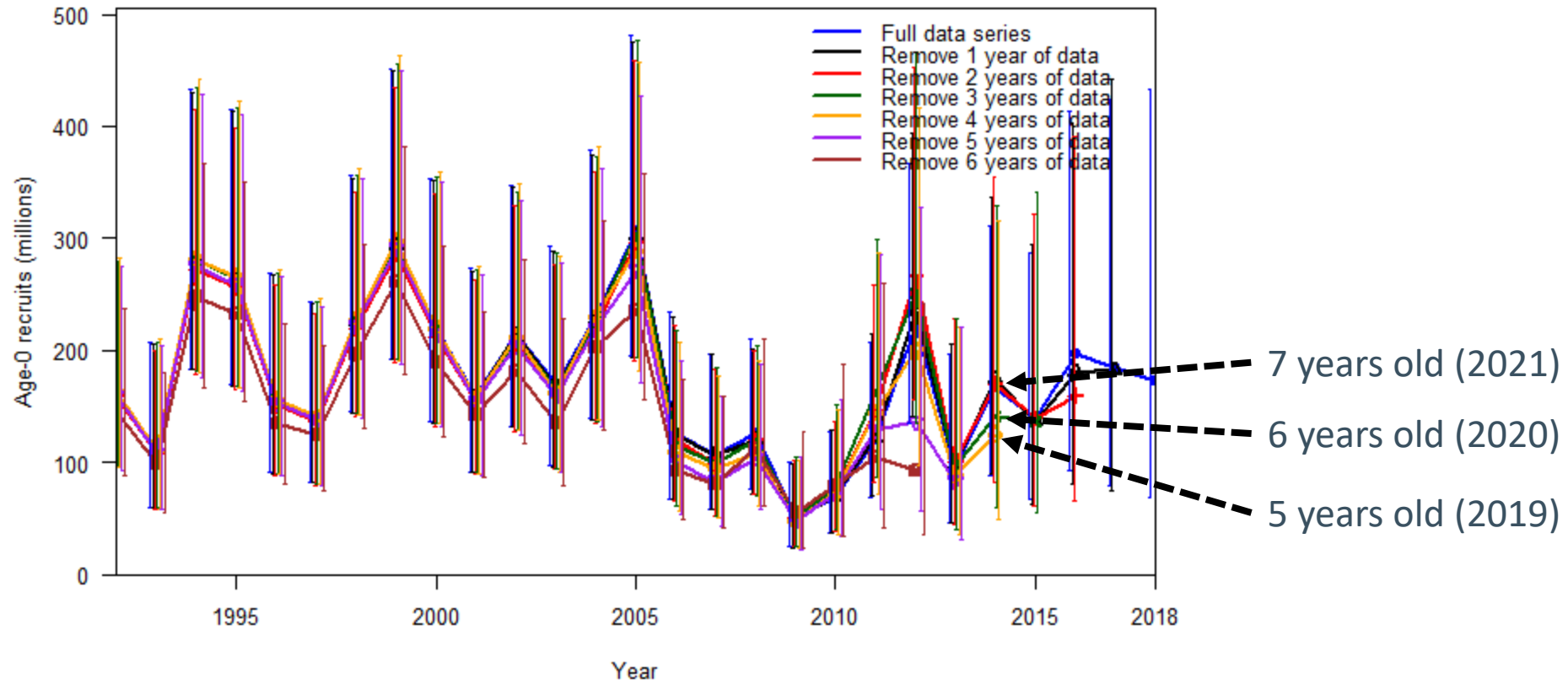
Relative recruitment estimates



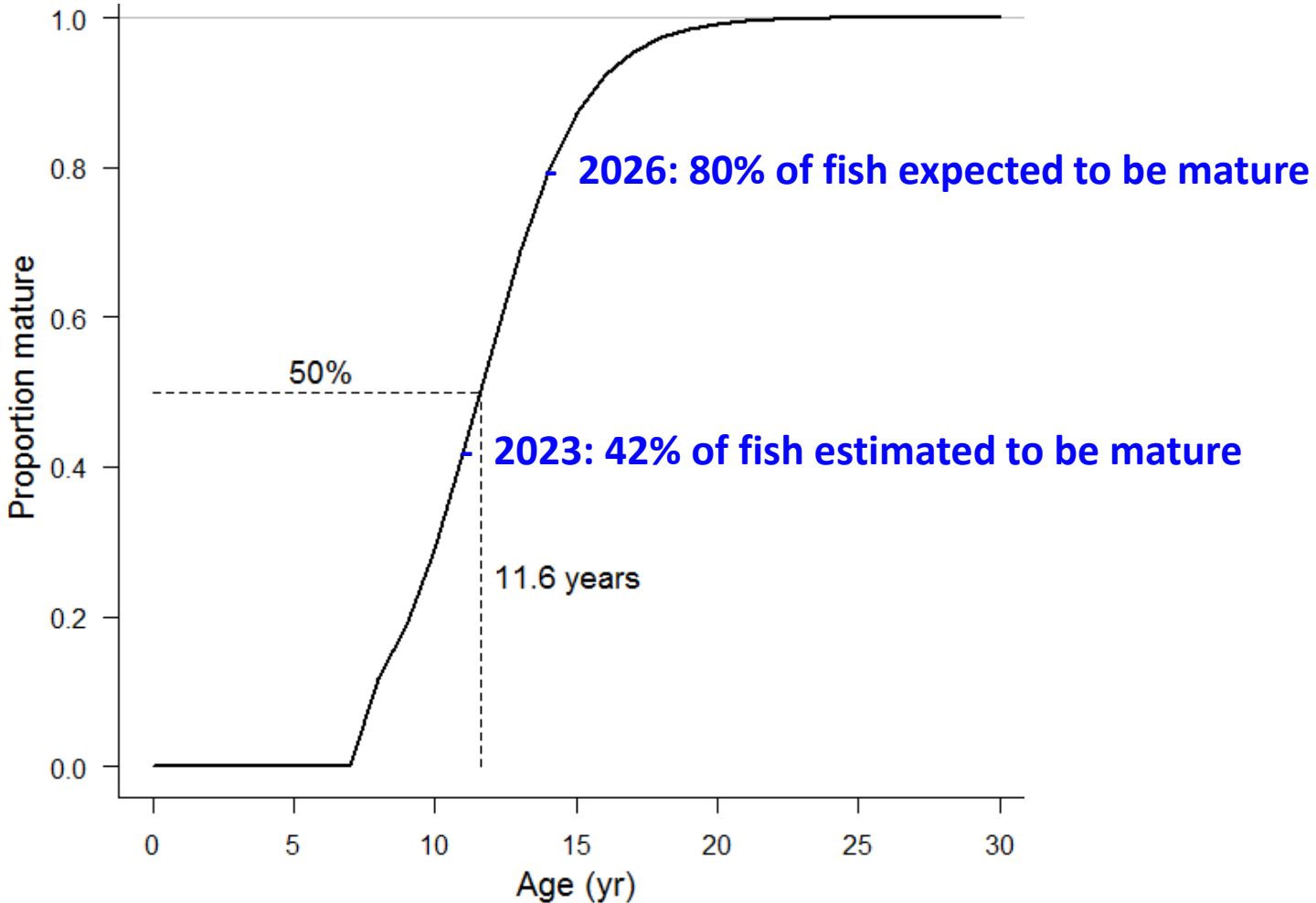
Learning about year class strengths: 2012



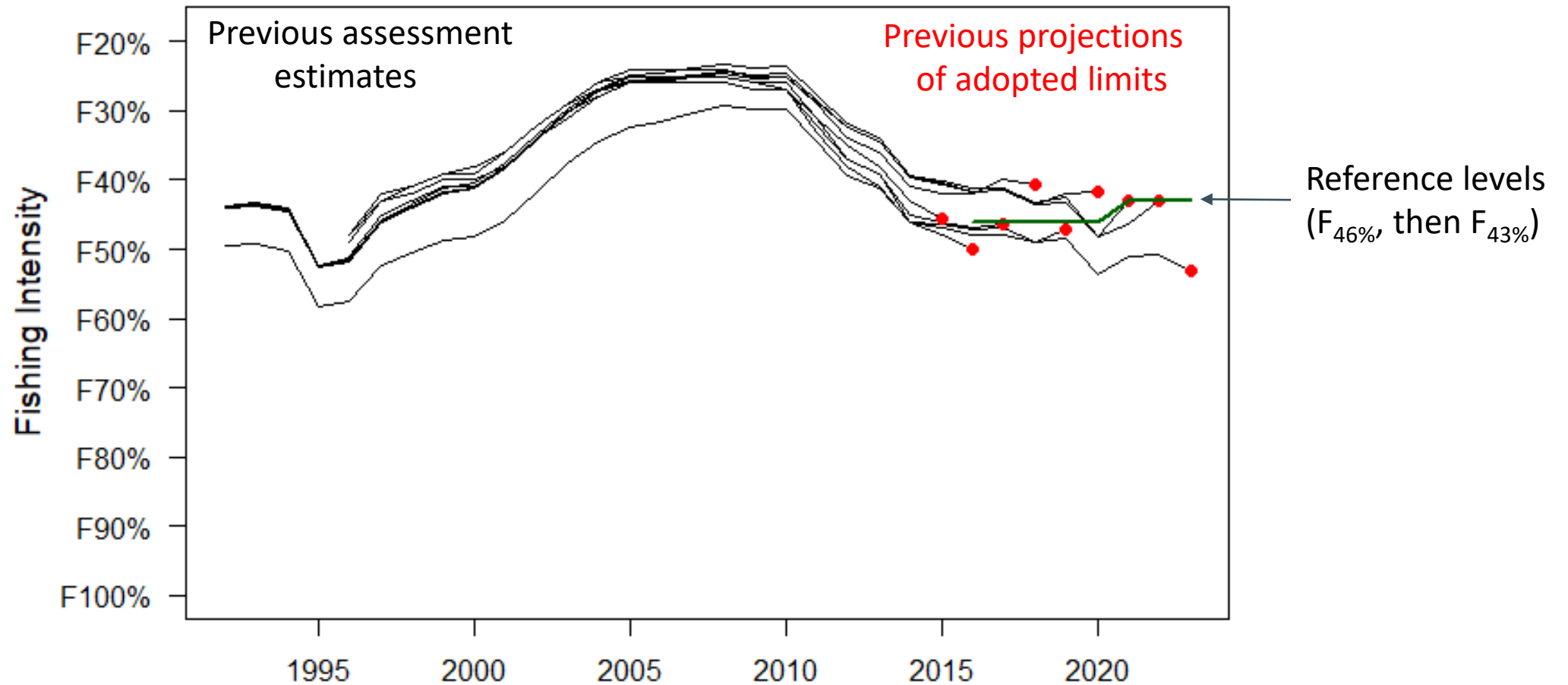
Learning about year class strengths: 2014



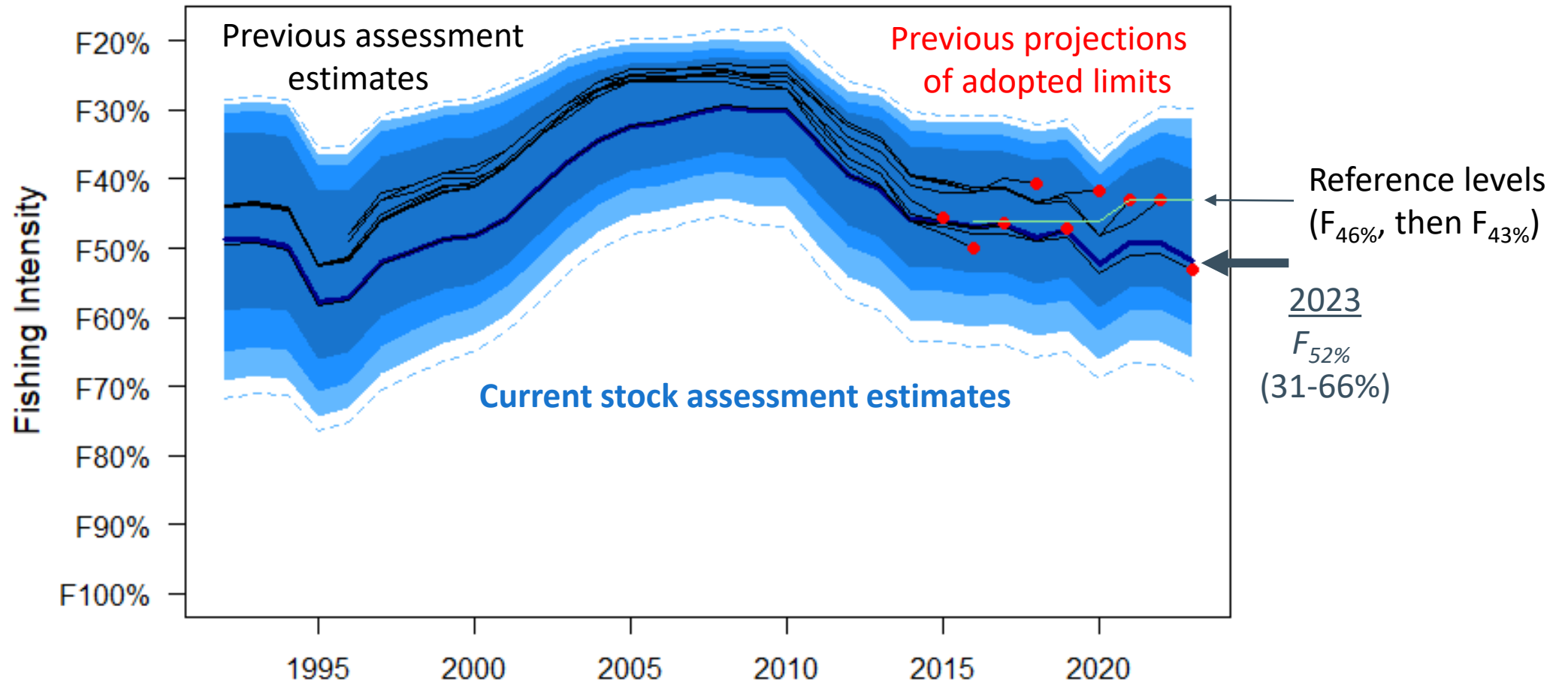
The 2012 year-class – still rapidly maturing



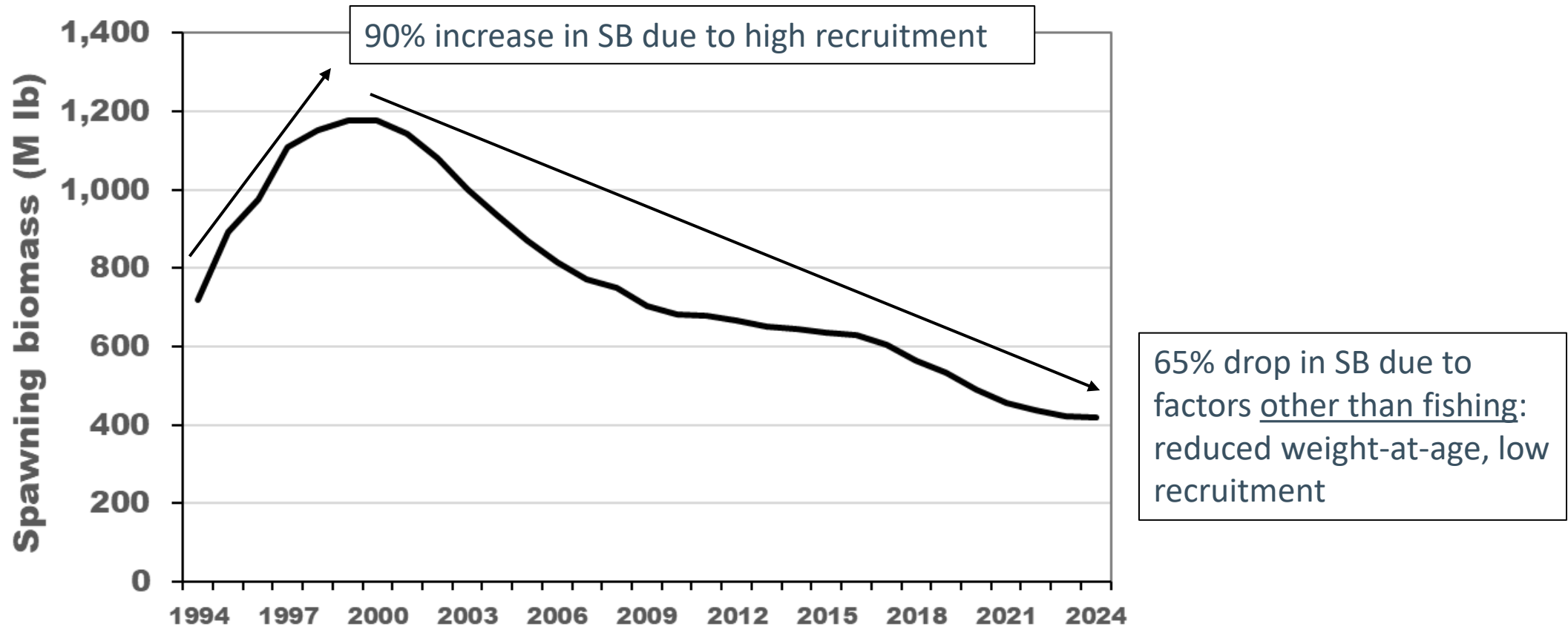
Estimated fishing intensity



Estimated fishing intensity

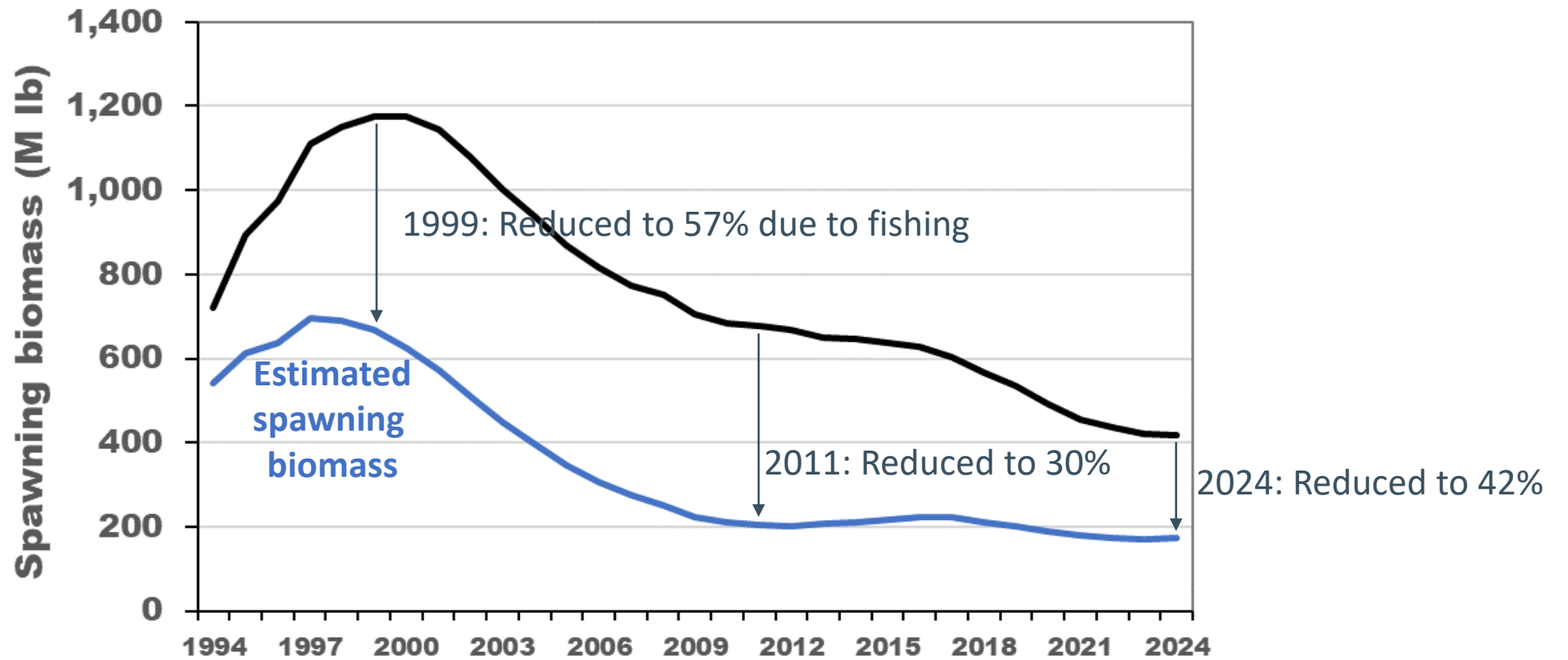


Stock status – estimated unfished trend

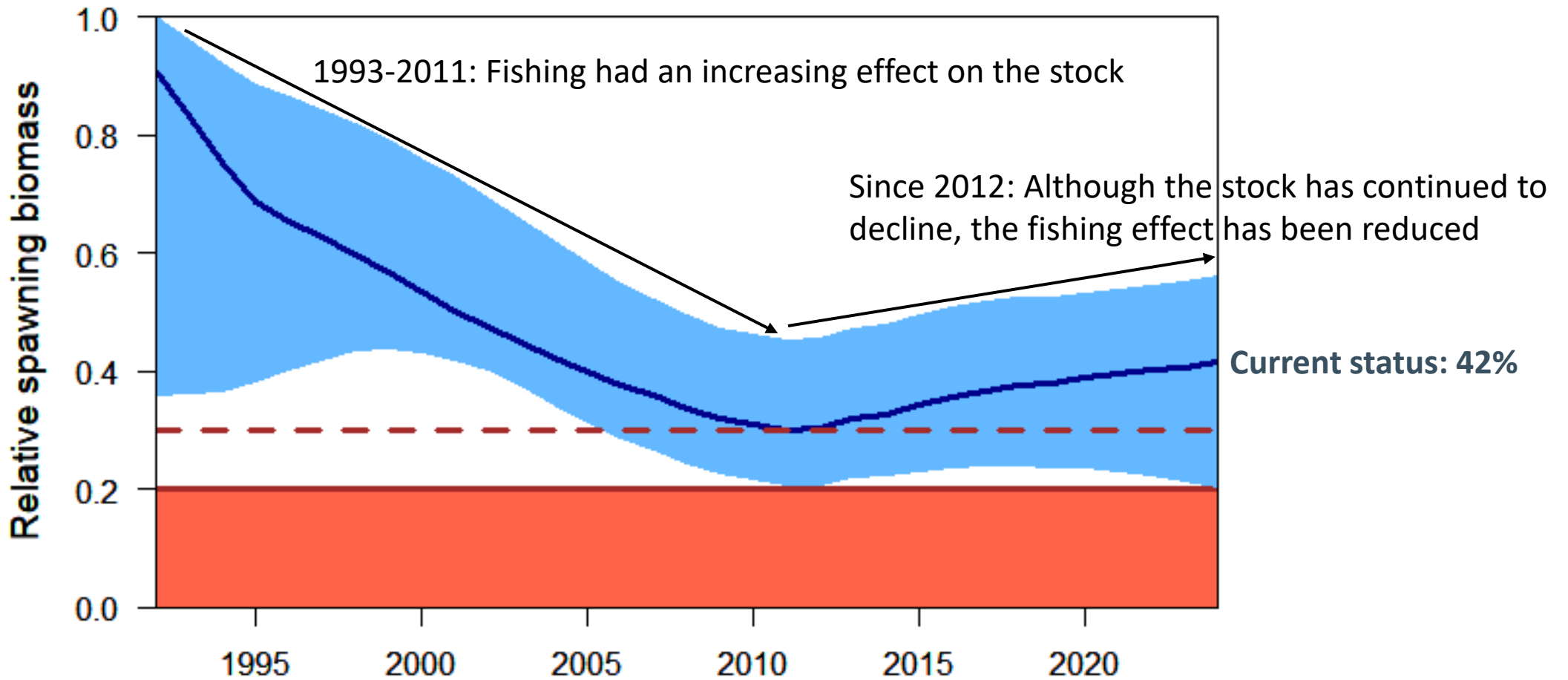


Allowing for natural/normal stock variability (but not unique catastrophic events)

Stock status – measuring the effect of fishing



Stock status – measuring the effect of fishing



Summary of results

- Fishery CPUE dropped more than expected in 2022 and 2023, this translated to an 11% decrease in the estimated 2023 spawning biomass from last year's assessment
- Current spawning biomass trend is estimated to be nearly flat from 2022-2023
- The stock status is at 42% of the unfished level at the beginning of 2024
- 2012 and 2014 are both moderate year-classes, not large enough to provide for an appreciable stock or fishery increase at current biomass levels
- It will be 1-3 years before we have clear coastwide information on the 2017-2018 year-classes observed in trawl surveys

Recommendations

That the Commission:

- 1) **NOTE** paper IPHC-2023-IM099-10 Rev_1, which provides a summary of the data and the results of the 2023 stock assessment.



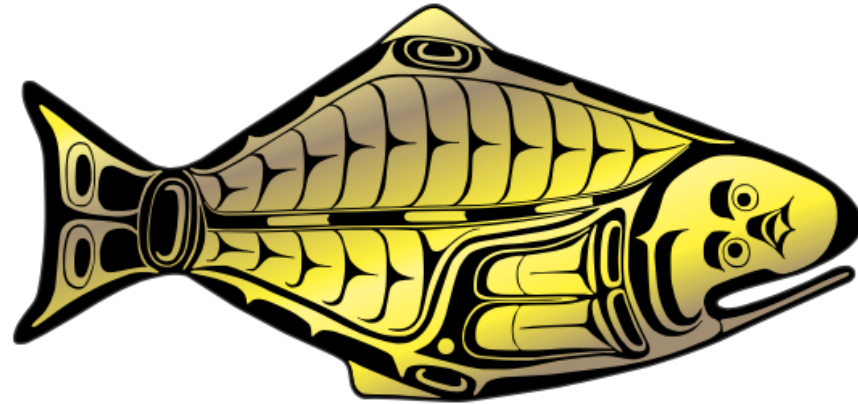
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