

Model Comparison with r4MAS - snapper-grouper complex

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Workflow

- Use the operating model (OM) from the age-structured stock assessment comparison project to simulate true population dynamics.

- Age-structured stock assessment comparison project OM:

- https://github.com/Bai-Li-NOAA/Age_Structured_Stock_Assessment_Model_Comparison

- R script to run the OM and Metapopulation Assessment System (MAS):

- https://drive.google.com/file/d/1QevaQJ-GnEyC_ctRsa7fczC9MmKsYXAt/view?usp=sharing

- Compare MAS estimates and OM “true” values

- R script:

- https://drive.google.com/file/d/1Ohvx5hnpfiK2M8LpLOurlS_NI686T0D/view?usp=sharing

- R Markdown:

- <https://drive.google.com/file/d/1Y3p5foK9uB9P7ZliMlHaKmXVFdgfMLyV/view?usp=sharing>

Description of cases

- Case 1: Null case
 - $\sigma_R = 0.4$
 - Fishing mortality (F) deviations are same per iteration
 - F pattern: increase
 - Selectivity pattern: simple logistic
 - Number of survey: 1
 - Initial condition: $\phi_F \neq \phi_0$
- Case 2: Increase recruitment variability
 - $\sigma_R = 0.6$
- Case 3: Stochastic F
 - F deviations are stochastic per iteration
- Case 4: Roller coaster F pattern
 - F increases first and then decreases
- Case 5: Constant F pattern
 - $F = F_{low}$
- Case 6: Constant F pattern
 - $F = F_{MSY}$
- Case 7: Constant F pattern
 - $F = F_{high}$
- Case 8: Selectivity pattern
 - Double logistic selectivity
- Case 9: Increase number of surveys

- Number of survey: 2
- Case 10: Initial condition
 - $\phi_F = \phi_0$
- Case 11: Increase survey coefficient of variation
 - $CV_I = 0.5$
- Case 12: Misreported catch
 - Multiply “true” age composition with randomly generated values that follow a normal distribution with a mean of 50 and standard deviation of 10

Table 1. Settings of recruitment variability, fishing mortality deviations, fishing mortality patterns, selectivity patterns, and initial condition.

Preliminary results

F_{low} and F_{high}

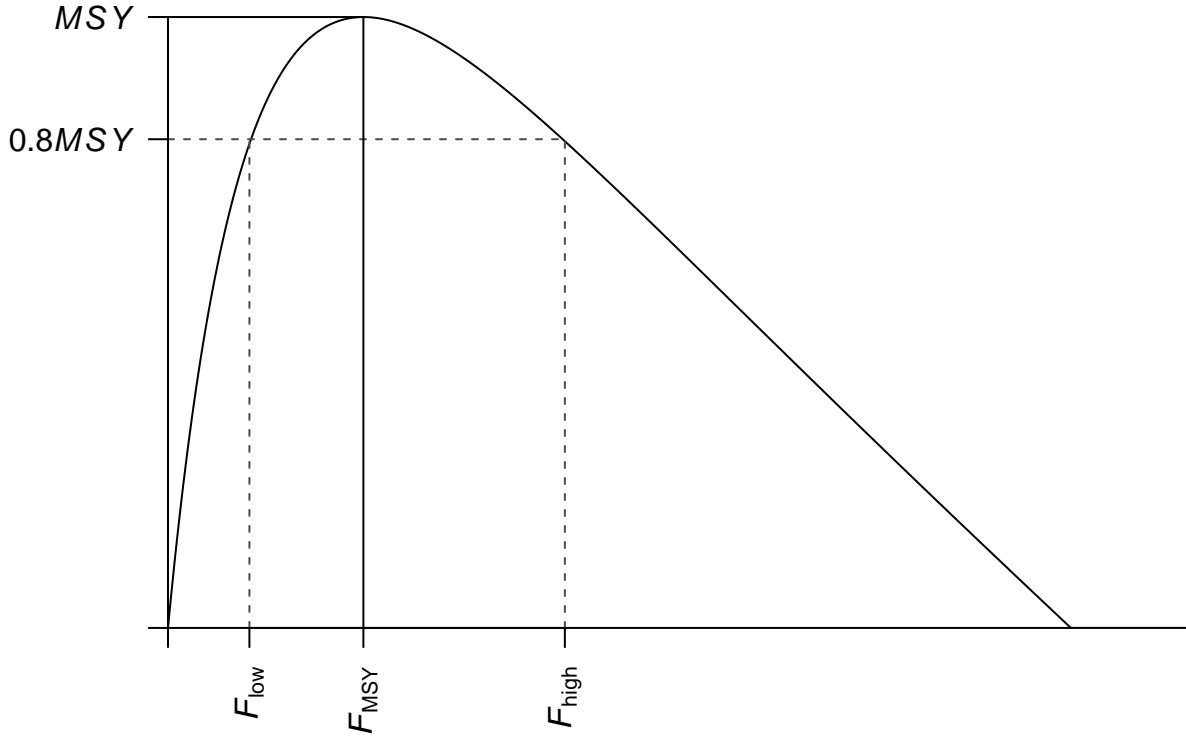


Figure 1. The curve of the relationship of yield and fishing mortality rate (F) and the definitions of the lower F value ($F_{low} = 0.08$) and higher F value ($F_{high} = 0.39$) used in creation of various patterns of F in the operating model. The horizontal lines indicate maximum sustainable yield (MSY) and $0.8MSY$, which is 80% of MSY . The vertical solid line indicates the F that corresponds to MSY (F_{MSY}).

Overall relative error (RE) in SSB , R , F , SSB/SSB_{MSY} , and F/F_{MSY}

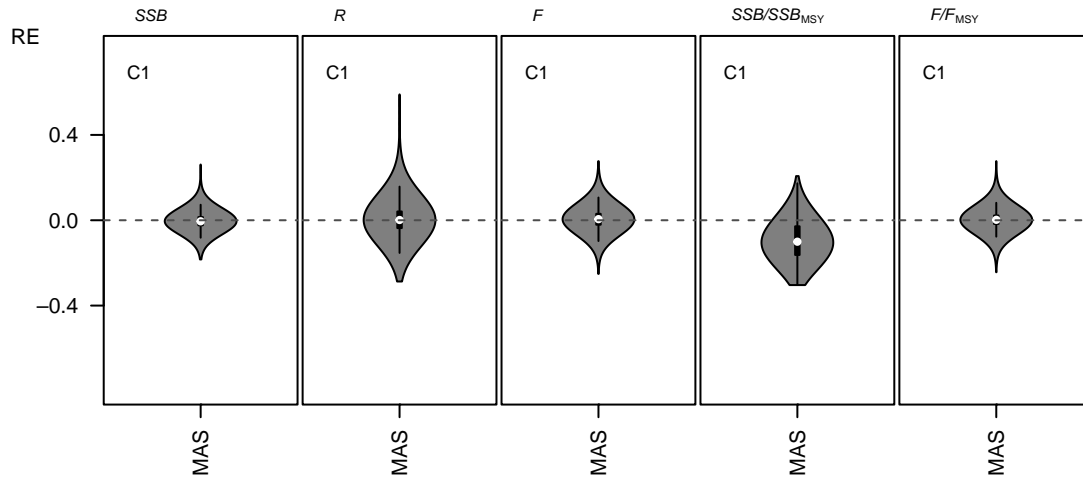
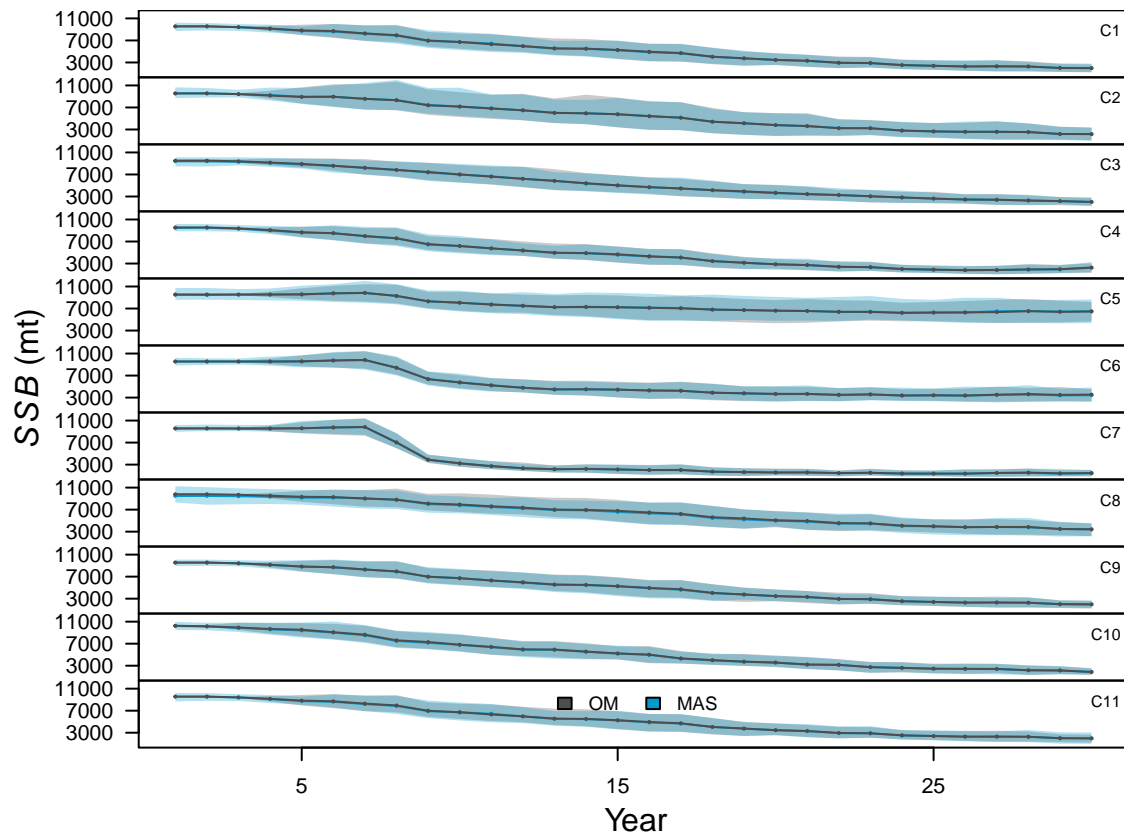
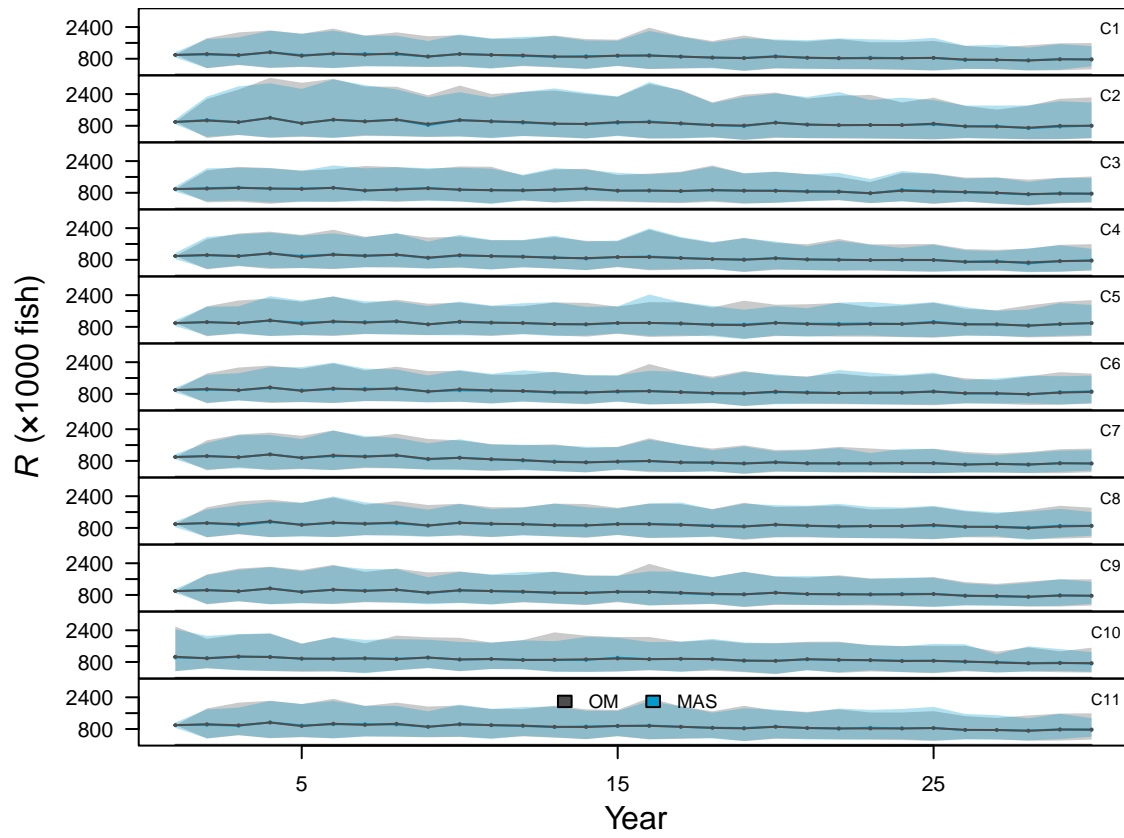


Figure 2. Violin plot of relative error (RE) across years and iterations for spawning stock biomass (SSB), recruitment (R), fishing mortality rate (F), SSB/SSB_{MSY} (SSB/SSB at maximum sustainable yield [MSY]), and F/F_{MSY} (F/F at maximum sustainable yield [MSY]) for MAS.

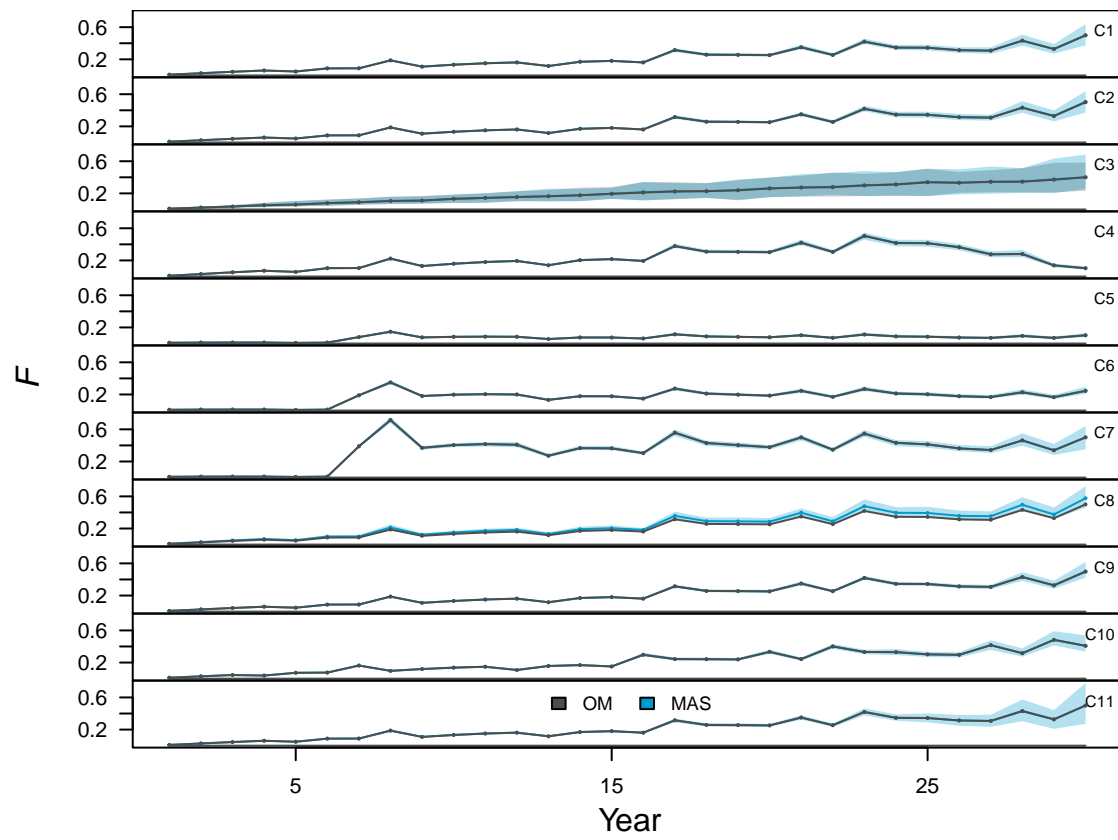
SSB over time



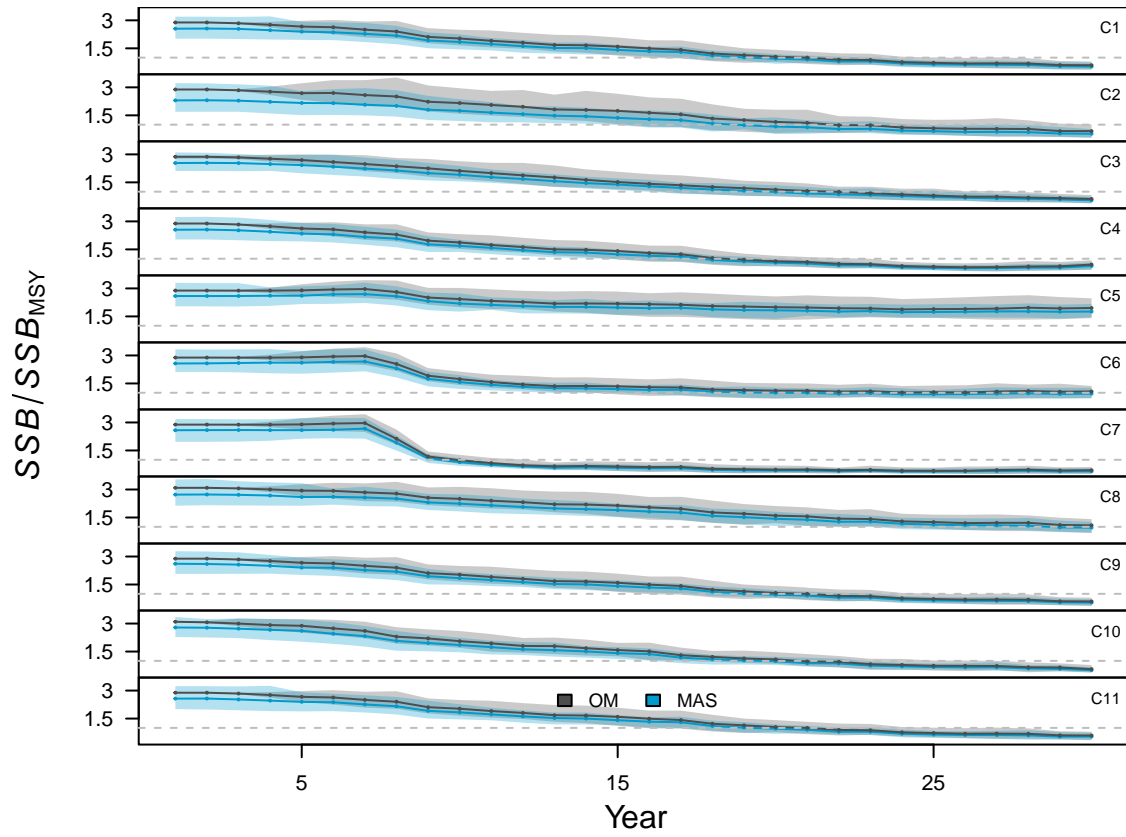
R over time



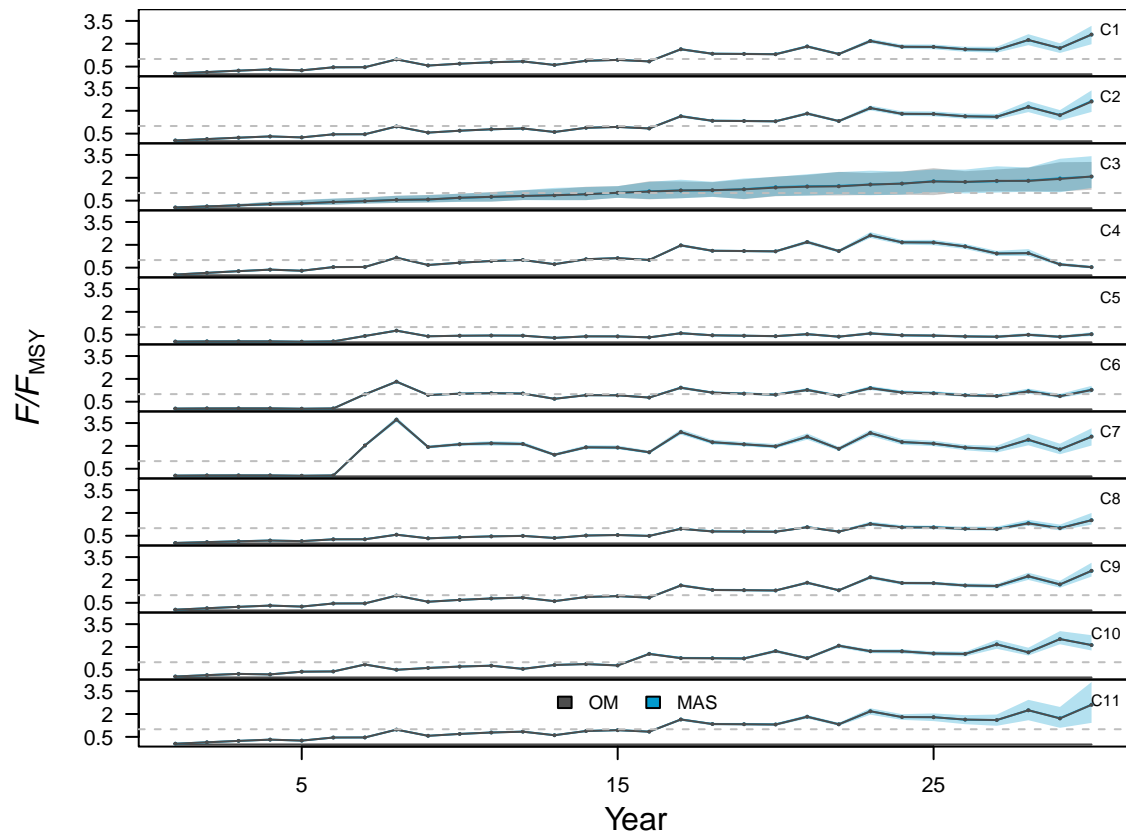
F over time



SSB/SSB_{MSY} over time



F/F_{MSY} over time



Relative error in MSY , F_{MSY} and SSB_{MSY}

