CIE review of GMACS

Alaska Fisheries Science Center,
Seattle, Washington,
June 29-July 1, 2015

Review specifics:

Three days at AFSC

- Michael Bell, Orkney Islands (Cancer pagurus, Norwegian lobster)
- Malcolm Haddon, CSIRO, Hobart (rock lobster, abalone)
- Nick Caputi, Western Australia (rock lobster)

Each had previous AFSC CIE review experience

Meeting chaired by local expert Martin Dorn

NOAA FISHERIES

Terms of Reference (ToR)

- Evaluation of functional forms, estimation approaches, and diagnostics used in GMACS including uncertainty characterization and satisfying required assessment elements.

- Evaluate application of GMACS to the BBRKC stock. Specifically, comment on what important features are missing relative to the current assessment approach?

- Evaluation of GMACS as a flexible assessment modeling tool. I.e., potential application to other crab stocks e.g., Tanner crab, data poor stocks (Tier 4), and stocks with unique data sets (e.g., snow crab and Bristol Bay red king crab cooperative survey data).

- Evaluation of utility of the modeling framework as a community supported modeling approach and practicality for managing into the future.

- Recommendations for further improvements and comment on the general applicability to the fishery management questions (risk assessment and MSE options).

Review of GMACS Modeling Framework
Alaska Fisheries Science Center, Seattle, WA
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For security and check-in: Anne Hollowed, Martin Dorn and William Stockhausen
Adjourn each day at about 5pm

Monday, June 29:
9:00 AM   Welcome (AFSC Leadership) and introductions (Martin Dorn, Chair),
                      Review/adopt agenda/schedule and Terms of reference, meeting protocols.
9:15 AM   NPFMC Crab Plan Team and Council cycle (Foy/Turnock)
10:30 AM – Break
10:45 AM   Overview of GMACS modeling framework. (Jim Ianelli)
12:00 PM – Lunch
1:00 PM   Current BBRKC Assessment (*Jie Zheng*)
3:00 PM – Break
3:15 PM   Comparisons of GMACS and current BBRKC assessment (Webber/Ianelli)
4:00 PM   Discussions, model run requests

Tuesday, June 30
9:00 AM   Results and requests from previous days' discussions
9:30 AM   Comparisons of GMACS and current BBRKC (continued)
10:30 AM – Break
10:45 AM   External simulation package and tests (Stockhausen)
12:00 PM – Lunch
1:00 PM   Within-GMACs simulation-testing options
3:00 PM – Break
3:15 PM   Discussions, model run requests

Wednesday, July 1
9:00 AM   Results and requests from previous days' discussions
9:15 AM   Data poor and alternative model configurations for other stocks
10:30 AM – Break
10:45 AM   API and wiki (user manual) overview
12:00 PM – Lunch
1:00 PM   git development cycle demo
3:00 PM – Break
3:15 PM   Discussions, model run requests

Managing expectations…

- GMACS is still a work in progress…

- We had hoped to be further along in developing GMACS…

- Etc…

Kudos

Haddon:

"The great potential of the GMACs software is clearly apparent, but the current functionality belies its future capacity."
belie: fail to give a true notion or impression of (something);

Bell:

"Gmacs should continue to be developed as a flexible size--based modeling framework with the purpose of achieving standardization and transparency across the assessments of Alaskan crab stocks."

Caputi:

"The current development of GMACS and its proposed final development will make a very flexible assessment modeling tool. While GMACS has been established primarily for stock assessments for the Alaskan crab fisheries, it should be generally applicable to crustacean fisheries stock assessment that are based on length-structured assessments."

Summary of recommendations: Continuous time vs sequential dynamics

"The current implementation of GMACs uses a continuous-F approach that operates with instantaneous fishing mortality rates across a full year. As a preliminary step to getting the assessment software functional this is a good first approximation, but to adhere to the generic technical specification (Maunder, 2012), and to allow for the idiosyncrasies of each fishery it will be necessary to convert the equations describing the dynamics into a step-wise seasonal interpretation of events, with the duration of each 'step' being approximated by the proportion of natural mortality imposed during each such 'step'."

Summary of recommendations:
# Additions to the GMACS Feature Set

- Include a SR relationship with a suitable lag

- Add an option for environmental forcing

- Add features to do snow crab growth and biology, i.e., a terminal molt.

- Not all features in existing crab assessments should be added to GMACS

    But enough to make valid side-by-side comparisons

- Audit of key characteristics of crab fisheries and biology for Alaska crab stocks

Example:
Sex-specific recruitment for BBRKC

Current BBRKC assessment model estimates sex-specific recruitment
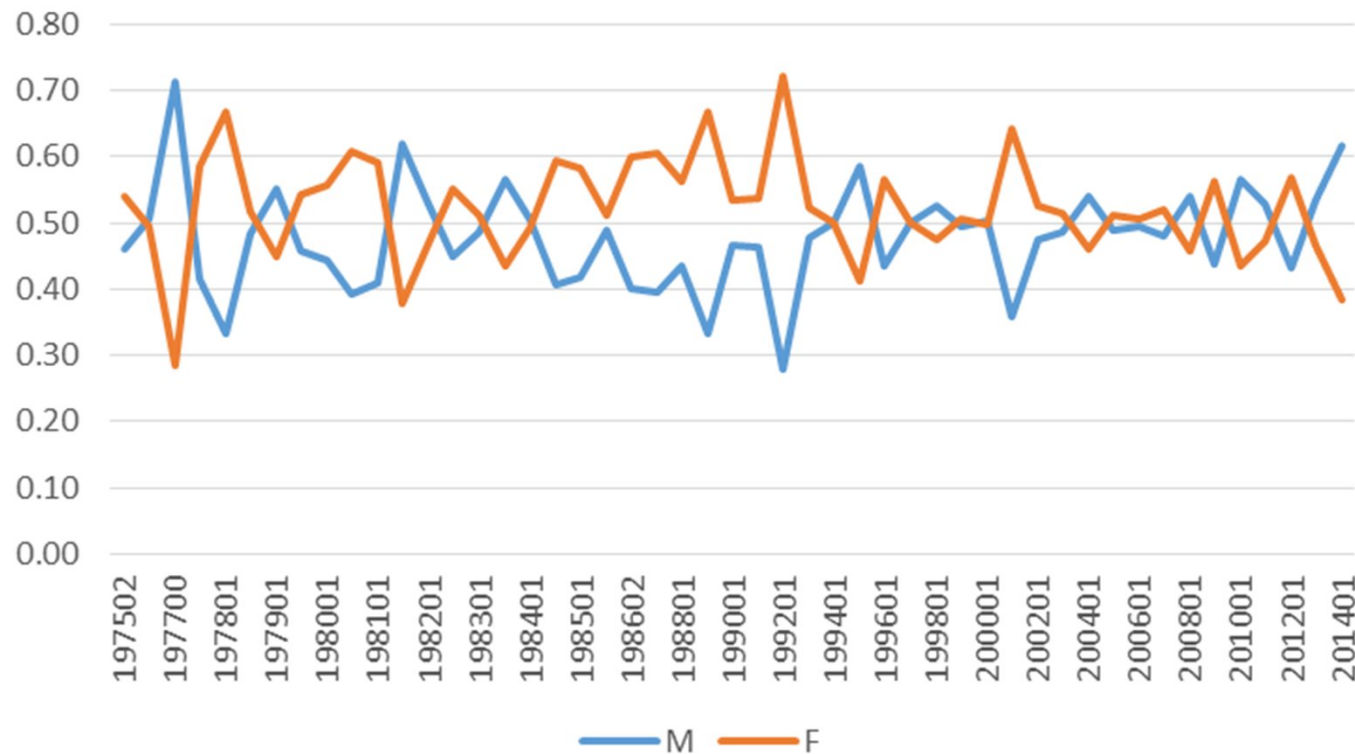
Sex ratio for 65-80mm BBRKC in the EBS bottom trawl survey
Adding sex-specific recruitment probably not needed to do an adequate model comparison.

Summary of recommendations: Project management

- Core development team, CDT

- Advisory committee needed to discuss features to be added, and plan future efforts of the CDT

Summary of recommendations: Modeling framework as a community supported modeling approach

- The use of Git and GitHub for software version control appears to have been implemented very effectively allowing for much more rapid collaboration and code development from multiple authors and coders.

- A great advantage of this software development environment is the relative ease with which the various components can be documented in a collaborative fashion.

Summary of recommendations: Options for Management Strategy Evaluation (MSE)

- The inclusion of the R-based MSE simulation framework (Stockhausen, 2015) is an innovation to be applauded.

- A simulation framework devised in R, as a contrasting programming language to the C++ used in GMACs, should assist in both finding bugs and providing for the simulation of multiple test data sets.

- The internal data simulator within the GMACs modules can play a similar role, although in this case using exactly the same dynamics as the assessment model.