Model Selection Procedure for SNEMA Yellowtail Flounder Research Track 2024

1. Initial setup in WHAM consisted of an "ASAP-like" run (no random effects). This setup (and all subsequent models) had six age classes (1-6+), an aggregate fleet CV of 0.05, and ran 1973-2022.
2. Model selection began without consideration of environmental effects. Assuming a given run converged, AIC, residuals, and retrospective patterns guided the process. The following parameters were generally considered in order. Anything in bold is an outcome that made it to the candidate model:
    - Fleet Selectivity (**logistic**)
    - Survey Selectivities (logistic for all three NEFSC surveys; age-specific for larval)
    - Recruitment Assumptions (initially determined here to be a BH SR relationship)
    - Fleet age comp (**logistic-normal-ar1-miss0**)
    - NAA random effects (**2dar1**)
    - Fleet selectivity random effects (**iid**)
    - Survey selectivity random effects (**none for all surveys**)
    - Catchability of surveys random effects (ar1 on NEFSC winter and larval surveys)
    - Revisit of survey age comps (**logistic-normal-ar1-miss0**)
    - M assumptions (**constant M=0.5**)
3. A full leave-one-out survey analysis was then conducted, where the best models were re-run with different combinations of surveys. This led to eventual exclusion of the larval indices. For now, work proceeded with two "basecase" models: one with the larval indices and one without. The model without the larval indices also had ar1 on NEFSC winter catchability removed (a revisit of survey assumptions was done) due to better diagnostics.
4. Environmental effects were then tested on the two basecase models. Residuals and retrospective patterns drove model selection, but many of these models could not converge:
    - Environmental Covariate Effects on R (**1-year lag of GSI**):
        - Tested: Atlantic Multidecadal Oscillation, North Atlantic Oscillation, Spring Bottom Temperature, Cold Pool Index, Gulf Stream Index , and Gulf Stream Index (Spring)
        - Previous assumptions of R were revisited and the BH SR was removed and R was decoupled from NAA
    - Environmental covariate effects on M (**none**):
        - Tested: Atlantic Multidecadal Oscillation, Spring Bottom Temperature, and Fall Bottom Temperature
    - Environmental covariate effects on survey qs (**none**):
        - Tested: Seasonally paired bottom temperature
5. Model selection was then narrowed down to four choices, and two decisions: whether to include an environmental covariate and whether to include the larval indices. The larval indices were removed and we chose to keep the effect of GSI on R due to improved diagnostics (especially retros).
6. At this point, a WHAM version was released that solved a potential issue in the SNEMA candidate model (when applying the effect of a covariate and random effects on R together). This new WHAM version was used to re-run many of the above models, but the same decisions were made except the change to make NEFSC fall selectivity be age-specific (and not logistic).
7. Self-tests and Jitter analyses were only conducted on the final four models discussed under '5' and (along with other details described in the WP), led to selection of the candidate model (m164_GSI).
8. During the peer review process, an additional run was conducted that utilized age-specific estimates of M. This model was preferred by the panel and became the new candidate model.