

# The FLR platform and the a4a initiative



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## Why, oh why?

Schnute *et al.* (2007 and 1998) compared the number of software tools and languages currently available for stock assessments with the Babel tower myth and concluded that: “The cosmic plan for **confounding software languages** seems to be working remarkably well among the community of quantitative fishery scientists!”

## A brief history of FLR

- Started by FEMS EU project
- COMMIT & EFIMAS EU projects provided much of time and sweat
- Presented to ICES WG Methods 2004
- FLCore version 1.0 - December 2005
  - FLQuant with 5 dimensions, no “iter”
  - Release often, release early. Bugs galore
- FLCore version 1.4 - 2007
  - Stable, full of treats an joy

## FLR 1.4 - The Golden Jackal



## A brief history of FLR (cont.)

- 2007-2009: The Silk Road to version 2
  - New FLQuant with 6 dimensions: uncertainty in structure
  - Rewrite of most methods
  - Extension of methods available
  - New classes: FLModel
  - Stronger use of class inheritance
  - Overhaul of man pages
  - Simplification of package map
- FLCore version 2.0 - January 2009
- FLCore version 2.2 - 2010

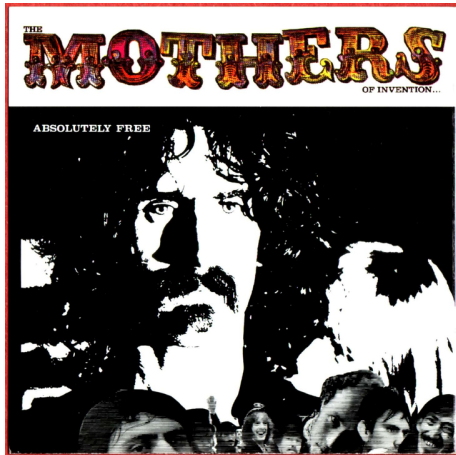
## FLR 2.2 - Swordfish Polka



## A brief history of FLR (cont. even more)

- 2009-2011: Settling ideas with 2.4
  - Clean code
  - Stabilize FLModel/FLSR
  - Improve documentation and include vignettes
  - Lots of minor corrections and additions
  - Redesign website and review 'Teach Yourself FLR'

## FLR 2.4 - The Duke of Prawns





## Current

- FLR 2.5.\*, in continuous development
- Changing package map, but
  - Classes are stable
  - New methods
  - Code does not brake
- Keep track of versions you used: local copies, github or packrat

## FLR 2.6 - Black Swan



## FLR development

FLR is a **collaborative development project**, where distinct scientists that constitute *the FLR Core Team* work simultaneously on code, documentation, etc.

- Development is managed through R-Forge
- Packages on repository
- Documentation on open website
- Funding has come from a number of EU projects (FEMS, COMMIT, EFIMAS, Fisboat, UNCOVER, JRC)

## GNU project (<http://gnu.org>)

*Free software is a matter of liberty, not price*

free = free speech

free != free beer

## Collaboration and Open Source

*I think the real issue about adoption of open source is that **nobody can really ever 'design' a complex system.** That's simply not how things work: people aren't that smart - nobody is. And what open source allows is to not actually 'design' things, but let them **evolve**, through lots of different pressures in the market, and having the end result just **continually improve***

Linus Torvalds



## Mission statement

The FLR project provides a **platform for quantitative fisheries science** based on the R statistical language. The guiding principles of FLR are:

- **openness** - through community involvement and the open source ethos
- **flexibility** - through a design that does not constrain the user to a given paradigm
- **extendibility** - through the provision of tools that are ready to be personalized and adapted.

## FLR goal

To **promote and generalize** the use of **good quality, open source, flexible software** in all areas of quantitative fisheries research and management advice, with a key focus on Management Strategies Evaluation.

## FLR aims

In detail, FLR aims to facilitate and promote research about:

- Stock assessment and provision of management advice
- Data and model validation through simulation
- Risk analysis
- Capacity development & education
- Promote collaboration and openness in quantitative fisheries science
- Support the development of new models and methods
- Promote the distribution of new models and methods to a wide public.



## Really, what is FLR?

- Extendable toolbox for implementing bio-economic simulation models of fishery systems
- Tools used by managers (hopefully) as well as scientists
- With many applications including:
  - Fit stock-recruitment relationships,
  - Model fleet dynamics (including economics),
  - Simulate and evaluate management procedures and HCRs,
  - More than just stock assessment (VPA, XSA, ICES uptake)
- A software platform for quantitative fisheries science
- A collection of R packages
- A team of devoted developers
- A community of active users

## R and FLR

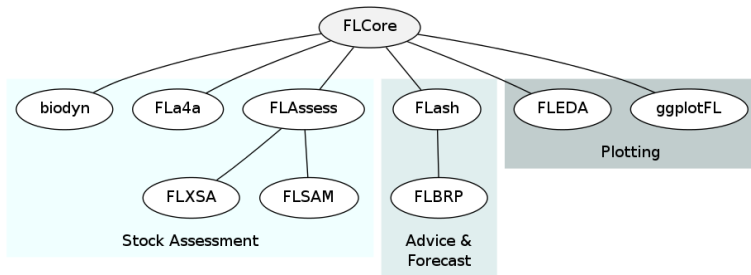
Why do we use R?

- Existing platform for statistical modelling
- Good graphics capabilities
- Multi-platform
- Open source
- Links with compiled languages like Fortran, C / C++ code for speed
- Easily extendable in the form of 'packages'

## Design principles

- Classes to represent different elements of fisheries systems
- 'physical' objects (e.g. FLStock class represents a fish stock)
- 'methodological' objects (e.g. FLBRP class containing methods to calculate BRP)
- Link objects to create simulations - Lego blocks (MSE example)
- Learning curve: trade off between flexibility and simplicity (no black boxes and no handle turning)

## Packages



## a4a - Assessment for All

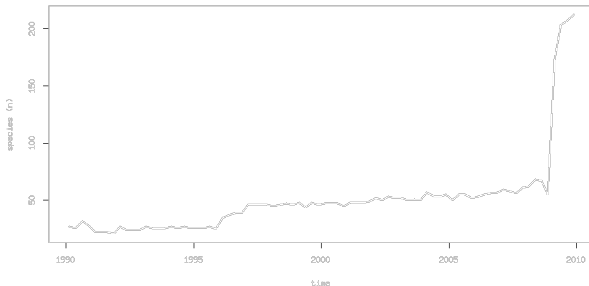
### Long term vision

- Standard methods to apply rapidly to a large number of stocks
- No strong statistical technical background
- Using technical knowledge on the fisheries, stocks and ecosystem

### Why

- Demand for abundance and exploitation estimates
- Large investments in collecting information
- Scientific advice for fisheries management.

## a4a - Sampled species (PT)



**What if we have to assess hundreds of stocks?**  
*Estimate what you know, simulate what you don't*

## a4a Initiative EC JRC

1. Develop a4a SA method
2. Discussion on *massive* stock assessment
3. Capacity building (this course)

<https://fishreg.jrc.ec.europa.eu/web/a4a>

## a4a SA model

- *Moderate* data stock (Catch, Survey/CPUE, little bio)
- NL CaA model, R/FLR/ADMB
- *Simple* syntax

```
> fmodel = separable()  
> qmodel = trawl(techcreep=0.03)  
> rmodel = beverton(a=s(NAO))
```

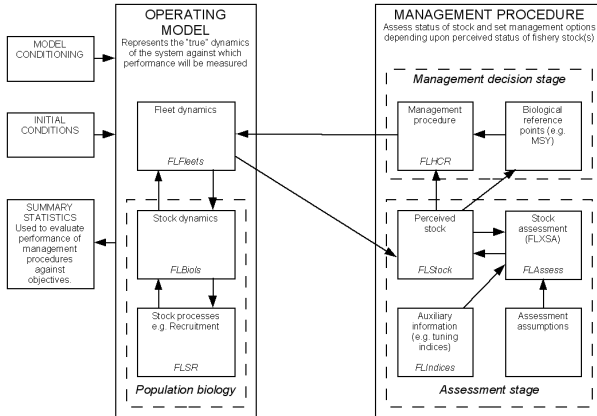


## a4a MSE

### Building an STANDARD MSE

1. OM uncertainty in growth,  $S/R$  and selectivity
2. HCRs based on catch, surveys, assessments
3. Assessment models of increasing complexity
4. OE for catch and index
5. IE in  $F$  or catch

## MSE - The Lego block approach

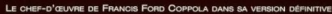


## Who's using it ? (2009)

- ICES - 22+ stocks
- STECF - Several including MP & HCR studies
- AFMA - Northern Prawn Fishery
- CECAF - Istam project
- CCAMLR - Patagonian toothfish, Mackerel icefish
- GFCM - Deepwater pink shrimp, Hake in GSA 05
- ICCAT - Bluefin CITES evaluations, Swordfish, Albacore
- IOTC - Albacore
- NEAFC - Blue Whiting, NOSS Herring
- NAFO - Greenland Halibut, American Plaice, Placentia Cod
- EC - Evaluation of new CFP
- JRC - a4a Initiative, STECF work

## Open All !!

- Open Science
- Open Data
- Open Source
- Reproducible research
- Open Mind !!

European  
Commission

THIS IS THE END...

MARLON  
BRANDO

Robert  
**DUVALL**

Martin  
**SHEEN**

FLIR Now

UN FILM DE  
**FRANCIS FORD COPPOLA**

[illegible]

## More information

- FLR Project @ <http://flr-project.org>
- Source code @ <http://github.com/flr/>
- ```
install.packages(repos="http://flr-project.org/R")
```



**KEEP  
CALM  
AND  
CODE  
FLR**