



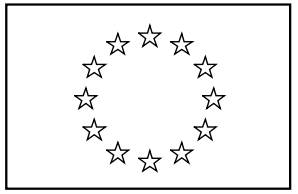

WP1_ECOFISH PROJECT

Hake assessment model benchmark

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DTU Aqua
National Institute of Aquatic Resources

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Background

Numerous Stock Assessment methods are used in the world.

These can be classified according to;

- **their statistical nature,**
- **their underlying assumptions**
- **their use of various available data sets**

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Background continue.....

- ✓Statistical catch-at-age (SCAA) and State-space stock Assessment Model (SAM) are applied to the Namibian hake data
- ✓ Both age based model assessments
- ✓Both model are based on Population dynamic equation

Objective of the study

✓**The aim of this study is to benchmark the Statistical catch-at–age model with a state-space stochastic stock assessment model.**

✓**Compare the features of the two models**

✓**Compare the model outputs as estimate by the two stock assessment model.**

✓ **Compare the uncertainties in model output**

✓**Summarize the pros and cons.**

Materials and Methods

Statistical catch-at-age model (SCAA)

Model:

- Includes all available data
- Assume known age-dependent M (set externally)
- Steepness parameter is estimated (stock-recruitment relationship)
- Catchability is estimated
- Different selectivity parameters for fisheries and survey
- An objective function is used to optimize the fit of the model to the available data

State space assessment model (SAM)

Model:

- Includes all available data
- Assume known age-dependent M (set externally)
- Estimation of uncertainties an integrated part of model and unobserved random variables included
- Reduced number of model parameters compared to a full SCAA model, due to:
  Example: fishing mortality (F) at age as a random walk with yearly variance (σ),
  → only one parameter (σ) to be estimated and F's for all years are predicted once the parameters are estimated
- It is able to handle missing observations
- Same selectivity-at-age across the entire region
- An objective function is used to optimize the fit of the model to the available data

Why a new model ?

SAM is easy to use, e.g. less

SAM has some technical advantages with respect to evolving selectivity by commercial fleets (not period specific) and statistically rigorous handling of observations

SAM comes along with a web-interface which allows utilisation without being ”the” stock assessment expert. This also ease internet based cooperation between assessment scientists from different institutes

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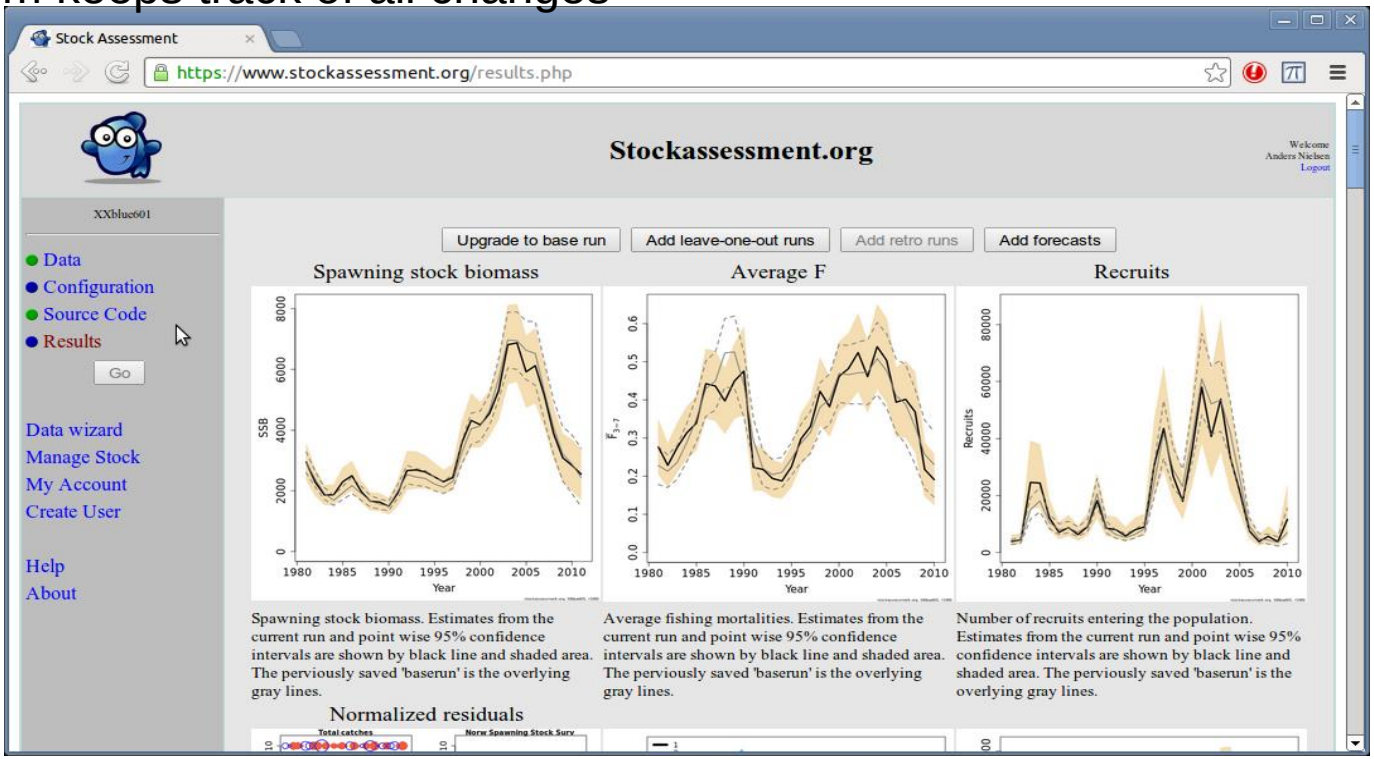
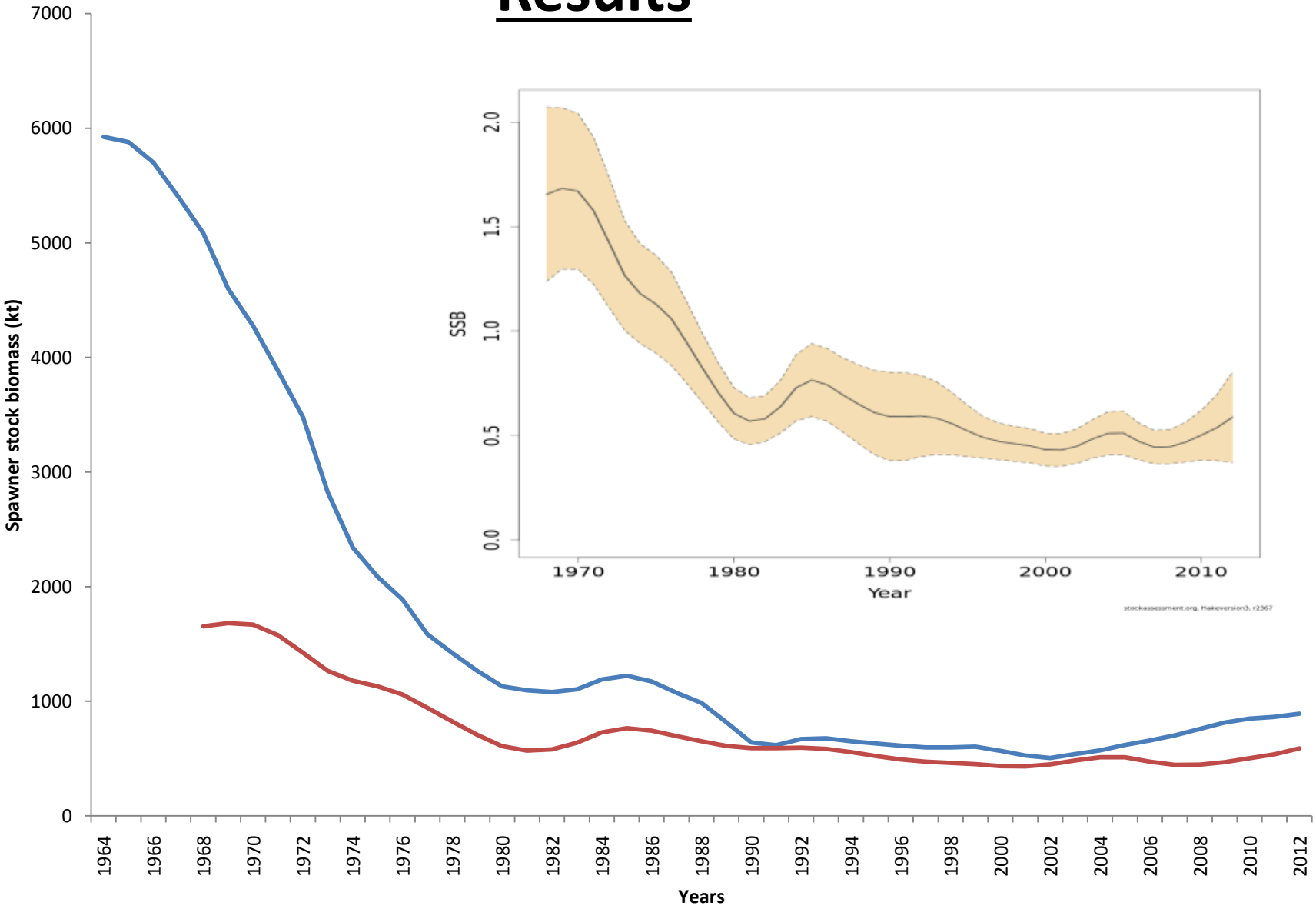
Web interface for SAM

Transparent for all users:

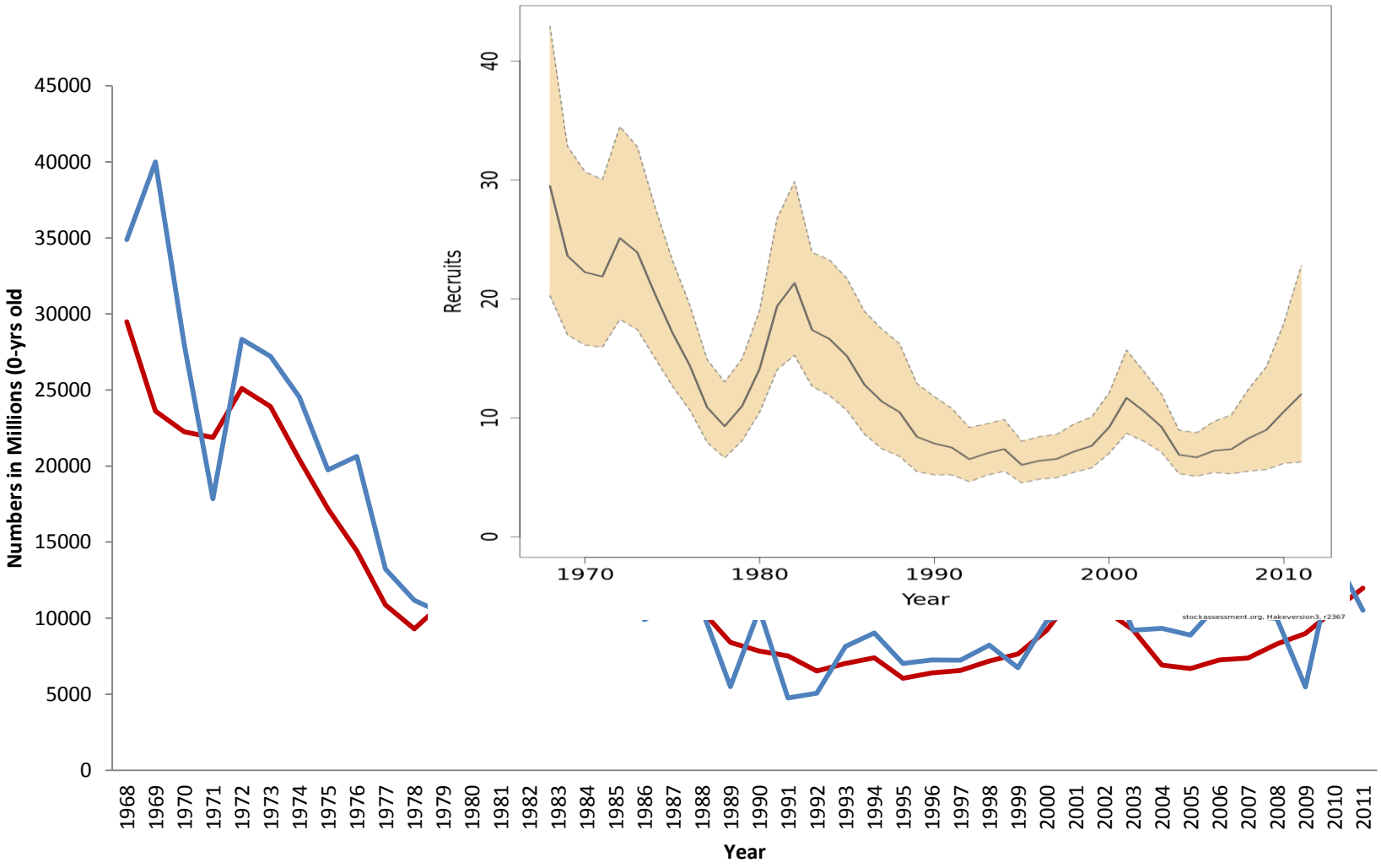
- see all details of the implementation
- run the assessment
- experiment with data
- experiment with model assumptions
- everyone is running the same version and uses same data
- makes update assessment very easy
- System keeps track of all changes



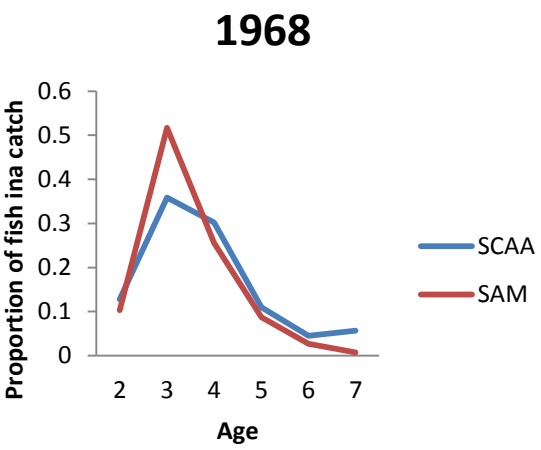
Results

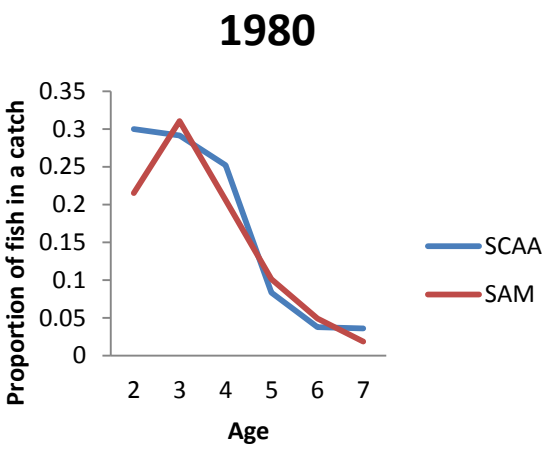

Spawner stock biomass (kt)
7000
6000
5000
4000
3000
2000
1000
0
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Years
SSB
2.0
1.5
1.0
0.5
0.0
1970
1980
1990
2000
2010
Year

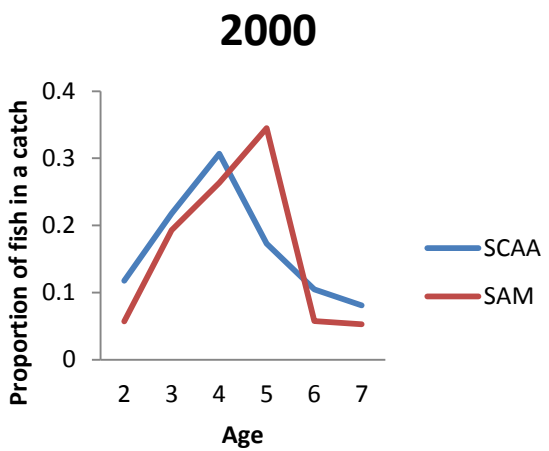
Recruitment

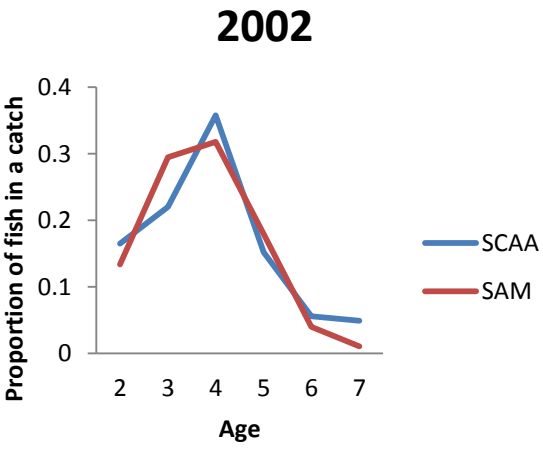


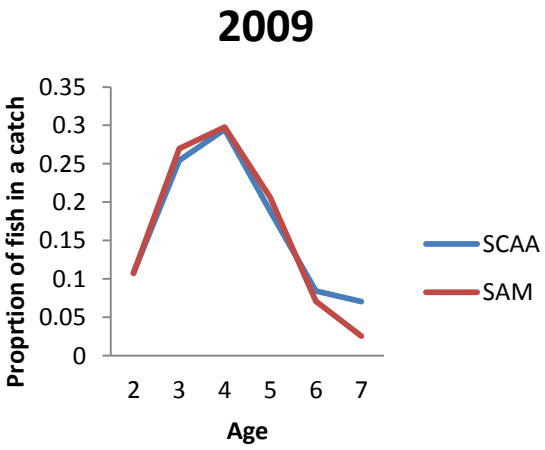
Models fit to catch-at-age

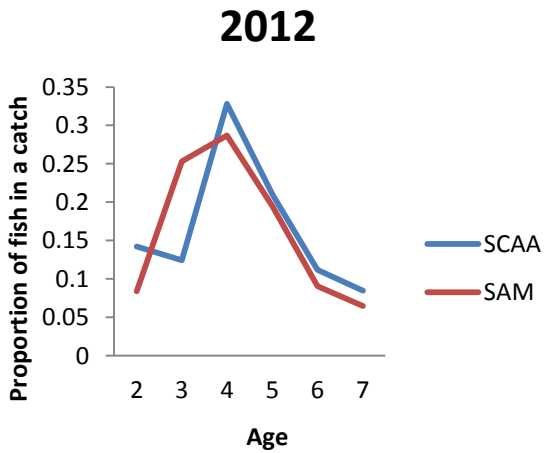




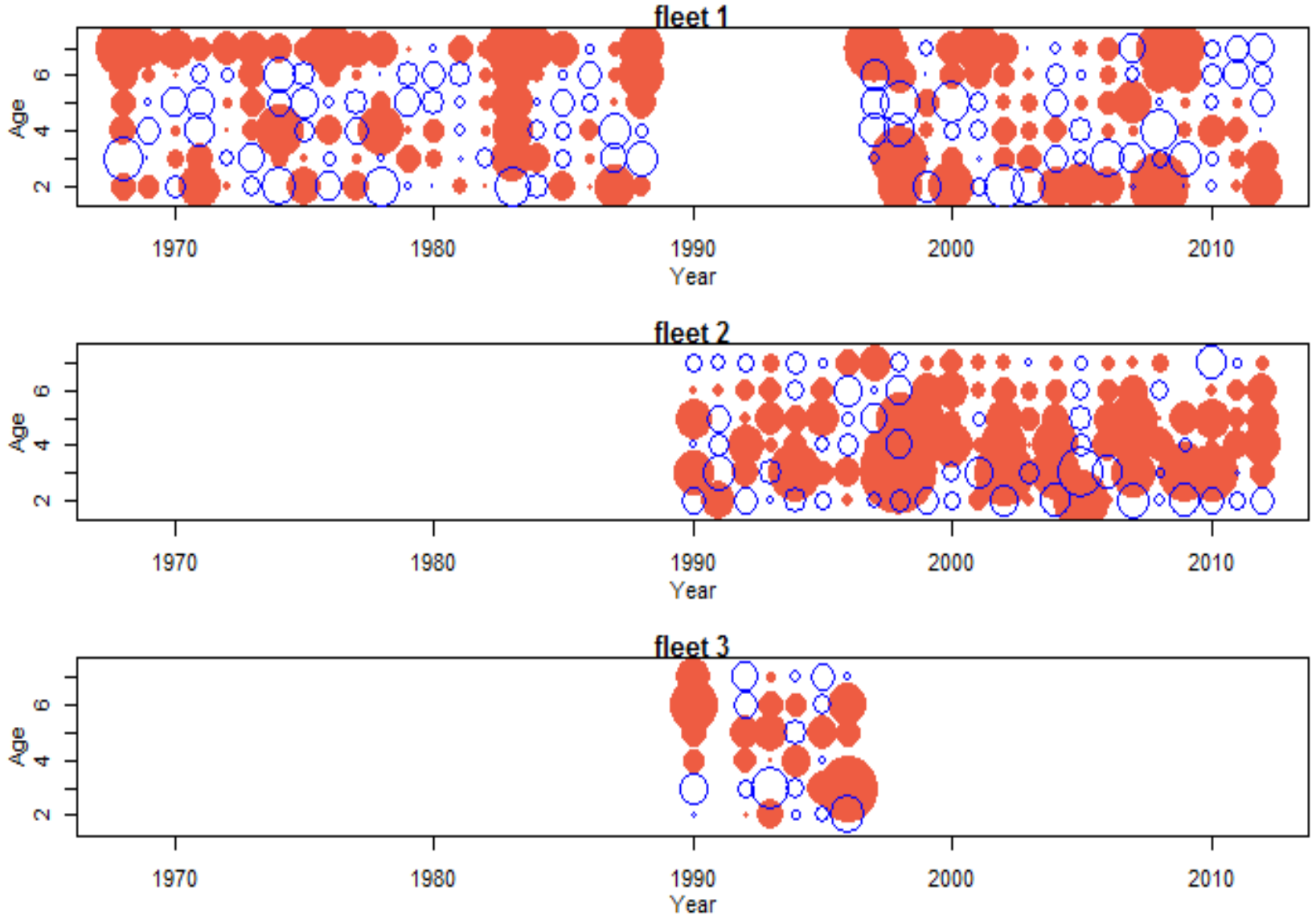




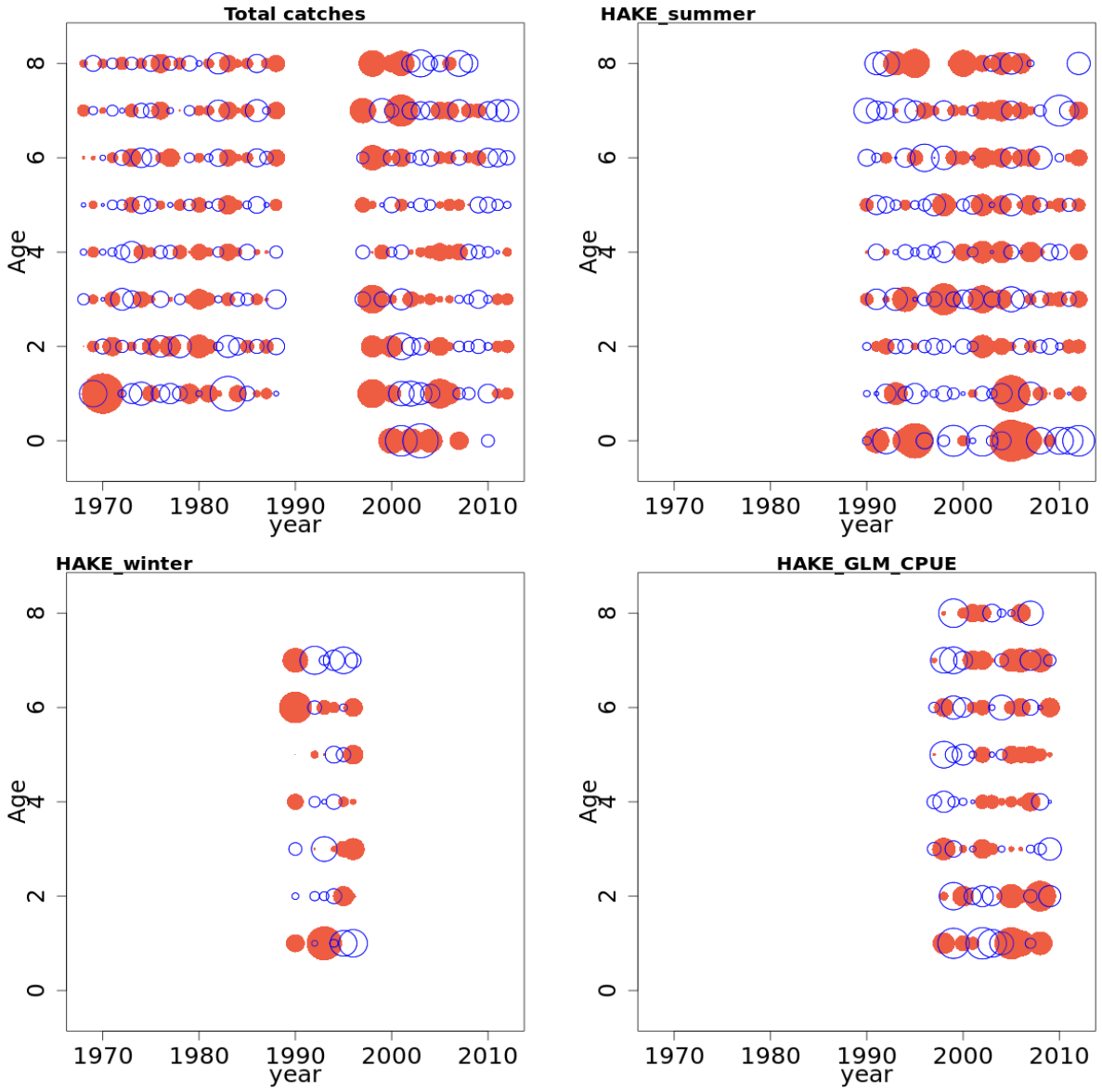


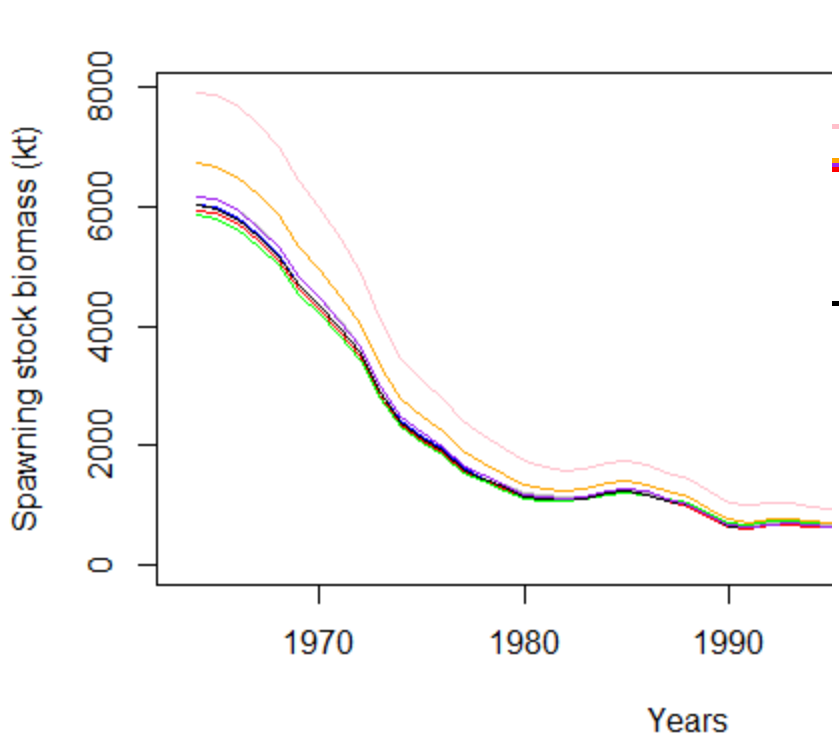


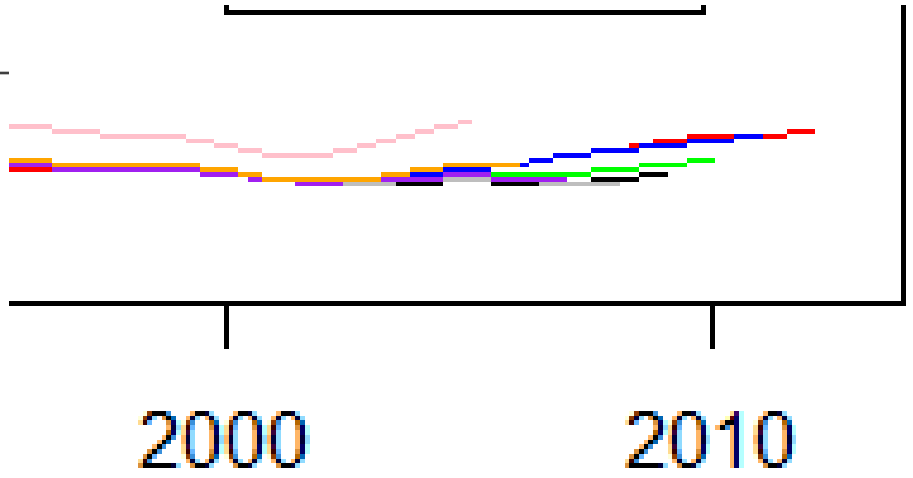
SCAA residuals

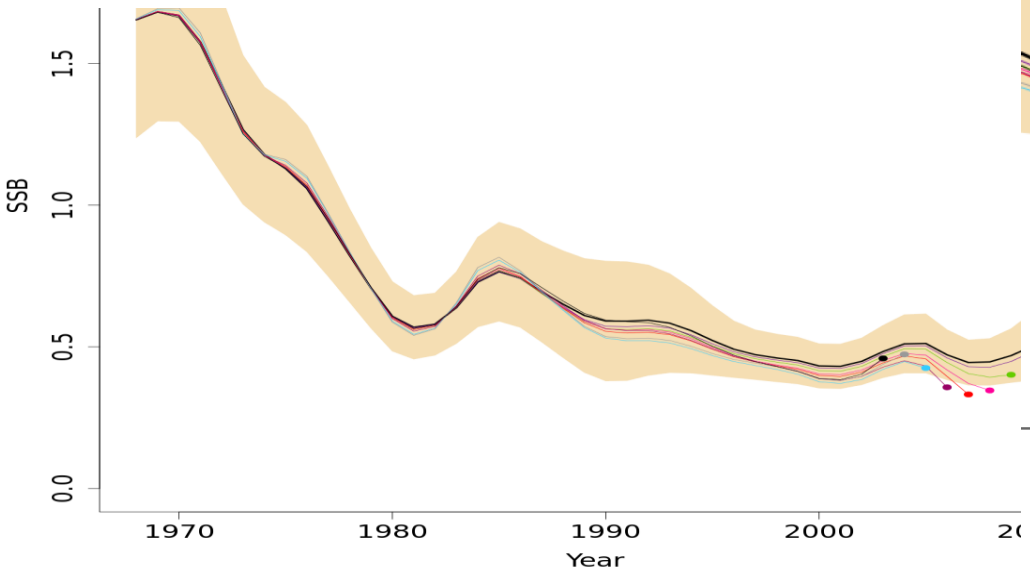


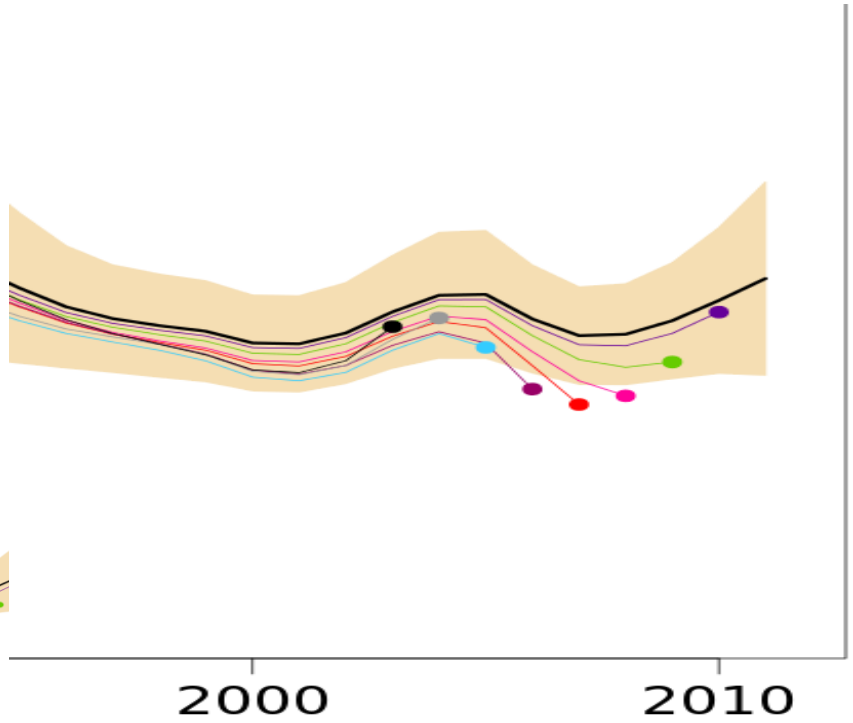
SAM catch-at-age residuals




Spawning stock biomass (kt)
0
2000
4000
6000
8000
1970
1980
1990
Years


2000
2010


SSB
0.0
0.5
1.0
1.5
1970
1980
1990
2000
Year


2000
2010

Summary

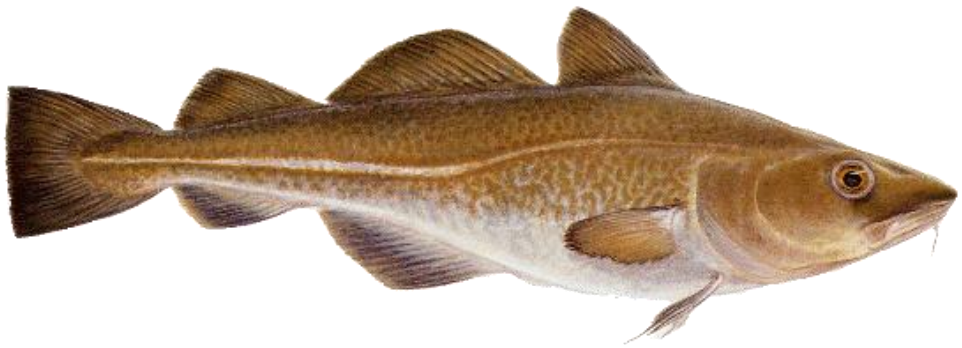
- **Both models predict the spawning stock biomass to be much lower than in earlier years , SAM estimated a lower spawner stock in the earlier years**

- **Both models provide a similar pattern/fits to the catch-at-age data, with minimum differences**

- **SCAA- Retrospective analysis did not show any patterns**

- **SAM -Retrospective analysis showed consistent underestimation of the spawning stock biomass and recruitment**

- **The largest difference in the diagnostics between the methods were found in the catch-at-age residuals, where patterns were found in the SCAA model.**



Model.what?

Thank you !!!!!

not sure...