



# Fisheries

## MSFD Descriptor 3

Current status and risk  
assessment

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# MSFD Descriptor 3

**‘Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock’**



# MSFD Descriptor 3

## Criteria 3.1:

Level of pressure of fishing mortality

-  $F_{MSY}$

Pressure

## Criterion 3.2:

Reproductive capacity of the stock

-  $B_{MSY}$

State

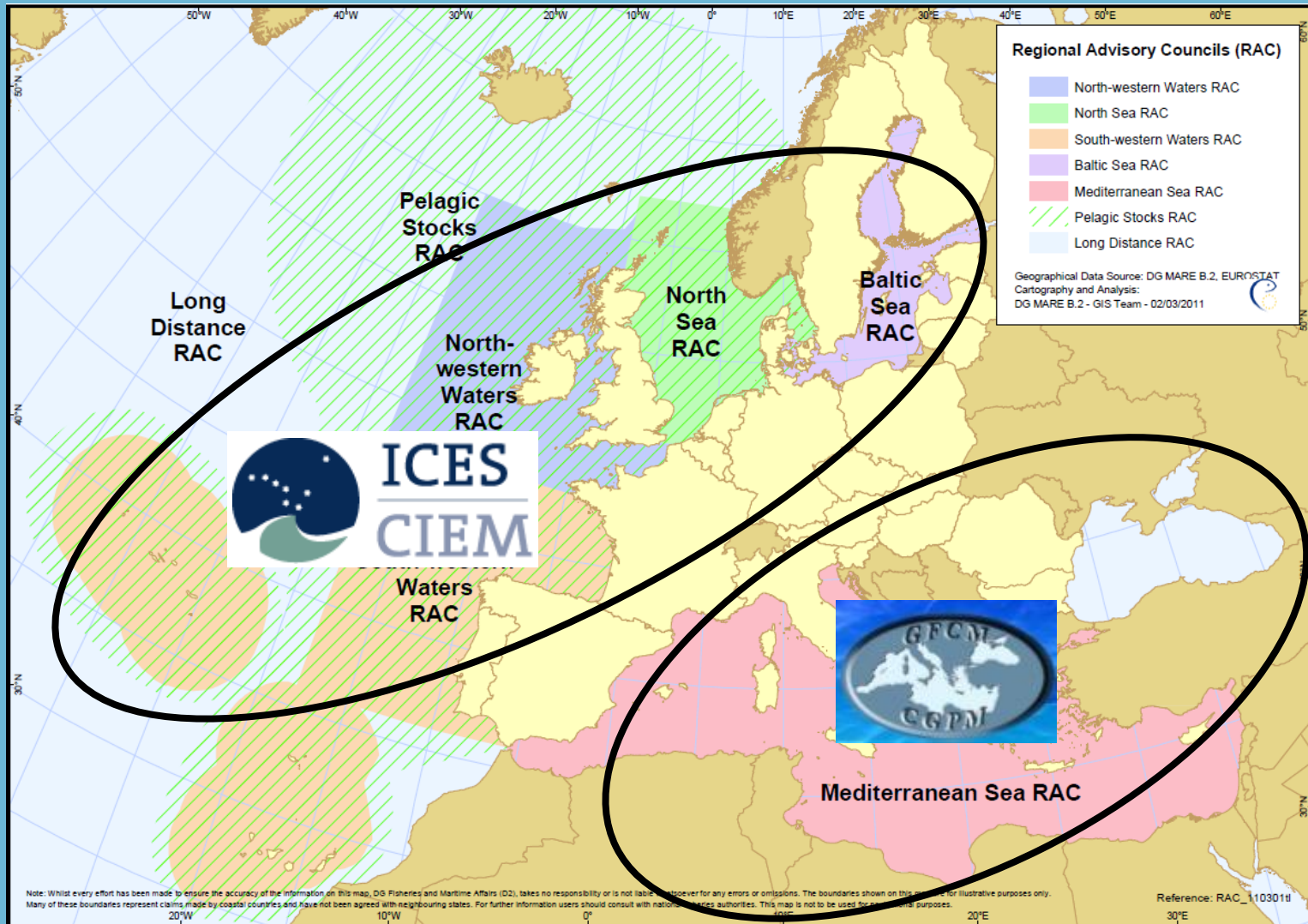
## Criterion 3.3:

Population age and size distribution

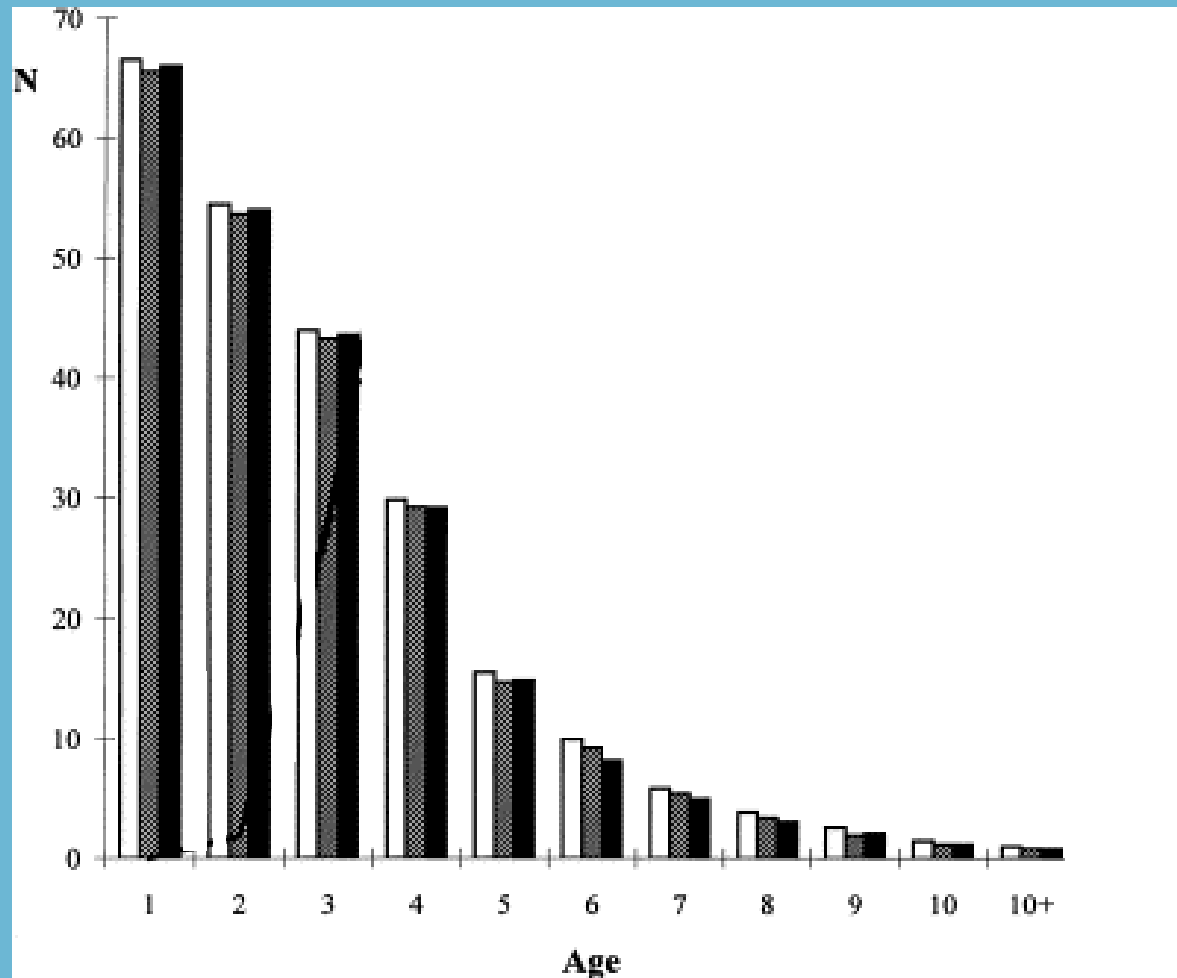
- ???



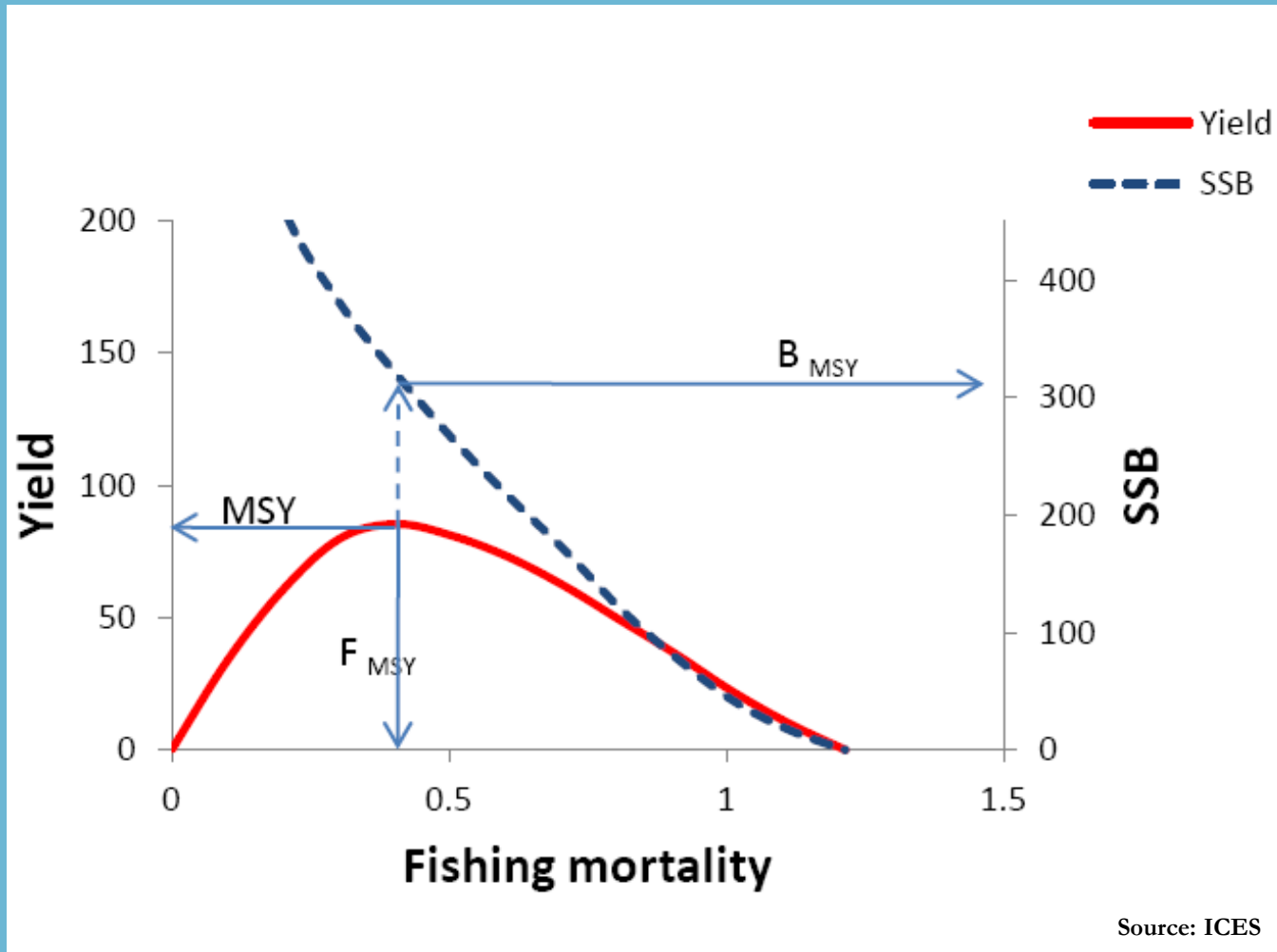
# European Fisheries Management



# Fisheries Assessments



# Fisheries Assessments



# MSFD Descriptor 3

## Criteria 3.1:

Level of pressure of fishing mortality

-  $F_{MSY}$

## Criterion 3.2:

Reproductive capacity of the stock

-  $B_{MSY}$

## Criterion 3.3:

Population age and size distribution

- ???

# ICES Stock Advice

## Annual stock advice

>200 stocks

covers MSFD criteria

6.4.3

Advice June 2013

**ECOREGION** North Sea  
**STOCK** Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak)

Advice for 2014

ICES advises on the basis of the EU-Norway management plan that landings in 2014 should be no more than 28 809 tonnes. If discards rates do not change from those in 2012, this implies catches of no more than 37 496 tonnes.

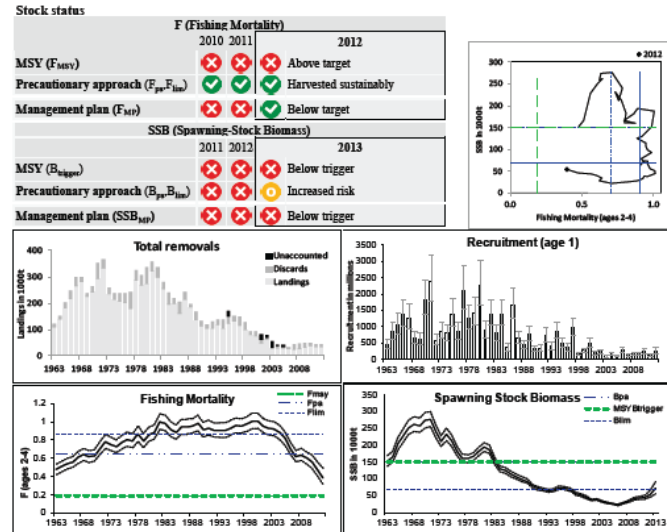


Figure 6.4.3.1 Cod in Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak). Summary of stock assessment with point-wise 95% confidence intervals, catch estimated, and adjusted for unaccounted removals (from 1993 to 2005).

There has been a gradual improvement in the status of the stock over the last few years. SSB has increased from the historical low in 2006, and is now in the vicinity of  $B_{lim}$ . Fishing mortality declined from 2000 and is now estimated to be around 0.4, between  $F_{pa}$  and the  $F_{MSY}$  proxy. Recruitment since 2000 has been poor.

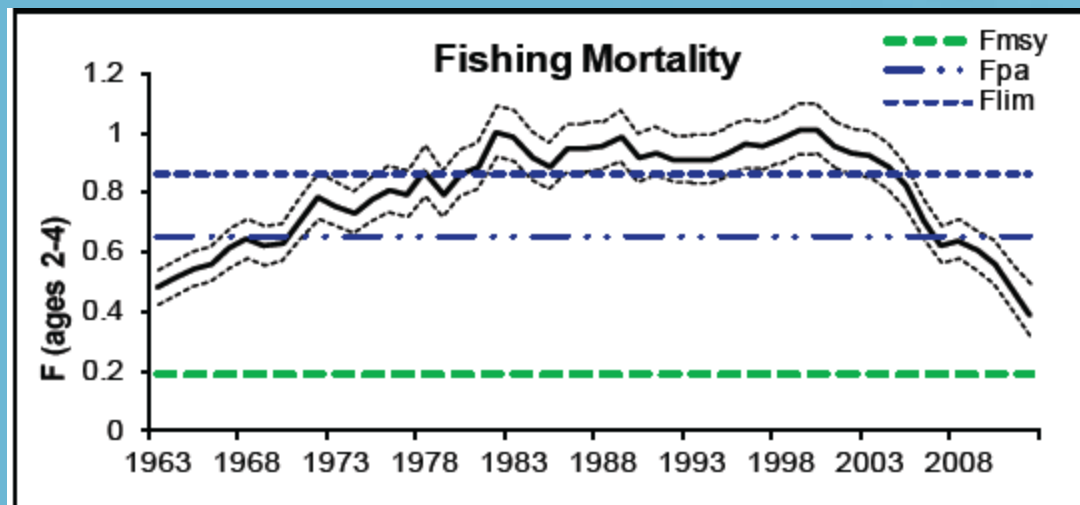
### Management plans

The EU-Norway agreement management plan was updated in December 2008 (Annex 6.4.3). The EU has adopted a long-term plan for this stock with the same aims (Council Regulation (EC) 1342/2008; Annex 6.4.3). ICES evaluated the plans in 2009 and concluded that they are both in accordance with the precautionary approach if implemented and enforced adequately.



# Criterion 3.1 Fishing pressure

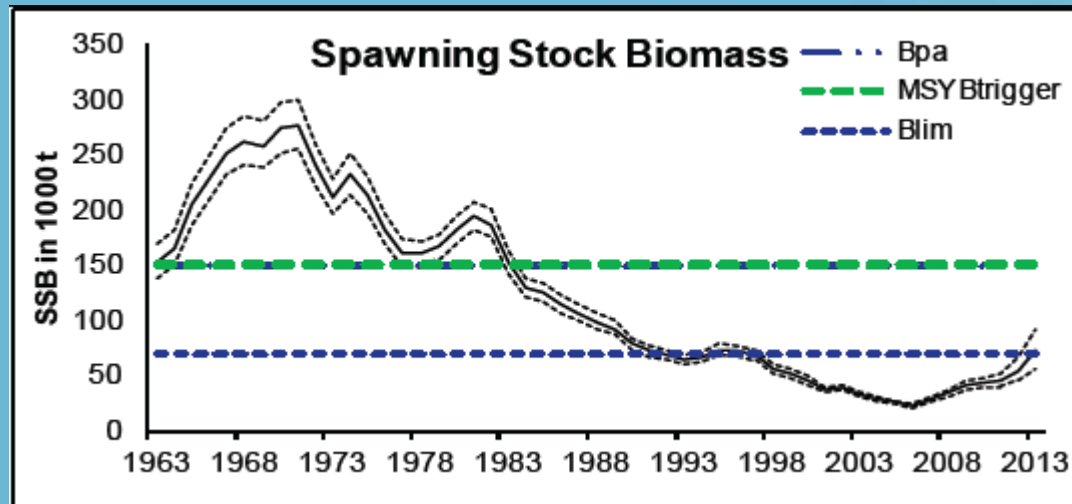
## Indicator 3.1.1 Fishing mortality (F)



| F (Fishing Mortality) |      |      |                |
|-----------------------|------|------|----------------|
|                       | 2010 | 2011 | 2012           |
| MSY ( $F_{MSY}$ )     | ✘    | ✘    | ✘ Above target |

# Criterion 3.2 Reproductive capacity

## Indicator 3.2.1 Spawning stock biomass



| SSB (Spawning-Stock Biomass) |      |      |                 |
|------------------------------|------|------|-----------------|
|                              | 2011 | 2012 | 2013            |
| MSY ( $B_{\text{trigger}}$ ) | ✘    | ✘    | ✘ Below trigger |

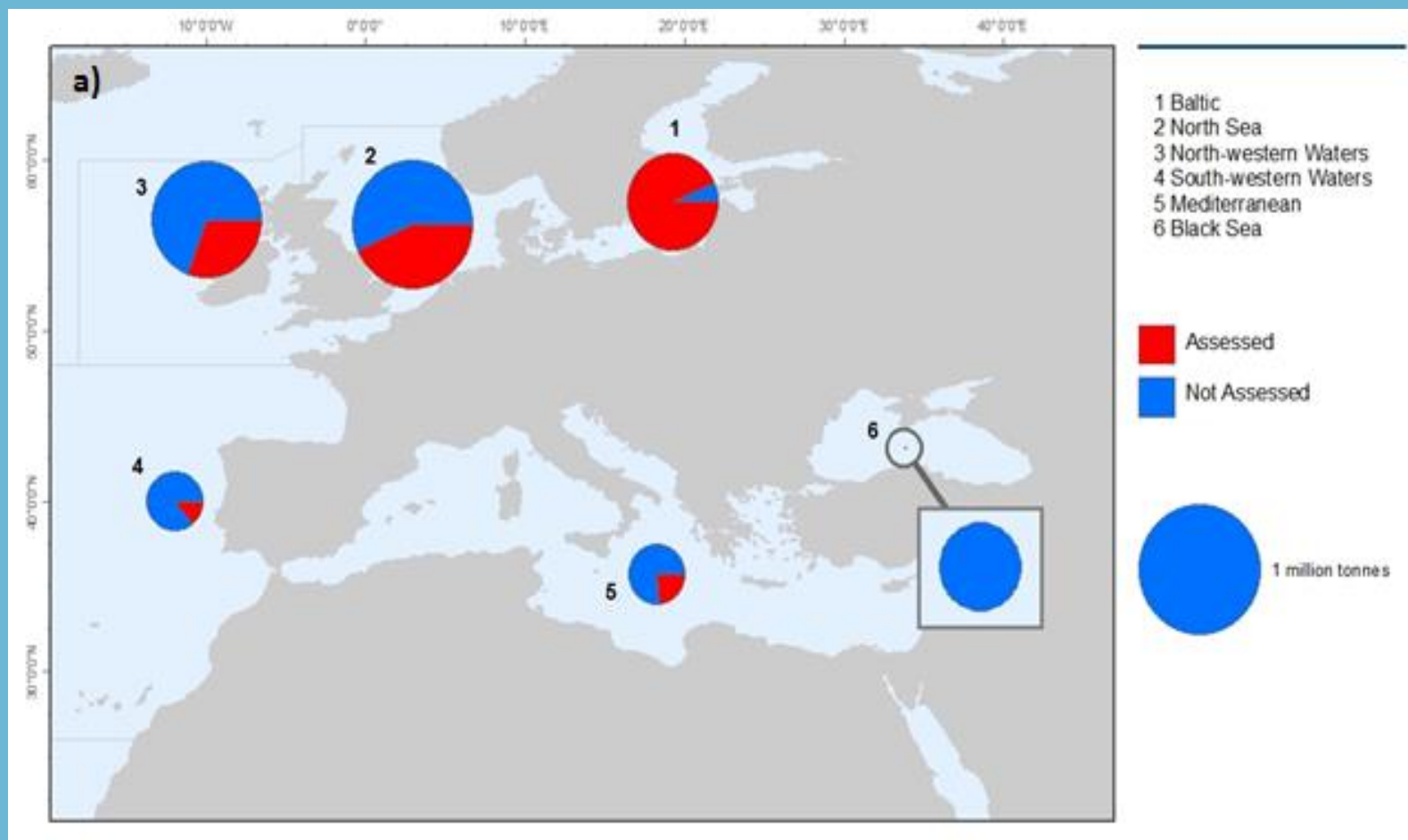
# Criterion 3.3 Population age structure

Indicator 3.3.1 % larger than first maturity ?

Indicator 3.3.2 Mean maximum length ✘

Indicator 3.3.3 length 95<sup>th</sup>0% in surveys ?

# Descriptor 3 ..... So it's easy?



# Why are there data-deficient stocks?

## Lack of data

Landings, discards, survey, biological samples

## Lack of biological knowledge

Growth, age, maturity

## Lack of models

Time consuming



# What can be done?

Some knowledge, not no knowledge

Not MSY based assessments

MSY proxies

Pragmatic common sense

ICES Data-limited stocks approach

quantitative catch advice

# ICES Data-limited stock approach

| ICES stock category  | Information required |             |                   |         |                  |                |
|--|----------------------|-------------|-------------------|---------|------------------|----------------|
|  | Population estimate  | Survey data | Fishing mortality | Biomass | Discards         | Landings       |
| <b>1: Data rich</b> – Full analytical assessment and forecast used for advice  | √                    | √           | √                 | √       | √ <sup>1</sup>   | √              |
| <b>2: Qualitative assessment and forecasts</b> – quantitative assessment and forecast available but they are only considered indicative of trends only.  | Trend                | (√)         | Trend             | Trend   | (√)              | √              |
| <b>3: Survey-based trends assessment</b> – surveys are reliable indicators of trends, but no quantitative assessment is available  |                      | Trend       | trend             | Trend   | √ <sup>1,2</sup> | √ <sup>2</sup> |
| <b>4: Catch data available over a short time series</b>  |                      |             |                   |         | √ <sup>1</sup>   | √              |
| <b>5: Data poor</b> – only landings data available   |                      |             |                   |         | (√)              | √              |
| <b>6: By-catch or negligible landings</b> – stocks with landings that are negligible in comparison to discards or part of stock complexes and caught primarily as by-catch in target fisheries |                      |             |                   |         |                  | (√)            |

Source: Modified from ICES (2013)

# Descriptor 3 secondary indicators

## Criterion 3.1:

Proxy for fishing mortality - catch advice

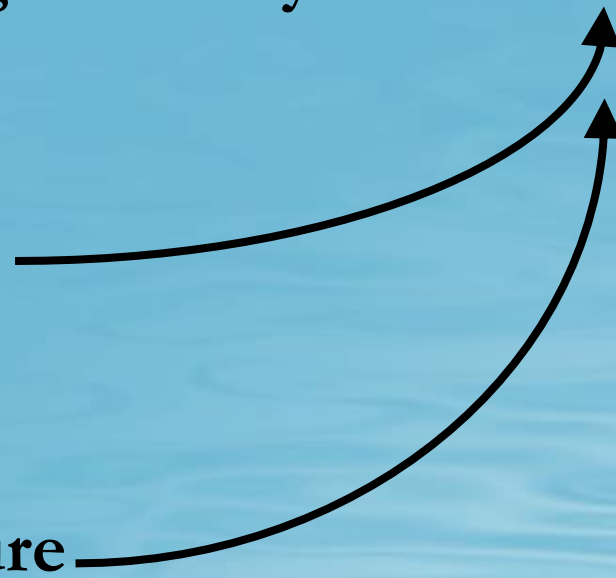
## Criterion 3.2:

Biomass indices

## Criterion 3.3:

Size/age structure

Size at first sexual maturation **x**



# Risk Assessment & D3

What is the risk?

Missing target – ‘over fishing’

Why is there risk?

Lack of data

Inappropriate management

# Risk Assessment 1 - Data

Never have all knowledge

- focus on greatest risk

Vulnerability = Sensitivity x Exposure

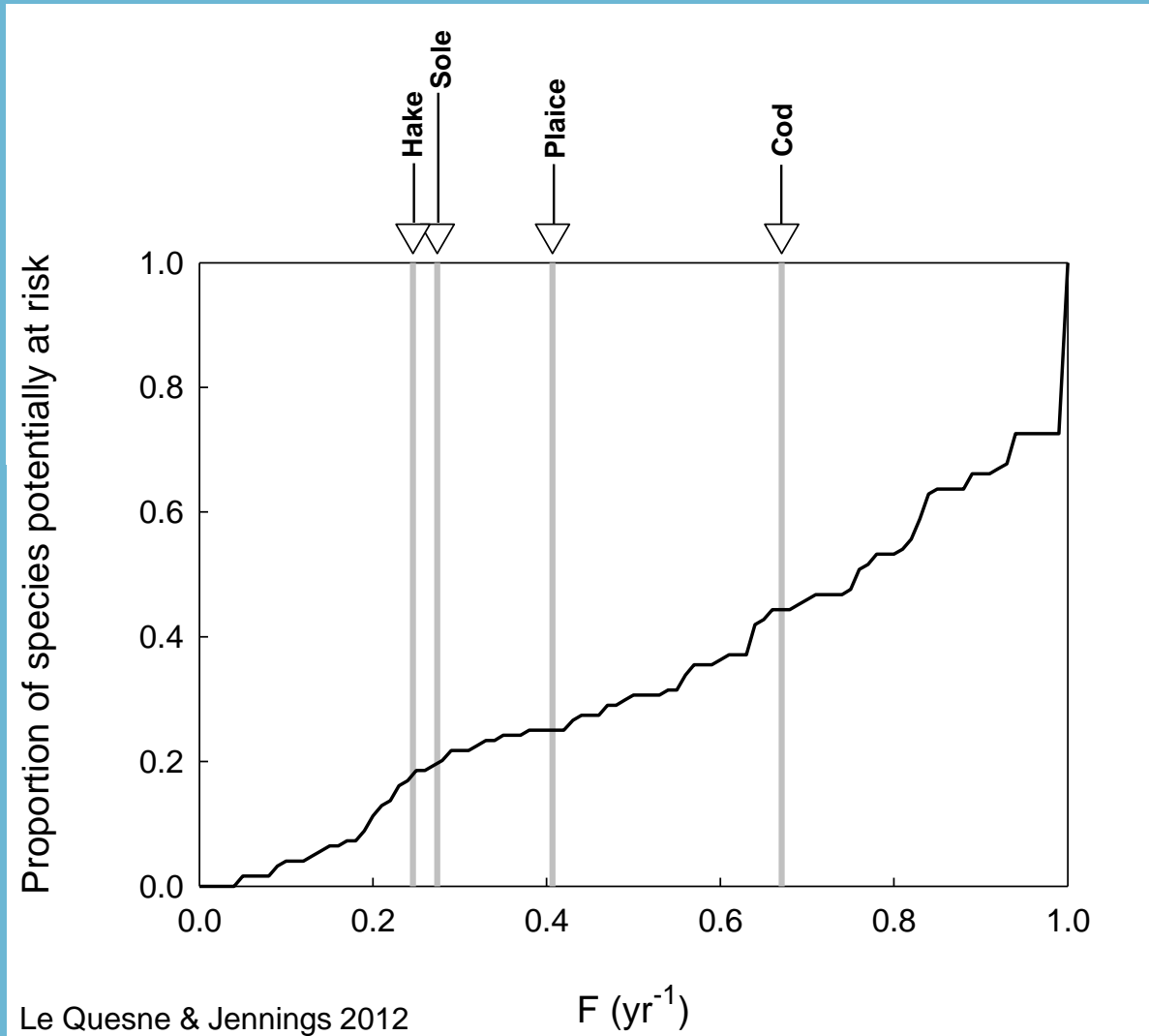
Example 1

Calculate sensitivity

Pope's postulate



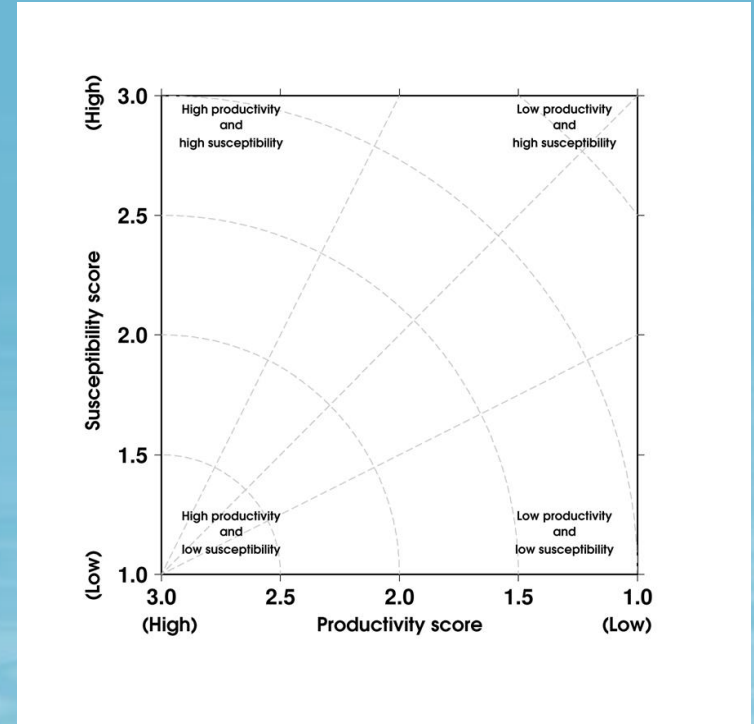
# Life-history based risk assessment



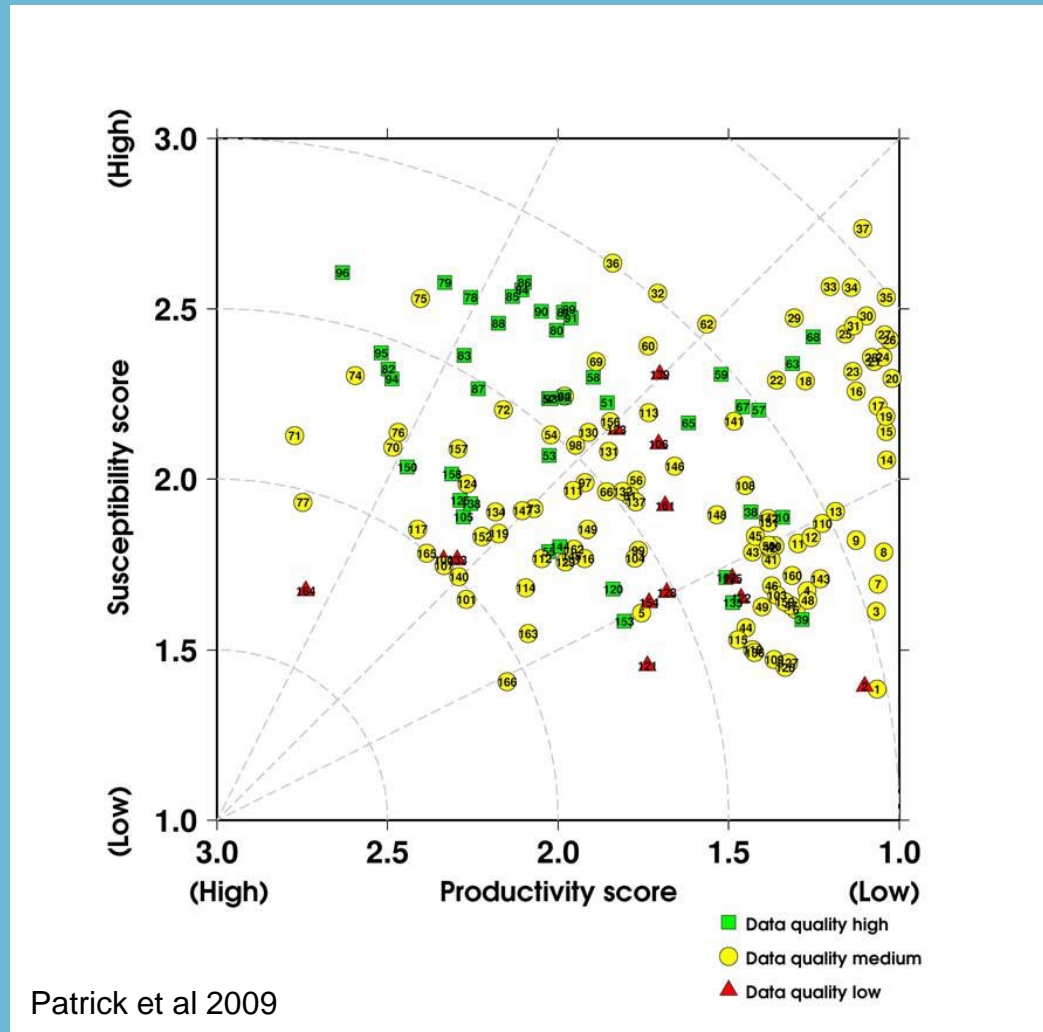
# Productivity-Susceptibility analysis

## Example 2

Calculate susceptibility  
Estimate exposure



# Productivity-Susceptibility analysis



# **Risk Assessment 2 – Management**

**Uncertainty over management outcomes**

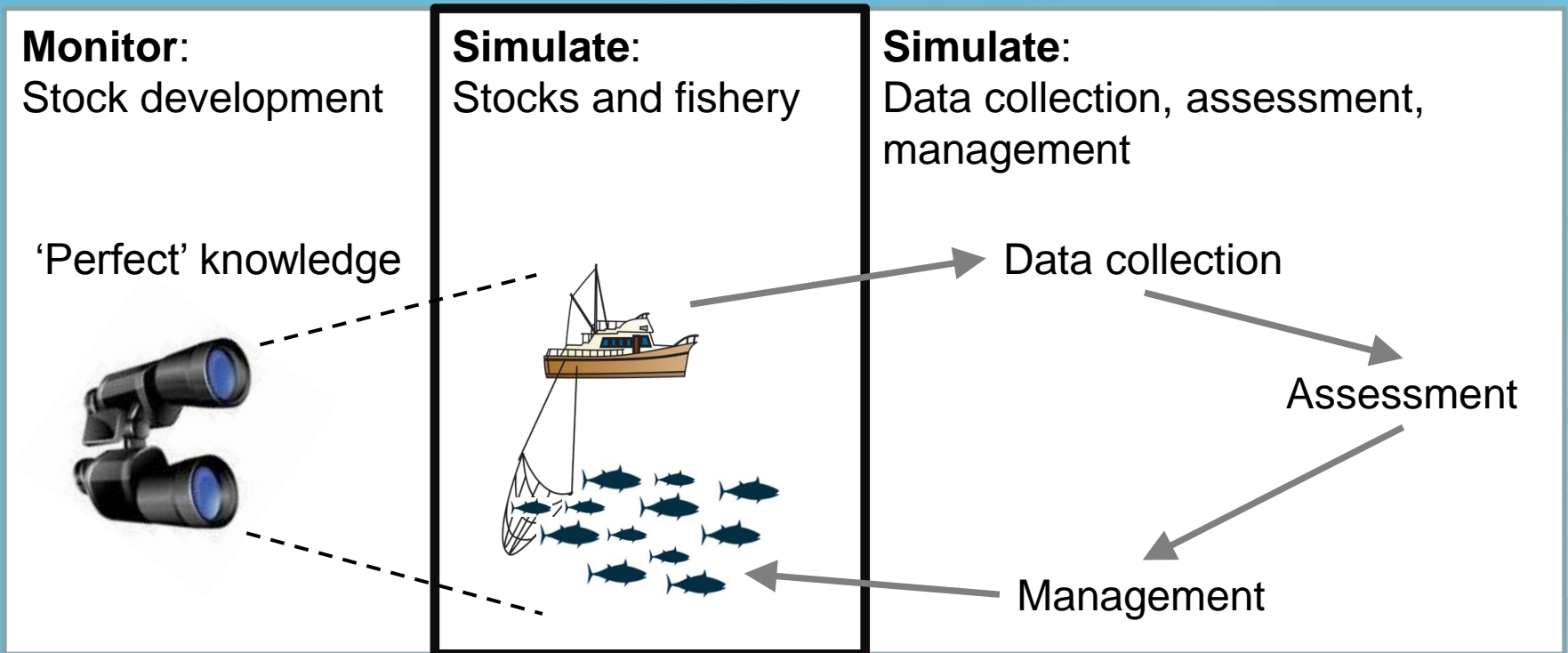
**Accept limited data**

**Evaluate risk in management decisions**

**Management strategy evaluation**

# Management Strategy Evaluation

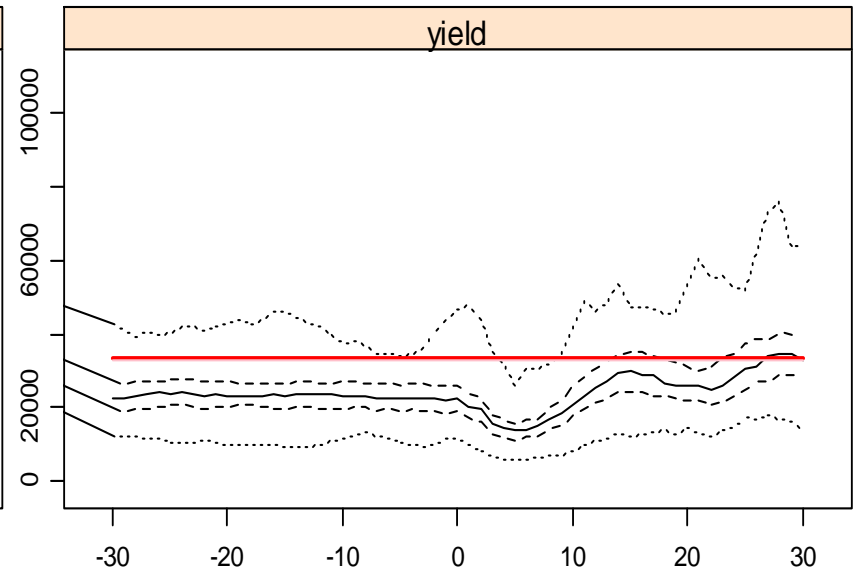
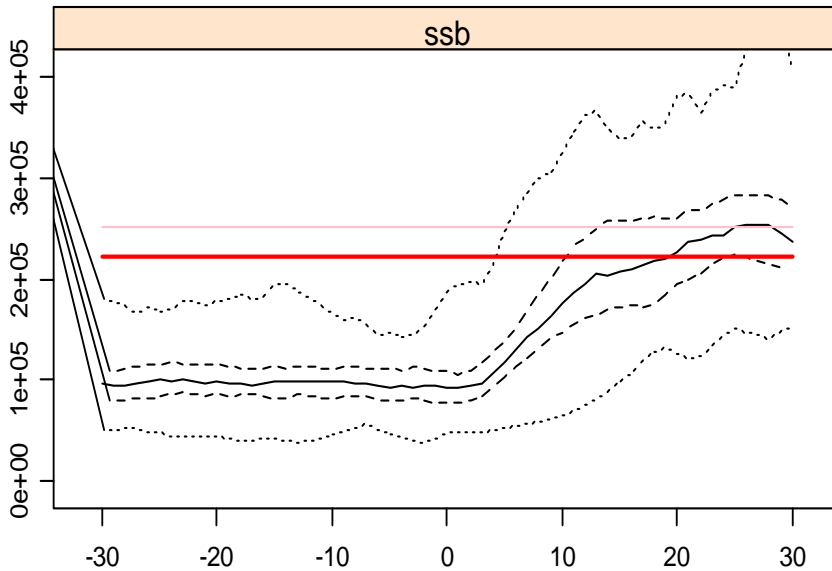
## Evaluating risk in the management system





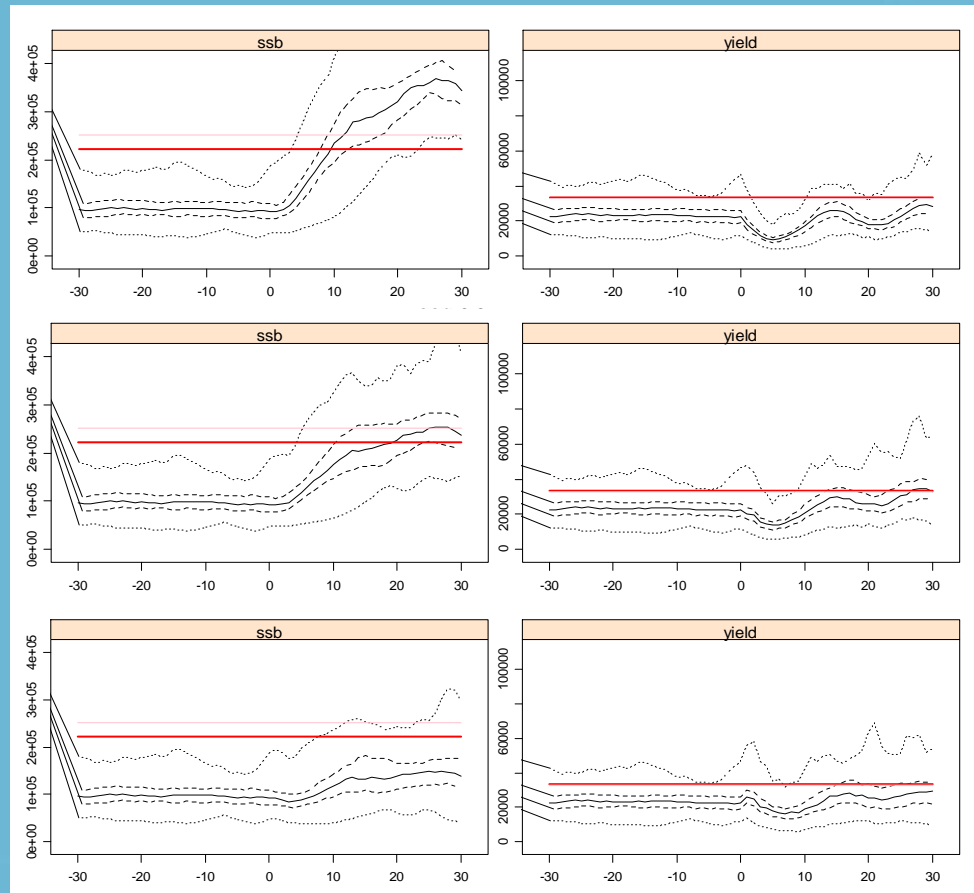
# Management Strategy Evaluation

## Testing the ICES DLS method



# Management Strategy Evaluation

## Testing the ICES DLS method



# Conclusions

- **D3.1 and D3.2 ‘easy’ for assessed stocks**  
‘mechanistic understanding’, processes in place
- **D3.3 unclear, possibly redundant?**
- **Data-deficient stocks more challenging**  
resource intensive, ad hoc reference points
- **Risk assessment approaches for objective  
prioritisation of resources**
- **MSE to minimise risk in management system**