**Sequence of ASAP model configurations**

This appendix details the sequence of model configurations explored to arrive at the final ASAP model. In the summary table below, the following abbreviations are used: Big = Bigelow, Alb = Albatross, RMSE = Root mean square error, OFV = objective function value; ESS = effective sample size; agg = aggregate, obs = observed, stdev = standard deviation, B = biomass, SSB = spawning stock biomass and AEP = annual egg production.

| **Run** | **Description** | **Diagnostics** |
| --- | --- | --- |
| 1 | Base Run, 2021 MT (Run 4) | Starting point; |
|  | **Add new years** |  |
| 2 | Maintained time series from 2021 assessment but added new years (2020-2022) | Fits about the same but terrifying retro because all peels now in one direction (F=-0.43, SSB=0.77, Recruitment=0.58. Somewhat bizarre pattern in F; Other patterns similar to 2021 benchmark |
|  | **Bridge runs to update time series** |  |
| 3 | Update full maturity time series (Sequentially updating full time series to account for changes in Canadian data processing) | Retro stayed the same, even for SSB (rho = 0.770 vs 0.769); Ofv increased by almost 300 points; May want to think about slightly adjusting weighting for SSB index due to RMSE; Fits reasonable; Need to think about F |
| 4 | Update full WAA (all three) and maturity time series (Sequentially updating full time series to account for changes in Canadian data processing) | Retro got worse – crap crap crap; (F=-0.46, SSB = 0.87, Rect = 0.66); Fit to SSB index got slightly worse (RMSE increased from 1.28 to 1.36) – should probably adjust weighting slightly, otherwise, no major change in fits |
| 5 | Update full catch, WAA and maturity time series (Sequentially updating full time series to account for changes in Canadian data processing) | Retro improved but still notable (F=-0.30, SSB=0.45, Rect=0.09); Ofv decreased by almost 11 points; Egg index RMSE increased again from 1.36 to 11.47 but overall index RMSE decreased slightly (by 0.02); Seems like some improvement in age-1 fishery comps; Fishery comps RMSE decreased from 1.52 to 1.3 but Alb comps RMSE increased from 1.61 to 1.77; Notable change in fishery selectivity – new fit potentially more realistic |
| 6 | Update egg index, full catch, WAA and maturity time series (Sequentially updating full time series to account for changes in Canadian data processing) | Retro worsened again but not as severe as Run 4 (F=-0.37, SSB=0.63, Rect=0.23). Ofv increased slightly (8 points); Fishery RMSE decreased slightly, index RMSE increased again (total went from 1.59 to 1.65 and was mainly in Egg index (1.47 to 1.65)); Now RMSE definitely looks like need to up the assumed CV for the egg index; Magnitude of negative SSB index residuals increased (so predicting more than observed during the 2000s) |
| 7 | Update Big index, egg index, full catch, WAA and maturity time series (Sequentially updating full time series to account for changes in Canadian data processing) | Slight increase in Big age comps RMSE (1.62 to 1.65) but effectively no change; Retro about the same (F=-0.36, SSB=0.61, Rect = 0.21); No change in estimated time series |
|  | **Tinkering** |  |
| 8 | Updated time series (Run7) but increase assumed CV for egg index by 0.3 from empirical estimates instead of 0.15 (Run7) | Not surprisingly, ofv decreased (by 8 points); Decrease in aggregate catch and egg index RMSE; Slight decrease (0.02) in fishery age comps RMSE; Slight increase (0.04) in Alb age comps RMSE; Retro improved slightly (F=-0.34, SSB=0.56, Rect=0.18) |
| **9** | Updated time series (Run7) but increased assumed CV for egg index by 0.45 from empirical estimates instead of 0.3 (Run8) | Ofv only decreased by 2 points; Two additional parameters have CVs close to 0.6; Egg index RMSE dropped considerably to 1.08 and is now well within the envelope; Retro again improved slightly (F=-0.31, SSB=0.48, Rect=0.13); Age comp RMSE for Alb and Big increased slightly (0.02); |
| 10 | Run 9 but decrease 2022 CAA ESS due to Canadian issue; Run 9 = Updated time series (Run7) but increased assumed CV for egg index by 0.45 from empirical estimates instead of 0.3 (Run8) | Retro improved (F=-0.27, SSB=0.42, Rect=0.11) but weirdly terminal year recruitment estimate higher in Run 10 (265575) than Run 9 (252424.5) |
| 11 | Run 9 but treat 2022 CAA as missing (set ESS = 0); Run 9 = Updated time series (Run7) but increased assumed CV for egg index by 0.45 from empirical estimates instead of 0.3 (Run8) | Retro again improved for F and SSB but not Rect (F=-0.23, SSB=0.35, Rect=0.13) but again terminal year recruitment estimate increased (370925) |
| 12 | Run 9 but adjust 2022 CAA to account for difference in sampling due to CA fishery closure | Retro improved but only slightly compared to Run 9 (F=-0.28, SSB=0.44, Rect=0.11); Bigger difference is that terminal year recruitment estimate is no longer above the median |
| 13 | Run 9 but create second selectivity block (logistic) for 2022 | Parameter confounding between the two selectivity parameters, not surprisingly |
| 14 | Run 9 but turn on weak recruitment penalty | Ended up with higher terminal year recruitment estimate and terrible retro (F=-0.59, SSB=1.55, Rect=1.11) |
| 15 | Run 9 but turn on weak recruitment penalty (Run14) and set 2022 fishery ESS to zero | Not surprisingly, terminal year recruitment is ~ at the median; Retro worsened (F=-0.51, SSB=1.09, Rect=0.91) |
| 16 | Run 15 but only turn on recruitment penalty for terminal year | Compared to Run9, retro slightly improved for F and SSB but worsened for Rect (F=-0.27, SSB=0.43, Rect=0.21) |
|  | **2024 Explorations** |  |
| 17 | Run 9 but with PPI M scaled to 0.2 |  |
| 18 | Run 9 but with PPI M scaled to 0.33 |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |