

Management Strategy Evaluation

Management Framework

-  *Common Fisheries Policy (CFP)*
-  *Ecosystem Approach to Fisheries Management (EAFM)*

Management Strategy Evaluation

FLR <http://www.flr-project.org/doku.php>

Summary of Talk

- Policy and Scientific Advice Framework
- Examples of Management Plans
 - Herring
 - North Sea Flatfish
 - Cod
- Future directions

Changing Policy Needs in Europe

Changing policy needs require a move from short-term reactive management to long-term strategic planning

Common Fisheries Policy (CFP) requires long-term management and recovery plans taking into account

- ★ Conservation status of stocks
- ★ Biological characteristics
- ★ Characteristics of the fisheries
- ★ Economic impact

EU also committed to

World Summit on Sustainable Development (WSSD) which requires targets

- ★ Recovery of stocks to MSY by 2015

Ecosystem Based Approach to Fisheries Management (EBFM) requires

- ★ Progressive implementation of an ecosystem-based approach

The Evolution of HCRs in Europe

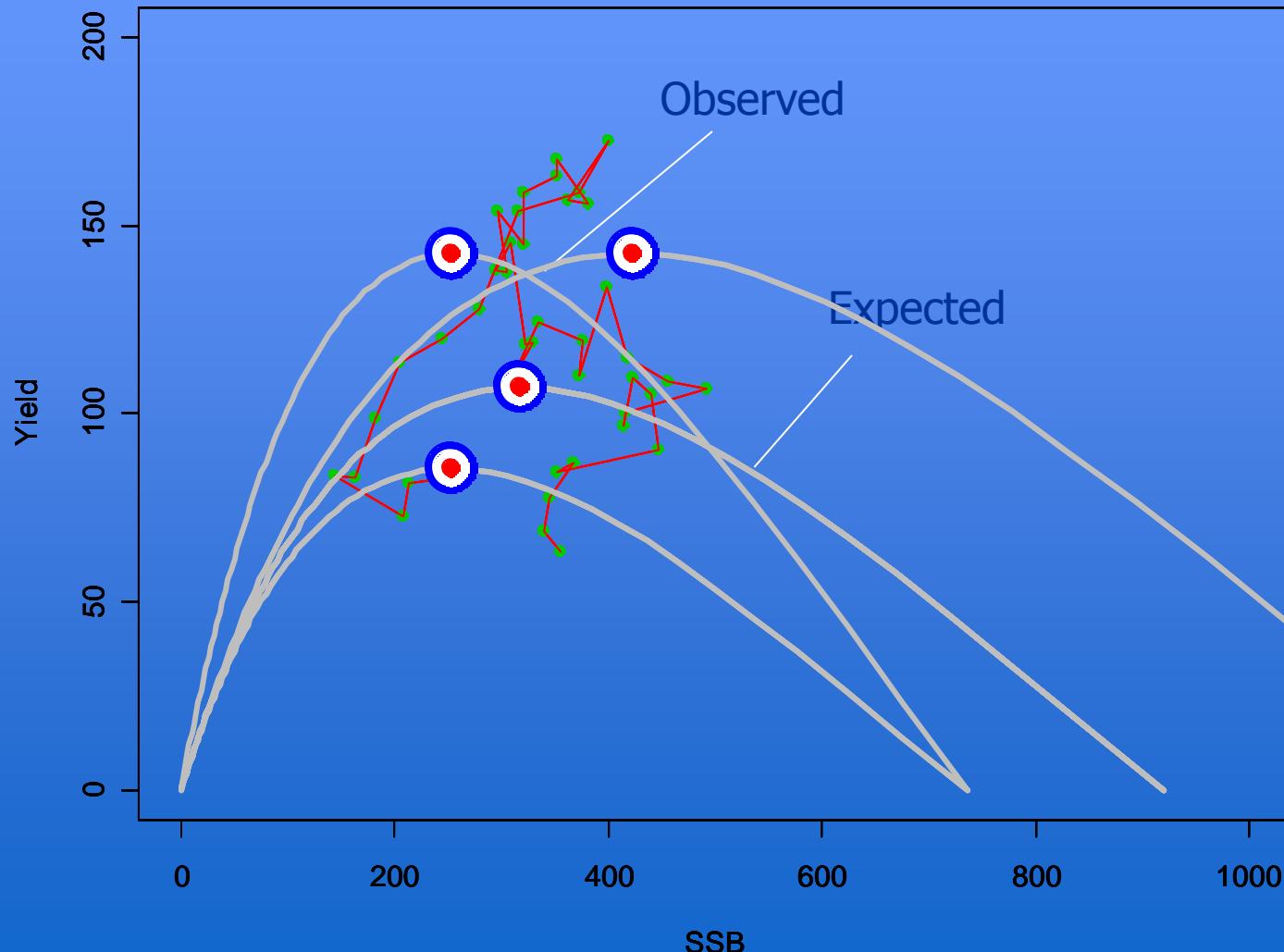
In this paper we review the changing policy objectives of fisheries management in the European Union, from the introduction of the precautionary approach through commitments under international agreements, such as the WSSD to rebuild fish populations to levels at which MSY can be taken and subsequent commitments to the progressive implementation of an ecosystem based approach to fisheries management.

As part of this process there has been a move away from ad-hoc management to the development of Harvest Control Rules (HCRs) under which both long-term goals and ways to reach them are pre-defined. We illustrate the required changes in governance by tracing the evolution of HCRs for fisheries managed in European Community waters under the Common Fisheries Policy (CFP) from a single species to ecosystem based control rules and discuss the demands for scientific knowledge, tools and social processes.

European Advice Framework

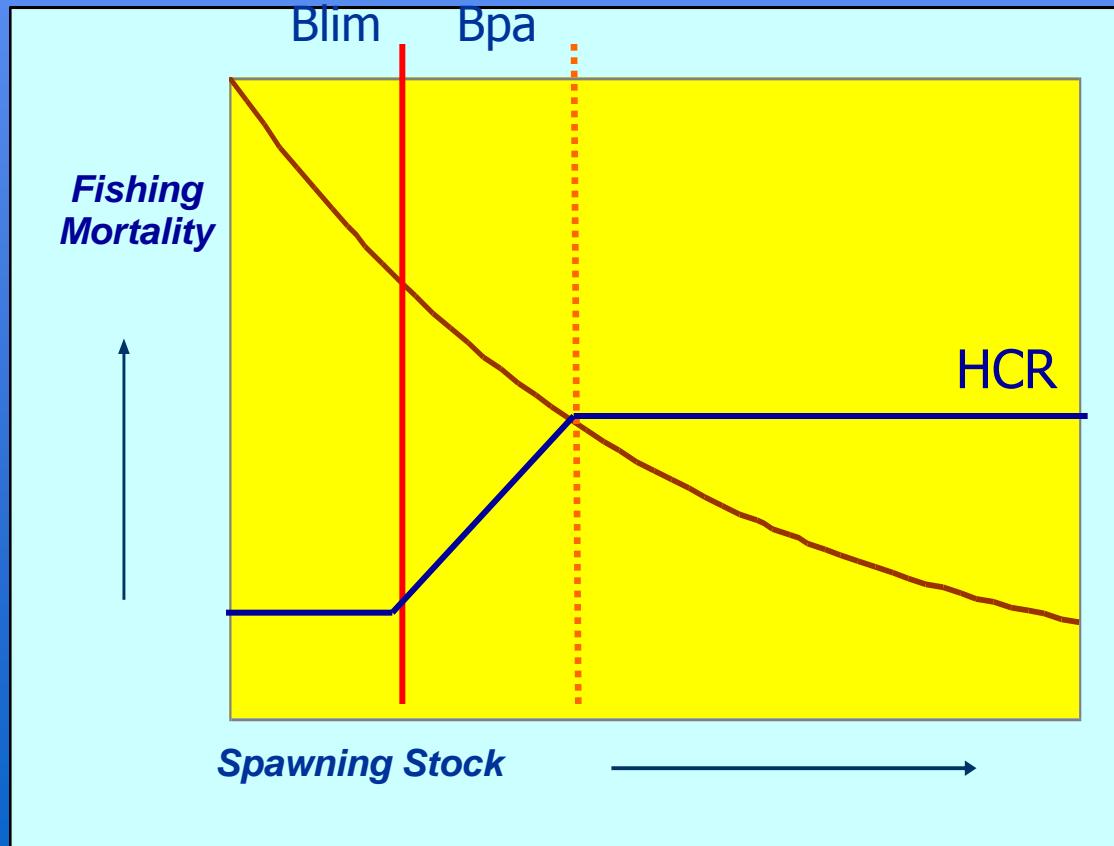
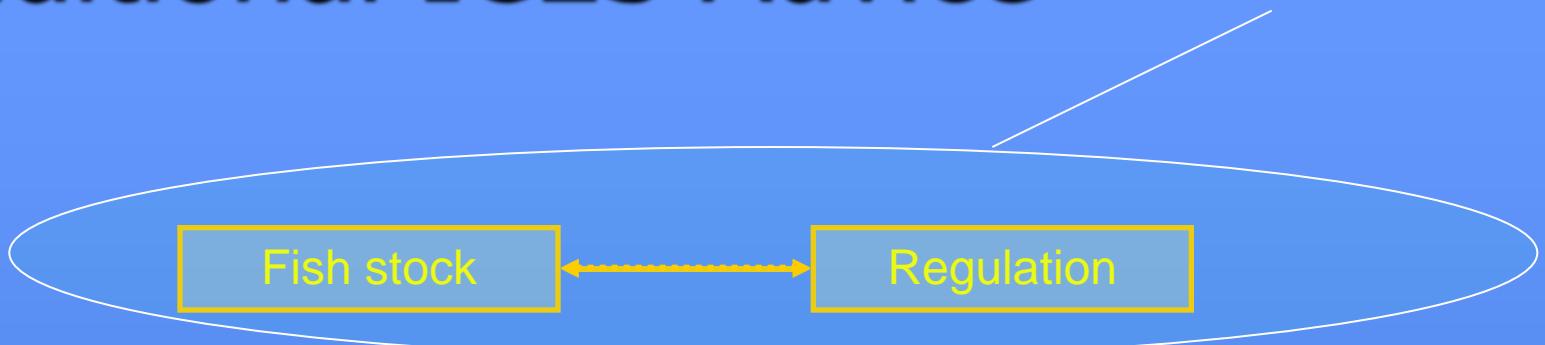


Reference Points



Traditional ICES Advice

Traditional ICES Advice

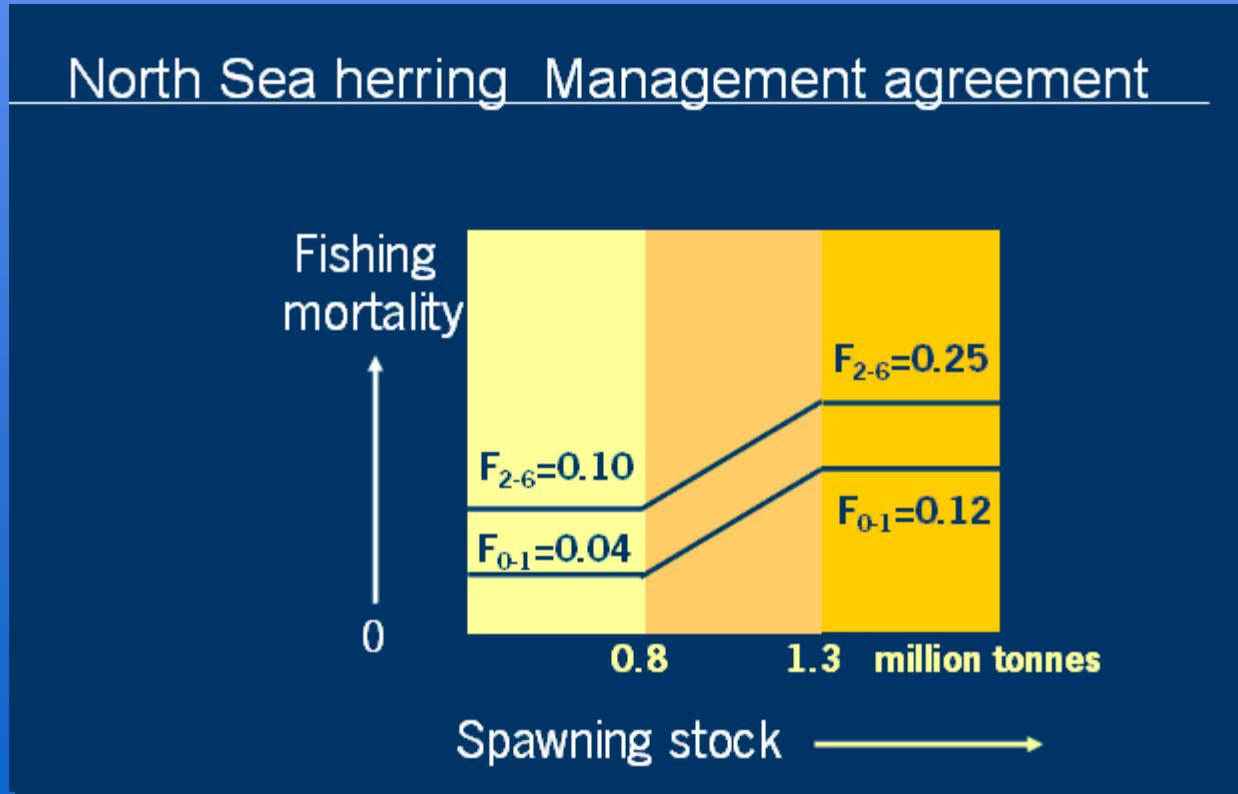


North Sea Herring Management Plan

1997: if SSB > Bpa (1.3Mt) $F_{0-1} = 0.12$ and $F_{2-6} = 0.25$

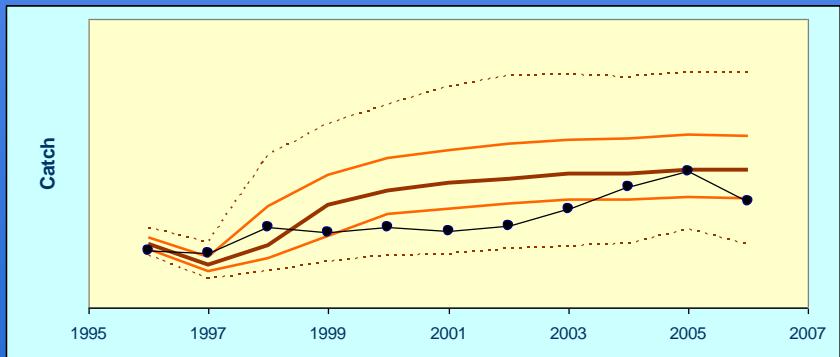
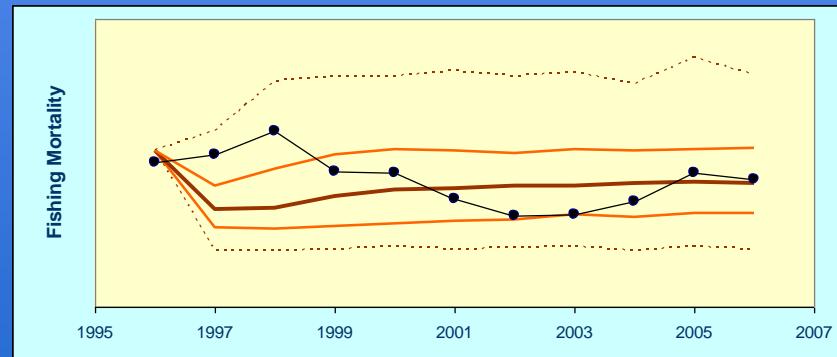
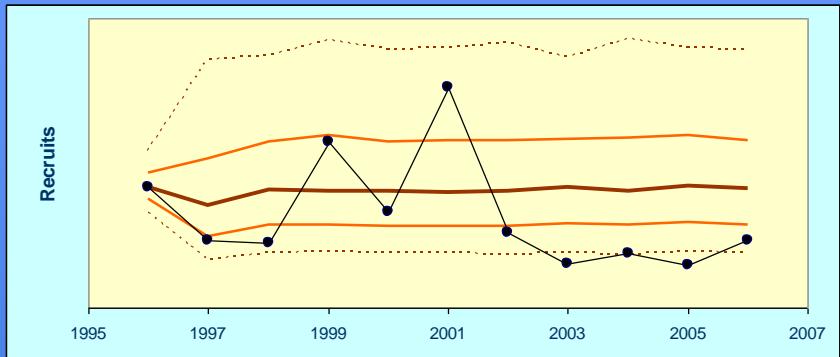
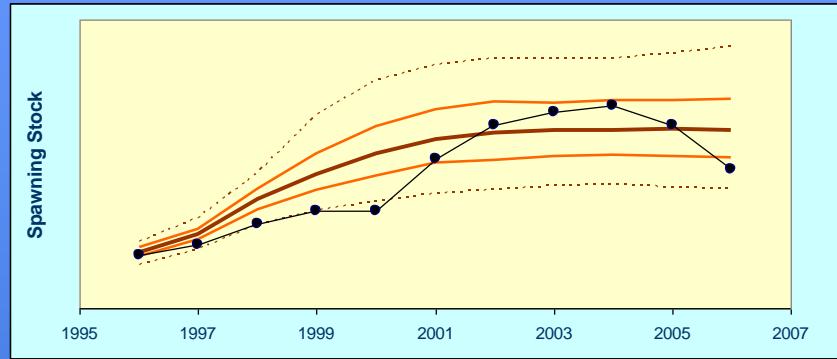
if SSB < Blim (0.8 Mt) $F_{0-1} = 0.04$ and $F_{2-6} = 0.10$

2004: 15% constraint to change in TAC



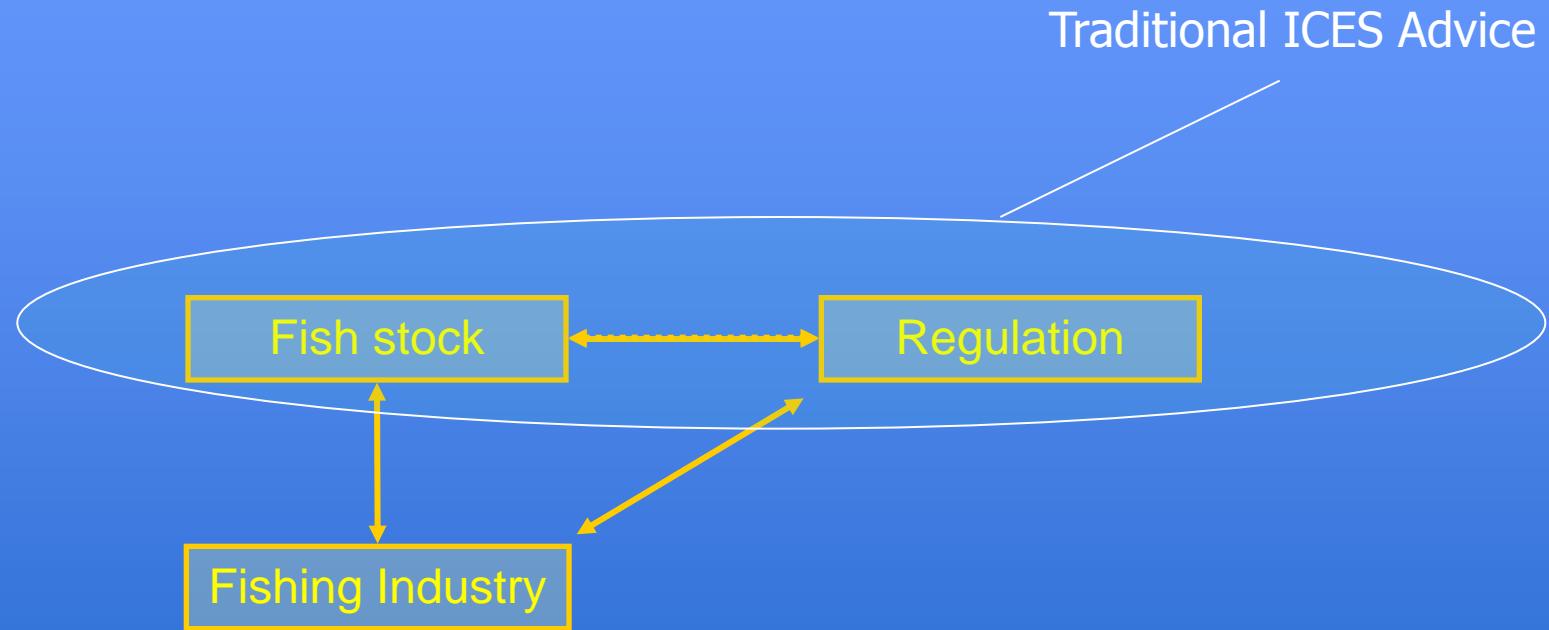
Did it work?

1996 proposed management vs 2007 assessment



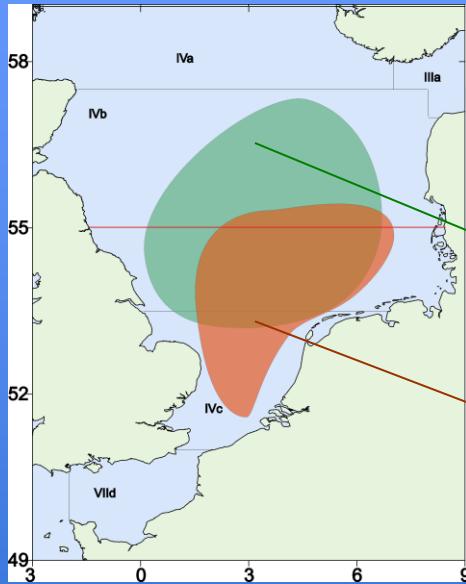
2007 advice recognises is that there is a regime shift
and need to reduce F further

Fisheries System

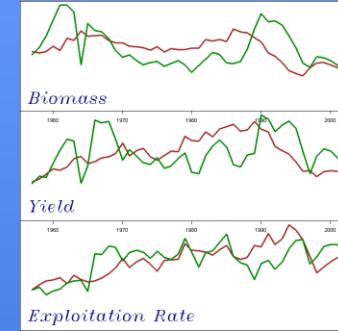


North Sea Flatfish Management Plan

Management plan for mixed North Sea flatfish fisheries

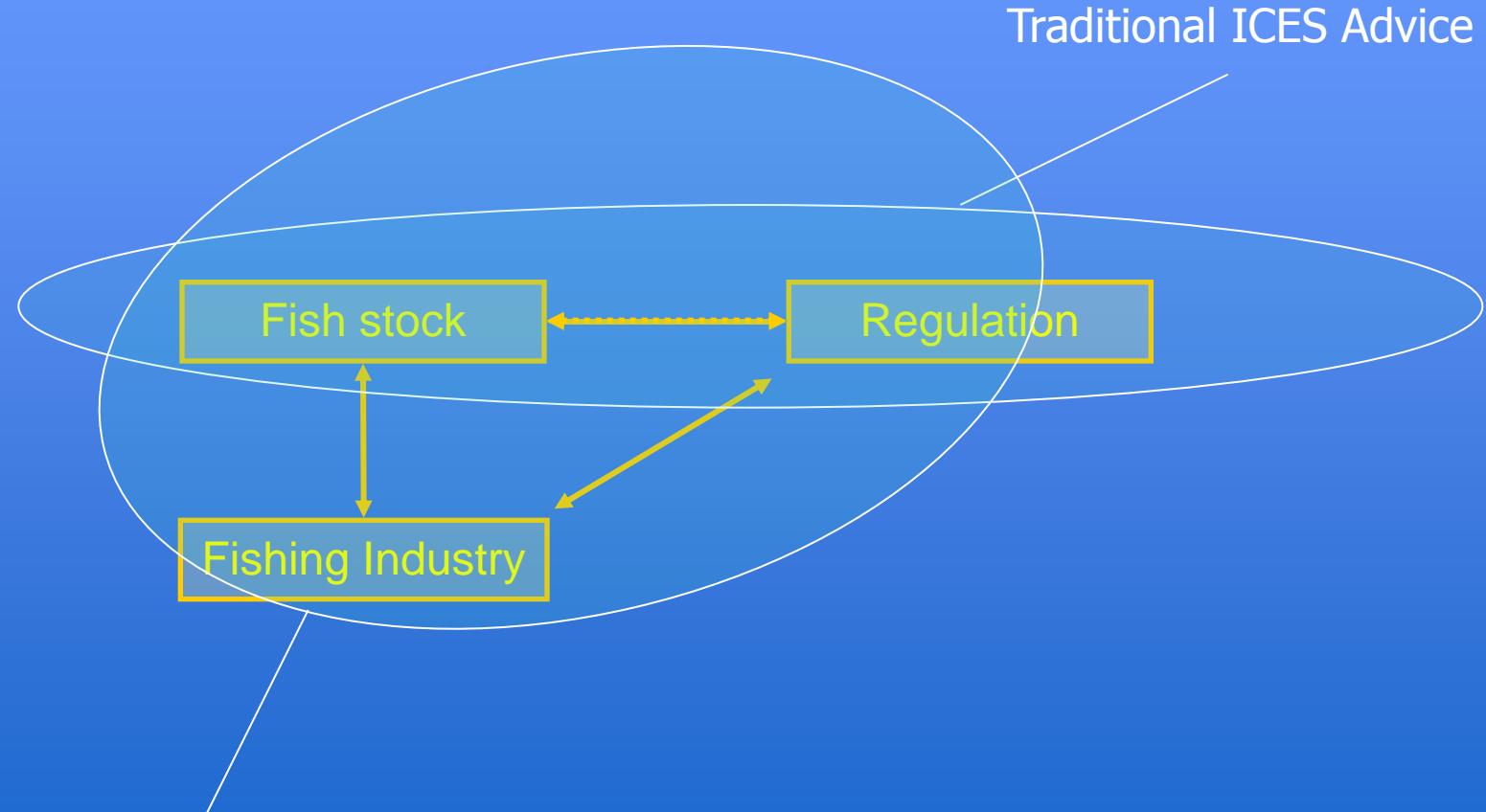


**TAC, Effort and
Area based management**



Single Species TAC

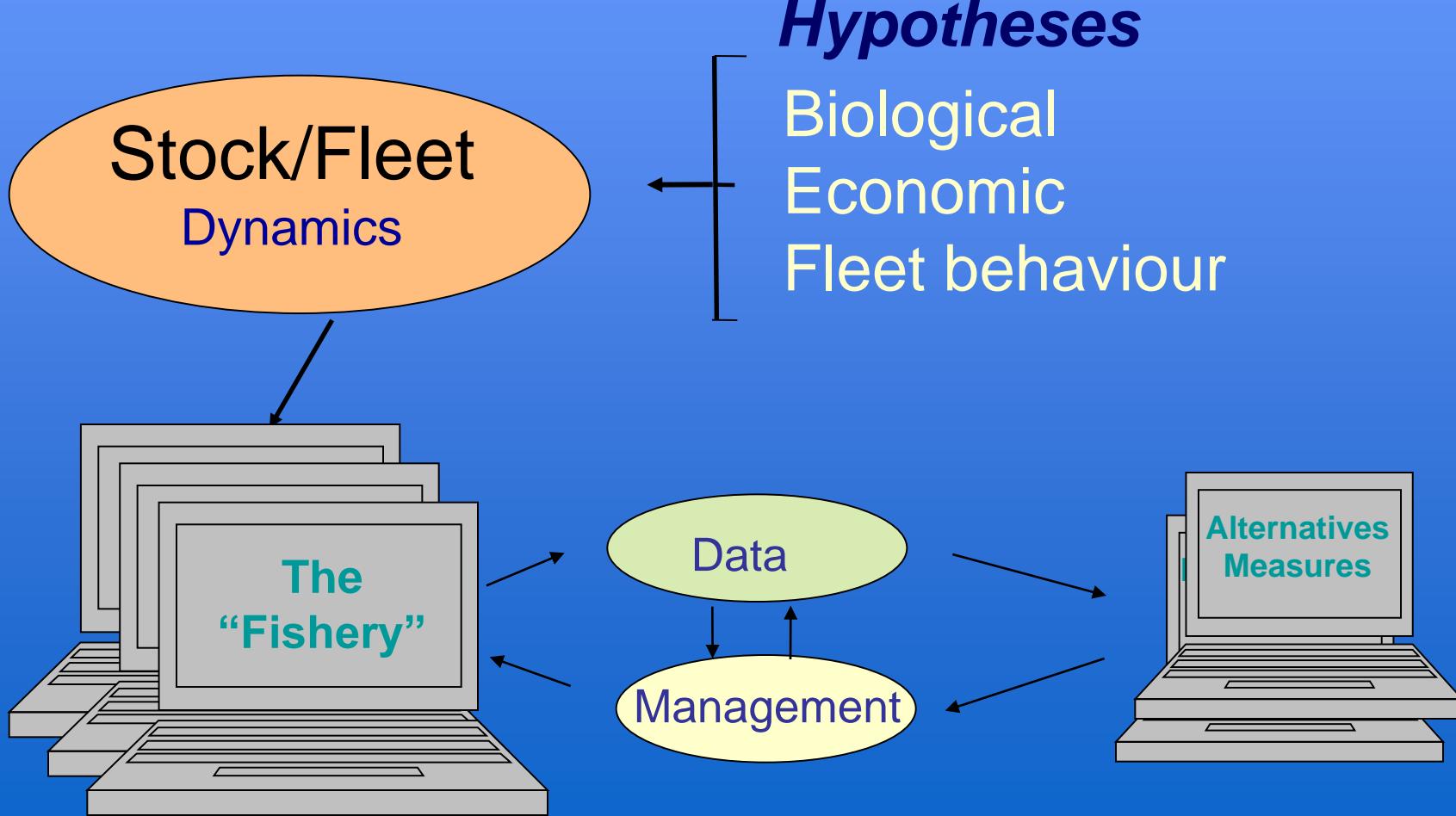
Fisheries System



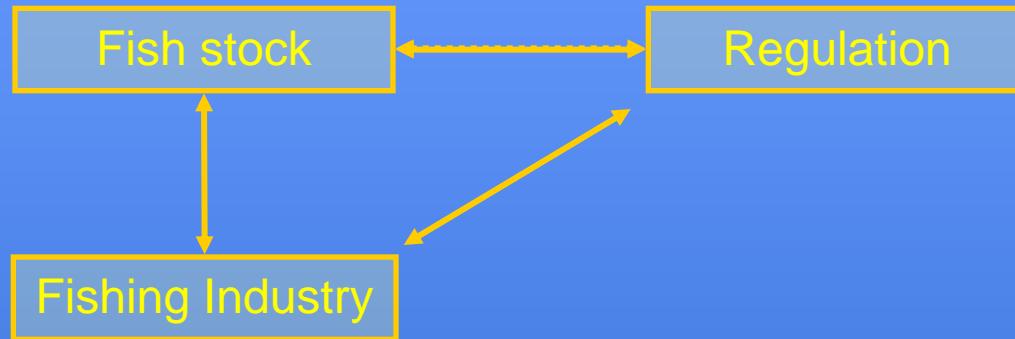
Management Strategy Evaluation
& Bio-economic models

Management Strategy Evaluation

Not used to set quotas but to work out whether we should be setting quotas at all



Fisheries System



EU COMMISSION now requires Economic and Social Impact Assessments to be conducted as well. Examples of bio-economic evaluations are

- ✿ Mediterranean Swordfish and
- ✿ North Sea Flatfish Management plan

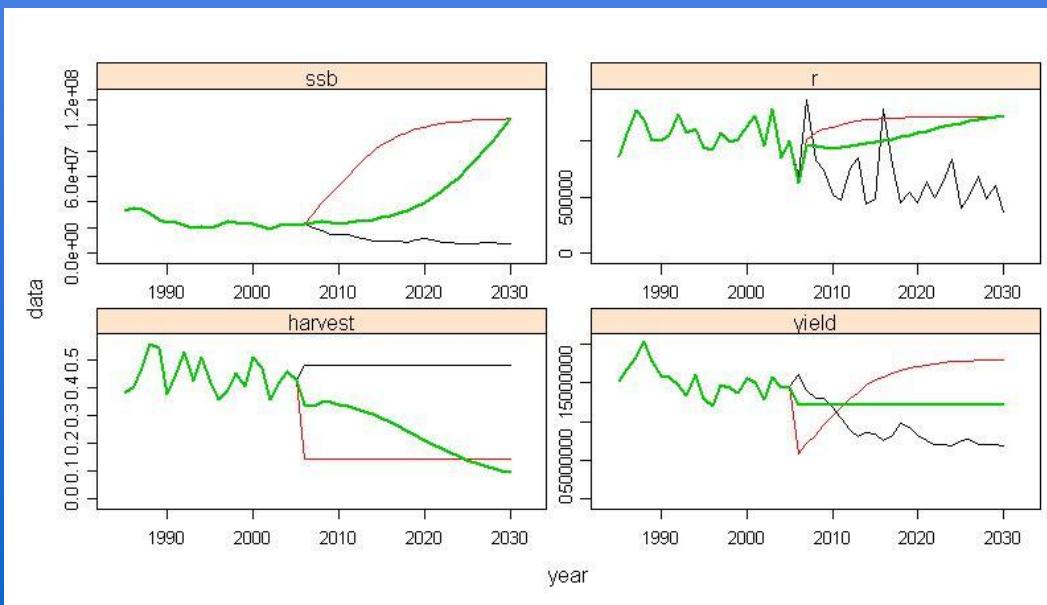
Mediterranean Swordfish

If two policies have same biological but differing economic impacts, then a preferred option can be derived e.g. days at sea, fleet reduction or closures?

The benefits of a policy may not outweigh the costs, e.g. management and enforcement costs needed to realise the benefit.

Fishers respond to changes in economic incentives, and management changes incentive structures so also changes behaviour

An evaluation of Mediterranean swordfish management to recover stock to BMSY

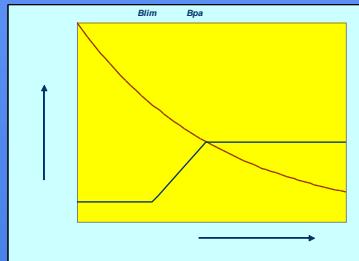


A variety of management plans were evaluated to try and recover the stock to BMSY by 2030; red shows the expected outcome for a constant fishing mortality strategy and green for a constant catch strategy.

North Sea Cod Recovery Plan

A run-off between two alternative proposals,

Norway



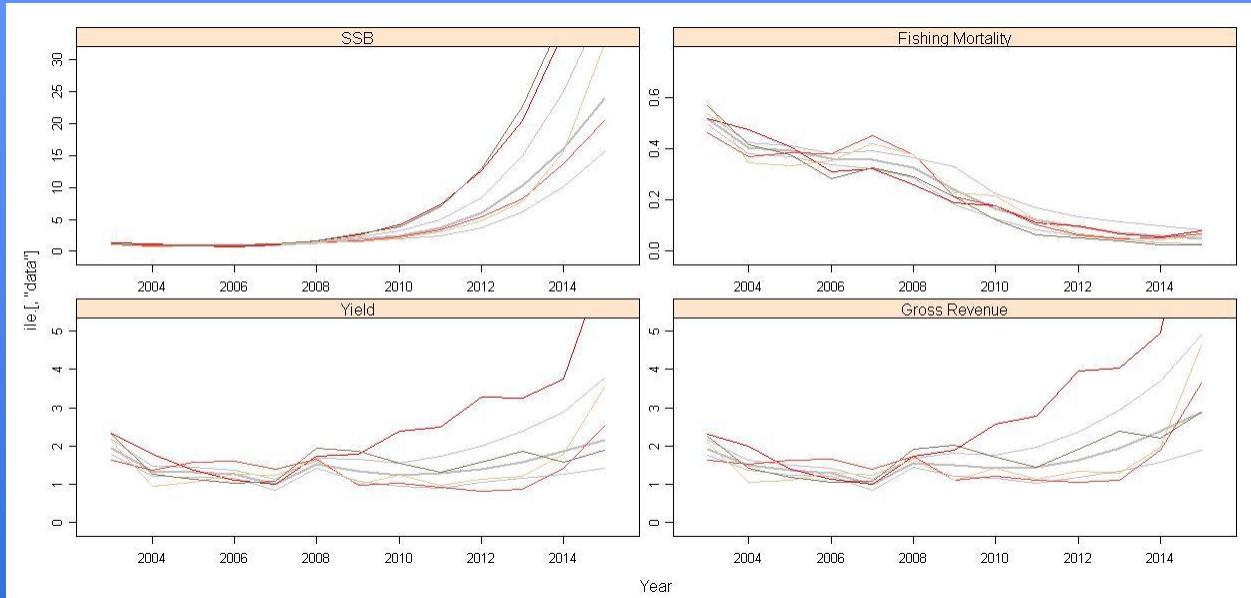
EU

If $SSB < Bpa$

$$Fy+1 = 0.85Fy$$

If $SSB < Blim$

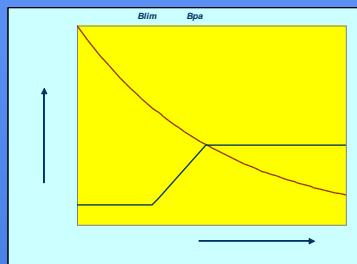
$$Fy+1 = 0.75Fy$$



North Sea Cod Recovery Plan

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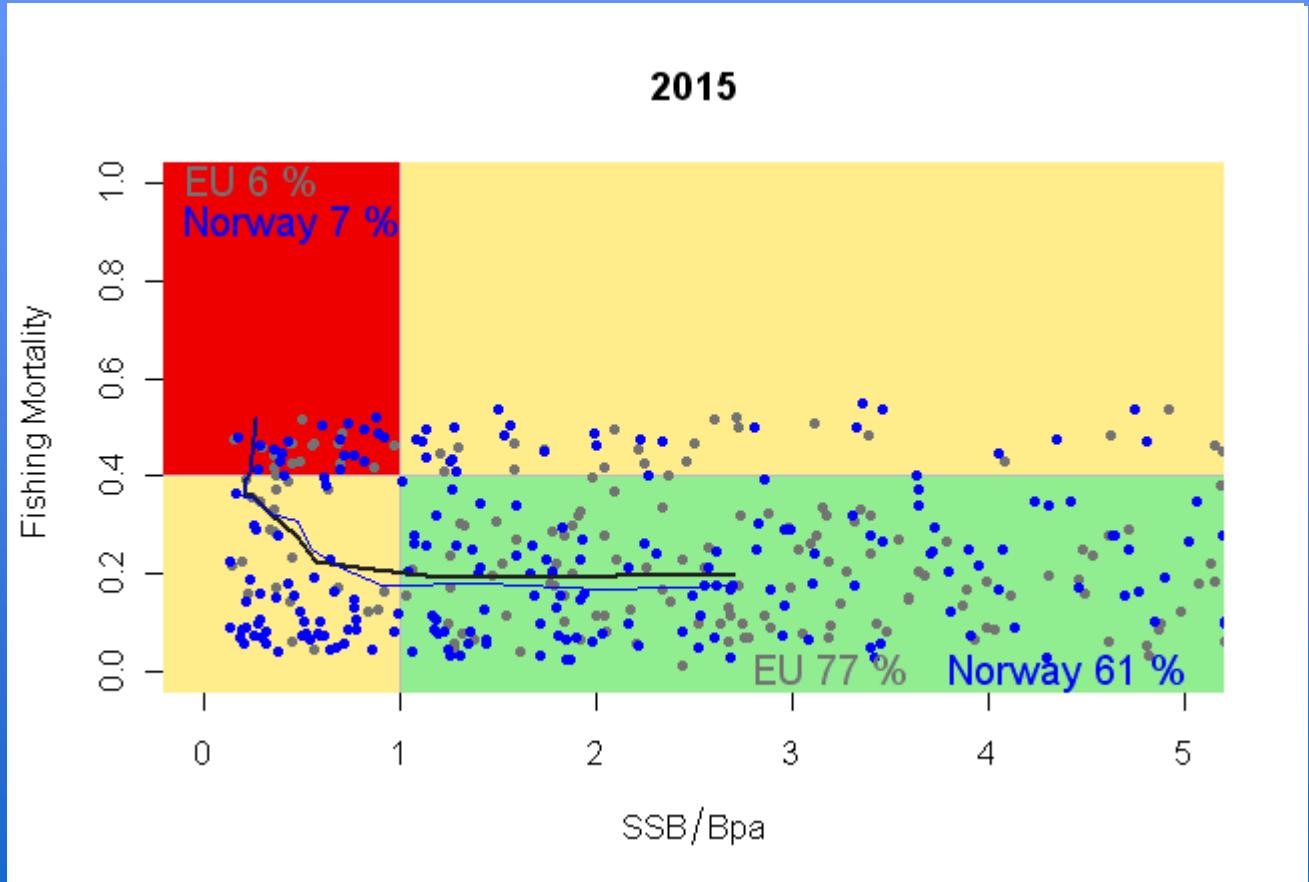
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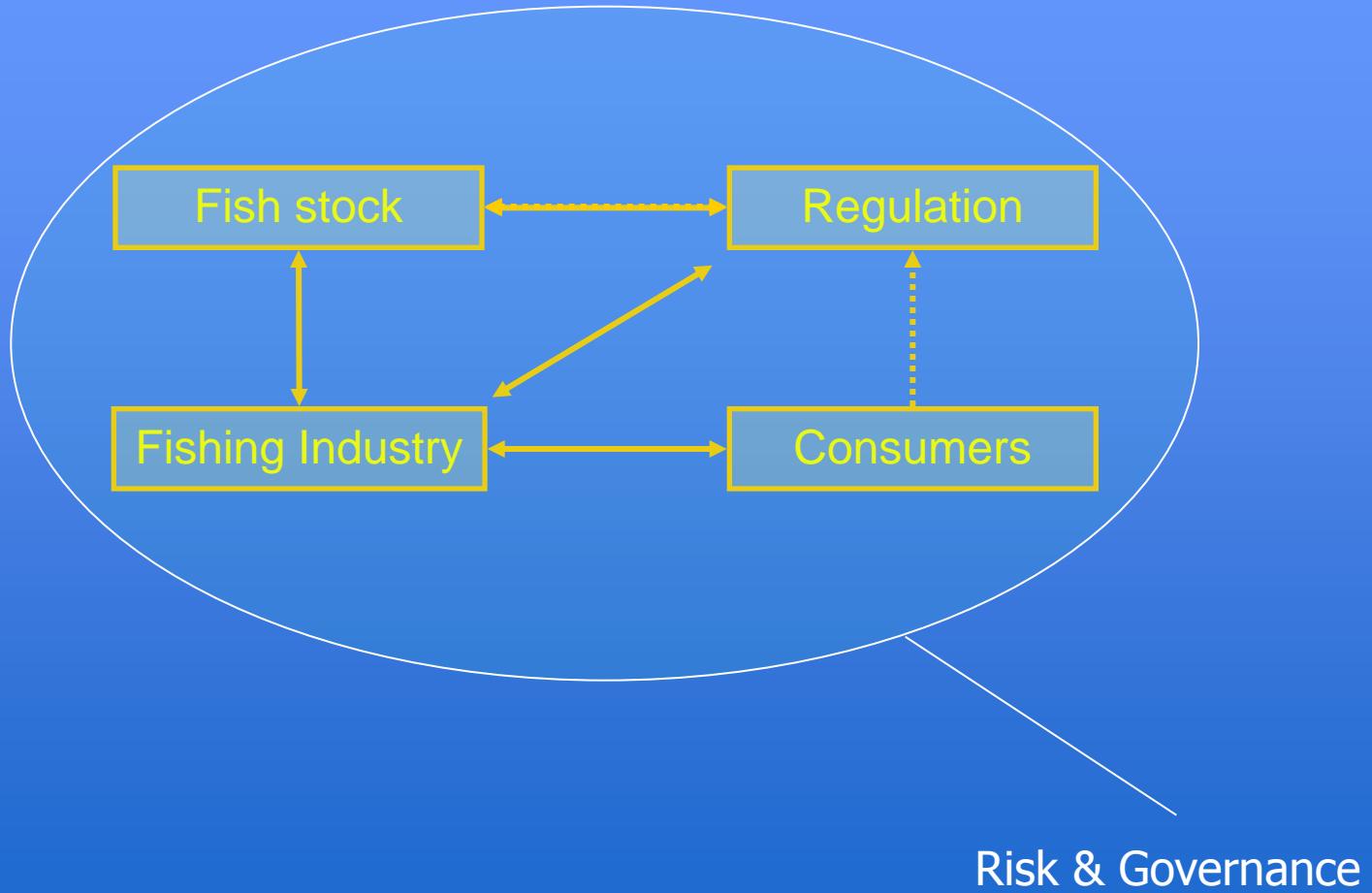
If $SSB < Blim$

$$Fy+1 = 0.75Fy$$

2015



Core fisheries system

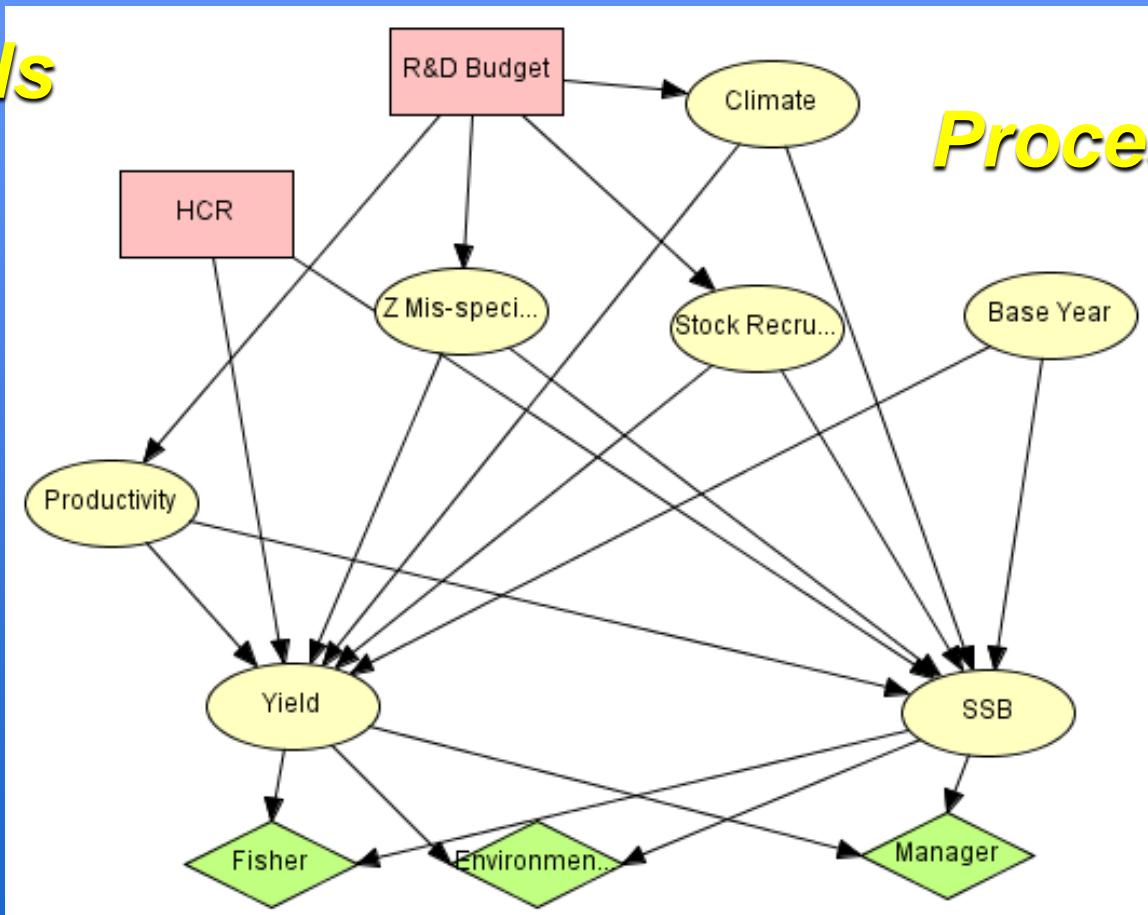


Decision networks

To compare the consequences of alternative actions and the trade-offs between management objectives for different stakeholders

Controls

Processes



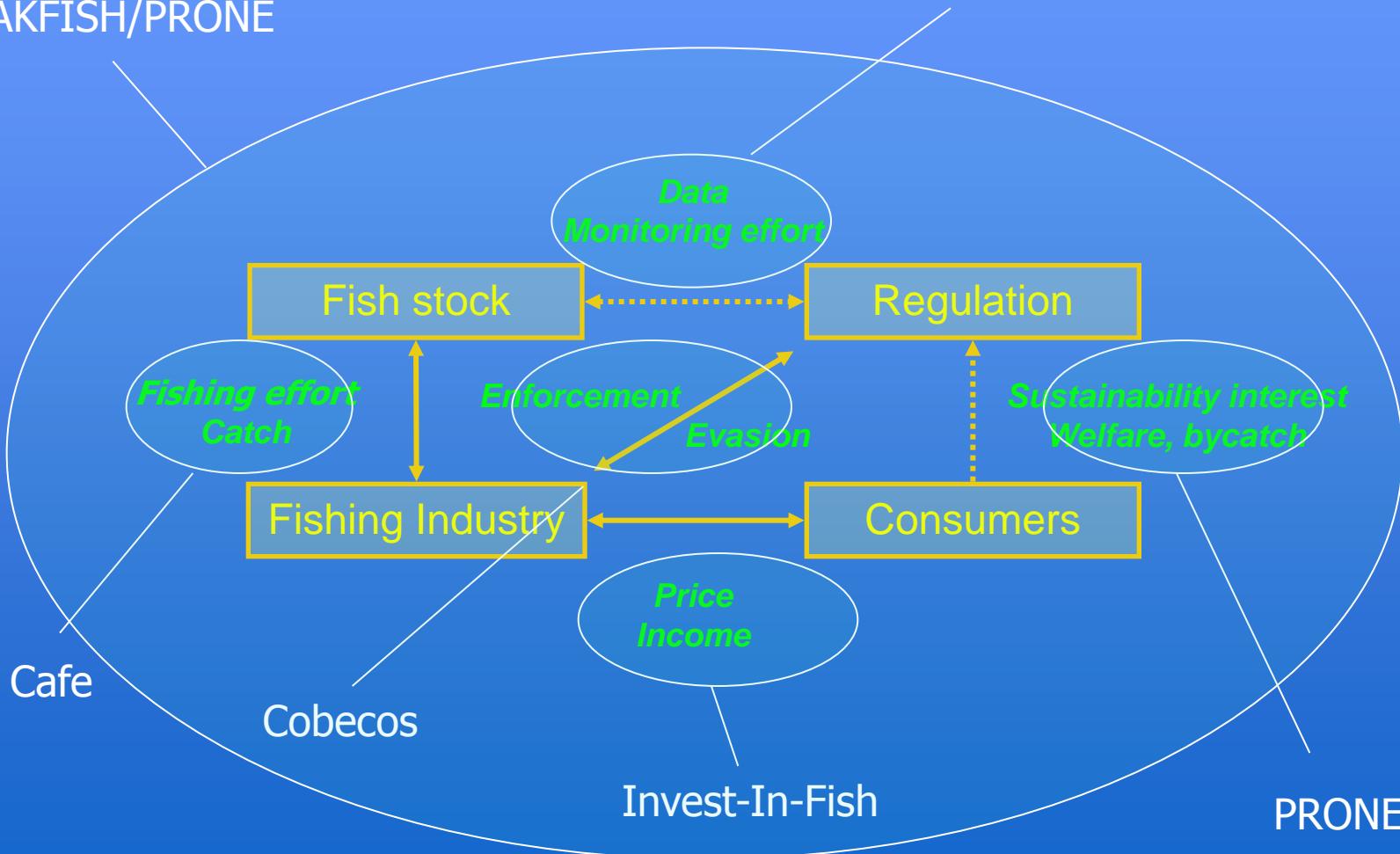
Utility Functions

Key systems interactions

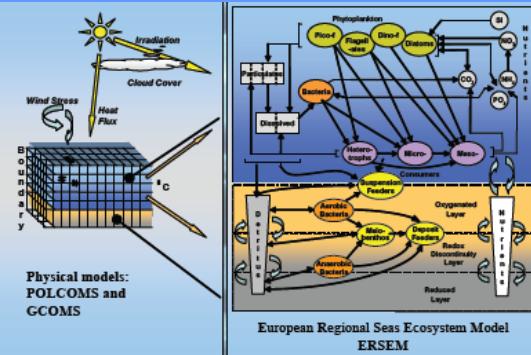
The EU Ecosystem!

JAKFISH/PRONE

EMAS/EVARES



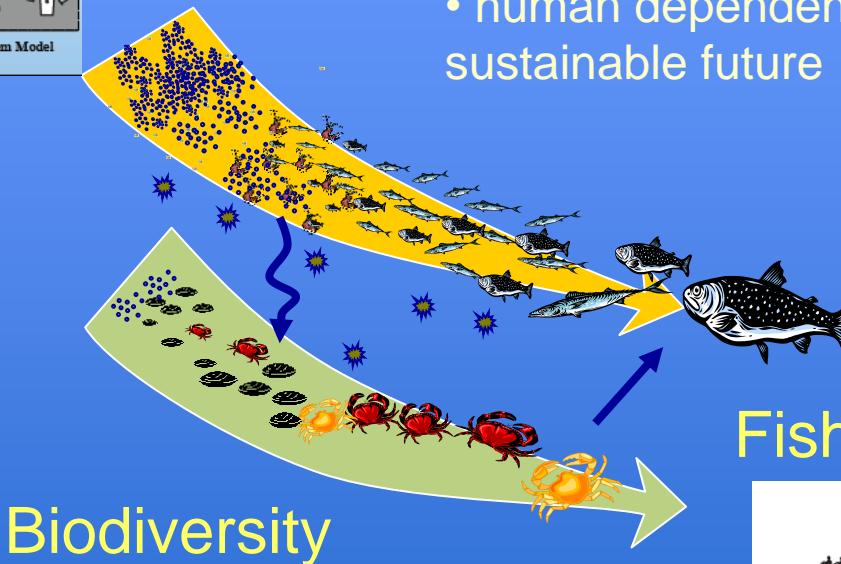
Linking it all together



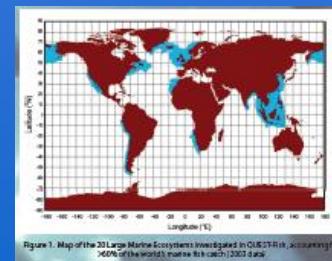
Understanding & predicting :

- the effects of climate change and human impacts on marine ecosystems
- human dependence on ecosystems for a sustainable future

Physical environment



Socio-economics



Common Fisheries Policy

Requires long-term management and recovery plans that take into account

- ✿ Conservation status of stocks
- ✿ Their biological characteristics
- ✿ Characteristics of the fisheries in which the stocks are caught
- ✿ Economic impact of the measures on the fisheries concerned

And targets expressed in terms of

- ✿ Population size
- ✿ Fishing mortality
- ✿ Long-term yields
- ✿ Catch stability

Precautionary Approach

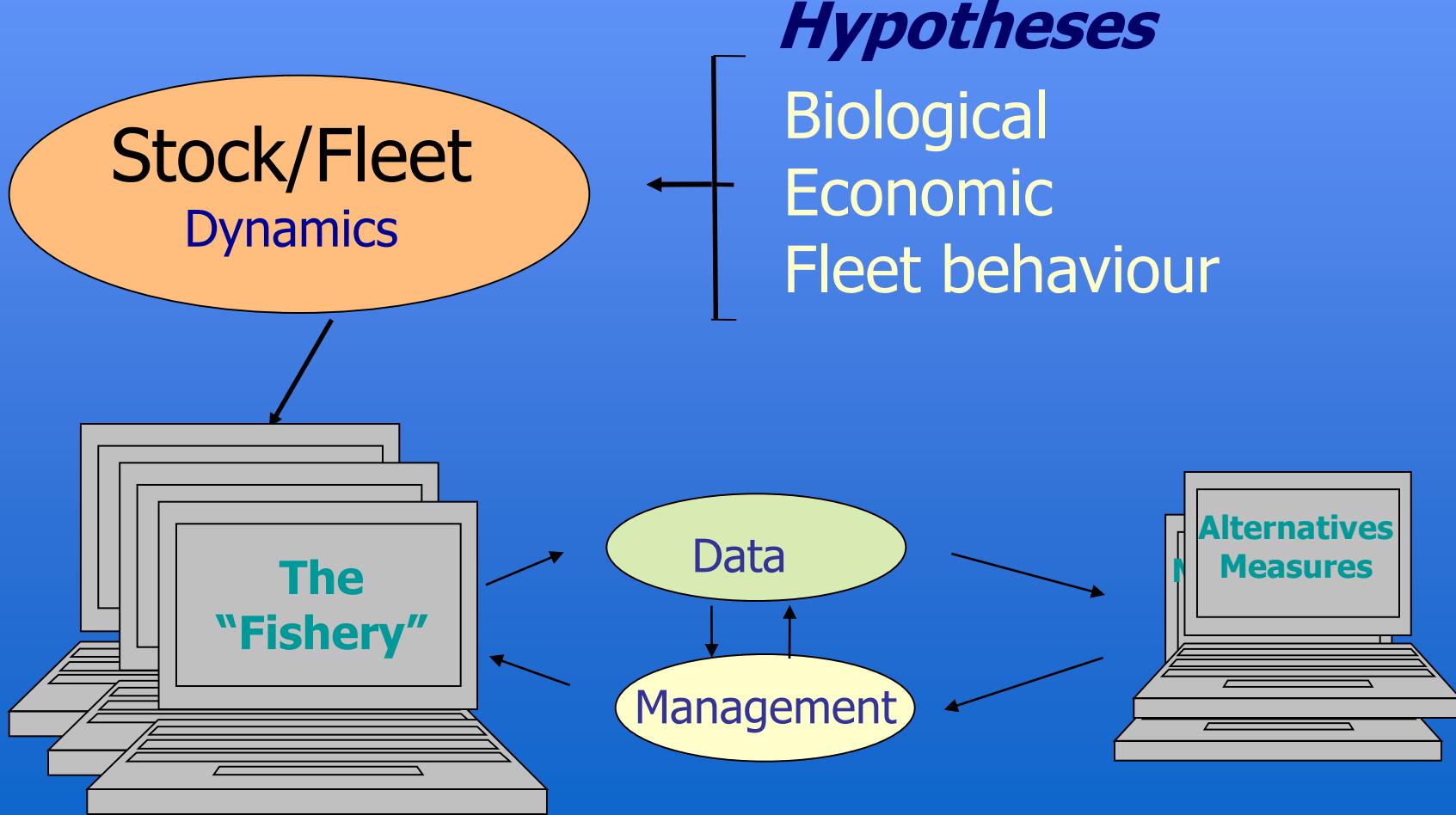
Management advice must comprehensively take into account uncertainties and associated risks

e.g. due to

- ✿ **Natural variability**
- ✿ **Stock assessment**, fish don't know the theory of VPA
- ✿ Even if they did, doesn't mean we'd get a good fit
- ✿ **Imperfect information**
- ✿ **Imperfect implementation**

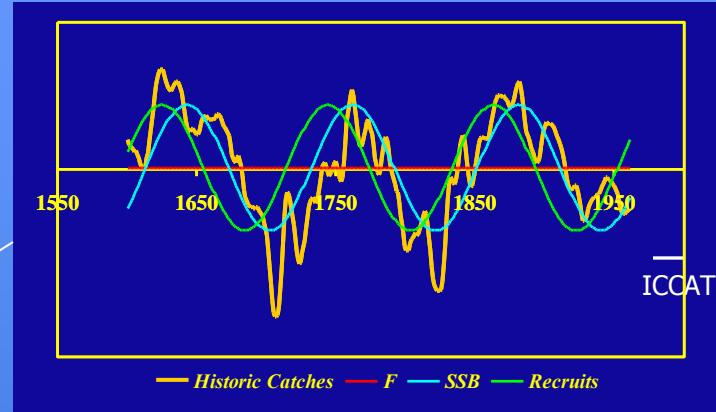
Management Strategy Evaluation

Not used to set quotas but to work out whether we should be setting quotas at all!

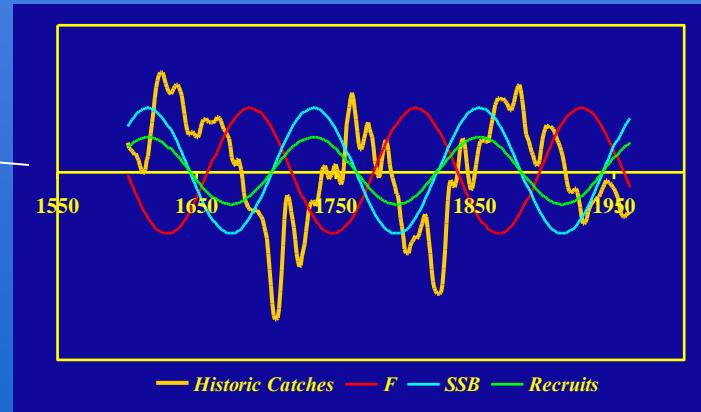


Example: Bluefin Tuna

- Spectacular fluctuations in catches have been seen since the 1600s



- Causes
 - Recruitment?
 - Migration?
- Consequences
 - Stock assessment bias
 - Reference points, what is MSY?
 - Robustness of Advice



Management Strategy Evaluation

Simulate a bluefin population for which there were two alternative but equally plausible hypotheses (H_R & H_K) about how historic catch data were generated (also included misreporting, sampling error and phase in the cycle)

Evaluated alternative management procedures i.e.

- TAC

- "Spawn at Least Once" based upon a Size Limit

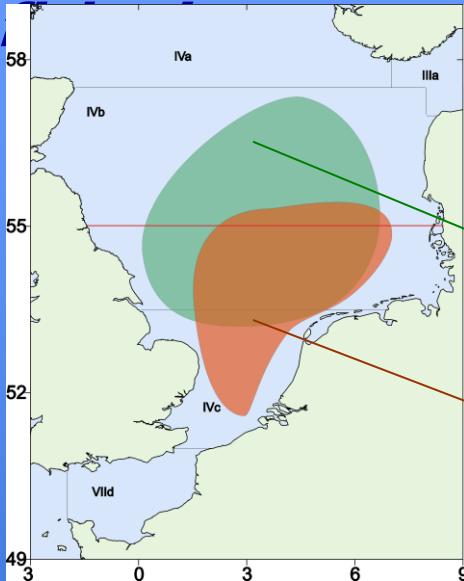
Conclusions

A strict implementation of the **Precautionary Approach** should act as an incentive to resolve uncertainty i.e. so that the less that is known, the lower the level of exploitation this provides an incentive to resolve key uncertainties about the population dynamics and/or to develop robust alternatives i.e. either

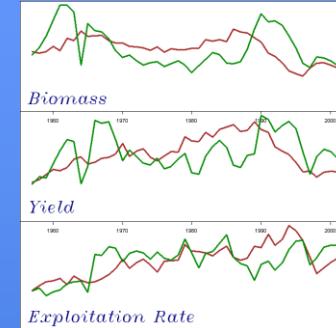
- ✿ develop management strategies that are robust to uncertainty about the dynamics or
- ✿ reduce uncertainty by improving biological knowledge e.g.
 - ✿ monitor spawning ground or migration routes using listening stations along the Gibraltar Strait or
 - ✿ conduct large scale tagging of juvenile fish with electronic chips.

Management Plan: NS Flatfish

Evaluation of long-term management plans for mixed



**TAC, Effort and
Area based management**



Single Species TAC

Generic Management Plans

*STECF WORKING GROUP ON EVALUATION OF
"POLICY STATEMENT" HARVEST RULES.*

1) ***Set target F***

$$F_y = \max(F_{sq}, F_{0.1})$$

2) ***Check F limit***

if $F_y > F_{pa}$ then set $F_y = F_{pa}$ and estimate TAC_y

3) ***Check SSB limit***

if $SSB_{y+1} < B_{pa}$ then re-estimate TAC_y so that $SSB_{y+1} = B_{pa}$

3) ***Check catch stability***

if $TAC_y \leq (1 - \alpha)TAC_{y-1}$ then $TAC_y = (1 - \alpha)TAC_{y-1}$ else

if $TAC_y \geq (1 + \alpha)TAC_{y-1}$ then $TAC_y = (1 + \alpha)TAC_{y-1}$

4) ***Check for stock collapse and implement recovery plan***

If $SSB_y < B_{pa}$ and $SSB_{y+1} \leq SSB_y$ then re-estimate TAC_y so $SSB_{y+1} = SSB_y$

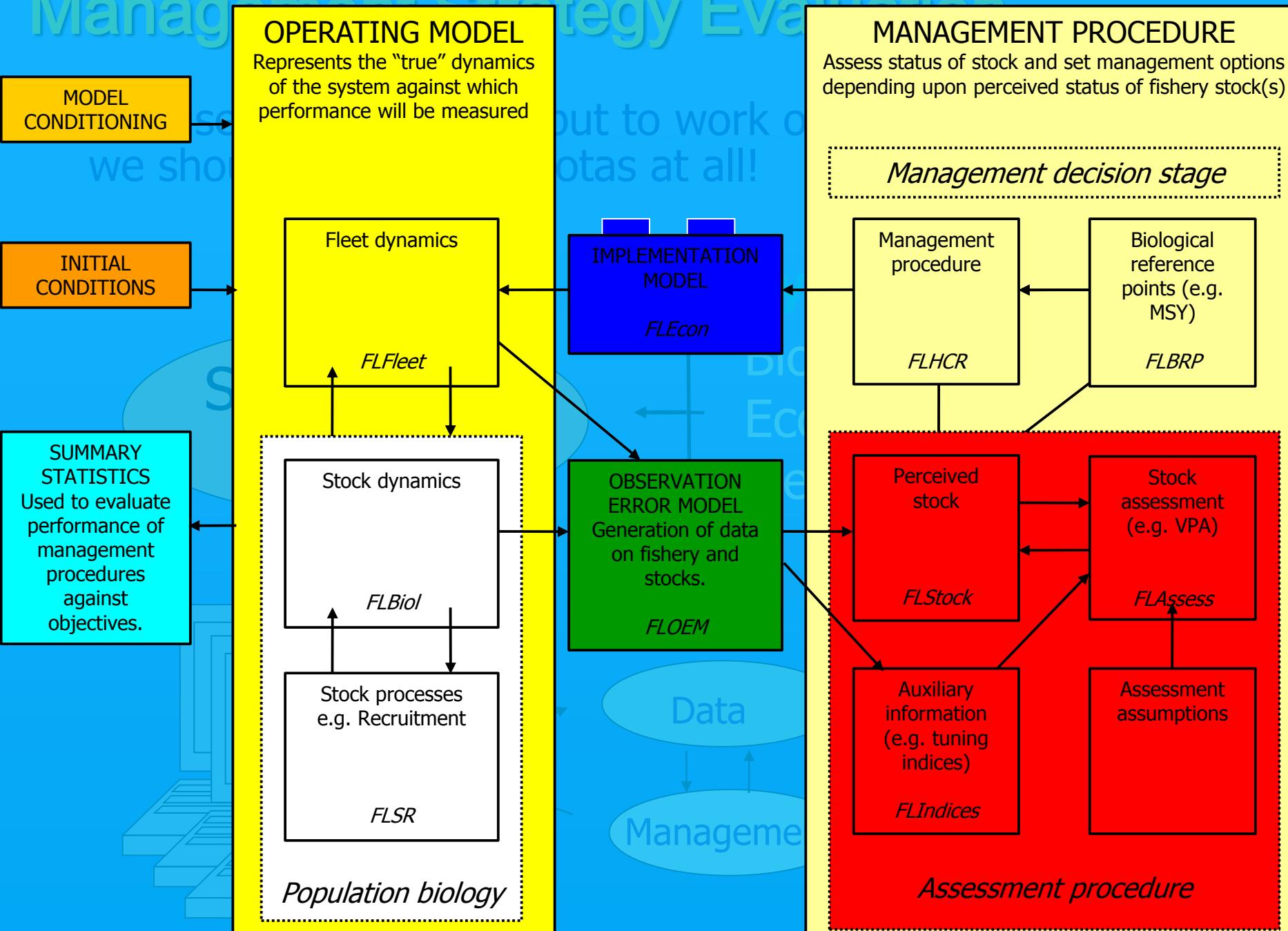
5) ***If impossible close fishery***

if $SSB_{y+1} < SSB_y$ even if $F=0.0$ then set $F = 0.01$.

6) ***Check for rise in F***

if $F_y > F_{sq}$ then set $F_y = F_{sq}$ and re-estimate TAC_y

Management Strategy Evaluation



Results Based Management

There is a move towards an alternative approach to management in which a maximum acceptable negative impact is set by an authority at a community or population level and stakeholders then identify the means to meet these requirements