CCGOM Summary of Steps leading to the final candidate model

- **Data Selection and Justification**:
    - The terminal year is **2022**, with the time series starting in **1985** to ensure consistent age composition data availability.
    - Combined fleet data (commercial landings + commercial discards) used to simplify fleet dynamics.
    - Decision to **split NEFSC surveys** (Albatross and Bigelow) to improve model diagnostics, informed by differences in inshore strata coverage between the Albatross and Bigelow years.
- **Model Framework Transition**:
    - Transitioned from VPA to WHAM via ASAP while retaining historical inputs from VPA to ultimately permit incorporation of process errors, random effects, and environmental covariates .
- **Initial Parameterization**:
    - Emulated ASAP (fixed effects only), low catch CV to best emulate VPA, and age classes (1-6+). This served as a baseline.

Proposed Candidate Model coming into the peer review (m452)

- **Survey Incorporation**:
    - Eight surveys initially tested (due to split in the NEFSC survey data in 2009). A comprehensive leave-one-analysis led to the **exclusion of the MADMF and MEDMR spring surveys** due to retrospective scaling issues, likely tied to overlap with spawning and migration periods.
- **Selectivity Parameterization**:
    - Fleet selectivity transitioned from age-specific models to logistic models with 2dar1 random effects, but unrealistic reference points prompted further refinement.
    - The final model adopted a **two-block selectivity structure (1985-1993 and 1994-2022) with no random effects**, improving FMSY estimates and stability.
- **Survey and Fleet Age Composition**:
    - Logistic-normal-ar1-miss0 distribution chosen for fleet age composition.
    - Survey age compositions modeled with logistic-normal-ar1-miss0 for improved fit and retrospective performance, except for MADMF fall (logistic-normal-miss0).

- **Recruitment and Natural Mortality**:
    - AMO and spring BT were considered as potential environmental covariates on both recruitment and natural mortality; however, the **incorporation of environmental covariates was not supported** by model diagnostics
    - Recruitment and age-2+ survival deviations were coupled and modeled as deviations from the time series mean with an **ar1_a** process, excluding environmental covariates.
    - Initially assumed a fixed natural mortality (M=0.4), but **age-specific M was selected by the peer review panel as the final model** (see below)
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- **Final model selected by peer review panel (m452g):**
    - The peer review requested an evaluation of an alternative model configuration with age-specific natural mortality rates. Diagnostics, including retrospective performance and residual fit, were similar between the two models, with a slight improvement in self-test results for SSB observed in the age-specific M model.
    - The most significant differences were in biological reference points (BRPs) and projections, where the age-specific M model provided outcomes that the panel deemed more biologically plausible. Ultimately, the age-specific M configuration was selected as it better aligned with biological expectations and was considered the more scientifically robust alternative.