Gmacs Example Stock Assessment

Athol R. Whitten, James N. Ianelli, André E. Punt

September 2014

Contents

Introduction

Gmacs is a generalized size-structured stock assessment modeling framework [more here on Gmacs]. Crab stocks of Alaska are managed by the North Pacific Fisheries Management Council NPFMC. Some stocks are assessed with integrated size-structured assessment models of the form described by Punt, Huang, and Maunder (2012). Currenlty, each stock is assessed using a stock-specific assessment model. The Gmacs project aims to provide software that will allow each stock to be assessed inside a single modelling framework.

Gmacs is used here to develop an assessment model for the Bristol Bay Red King Crab (BBRKC) stock. This analysis serves as a test-case for the development of Gmacs: the example assessment is intended to match closely with a model scenario presented to the Spring 2014 BSAI Crab Plan Team Meeting by Zheng and Siddeek (2014).

Together, the Gmacs-BBRKC model and this report serve as the first example of what should follow for other crab stocks: that is, direct model comparisons to (1) test the efficacy of Gmacs, and (2) determine whether Gmacs can be used in practice to closely match the outputs of existing ADFG stock assessment models.

Comparison of Data and Model Specifications

The data and model specifications used in the Gmacs-BBRKC model are very similar to those used in the '4nb' scenario developed by Zheng and Siddeek (2014), herein referred to as the ADFG-BBRKC model.

Population Dynamics

Life History Trait	Parameter	ADFG Value	Gmacs Value	Comments
Natural Mortality	M	Fixed	Fixed	M is fixed in both models

Fishery Dynamics

Specification	Parameter	ADFG Value	Gmacs Value	Comments
No. Fleets		5	5	

Specification	Parameter	ADFG Value	Gmacs Value	Comments

There are five separate fishing fleets accounted for in the ADFG model:

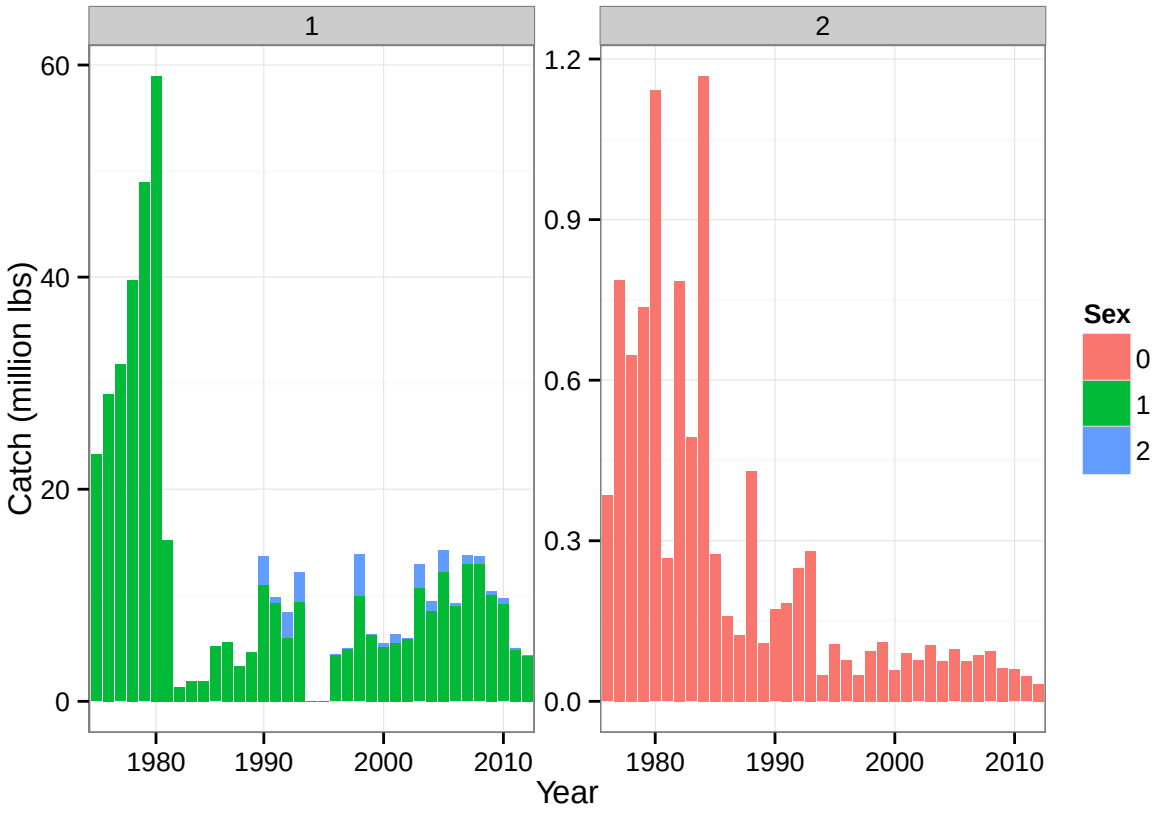
Comparison of Model Results

The results of the ADFG-BBRKC model are compared here to the results of the Gmacs-BBRKC model.

Gmacs Results

In what follws, we demonstrate the use of the `gmr` package to process the output of the Gmacs-BBRKC model and produce plots that can be used in assessment reports.

```
## The ggplot theme has been set to bw for this working session
```



Discussion

This discussion will focus on the challenges in developing a Gmacs version of the BBRKC model: those met, and those yet to be met.

References

Punt, Andre E, Tzuchuan Huang, and Mark N Maunder. 2012. "Review of Integrated Size-Structured Models for Stock Assessment of Hard-to-Age Crustacean and Mollusc Species." *ICES Journal of Marine Science* 70 (1): 16–33. doi:10.1093/icesjms/fss185. http://icesjms.oxfordjournals.org/cgi/doi/10.1093/icesjms/fss185.

Zheng, J, and MSM Siddeek. 2014. "Bristol Bay Red King Crab Stock Assessment in Spring 2014." *Notes*. Alaska Department of Fish & Game.