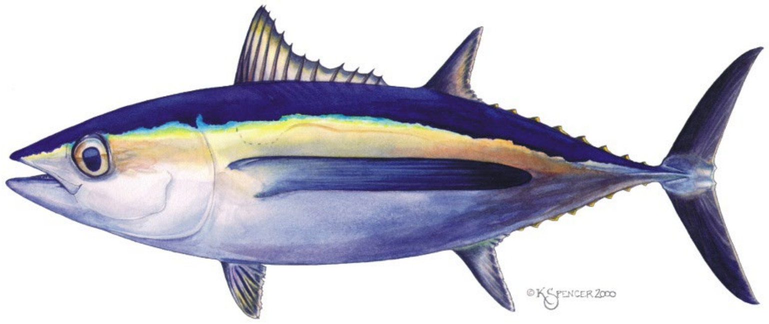
Preliminary Results of the 2023 Stock Assessment of Albacore Tuna in the North Pacific Ocean [SAC-14-INF-R]



Albacore Working Group (ALBWG)
of the
International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)

14th Meeting of the IATTC SAC
15 – 19 May 2023
La Jolla, California

Acknowledgements

- 2023 North Pacific albacore assessment is the result of a collaborative team effort by the ALBWG, including:
- Sarah Hawkshaw (Chair), Carolina Minte-Vera, Haikun Xu, Hirotaka Ijima, Jhen Hsu, Kevin Hill, Naoto Matsubara, Steve Teo (lead modeller), Yi-Jay Chang, Yoshinori Aoki, and Yuichi Tsuda
- Also thanks to IATTC and WCPFC for providing data for non-ISC members
- To be reviewed by ISC Plenary in July 2023

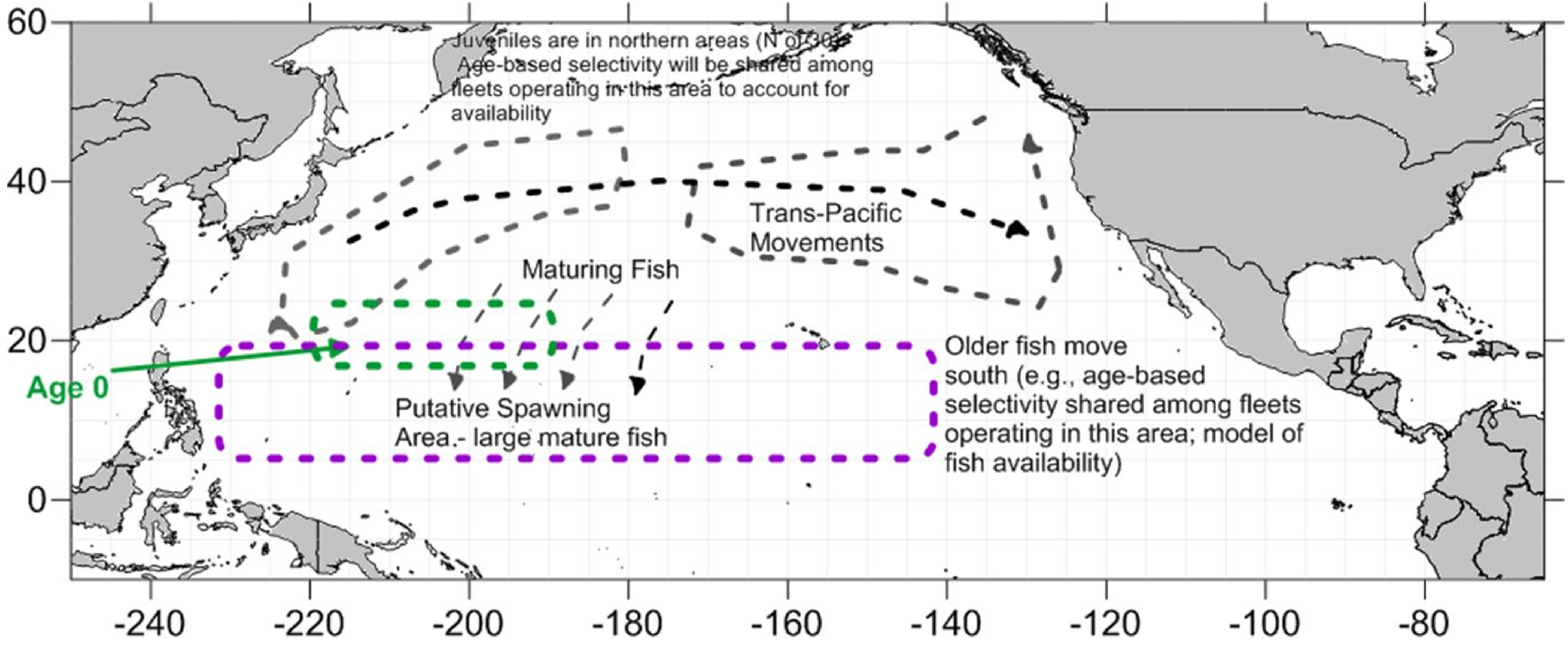
Yokohama, Dec 2022

La Jolla, Mar 2023

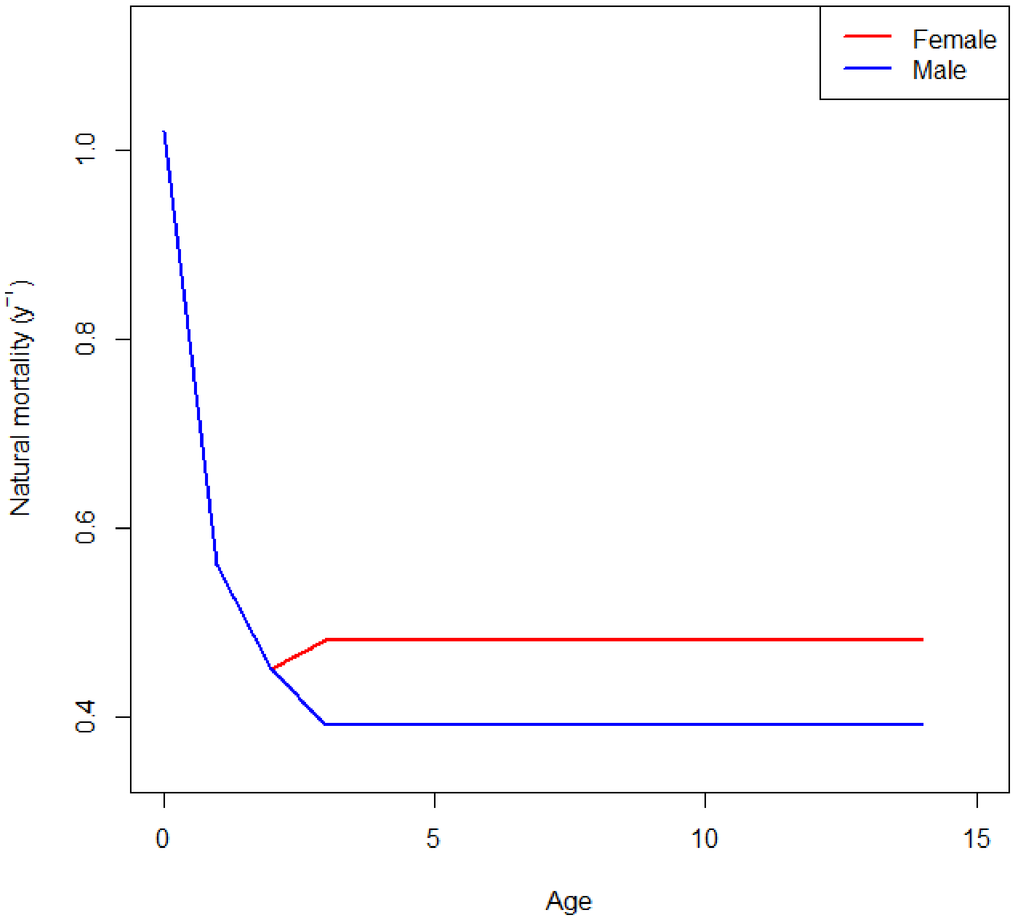
Important Changes from 2020 Assessment

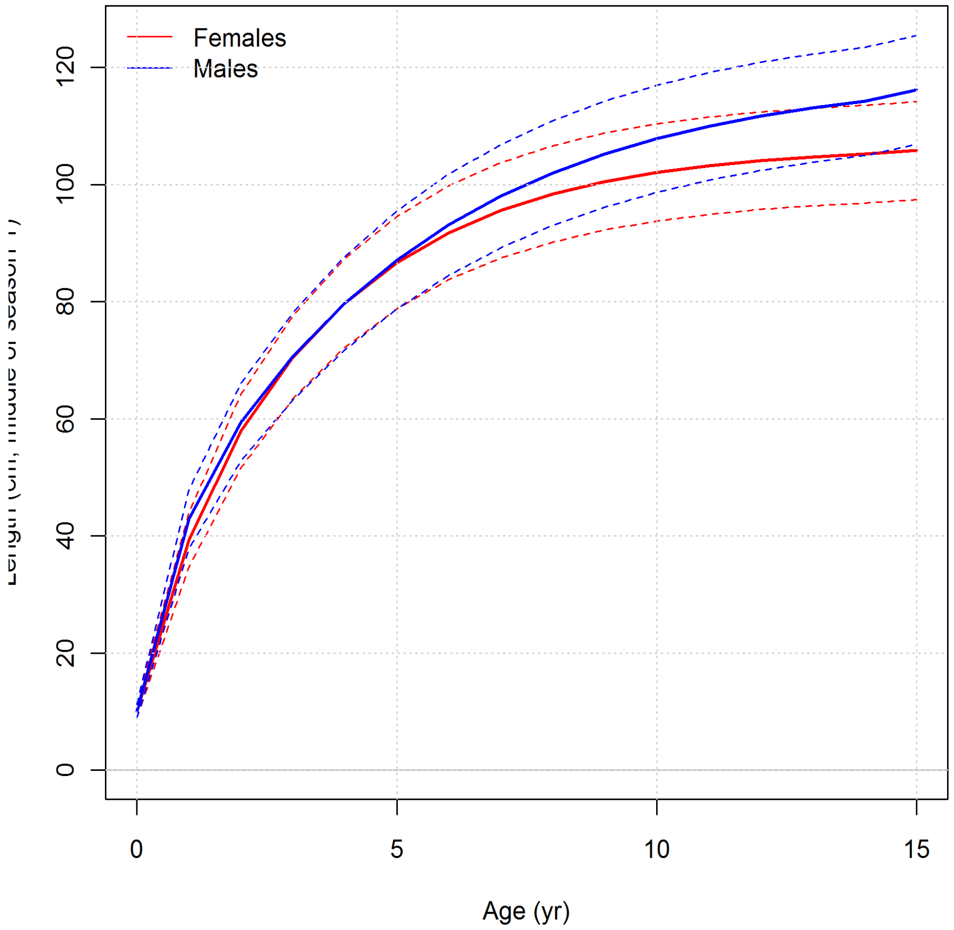
- Changes from 2020 to 2023 were relatively minor compared to between 2014 and 2017 assessments
- Increased uncertainty was imposed on size composition and abundance index for 2020 and 2021 because fishery operations and data collection were likely impacted by COVID-19 safety protocols
- Two JPLL fleets were further subdivided nominally into juvenile and adult fleets to improve model fits and diagnostics
- A new adult abundance index was developed from the JPLL fleet in the spawning area and season (Area 2, Quarter 2) and used as the abundance index
- Selectivity patterns for the two main JPPL fleets were modified to have only a single time block (2016 – 2021) due to model convergence issues

Conceptual Model



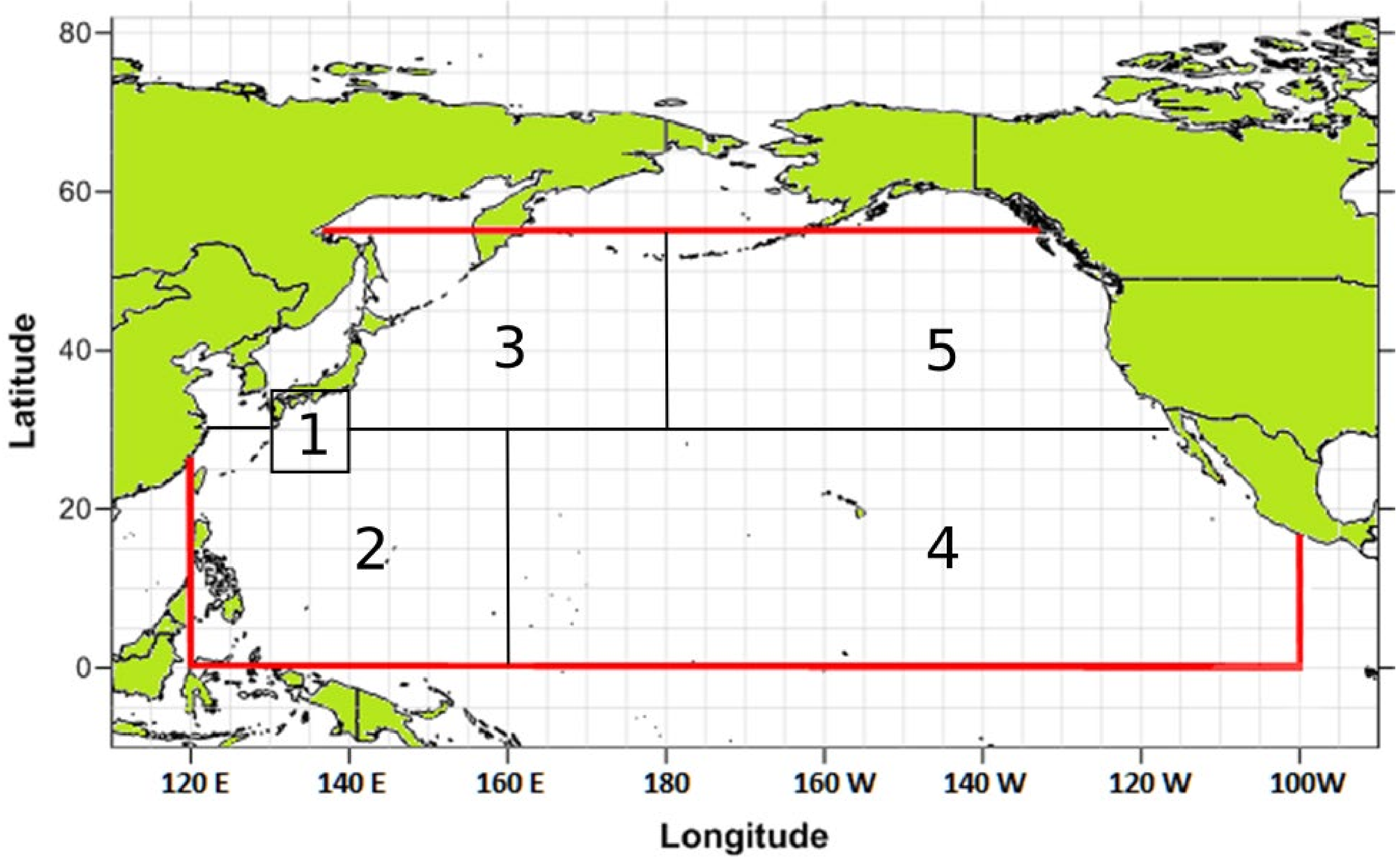
Biology





- Same as for 2017 and 2020 assessments
- Fixed sex-specific growth (Xu et al. 2014), sex-specific M (Kinney & Teo 2016)
- ALBWG considers the growth model to be major axis of uncertainty for this assessment
- ALBWG recommends a coordinated biological sampling plan for age-length samples

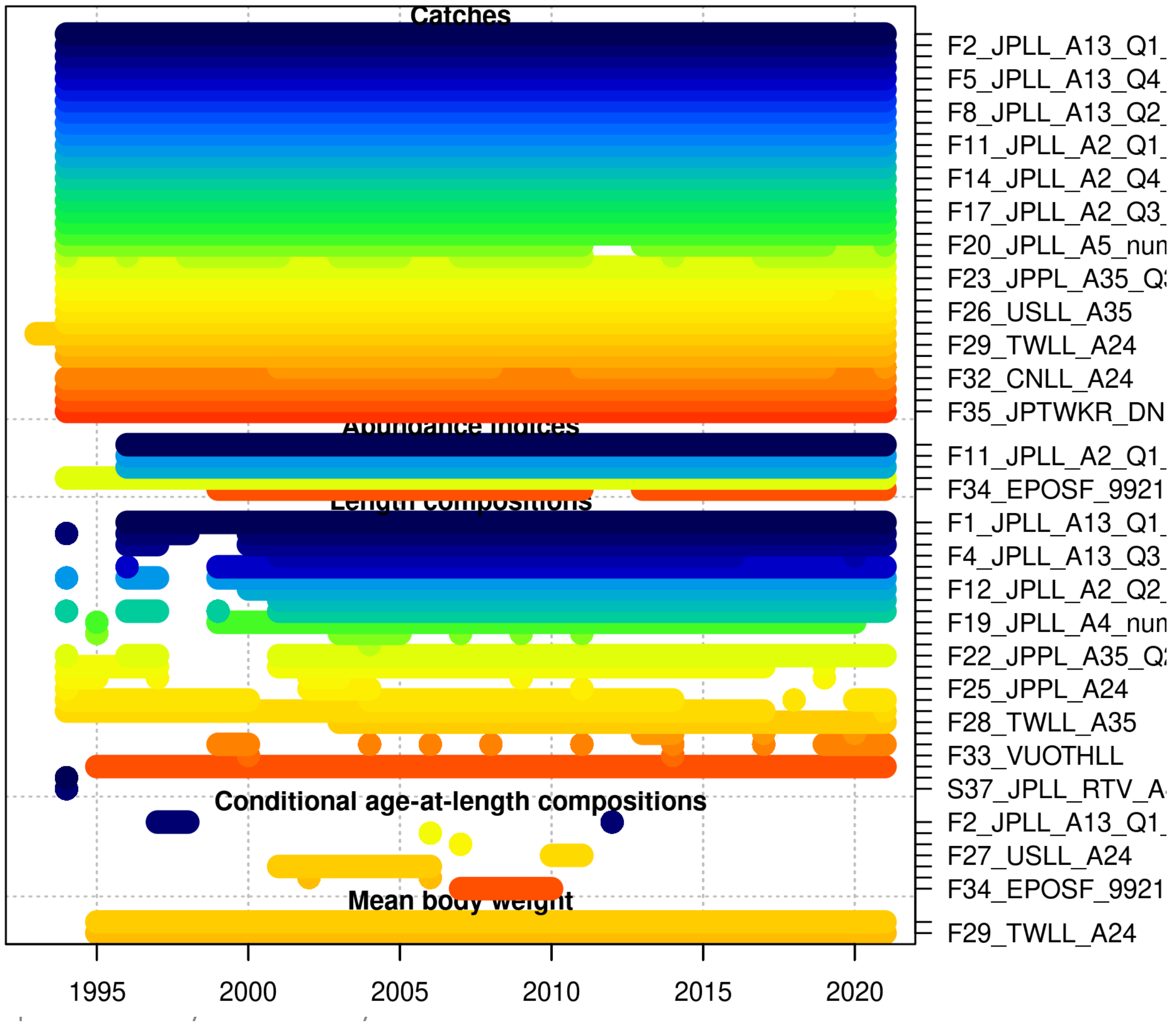
Spatial Domain & Area Definitions



- Area definitions based on conceptual model and cluster analysis of size compositions of US and JP longline fisheries
- Same as 2017 assessment

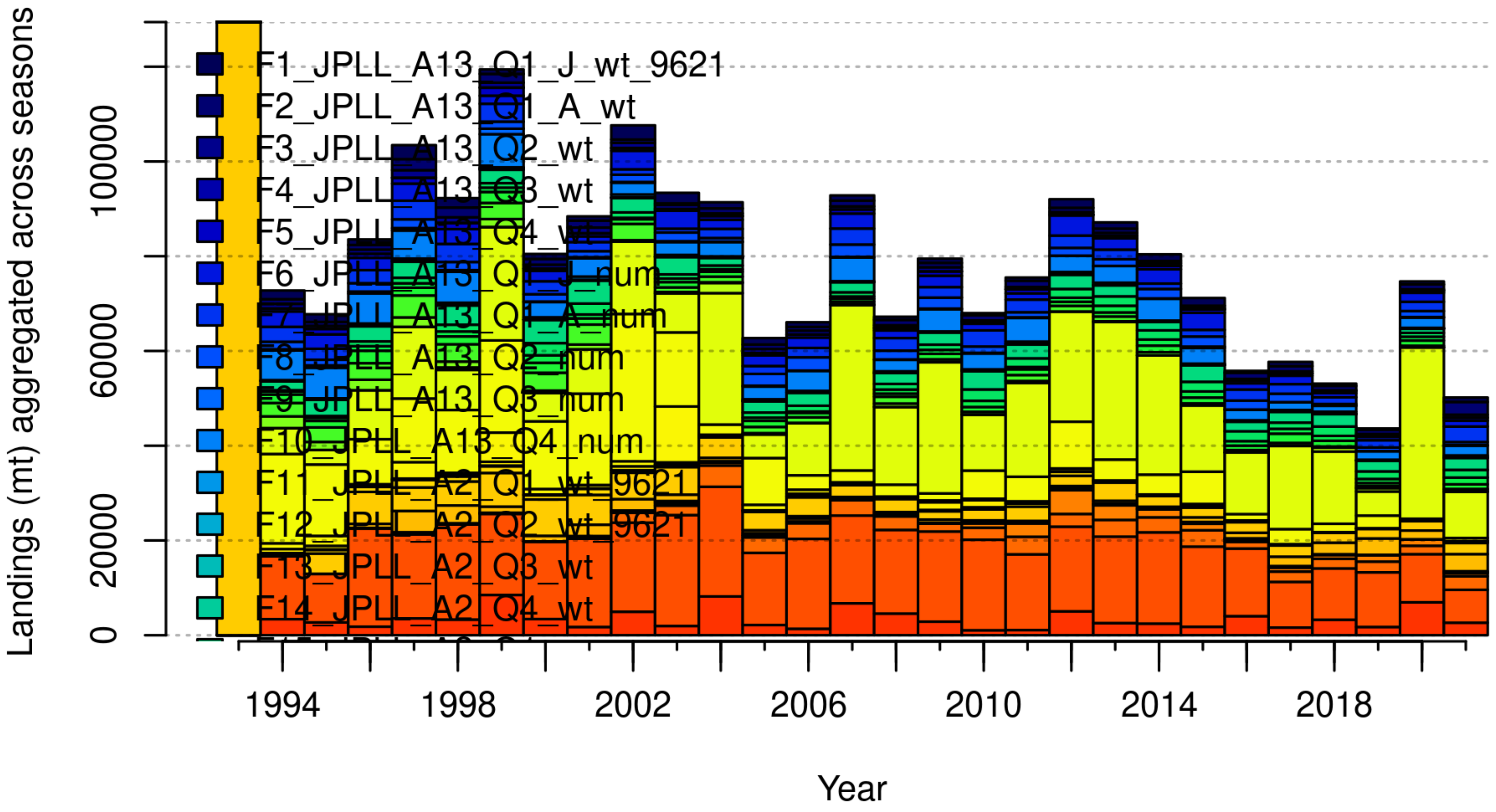
Data – 35 Fleets

ID	Fishery name	Area	Primary gear	Quarter	Catch unit	Notes
F01	F01_JPLL_A13_Q1_J_wt	1 & 3	Longline	1	Tonnes	Size, Index*
F02	F02_JPLL_A13_Q1_A_wt	1 & 3	Longline	1	Tonnes	
F03	F03_JPLL_A13_Q2_wt	1 & 3	Longline	2	Tonnes	Size
F04	F04_JPLL_A13_Q3_wt	1 & 3	Longline	3	Tonnes	Size
F05	F05_JPLL_A13_Q4_wt	1 & 3	Longline	4	Tonnes	Size
F06	F06_JPLL_A13_Q1_J_num	1 & 3	Longline	1	1000s	
F07	F07_JPLL_A13_Q1_A_num					
F08	F08_JPLL_A13_Q2_num	1 & 3	Longline	2	1000s	
F09	F09_JPLL_A13_Q3_num	1 & 3	Longline	3	1000s	
F10	F10_JPLL_A13_Q4_num	1 & 3	Longline	4	1000s	
F11	F11_JPLL_A2_Q1_wt	2	Longline	1	Tonnes	Size, Index*
F12	F12_JPLL_A2_Q2_wt	2	Longline	2	Tonnes	Size, Index
F13	F13_JPLL_A2_Q3_wt	2	Longline	3	Tonnes	Size
F14	F14_JPLL_A2_Q4_wt	2	Longline	4	Tonnes	Size
F15	F15_JPLL_A2_Q1_num	2	Longline	1	1000s	
F16	F16_JPLL_A2_Q2_num	2	Longline	2	1000s	
F17	F17_JPLL_A2_Q3_num	2	Longline	3	1000s	
F18	F18_JPLL_A2_Q4_num	2	Longline	4	1000s	
F19	F19_JPLL_A4_num	4	Longline	All	1000s	
F20	F20_JPLL_A5_num	5	Longline	All	1000s	Size
F21	F21_JPPL_A3_Q1	3	Pole & line	1	Tonnes	Size
F22	F22_JPPL_A3_Q2	3	Pole & line	2	Tonnes	Size
F23	F23_JPPL_A3_Q3	3	Pole & line	3	Tonnes	Size
F24	F24_JPPL_A3_Q4	3	Pole & line	4	Tonnes	Size
F25	F25_JPPL_A2	2	Pole & line	All	Tonnes	Size
F26	F26_USLL_A35	3 & 5	Longline	All	Tonnes	Size
F27	F27_USLL_A24	2 & 4	Longline	All	Tonnes	Size
F28	F28_TWLL_A35	3 & 5	Longline	All	Tonnes	Size
F29	F29_TWLL_A24	2 & 4	Longline	All	Tonnes	
F30	F30_KRLL	All	Longline	All	Tonnes	
F31	F31_CNLL_A35	3 & 5	Longline	All	Tonnes	Size*
F32	F32_CNLL_A24	2 & 4	Longline	All	Tonnes	Size*
F33	F33_VU_OTH_LL	All	Longline	All	Tonnes	Size*
F34	F34_EPOSF	3 & 5	Surface	All	Tonnes	Size
F35	F35_JPKRTW_DNMISC	All	Drift net, Miscellaneous	All	Tonnes	



Catch

- Largest fisheries are on juvenile fish: JP pole-and-line (PL; F22 & F23) and EPO Surface (F34)
- Lowest catches in 2019

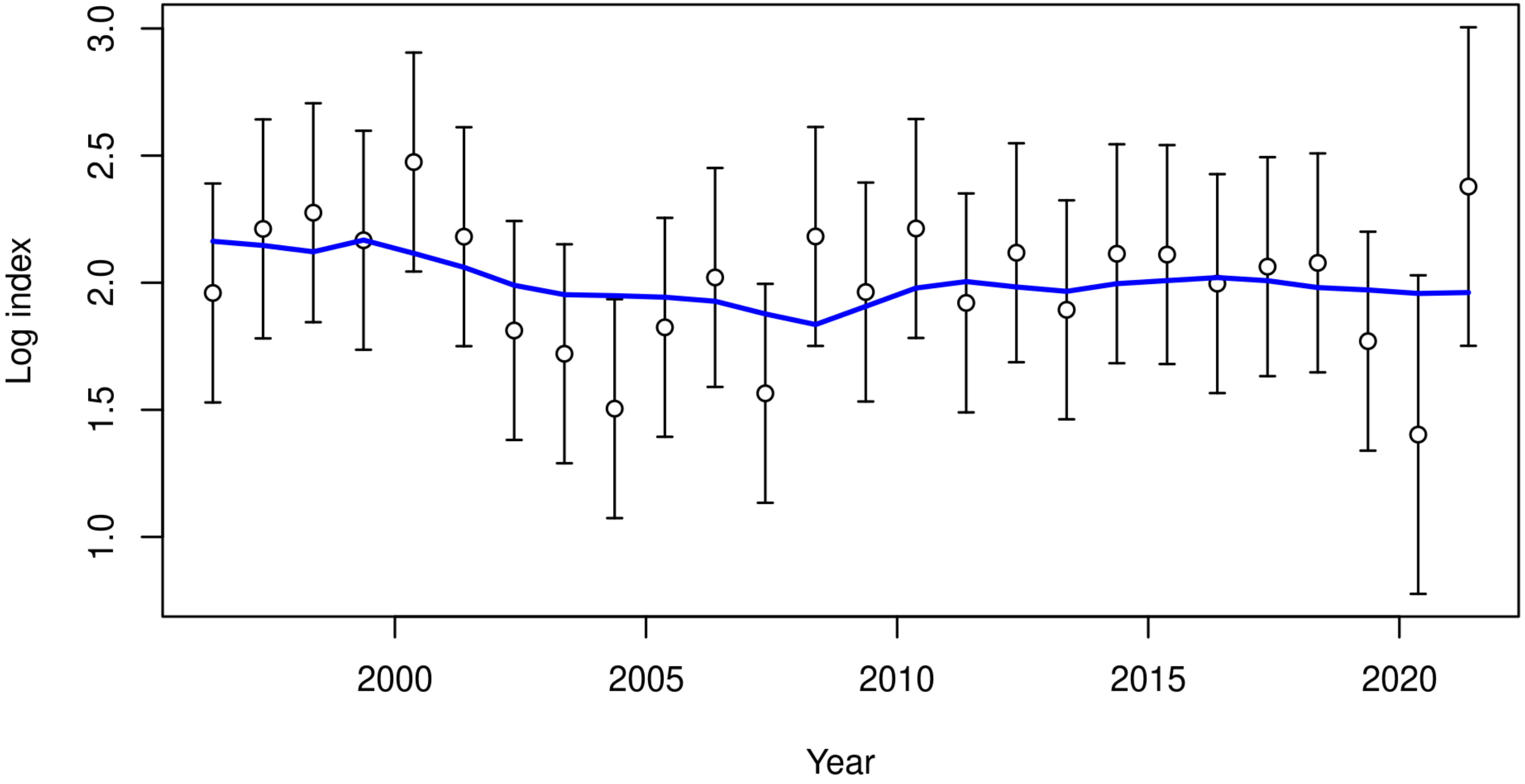


Abundance Index

Base Case

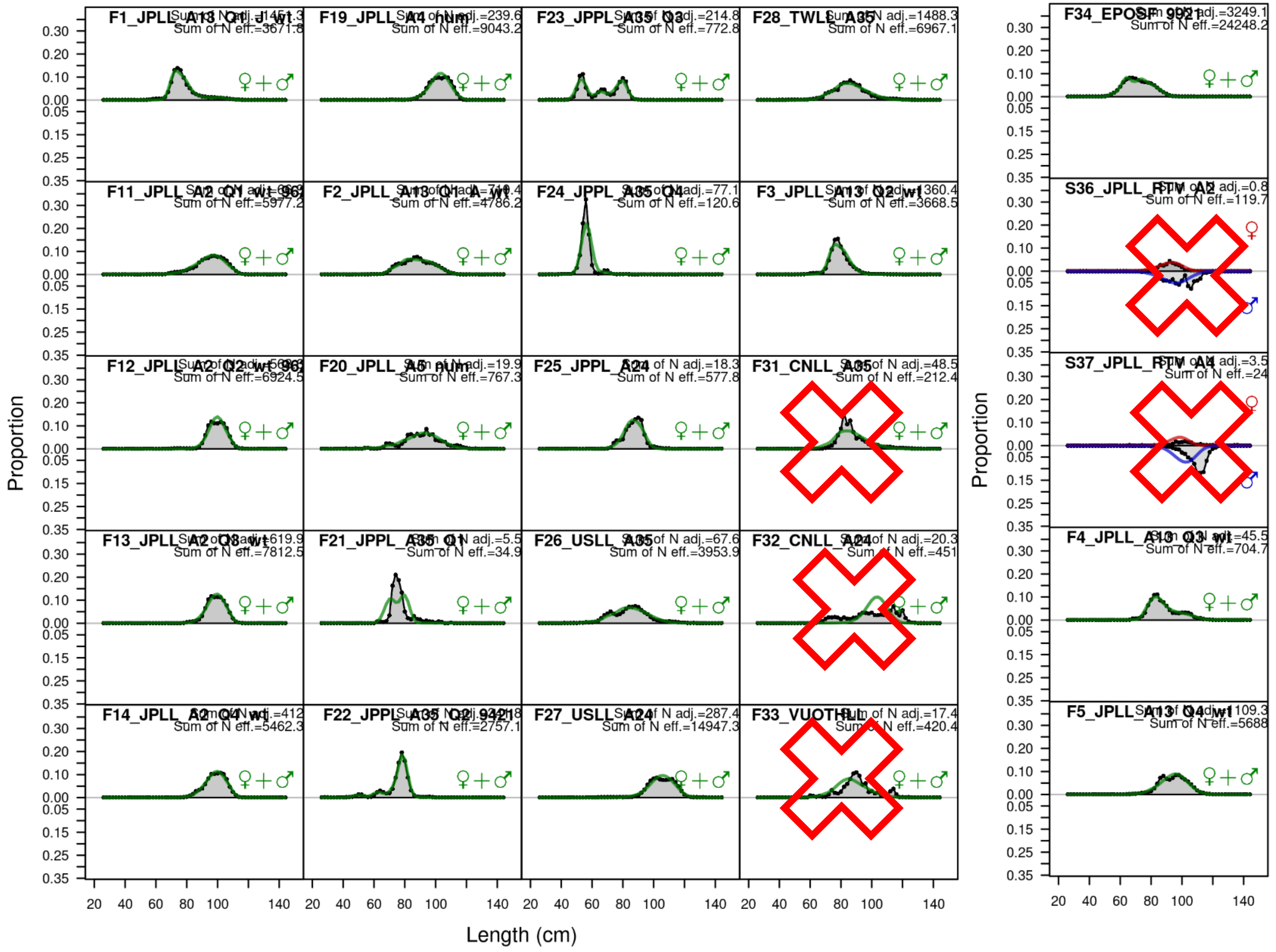
- F12 is the only abundance index fitted in the base case model
- F12 is the JPLL index for the main spawning area (Area 2) and season (Qtr 2)
- 0.3 CV for 2020 & 2021, 0.2 CV for all other years
- Other indices considered to be less representative of adult female stock abundance and were fit in sensitivity runs

F12 – Adult index (JPLL_A2_Q2)

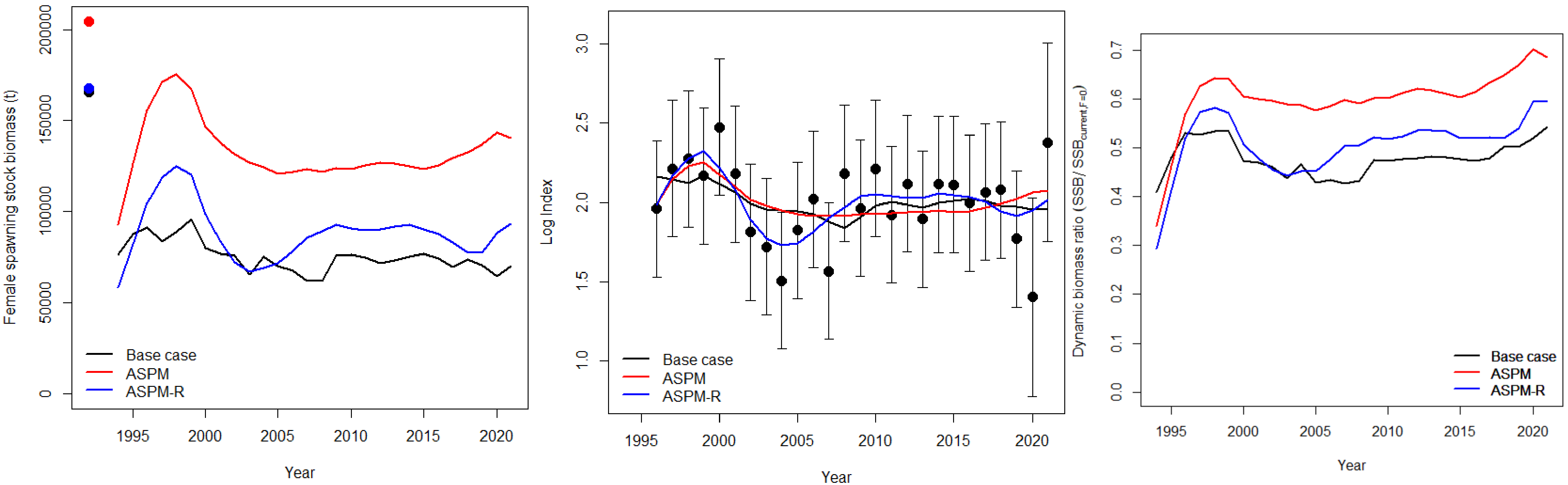


Size Compositions

- 25 fleets with size composition data
- 2020 & 2021 size data were downweighted by a 0.1 multiplier for sample size
- Downweighted size data from 5 fisheries so that Francis multipliers were all ≥ 1
- Size data from JPLL_RTV, CN and VU longline fisheries were aggregated into 'superyears' and not fitted. Used as visual checks



Model Diagnostics – Age-Structured Production Model (ASPM)

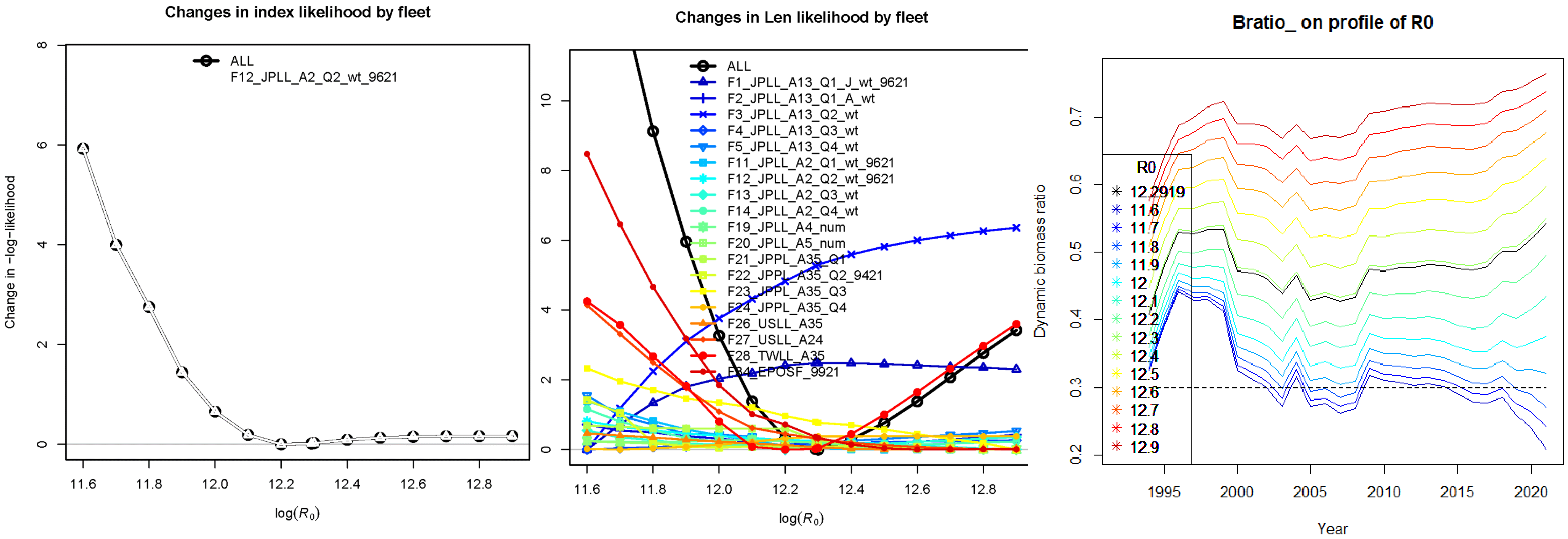


Base case model modified into an ASPM & ASPM-R

ASPM and ASPM-R had reasonably similar scale and trends to base case model, and better fits to index.

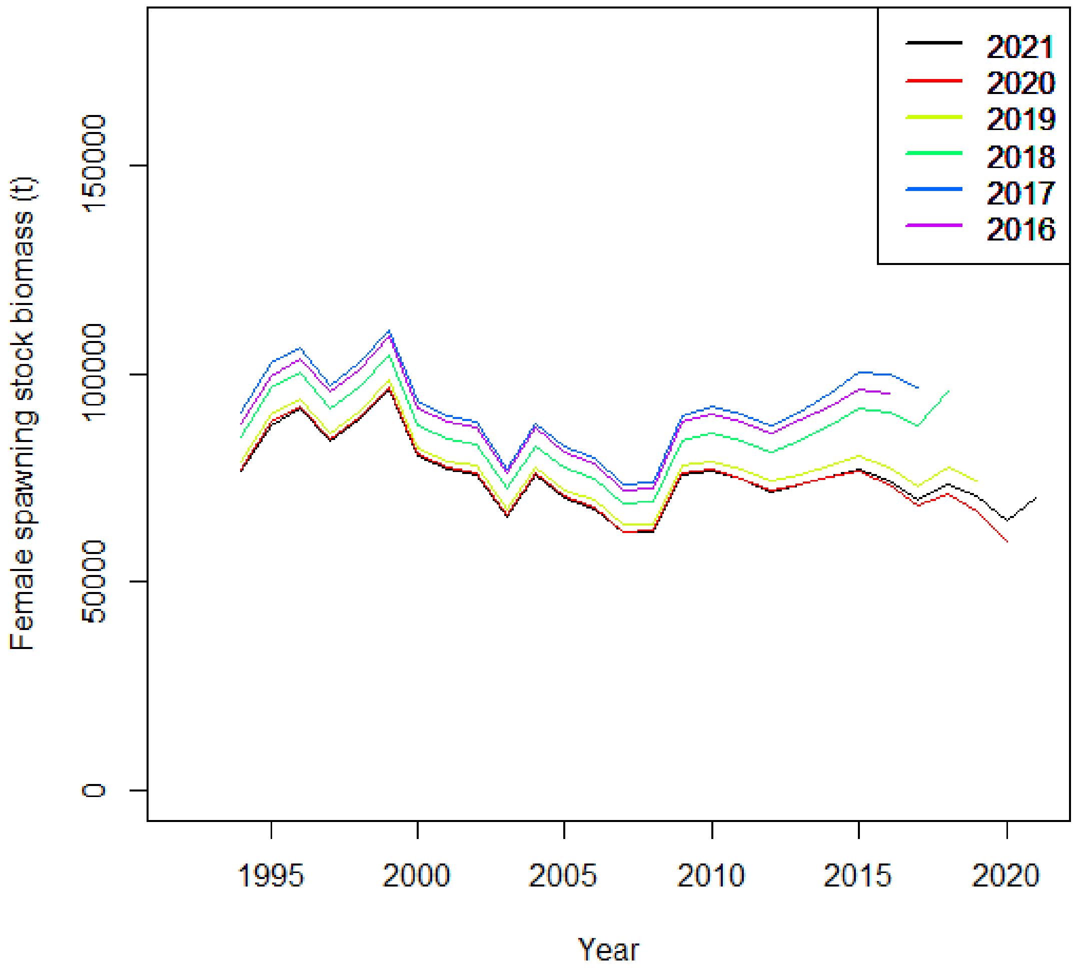
Conclusions: 1) Catch-at-age and productivity parms can explain changes in index without process variability (i.e., recruitment deviates). 2) Catch-at-age and index are informative and model is able to estimate the production function of stock, population scale, and the effects of fishing on population.

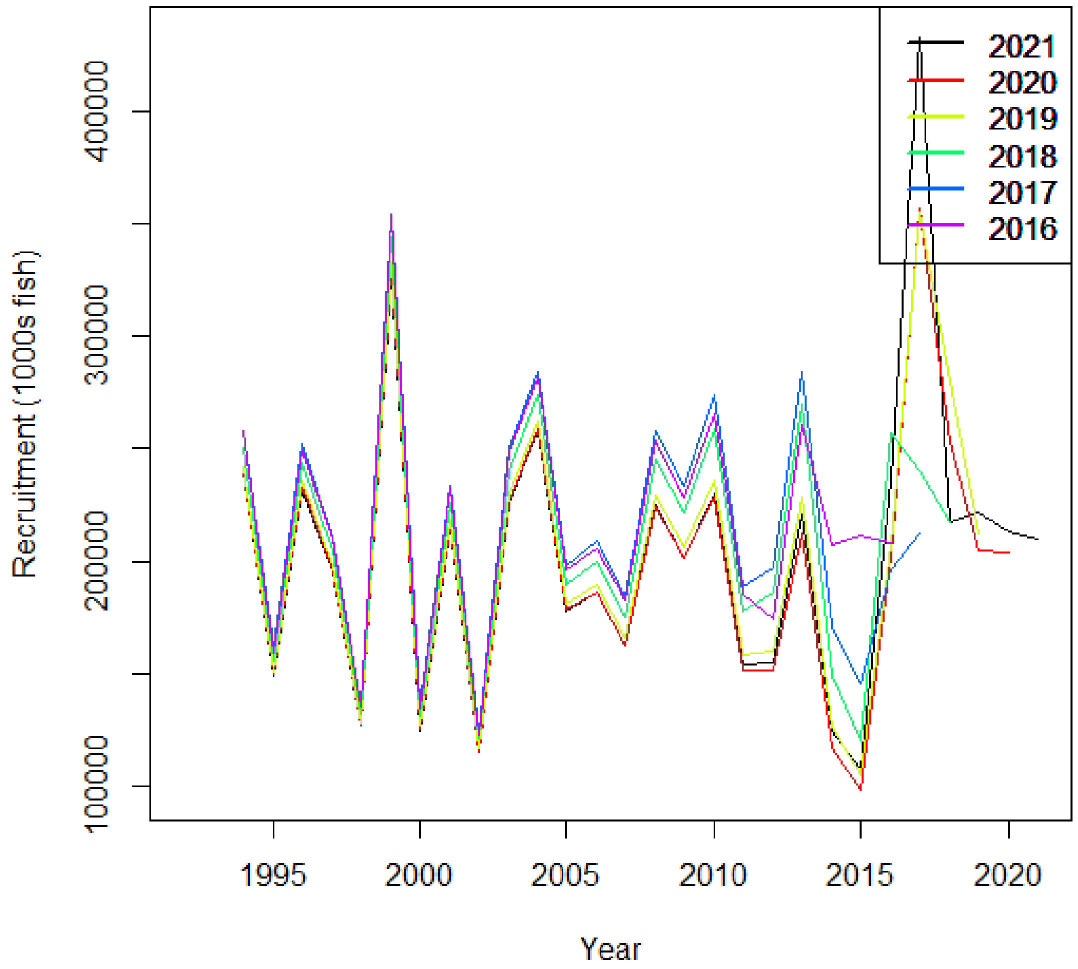
Model Diagnostics – Likelihood profile on R0



Changes in likelihood of data components on R0 indicate how informative each component is on the estimated population scale. Changes in likelihood of F12 index were relatively moderate (~6 log-likelihood units) over the range of log(R0) investigated due to moderate exploitation levels, which indicates higher uncertainty in the estimated population scale. Likelihood profile of F12 index was asymmetrical and indicates that the index is more informative on whether the population is higher than a certain level, which is the main objective of this assessment. Information from size data relatively consistent with index.

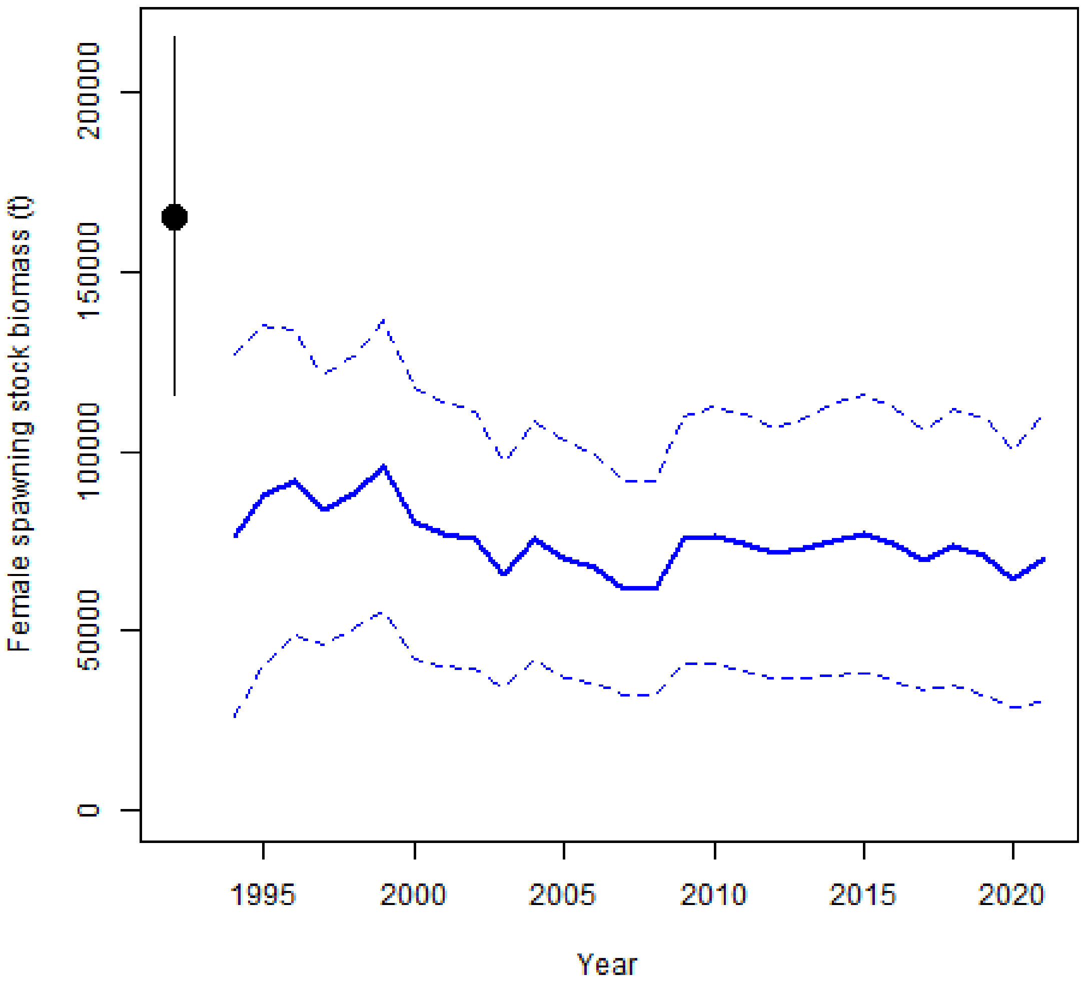
Model Diagnostics - Retrospective

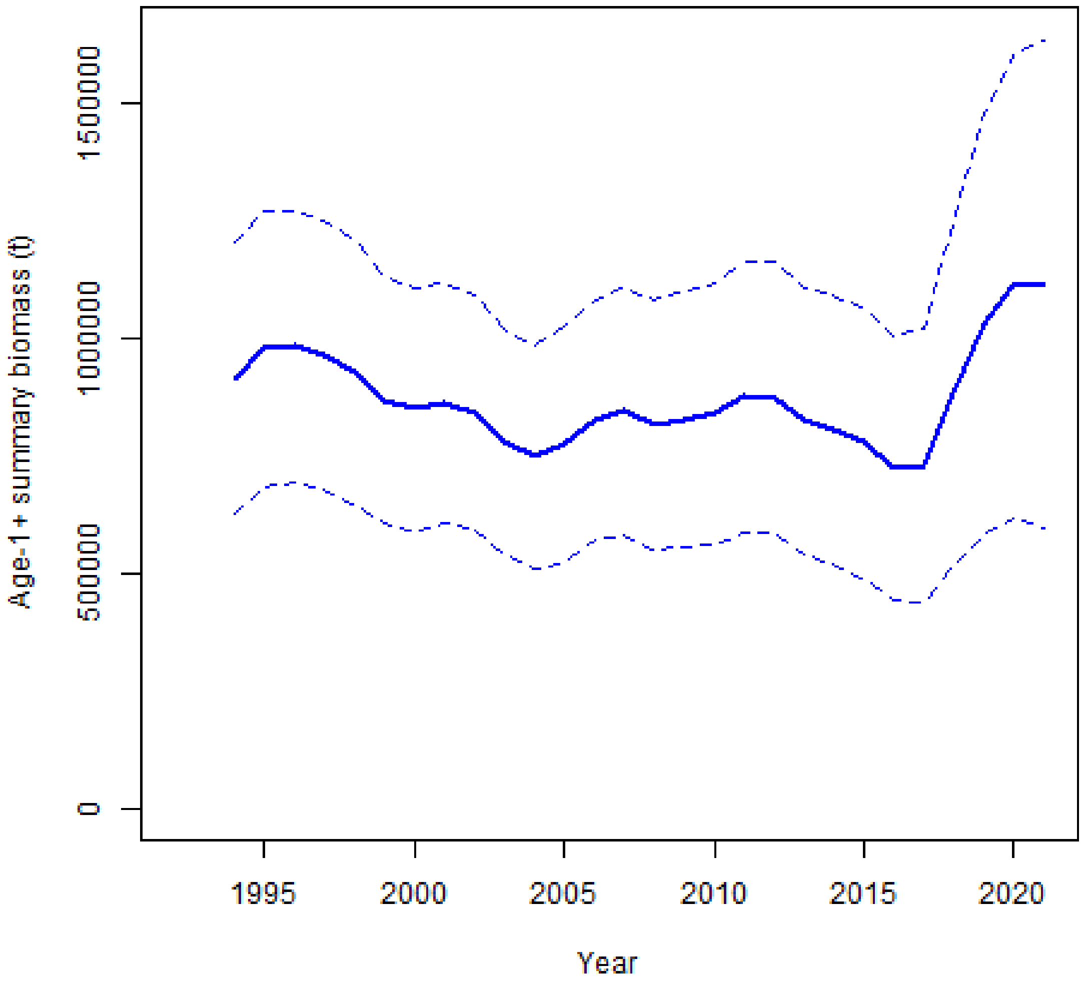




Moderate retrospective pattern (SSB Mohn's rho = ~0.19) largely due to 2 – 3 years data

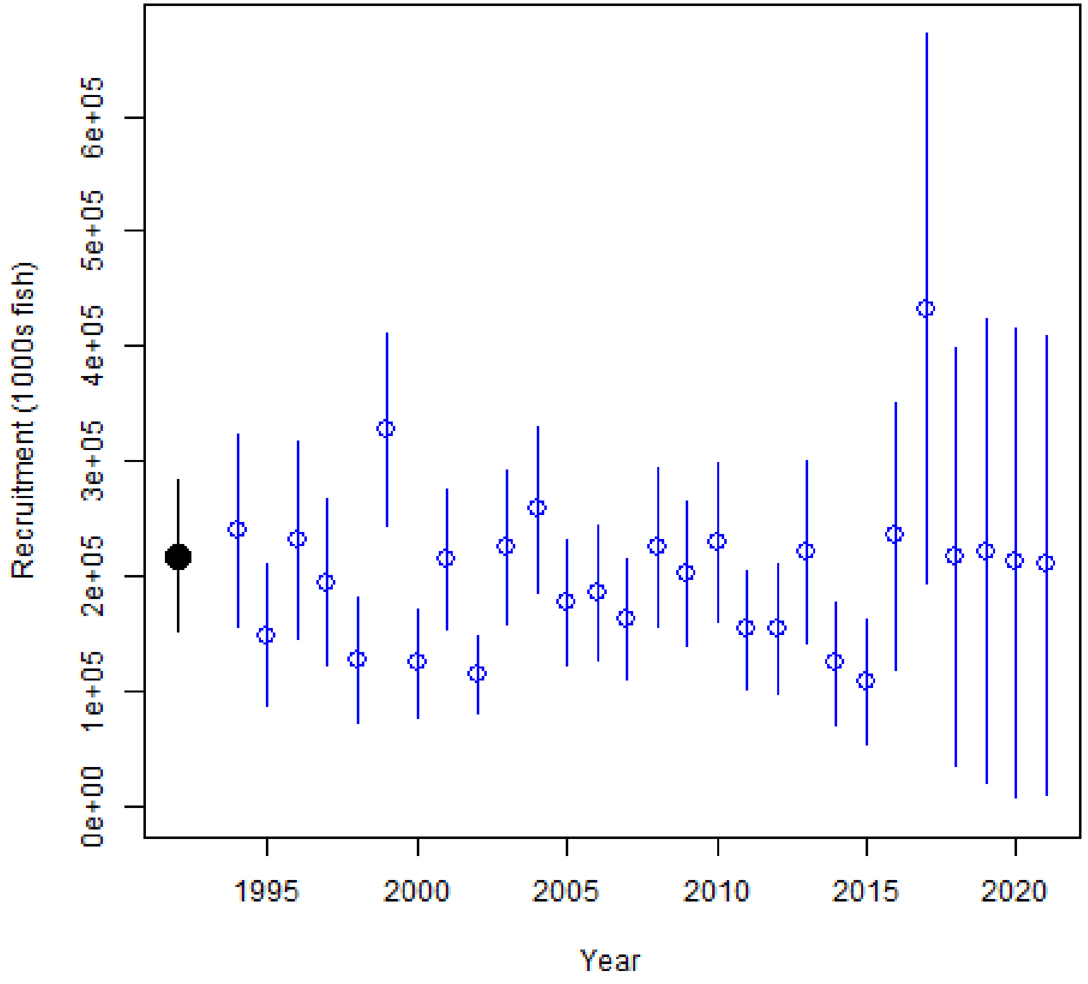
Model Results – Total and Spawning Biomass





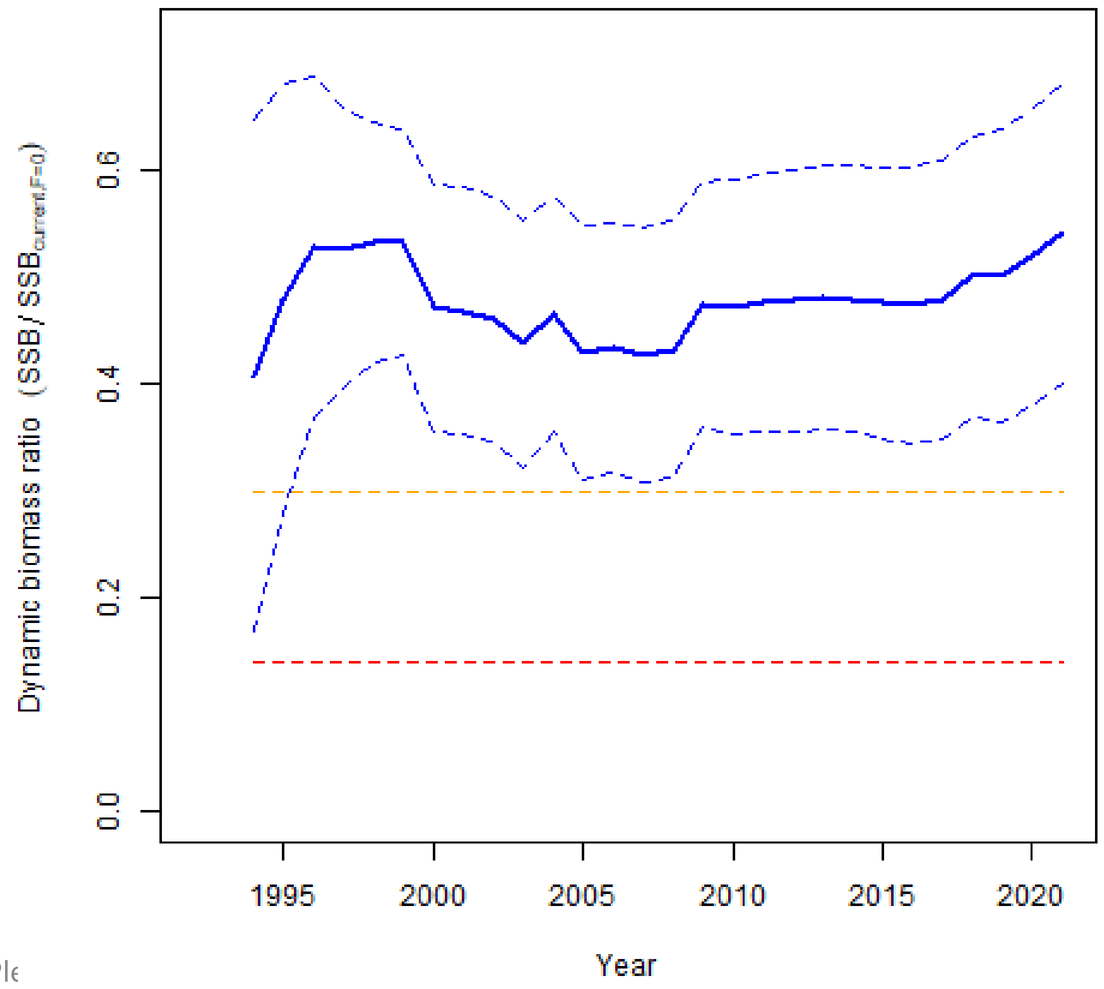
Model Results - Recruitment

- Very high and uncertain recruitment estimated in 2017
- Largely due to data from 2020 and 2021, and may be biased from COVID-era data
- Recruitment in 2017-2021 considered to be poorly estimated



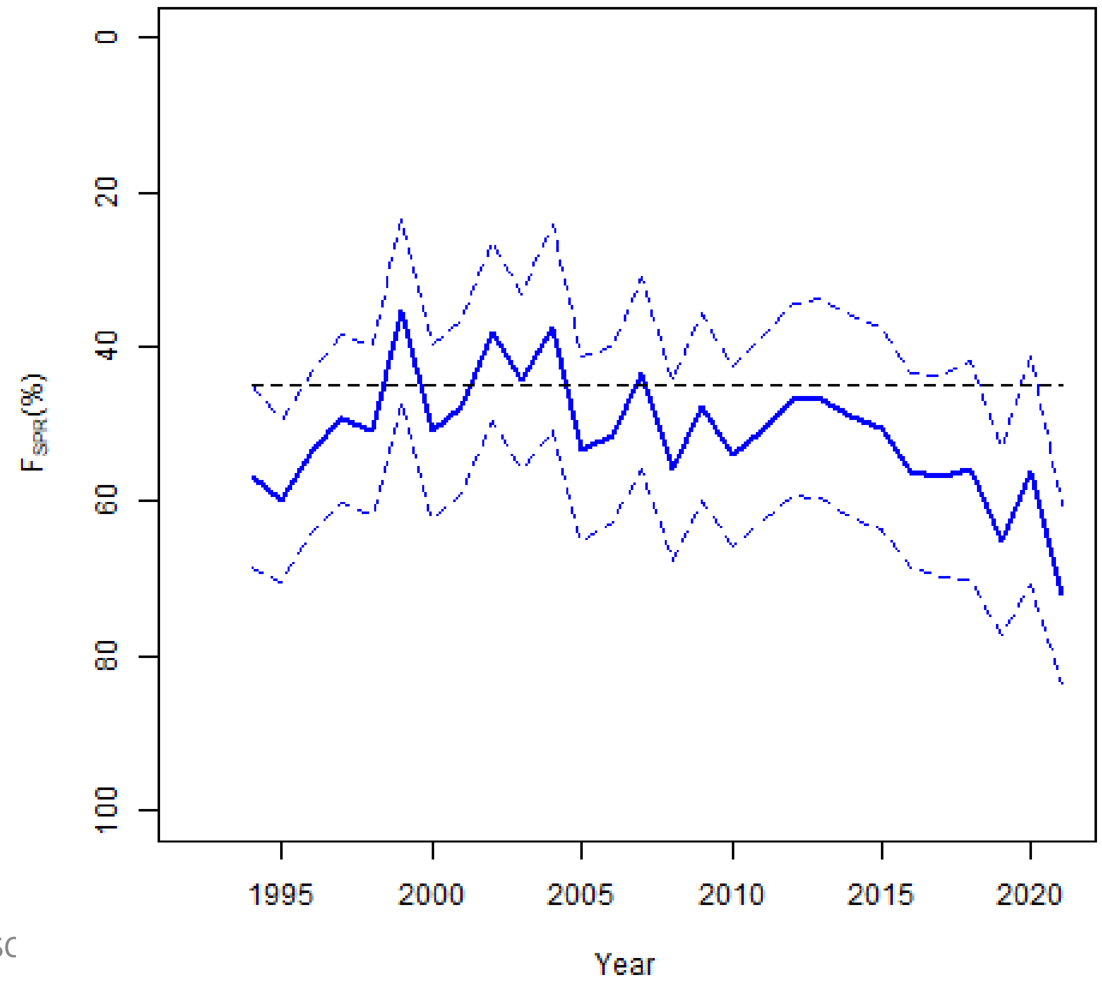
Model Results – Dynamic SSB ratio

- Dynamic SSB ratio, calculated as $SSB/SSB_{current,F=0}$, is the ratio of current SSB to the current SSB without fishing
- Accounts for changes in recruitment over time
- Threshold reference point is $30\%SSB_{current,F=0}$
- Limit reference point is $14\%SSB_{current,F=0}$,



Model Results – Fishing Intensity

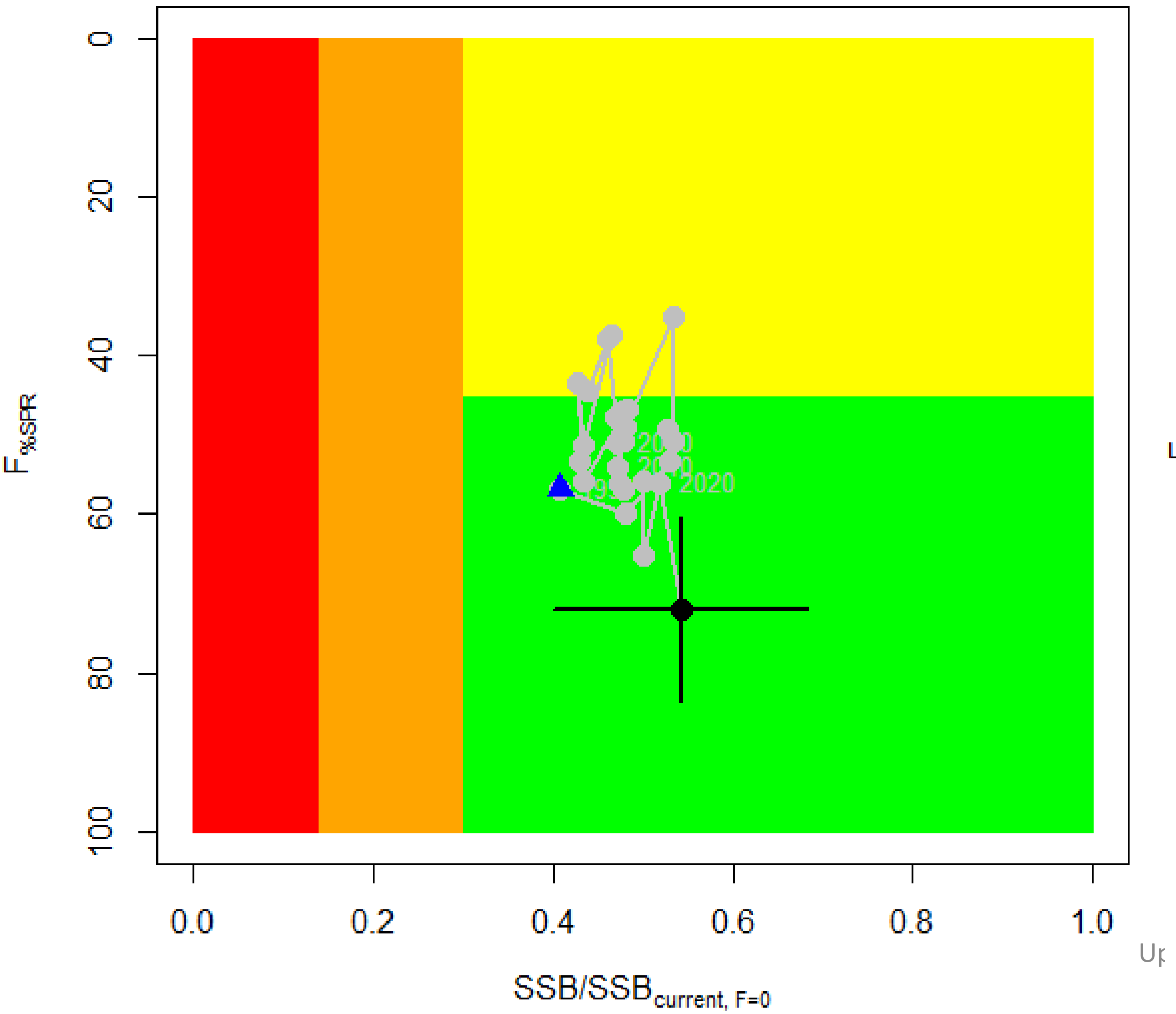
- Fishing intensity, calculated as $F_{\%SPR}$, is a measure of fishing mortality expressed as the decline in spawning biomass produced by each recruit, relative to the unfished state
- For example, a fishing intensity of $F20_{\%SPR}$ will result in a SSB approx. 20% of SSB0 over the long run
- Fishing intensity is used as a proxy for fishing mortality
- Target reference point is $F45_{\%SPR}$

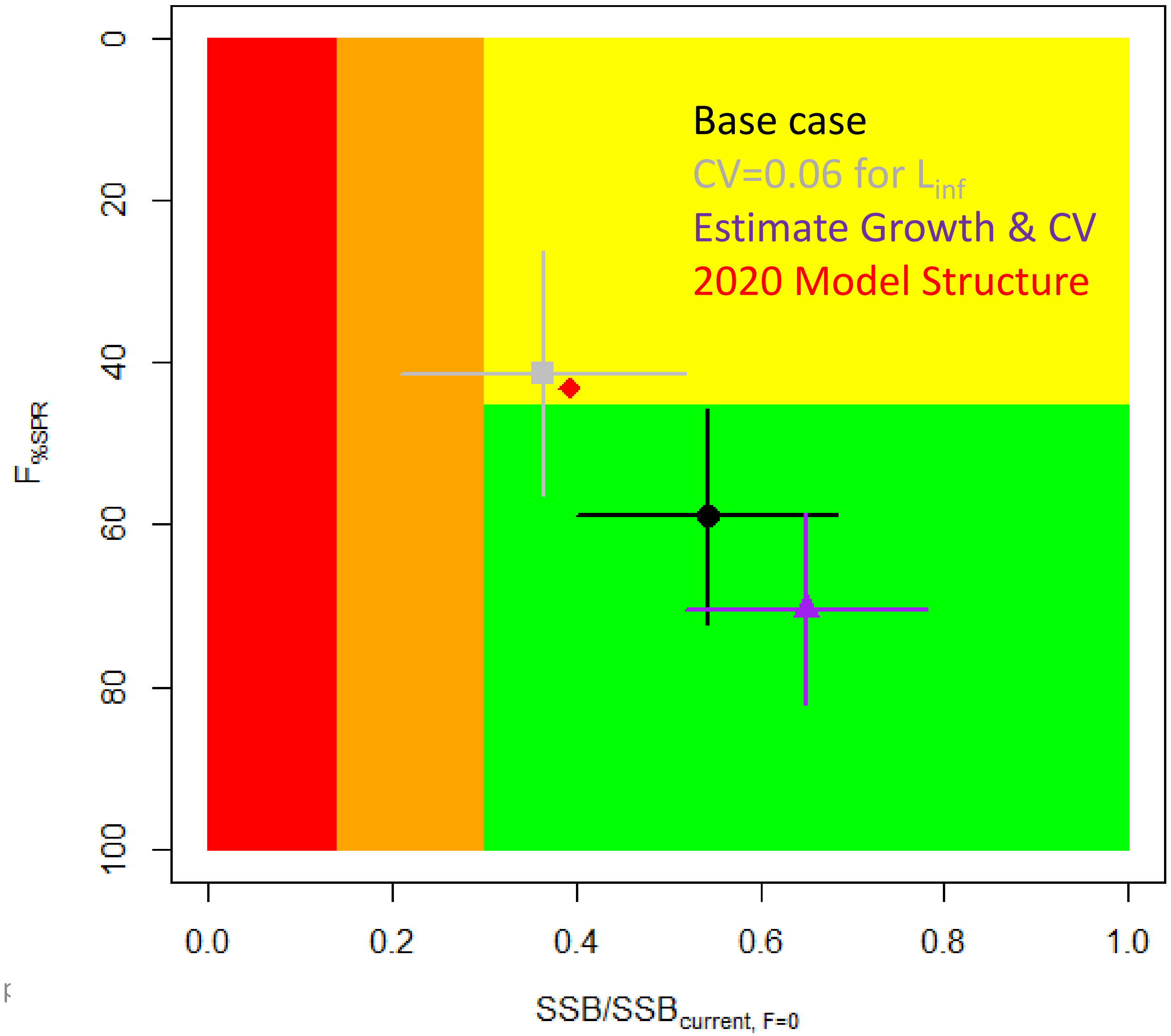


Model Results – Reference Points

Quantity	Base Case	Growth CV = 0.06 for L_{inf}	Growth All parameters estimated	Update of 2020 base case model to 2023 data*
MSY (t)	121,880	93,167	144,792	97,777
SSB_{MSY} (t)	23,154	18,133	30,435	18,756
SSB_0 (t)	165,567	128,155	198,913	132,570
SSB_{2021} (t)	70,229	35,418	101,161	36,909
$SSB_{current, F=0}$ (2021 estimate)	129,581	97,368	155,542	93,808
$SSB_{2021}/SSB_{current, F=0}$	0.54	0.36	0.65	0.39
$SSB_{2021}/30\%SSB_{current, F=0}$	1.81	1.21	2.17	1.31
$SSB_{2021}/14\%SSB_{current, F=0}$	3.87	2.60	4.65	2.81
†$Depletion_{2021}/Depletion_{2006-2015}$	1.34	1.33	1.37	1.30
§ $F_{\%SPR, 2018-2020}$ (%SPR)	59.0	41.4	70.4	43.2
§ $F_{\%SPR, 2011-2020}$ (%SPR)	55.0	36.6	63.8	37.9
¶ $F_{\%SPR, 2018-2020}/F_{\%SPR, MSY}$	2.04	1.42	2.78	1.47
¶ $F_{\%SPR, 2011-2020}/F45_{\%SPR}$	1.22	0.81	1.42	0.84
¶ $F_{\%SPR, 2018-2020}/F45_{\%SPR}$	1.31	0.92	1.56	0.96
¶ $F_{\%SPR, 2018-2020}/F_{\%SPR, 2002-2004}$	1.48	1.63	1.40	1.25

Model Results – Stock Status Plots





Preliminary Stock Status Recommendations

Based on these findings, the following information on the status of the north Pacific albacore stock is provided:

1. The stock is likely not overfished relative to the threshold ($30\%SSB_{current,\ F=0}$) and limit ($14\%SSB_{current,\ F=0}$) reference points adopted by the WCPFC and IATTC, and
2. The stock is likely not experiencing overfishing relative to the target reference point ($F45_{\%SPR}$).

Future Projections & Conservation Information

- The future projections for the 2023 stock assessment are currently still under development, and are not included in this preliminary document.
- Therefore, the conservation information for the 2023 stock assessment is currently unavailable.

Exceptional Circumstances

- IATTC Resolution C-22-04 requested that IATTC Staff coordinate with the ISC to develop in 2023, criteria for identifying exceptional circumstances with respect to the NPALB Harvest Strategy
- Together with IATTC Staff, the ALBWG developed preliminary criteria for identifying exceptional circumstances for north Pacific albacore tuna [SAC-14-INF-S]
- The preliminary criteria are still incomplete and will continue to be reviewed as HCRs are adopted and the assessment is finalized
- For the 2023 assessment, the ALBWG found no strong evidence of exceptional circumstances with respect to the current conservation and management of this stock

Questions?