Peer review of applying state-space models

Simulation studies

- Statistical reliability (process errors):
  - Operating models with alternative sources of and levels of process error, level of observation error, fishing history, B-H stock recruit or not.
  - Estimating models with alternative sources of process error
- Statistical reliability (environmental covariates with M)
  - Operating models with alternative levels of process error in M and covariate, levels of observation error, levels of effect of covariate, fishing history
  - Estimating models with and without process errors and effects assumed.
- Statistical reliability of Stock-recruit relationships and covariate effects on recruitment
- Statistical reliability of covariate effects on catchability

Improvements over traditional assessment models

Better at everything

- Better representation of realism of biology and data generating mechanisms
- Better statistical reliability
- Better method of incorporating covariate effects
- Better prediction skill for projections

Good practices

- Treat recruitment as a random effect (estimate variance)
- Consider as many plausible sources of process errors as possible
- Incorporate ability to estimate mis-reported catch
- Use reliable estimates of observation error precision when possible
- Use a wide array of diagnostics to evaluate models including posterior predictive checks of random effects models
- More general form for MASE diagnostic is needed.
- Decouple recruitment from “survival” random effects
- Better partitioning of observation and process errors is expected when multiple observation types are available (e.g., multiple indices, fleets)
- AIC is useful for model selection

Cautions

- Models that do not converge at high rate in simulation self tests
- Models that show trend in bias in simulation self tests
- Estimation of mean M in models with random effects on M
- Better method of incorporating covariate effects
- Better prediction skill for projections