Stock Assessment Fight Night with a4a!

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Welcome to a4a Fight Night!

This evening we will:

- Learn about Assessment For All (a4a)
- Introduce the web portal
- Fight!

The first rule of a4a Fight Night is:

Install a Google Chrome browser or Safari for iOS

Use a laptop, tablet, even a smart phone (Android)

The a4a initiative

- Lots of stocks
- Lots of data (DCF)
- Limited resources (time and expertise)

Proposition:

- Make stock assessment more accessible
- Automate some processes

Linear models

Widely used in science - intuitive syntax

Including stock assessments e.g. seperable F assumption:

$$F_{a,y} = S_a * F_y$$

As a linear model:

$$logF \sim age + year$$

Examples

Seperable model where level of F is smooth over time:

$$logF \sim age + s(year)$$

Seperable model where level of F is smooth over age:

$$logF \sim s(age) + year$$

Seperable model where level of F is smooth over age and year:

$$logF \sim s(age, year)$$

More examples

F is modelled by 2 seperable periods e.g. step change in catchability

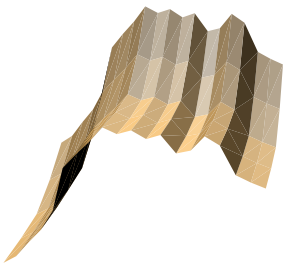
$$logF \sim age : block + year$$

A SAM or TSA-like model:

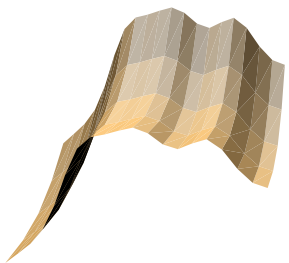
$$logF \sim s(year) : age + s(age)$$

Examples of linear models for F

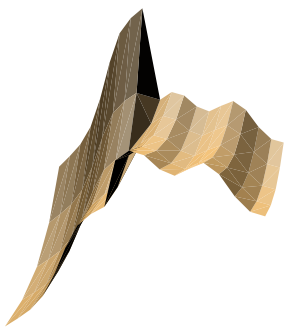
~ age + year



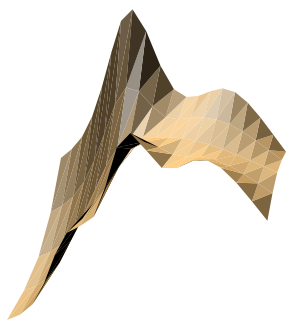
~ s(age) + s(year)



~ s(age):group + s(year)



~ s(age, year)



a4a model details

Statistical catch-at-age model

Implemented in R / FLR (source code on Github)

Linear *submodels* for:

- log F
- log Q
- log R

Recruitment modelled as *fixed variance* random effect

Models: Ricker, Beverton-Holt, smooth hockey-stick, mean

What we can do

- Missing values
- Multiple surveys
- Variable Q, F, variance
- Splines (fixed degrees of freedom)
- Stock recruit relationship (fixed variance)
- Stock recruit relationship (estimated variance - SLOW)
- Fixed variance random effects

Model performance

- Estimated SSB, Recruitment, F and Catch
- Residual patterns
- Bayesian Information Criterion (BIC)

The web portal

browser: Google Chrome or Safari for iOS

https://fishreg.jrc.ec.europa.eu/a4asurvey/

Register with your email or a nickname containing:

joesmith@something.com

or if you want to get creative something like

XSArevenge@xsa.com

Choose a password

Screenshots and tour

Stock data

- Simulated data from real life histories
- Range of fishing histories
  - Developing
  - Developing and stabilising
  - Stabilising with high F
  - Recovery
  - Developing-stable-recovery

Submodels

- F (Fishing mortality)
- Q (Catchability)
- R (Recruitment)

F submodels

- **~factor(age)+factor(year)** *(Factor on age and year)*
- **~factor(age)+s(year,k=6)** *(Factor on age, smoother on year)*
- **~factor(year)** *(Factor on year)*
- **~s(age, k = 4)+factor(year)** *(Smoother on age, factor on year)*
- **~te(age, year, k=c(4,6))** *(Smoother on age and year)*

Q submodels

- **list(~factor(replace(age,age>(max(age)-2),max(age)-2)))** *(Flat top)*
- **~s(age, k = 3)** *(Smoother on age)*
- **~te(age, year, k = c(3, 3))** *(Smoother on age and year)*

R submodels

- **~bevholt(CV=0.3)**
- **~bevholt(CV=0.3, a=~s(year,k=3))**
- **~geomean(CV=0.3)**
- **~geomean(a=~s(year,k=3),CV=0.3)** *(Geometric mean with smoother on year)*

Gives **80** submodel combinations

Let's get ready to rumble!

The rules

Timed rounds.

Within each round:

1. Look at the input data
2. Choose submodels
3. Evaluate fit, residuals and BIC
4. Repeat 2 and 3 until happy
    - save different models and then submit the best one
    - you want to minimize the BIC, so the lowest number (negative) will be the best.

Failure to submit within time limit = NUL POINTS!