Retrospective forecasting of the 2014 WCPO bigeye tuna stock assessment

SC12-SA-WP-02

August 2016

Objectives

- Retrospective analysis
  - Stock assessment diagnostic (routinely conducted)
  - Retrospective hindcast to evaluate the performance of projections.
- Short term catch (or effort) based projections are used as one of the indicators of stock status (SC12-SA-WP-03).
- Projections are also used to evaluate the likely performance of management measures (e.g. CMM 2014/01)
- These projections will be biased if the assessment is subject to pronounced retrospective bias.

Retrospective Bias

Plaice VIIa 2010 retrospective analysis

biomass

recruitment

fishing mortality

2004

2010
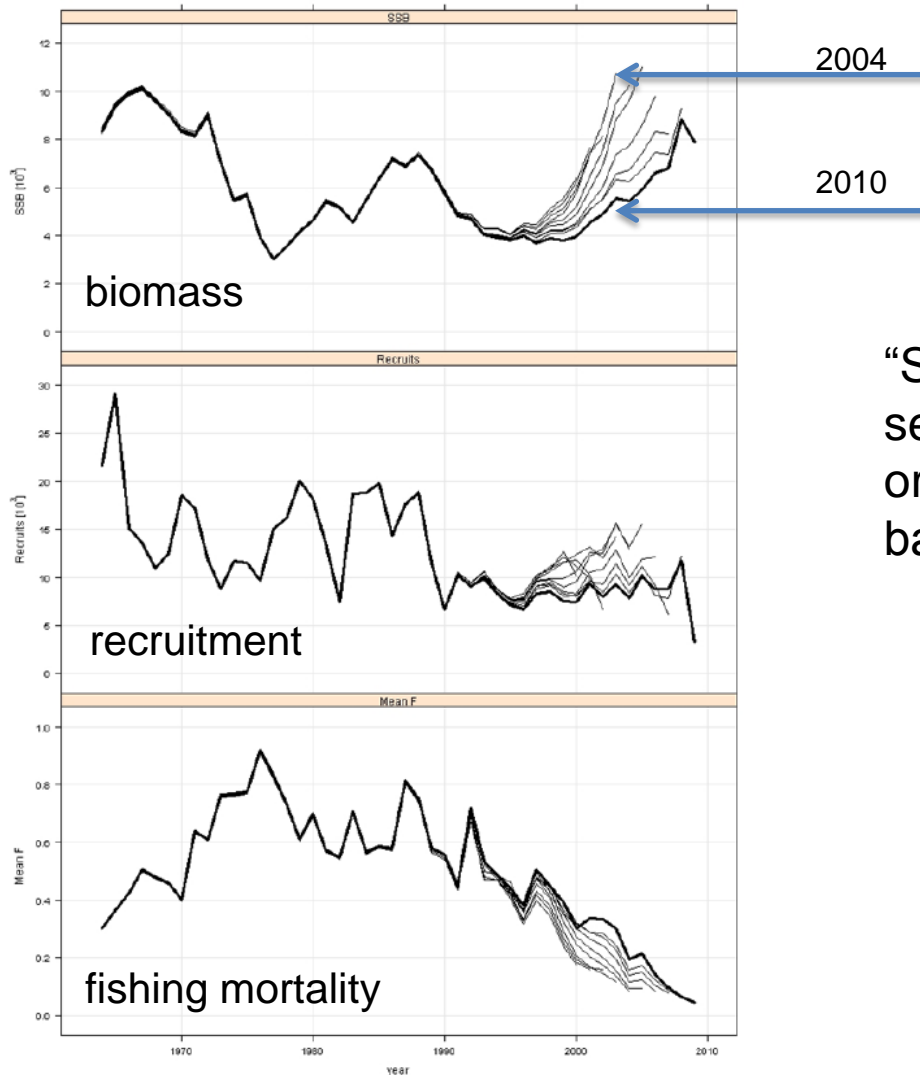
"Systematic inconsistency among a series of estimates of population size, or related assessment variables, based on increasing periods of data."
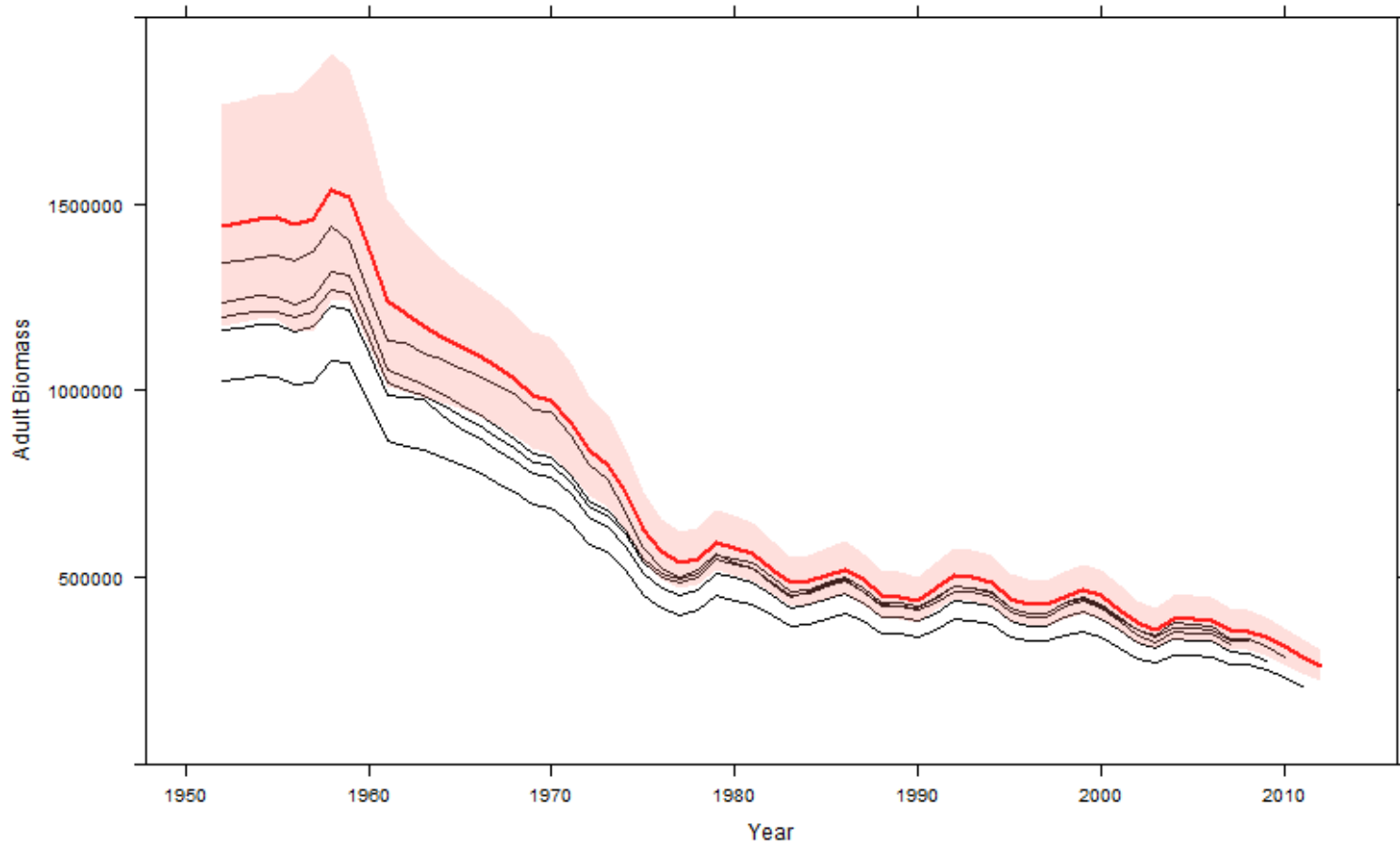
Retrospective Analysis

BET 2014 Reference case assessment (red line)
Retrospective analysis from 2012 to 2007
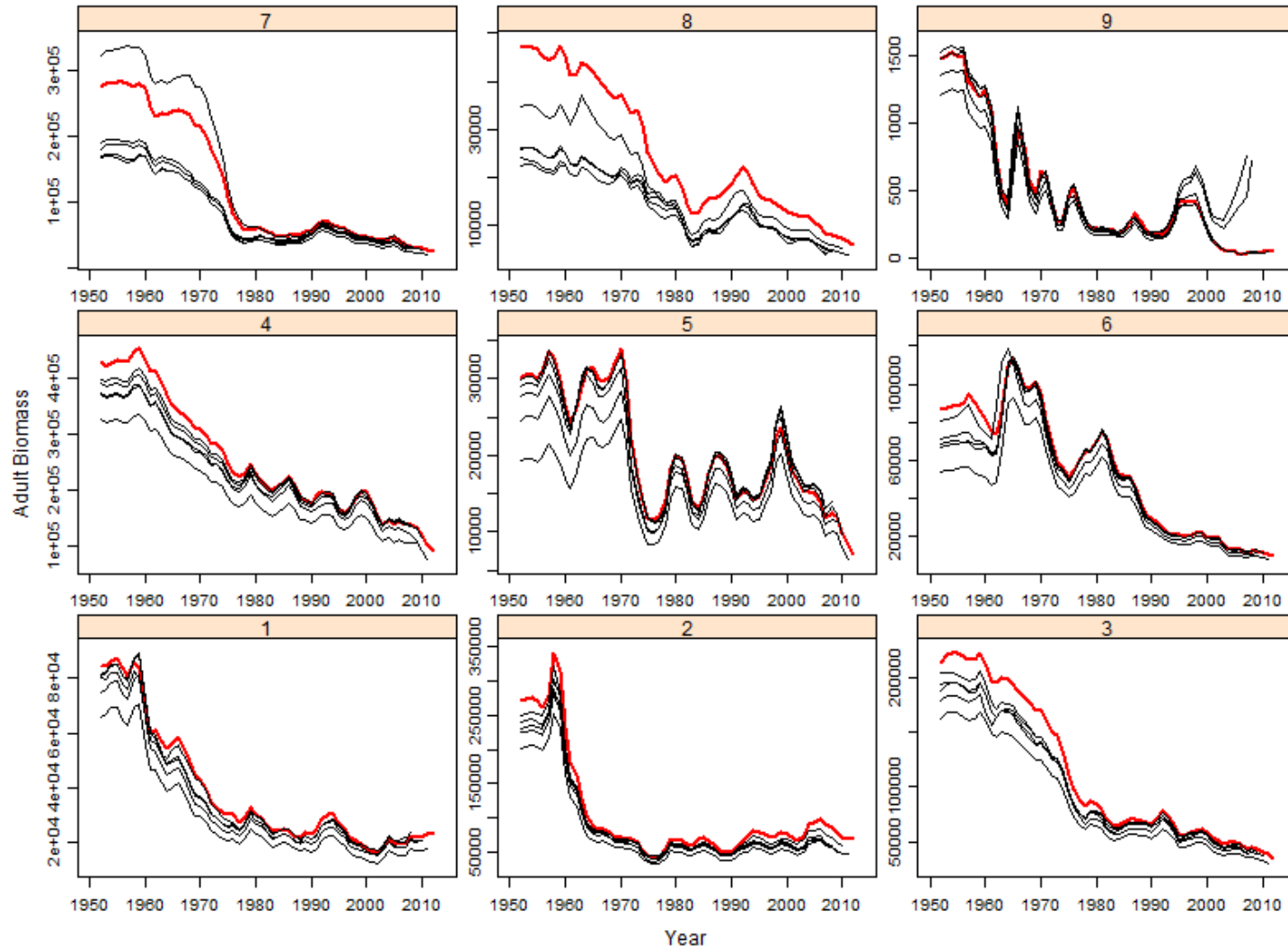Successively truncated frq, tag and ini
Mixed success with convergence criteria (same number of function evaluations)
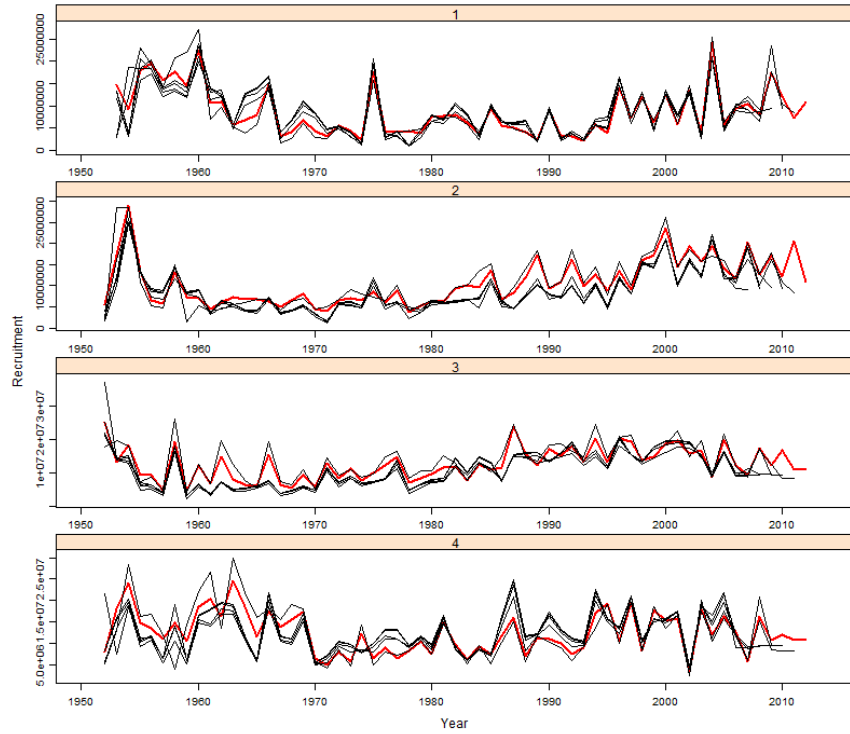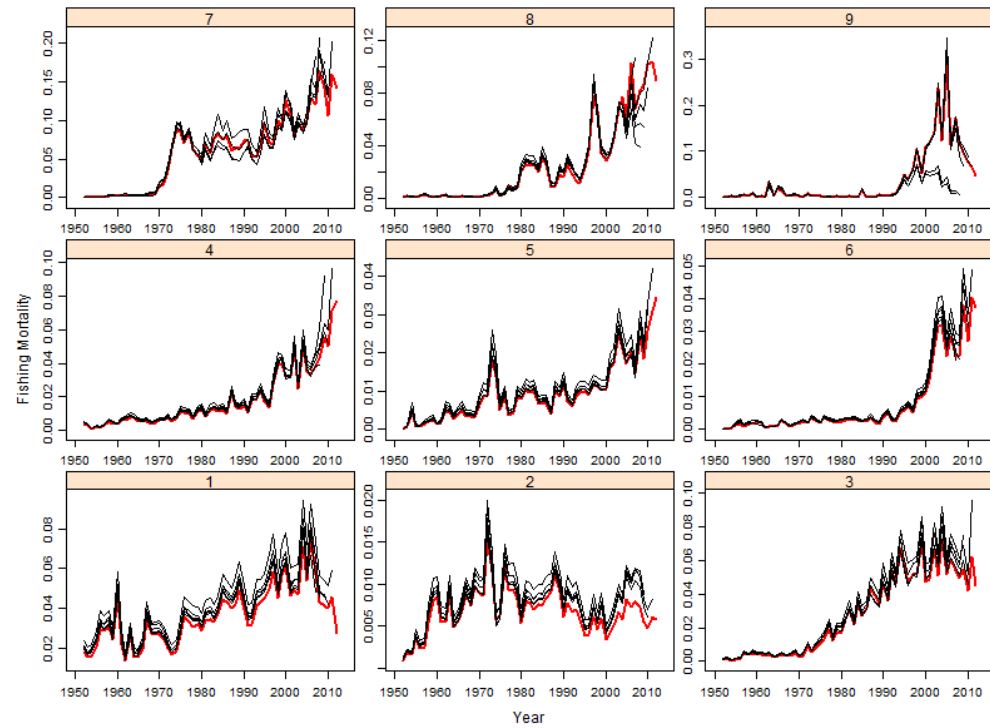
Retrospective Analysis

Retrospective Analysis

Recruitment

Fishing Mortality
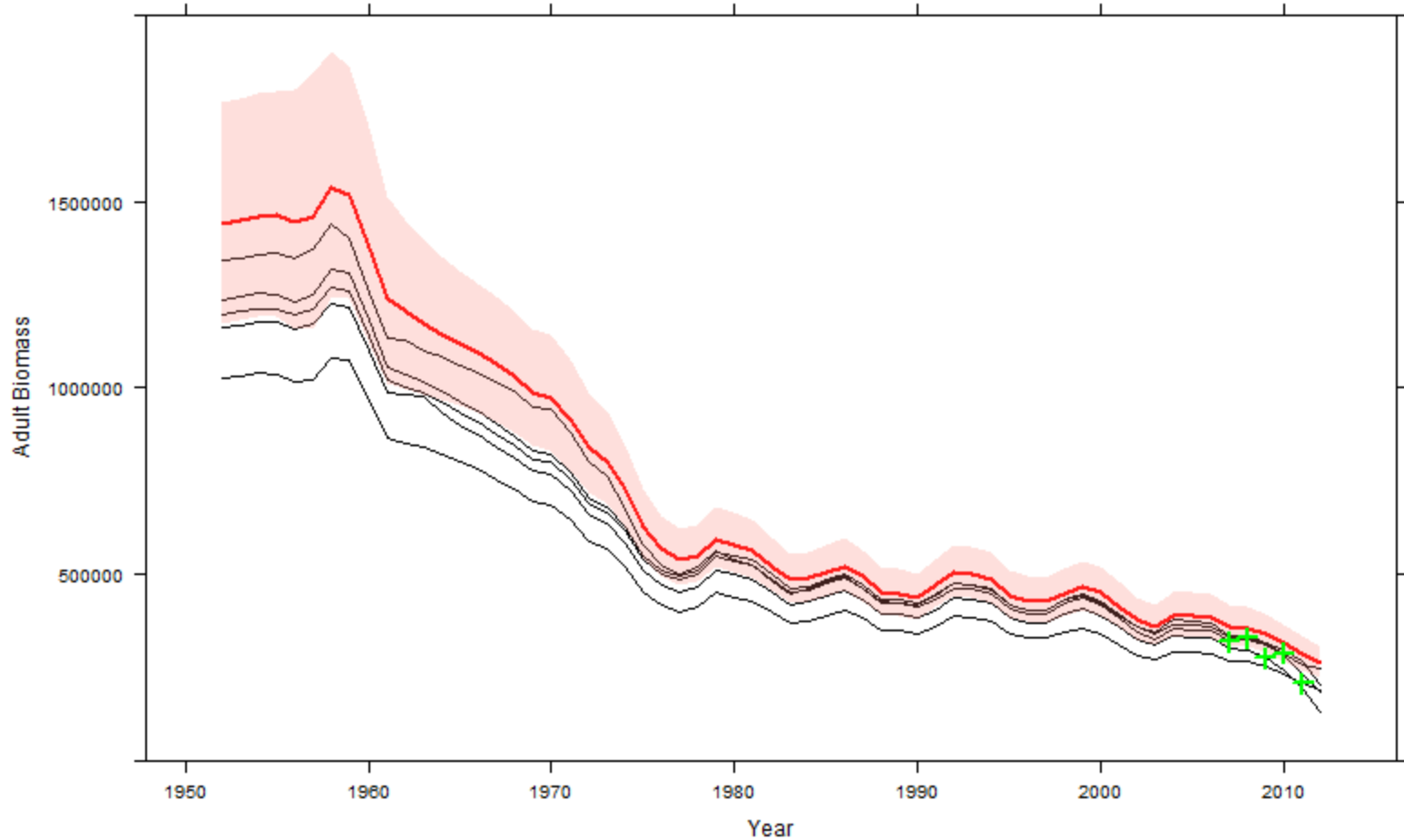
Retrospective Analysis

- Mohn's rho statistic   -0.106

- Rules of thumb
  - Brooks and Legault – inside the 90% confidence interval ✓
  - Hurtado-Ferro et al – between -0.15 and 0.2 (for longer-lived species) ✓

Hurtado-Ferro *et al* (2014) Looking in the rear-view mirror: bias and retrospective patterns in integrated, age structured stock assessment models. *ICES Journal of Marine Science*, doi: 10.1093/icesjms/fsu198.

Projections

- Both deterministic and stochastic projections

- Projections from the terminal year to 2012

- Projections based on catch for all fisheries

- Future recruitment determined from the SRR.

- Stochastic recruitment deviates taken from the recent 10yr period (excluding the terminal year).

  - 2002:2011; 2001:2010 etc.

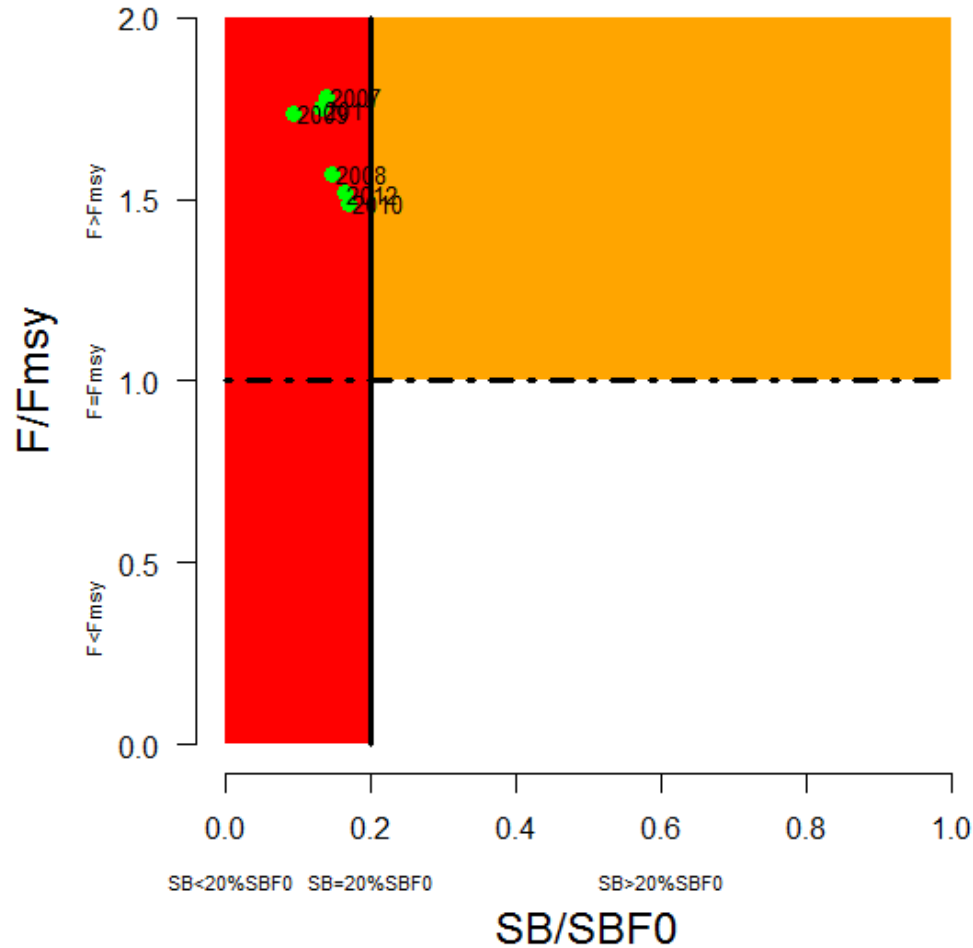- Catchability remained fixed at terminal assessment estimates.

Hindcast Analysis
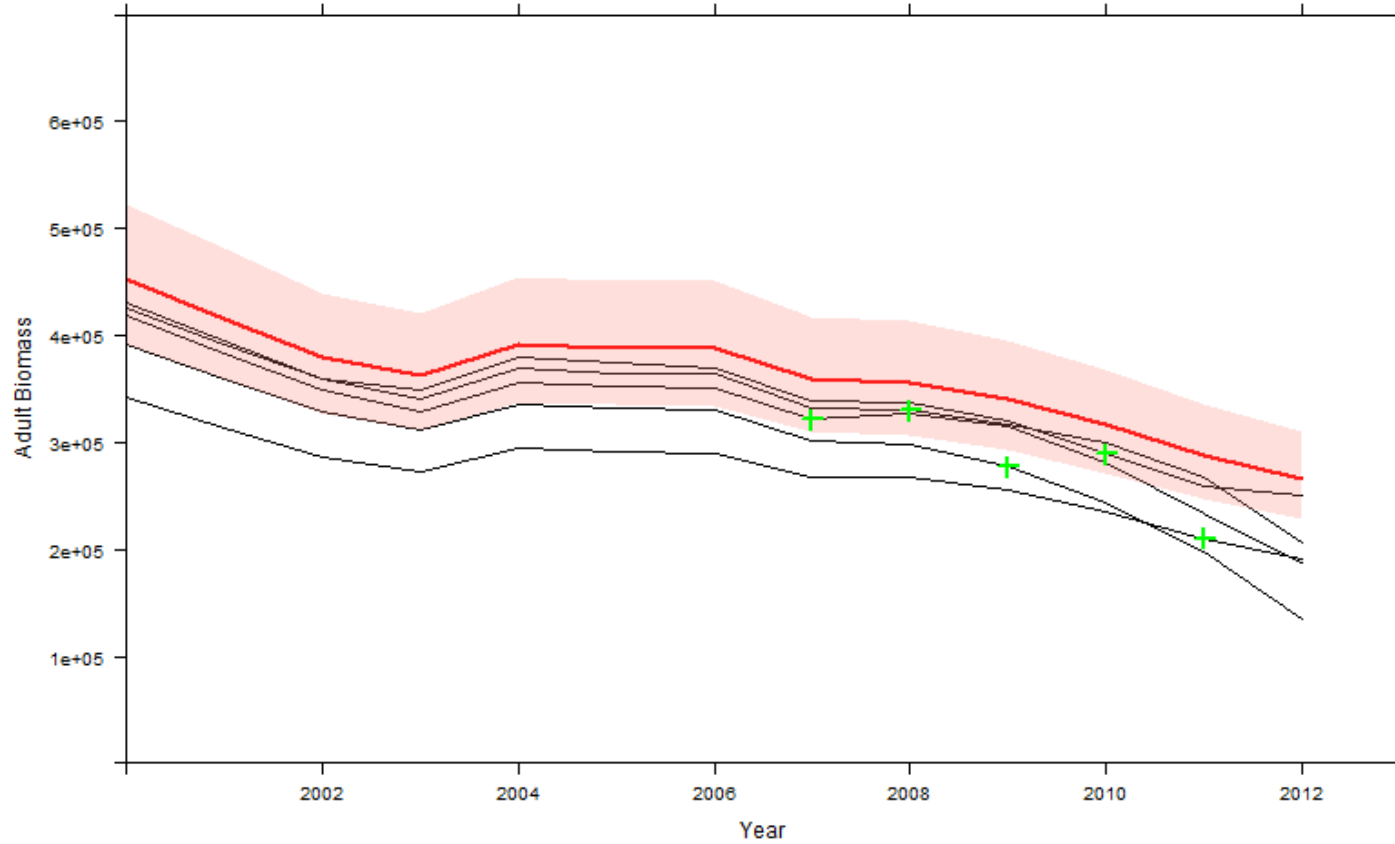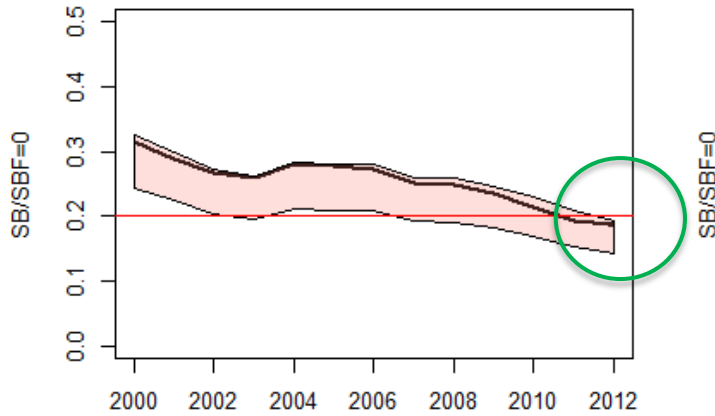
Hindcast Analysis

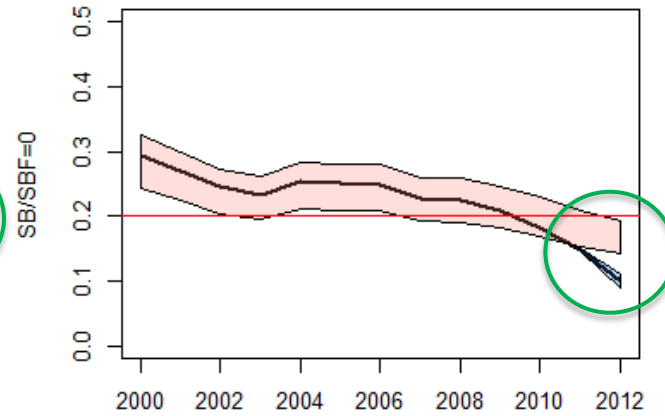# Hindcast Analysis

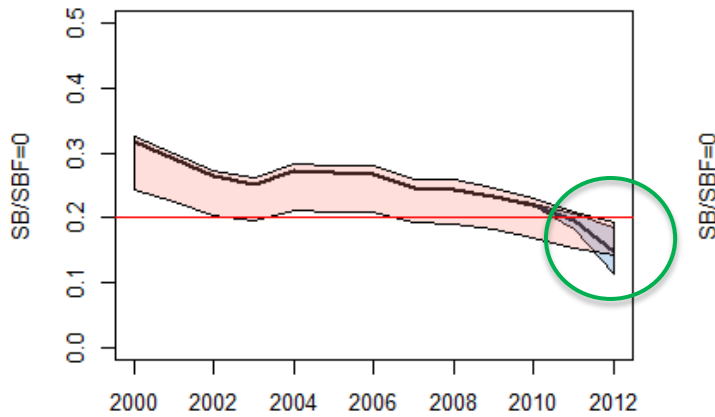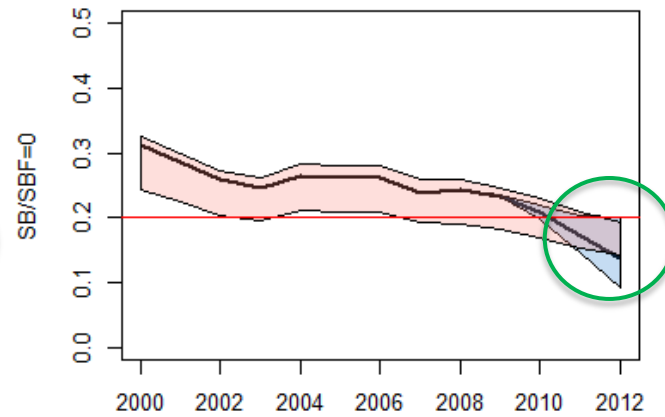SB/SBF0   0.09 to 0.17

F/Fmsy   1.48 to 1.78

Stochastic Hindcast

Discussion

- Retrospective analyses are an important diagnostic tool for stock assessments.
- Mohn's rho is just one metric of model performance
  - The magnitude of Mohn's rho is not related to bias in biomass or F and should not be used to assess how far an assessment is from the truth

- Retrospective forecasts
  - Short term, variability in the terminal population numbers.
  - Longer term, variability in future recruitment.
- Regional effects of retrospectives to be further examined.
- Retrospective issue is dominated by VPA concerns
  - Integrated assessments behave differently
  - More robust results when presented relative to $SB_{F=0}$

Conclusion

- No strong evidence of significant retrospective bias in 2014 BET assessment

- Short term, catch based, deterministic projections provide a consistent and relatively accurate indication of stock status when expressed relative to $SB_{F=0}$

- Stochastic projections will underestimate uncertainty in stock status in the first few years (under the current implementation of MFCL).

But note that

- Future development of MFCL will allow for variability in terminal population numbers at age.

- Integrated assessments can exhibit different characteristics to VPA under conditions that generate retrospective bias.