The a4a Initiative

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Long term vision

To have a group of standard methods *that can be applied* rapidly *to a large number of stocks,* without requiring *a strong statistical technical background, but* making use *of the technical knowledge on the fisheries, stocks and ecosystem characteristics.*

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Why ?

Increasing demand for marine fish abundance and exploitation estimates.

Large investments being made in collecting information.

Increasing will to rely on scientific advice for fisheries management.

Setting the scene in Europe

- Biological parameters (growth & reproduction) are being collected for 250+ stocks in waters where European fleets operate.
- DCF's "concurrent sampling" concept(**) requires *sampling all or a predefined assemblage of species, simultaneously in a vessel's catches or landings*
- DCF & Advice budget 2007-2013 is ~360m€(*)

(*) SEC(2011) 1417 final (**) *2008/949/EC, Annex, Chapter I, 1.b*

Setting the scene in Europe

- The DCF reports make it difficult to evaluate the number of species each Member State is sampling, but it should be hundreds.

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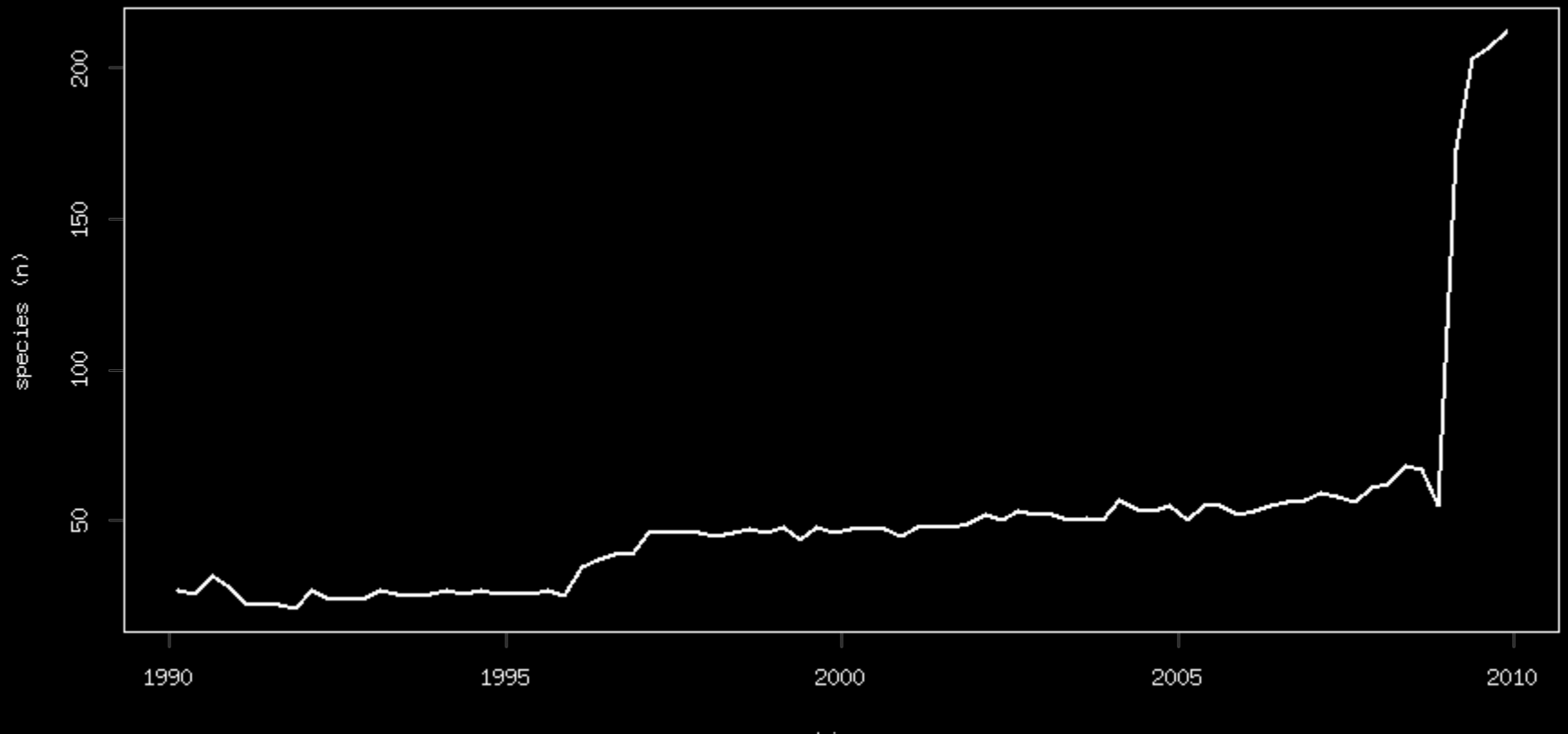
e.g. PT sampled species (lenghts)



Setting the scene worldwide

- US law requires all federal fisheries to come up with annual catch limits, including appropriate buffers to account for scientific and management uncertainties.

However ...

- Beddington et.al (2007) show that intermediate data stocks that are not being assessed make up for 30% in the USA, 78% in New Zealand, 48% in Australia, 61% in the North-East Atlantic.

So what ? (Miles *dixit*)

What if ~2020 EU fisheries scientists are asked to assess hundreds of stocks, and justify ~1bn€ spent in data collection ?

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Solution !?

Standardize and enter automatic mode !!

Solution !?

Estimate what you know,
MSE(*) what you don't,
and keep it intuitive !!

(*) Management Strategies Evaluation (kell et.al, 2007)

Solution !?

Move focus from numerical magic into more interesting subjects, like ecossystem, population or fleet dynamics.

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(a) develop an assessment method targeting stocks that have a reduced knowledge base on biology and moderate time series on exploitation and abundance;

(b) trigger the discussion about the problem of massive stock assessment.

(c) capacity building

How ?

(1) Define a moderate data stock (entry level)

(2) Develop a stock assessment framework

(3) Develop a forecasting algorithm based on MSE

(4) Make it intuitive

(1) The "moderate data stock"

(a) Exploitation

- Nominal effort
- Volume (L, D)
- Length frequencies

(b) Biology

- Information based knife edge mat ogive
- Indications for growth model
- Length – weight relationship

(c) Index of abundance

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(2) The stock assessment ~~model~~ framework

- Non-Linear Mixed model implemented in R/FLR(*)/ADMB that can be applied rapidly to a wide range of situations with low parametrization requirements

(*) http://flr-project.org

- As simple as a linear regression !?

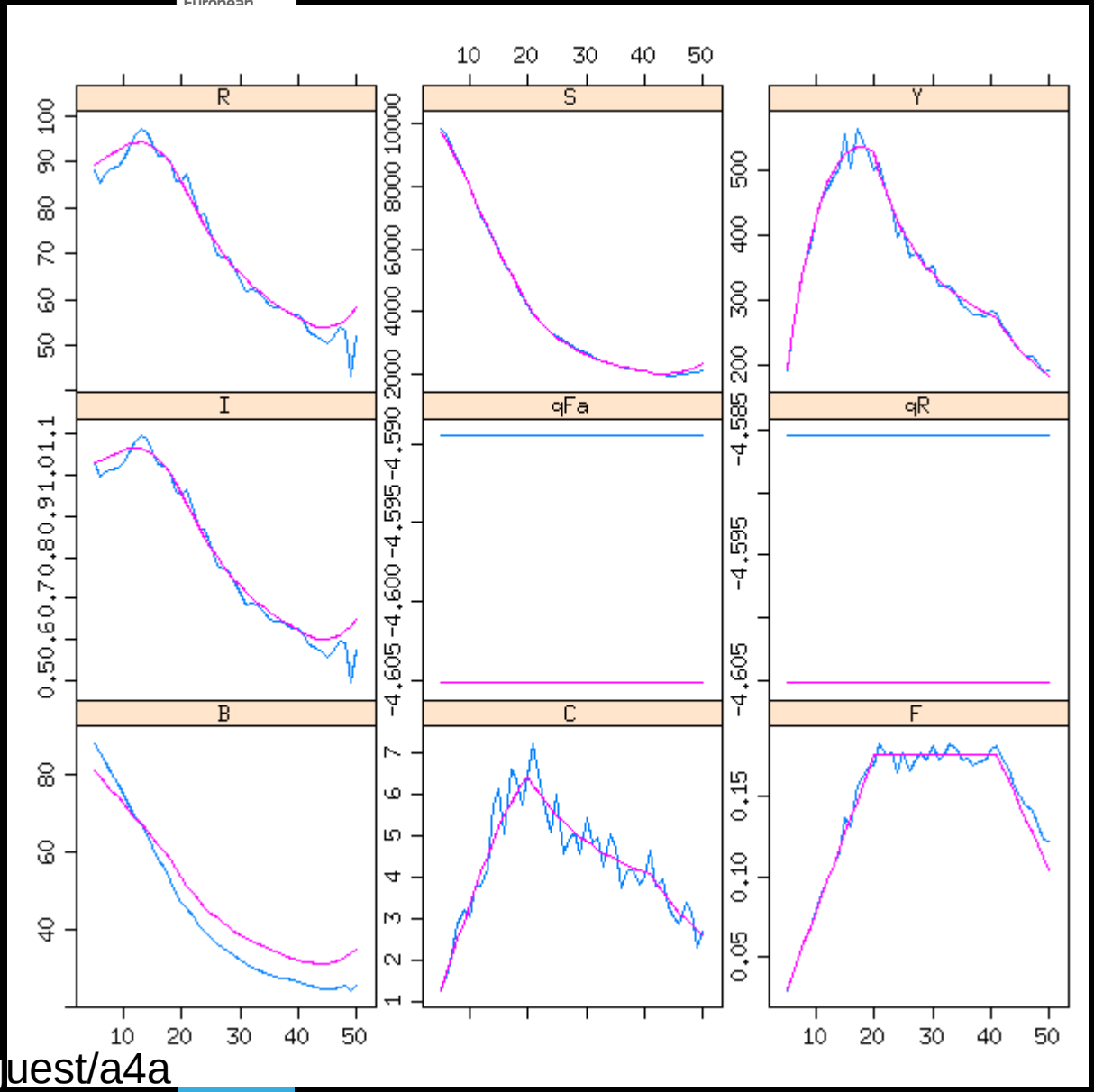
```
fmodel = separable()
qmodel = trawl(techcreep=0.03)
rmodel = beverton(a=s(NAO))
```

(*) http://flr-project.org

Testing, 1,2 …

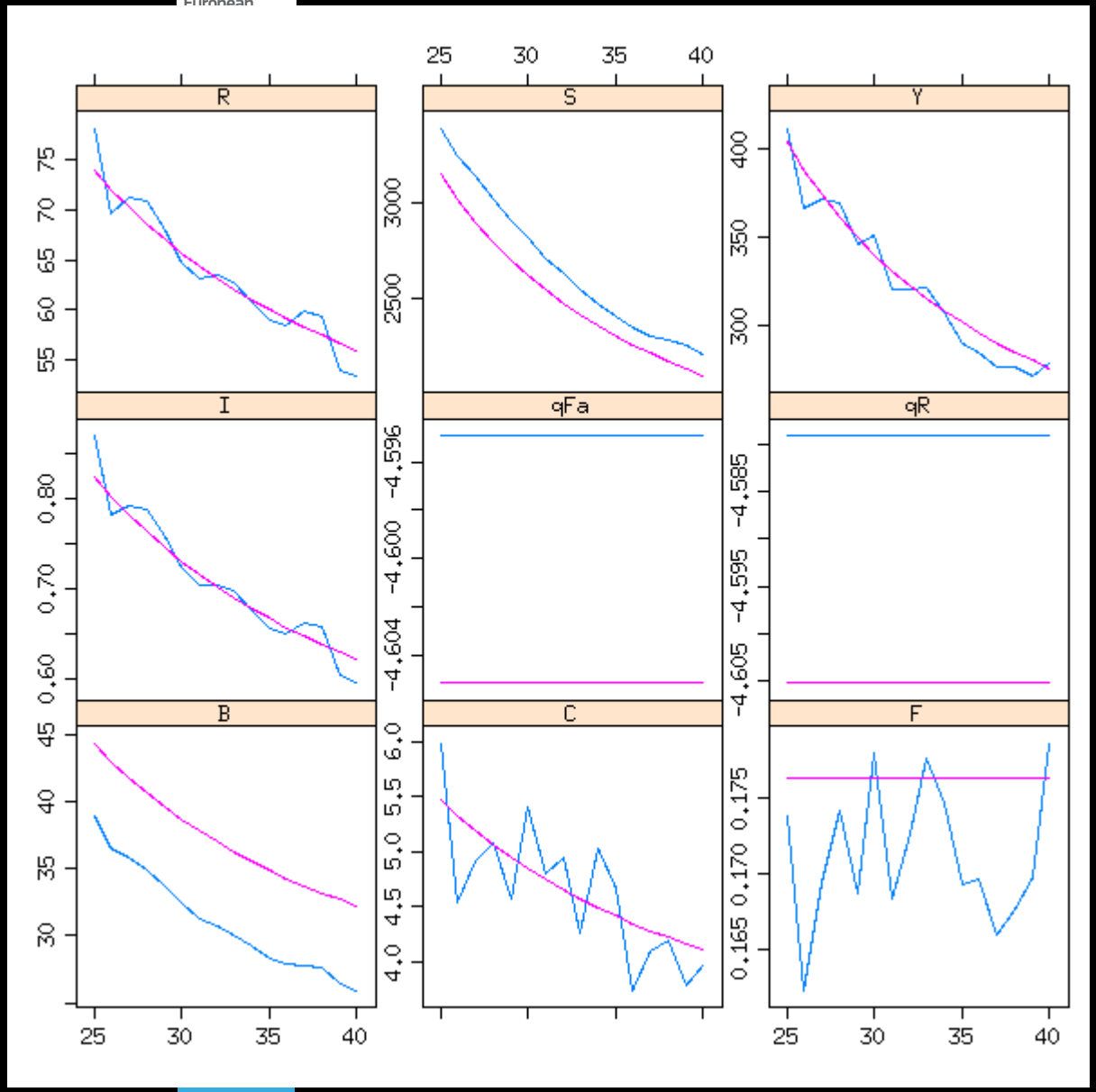
WKLIFE stocks

Fishbase stocks(*)



(*) http://fishnet-dev.jrc.it/web/guest/a4a

Testing, 1,2 ...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-4.595
-4.585
30
35
40
45
4.0
4.5
5.0
5.5
6.0
0.165
0.170
0.175

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(3) MSE in the context of a4a

A sophisticated forecasting algorithm that takes into account structural uncertainty about stock dynamics (growth, recruitment, maturity) and on exploitation by commercial fleets (selectivity), embedding the framework of decision making.

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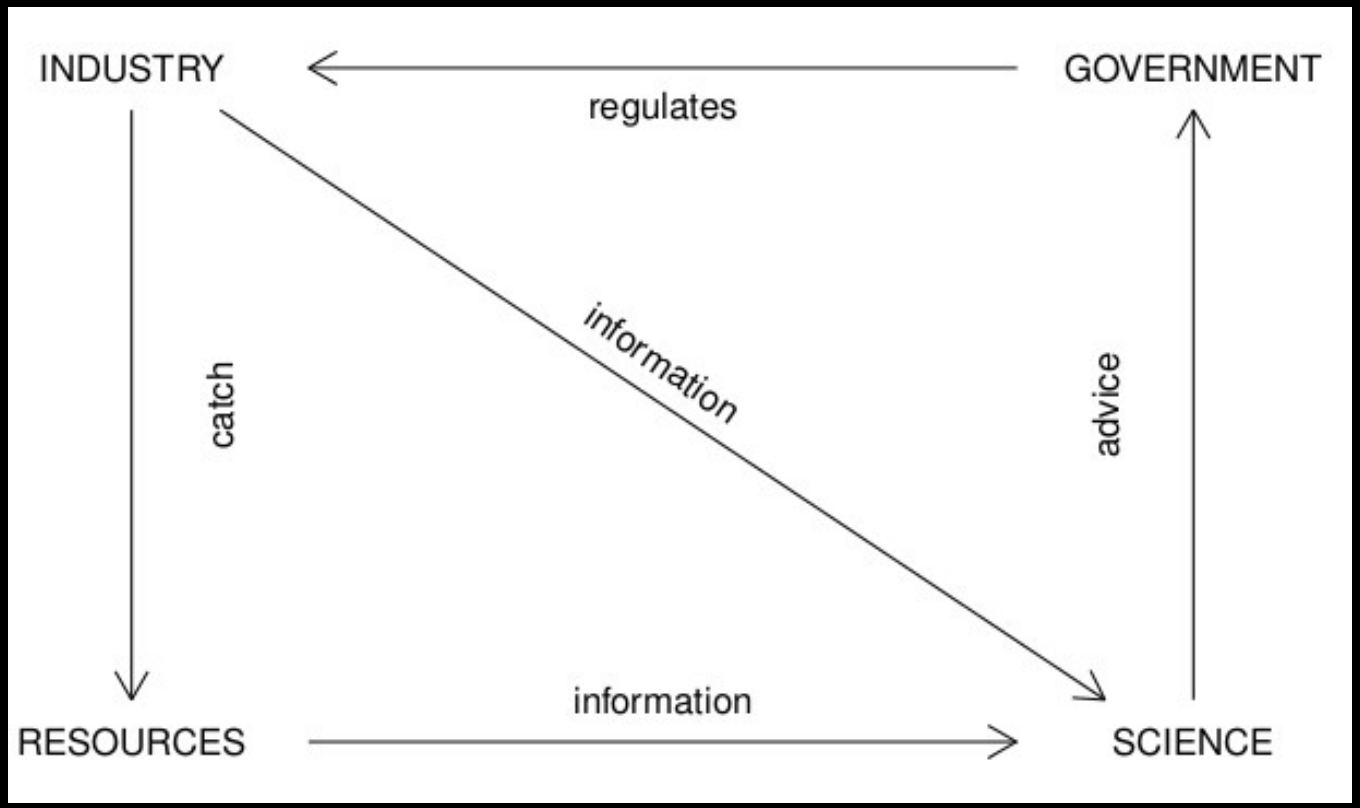
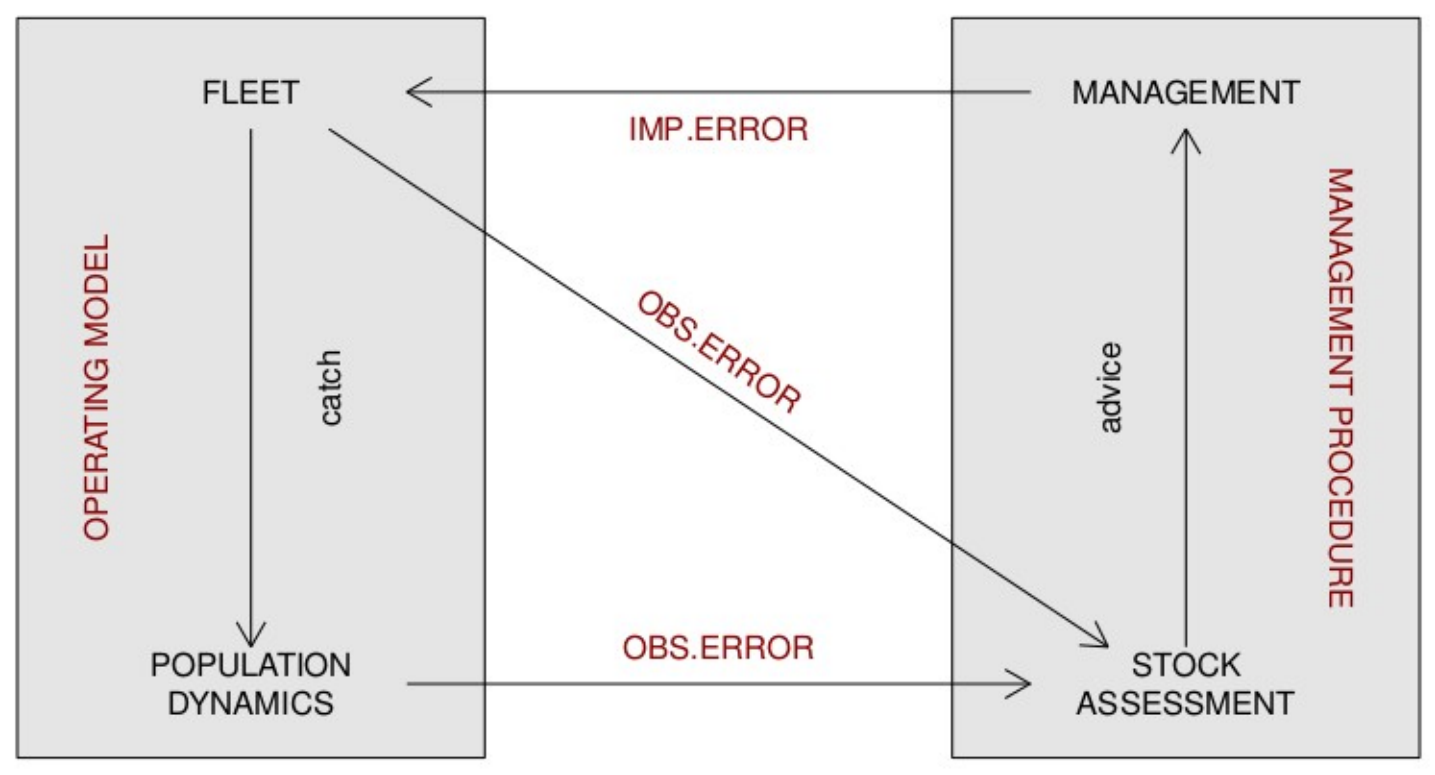
Fisheries Management Cycle



Management Strategies Evaluation (MSE)



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The standard MSE

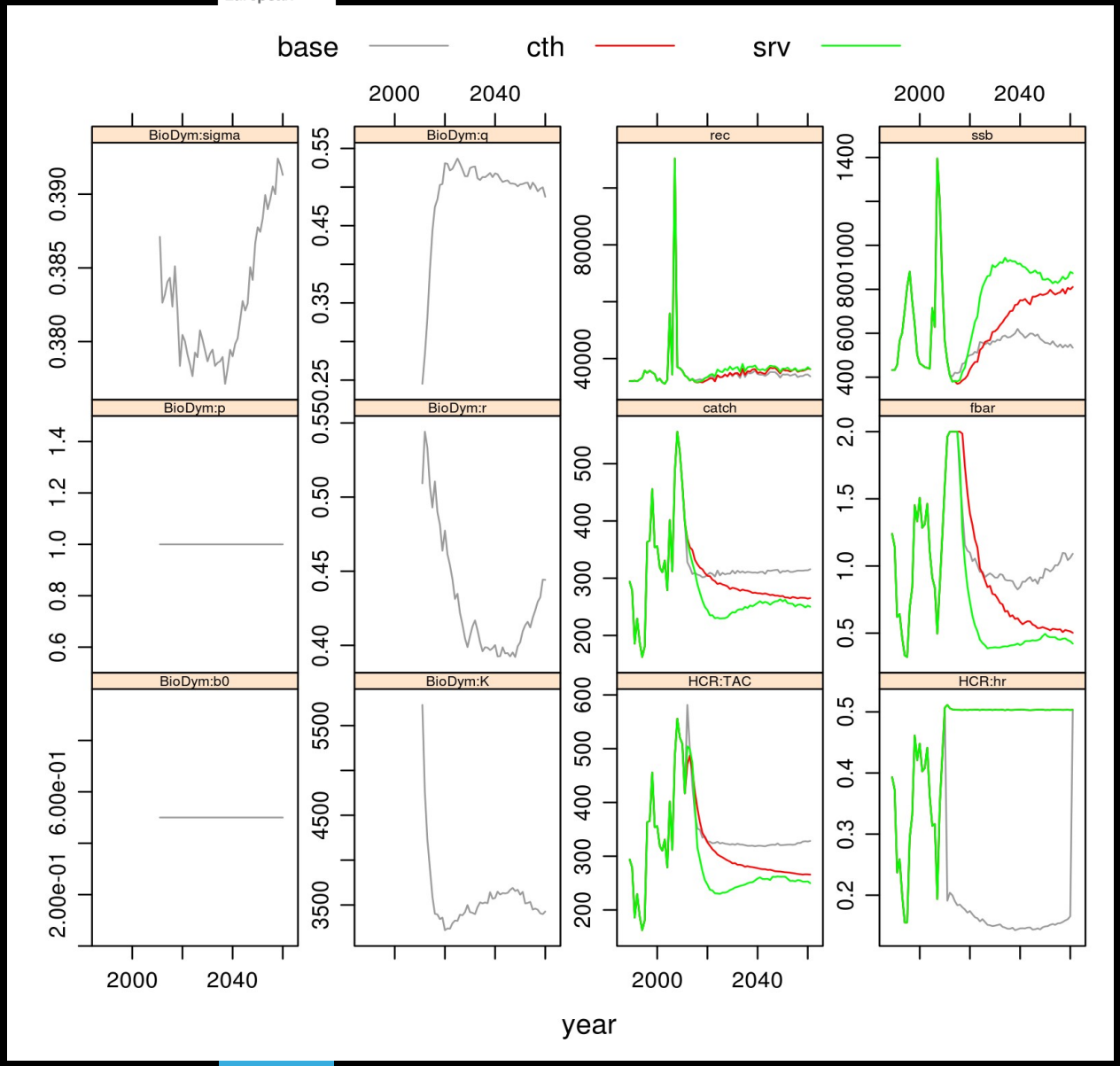
- OM uncertainty in growth, S/R and selectivity
- 3 HCR based on:

  catch, surveys, assessments
- 3 assessment models

  biodyn , simple and complex SCA
- OE for catch and index
- IE in F or catch

MSE example

(loosely based on *S.aurita* in Northwest Africa)



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(4) Intuitive

- Methods should be implemented in a way that it doesn't require a highly specialized statistician to use them.
- Parametrization must have a biological meaning:

```
trawl(catchability="linear")
s(age, 4) + factor(year) + year
```

- Courses and dissemination/demonstration actions

Wrapping up

a4a aims to provide standard methods for stock assessment and forecasting that can be applied rapidly to a large number (all ?) stocks in a sea basin.

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Thank you for your attention !

(**https://fishreg.jrc.ec.europa.eu/web/a4a**)

Joint Research Centre