Identification and performance of stock-recruitment functions in state space assessment models

Working Paper 1

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2024-02-06

Background

Introduction

- State Space Research Track Working Group (SSRTWG) is investigating performance of the Woods Hole Assessment Model (WHAM)
- Simulation studies with data generated from operating models (OMs), then fit with a series of estimation models (EMs)
- This framework allows us to evaluate how the EM fits compare to the known OM "true values", evaluate model selection, bias, precision, etc.

Terms of Reference (TORs) Addressed

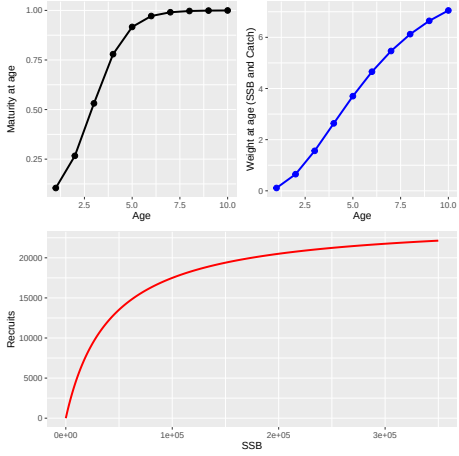
- TOR 2: Investigate the efficacy of estimating stock-recruit functions within state-space models and their utility in generating scientific advice.
- TOR 3: Develop guidelines for including ecosystem and environmental effects in assessment models and how to treat them for generating biological reference points and scientific advice.

Outline

- 'Stock' parameters, fishery and index parameters
- OM factors and simulated data examples
- EM models
- Beta standardization
- Analysis & Results
- Conclusions
- Future Work

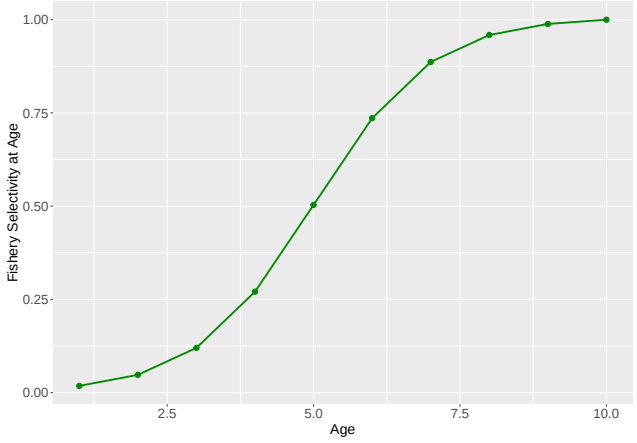
Inputs

Stock parameters for generic gadid



- Natural mortality $= 0.2$ at all ages
- Maturity, weight, natural mortality are time-invariant

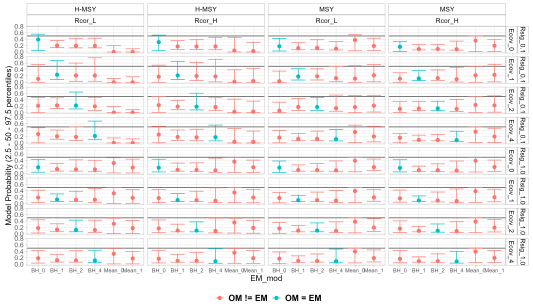
Fishery and index parameters



- two fishery independent indices were also generated, taking place at 0.25, 0.75 yr
- catchability for both indices was 0.3; selectivity was same as fishery

OM

OM factors and simulated data examples



- make some plots to illustrate OM inputs and resulting simulated data generated
- looks like i can have multiple bullets below a figure

Couple of slides for Beta standardization

- greg's plots

EM

EM models

- simple bullets above table
- we only have 6 EMs that were considered

ecov_how	r_mod	SR	EM_mod	EM
0	2	Mean	Mean_0	1
1	2	Mean	Mean_1	2
0	3	BH	BH_0	3
1	3	BH	BH_1	4
2	3	BH	BH_2	5
4	3	BH	BH_4	6

Analysis & Results

Analyses

1. Convergence of the estimating models
2. Model identifiability of an underlying stock recruitment model and/or an underlying relationship between environmental covariate
3. ΔAIC and model probability
4. Assessment error (recruitment, spawning stock biomass, and Fbar)
5. Bias of estimated parameters
6. Mohn's ρ
7. Projection performance relative to assumptions about the environmental covariate

Convergence

Model Identifiability

ΔAIC and model probability

Assessment error (recruitment, spawning stock biomass, and Fbar)

Bias of estimated parameters

Mohn's ρ

Projection performance relative to assumptions about the environmental covariate

Conclusions

Take-aways

- These are the take-aways (copy from WP)

Future Work

List of what's next

- This is what we suggest for follow-up
- Note that WP1-Appendix looked at σ_R=0.5 and found no difference from results in WP1

Acknowledgements

- This work could not have been completed without the use of Azure computing (NOAA) and MIT (... greg to fill in)
- We thank other members of the SSRTWG for thoughtful comments during earlier discussions and presentations of this work