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:

 $https://drive.google.com/file/d/1Ohvx5hnpfiiK2M8LpLOurlS_NI686T0D/view?usp=sharing$

- R Markdown:

https://drive.google.com/file/d/1Y3p5foK9uB9P7ZIiMlHaKmXVFdgfMLyV/view?usp = sharing the state of the state

Description of cases

- Case 1: Null case
 - $-\sigma_{R} = 0.4$
 - Fishing mortality $({\cal F})$ 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}

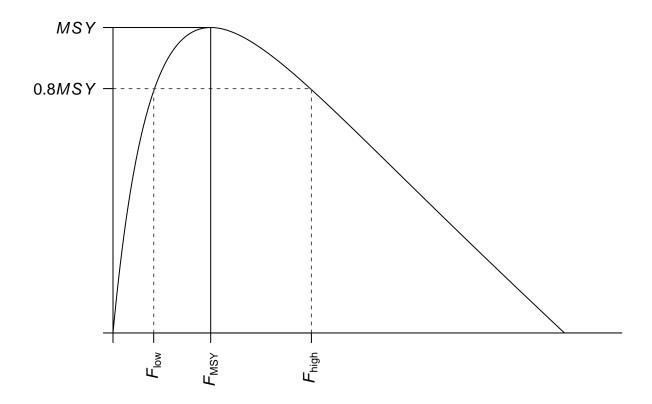


Figure 1. The curve of the relationship of yield and fishing mortality rate (F) and the definitions of the lower F value $(F_{low} = 0.08)$ and higher F value $(F_{high} = 0.39)$ used in creation of various patterns of F in the operating model. The horizontal lines indicate maximum sustainable yield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

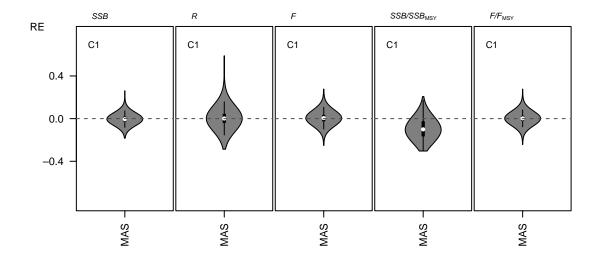
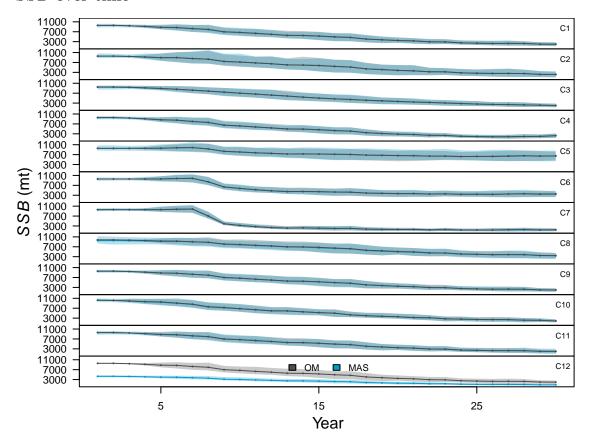
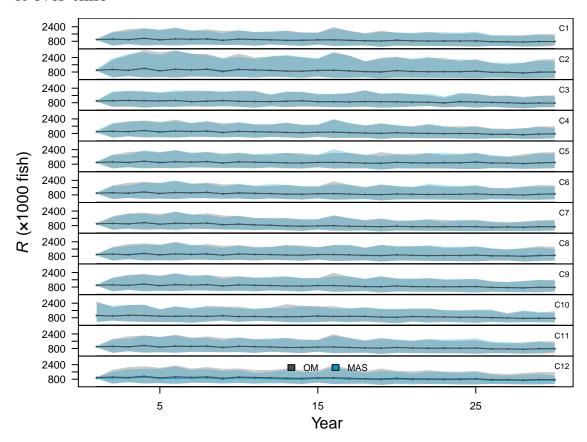


Figure 2. Violin plot of relative error (RE) across years and iterations for spawning stock biomass (SSB), recruitment (R), fishing mortality rate (F), SSB/SSB_{MSY} (SSB/SSB at maximum sustainable yield [MSY]), and F/F_{MSY} (F/F) at maximum sustainable yield [MSY]) for MAS.

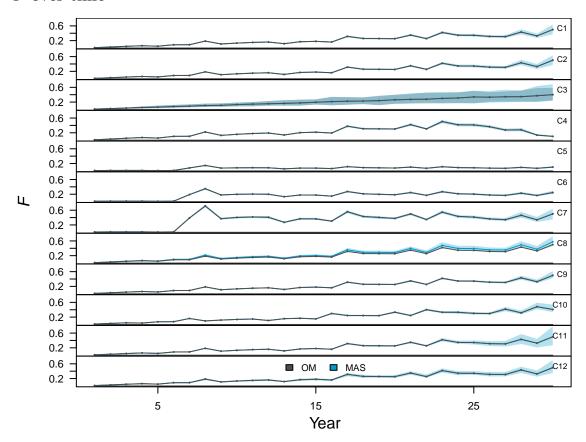
SSB over time



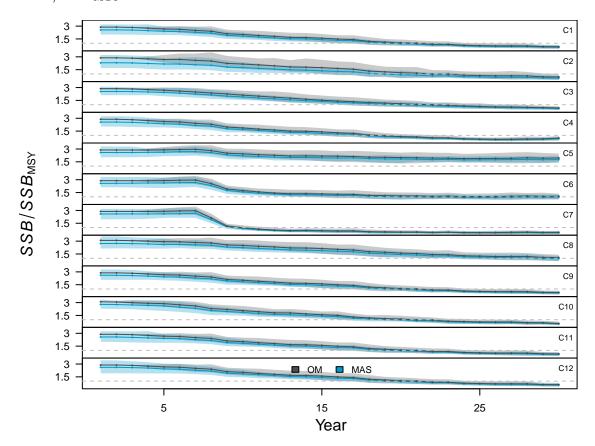
R over time



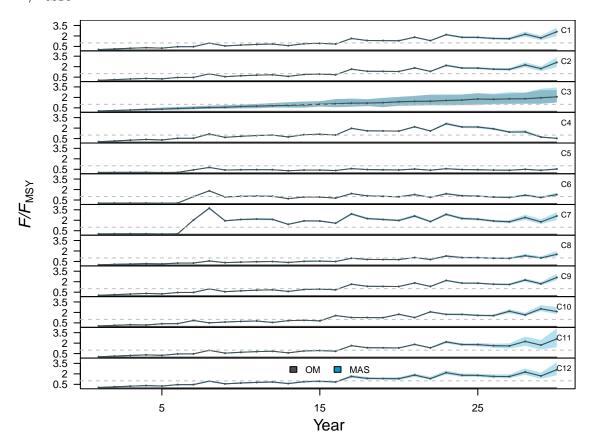
F over time



SSB/SSB_{MSY} over time



 F/F_{MSY} over time



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

