

GMACS Progress Report for the September 2018 CPT

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Background

- GMACS (Generic Size-structured stock assessment Model for Alaska Crab Stocks) consists of:
 - An assessment model (which should ultimately include all current models);
 - R-packages and scripts for diagnostics / to conduct simulations; and
 - Documentation.
- GMACS has been applied for St Matthews Blue King crab.
- Initial runs has been conducted for Bristol Bay red king crab.

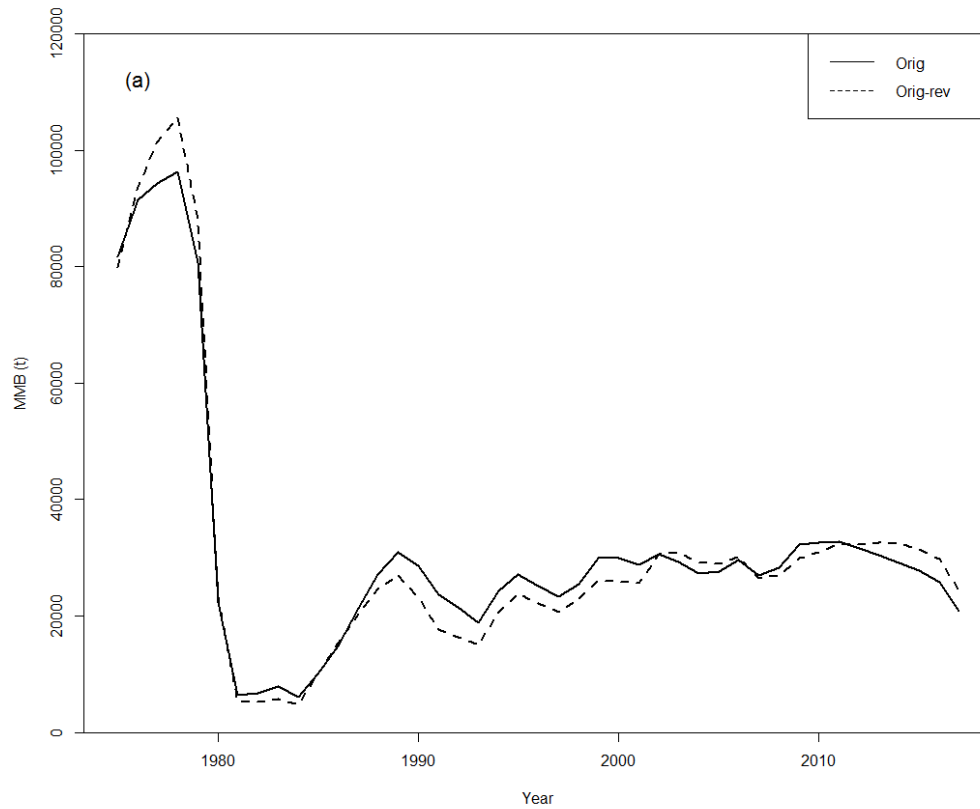
Process

- The code for GMACS and Jie's Zheng's assessment were compared and the code for both models modified so that given the same parameter values the same outputs and likelihoods are obtained
 - The models have different penalties (albeit conceptually the same); and
 - Jie's model was updated to better match GMACS and vice versa (the additions to GMACS form part of the new code base).

Current assessment model (issues and recommendations)-I

- Errors discovered:
 - The likelihood for the NMFS survey length data was incorrect (it overweighted small animals)
 - The way additional variance was accounted for for the BSFRF survey was incorrect.
- Recommendations:
 - The size-transition matrix could be calculated more accurately using the ADMB built-in `cum_d_gamma` function.
 - The number of length-classes for the length-frequencies for which both sexes are fitted at once should be the number of male + female length-classes.

Current assessment model (issues and recommendations)-II



GMACS (Issues)-I

- Errors discovered:
 - Discard was not being accounted for years with no data on discard
 - The discard rate for some fleets was wrong
 - The input sample sizes were incorrect in some cases
- Other changes:
 - Added the ability for fisheries to be instantaneous (the “GMACS catch equation” is inappropriate for instantaneous fisheries). This added several time-steps to the GMACS implementation.
 - The size-distribution of recruits can differ between males and females.
 - The initial size-distribution can be estimated.
 - Added an option to allow the expected growth increments by sex and size-class to be parameters

GMACS (Issues)-II

- Other changes (Continued):
 - Added a new retention option (all catch discarded)
 - Natural mortality can now change in discontinuous blocks
 - Emphasis factors can be applied (which matches Jie's approach)
 - Added the ability for the number of size-classes to differ between males and females.
 - Added the ability for one survey to be nested within another survey.
 - More quantities can be set in the CTL file.
 - How selection is parameterized has been changed.

Next steps

- GMACS' ability to calculate reference points needs to be checked.
- GMACS and Jie's model treat years with bycatch in the Tanner crab fishery differently.
- The approach to penalties differs between the two implementations.
- The GMACS hessian matrix is not positive definite – which suggests that something may be non-differentiable.