myfish

Maximising yield of fisheries while balancing ecosystem, economic and social concerns

THE MSY CONCEPT IN A MULTI-OBJECTIVE FISHERIES ENVIRONMENT – LESSONS LEARNED FROM THE NORTH SEA

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The challenge (I)

The North Sea as management area is characterised by:

- Complex biological interactions
  ➔ Single species MSYs cannot be reached for all species simultaneously

- Complex technical interactions in mixed fisheries
  ➔ “chocke species problem”

➔ Implementing MSY under a landing obligation is a great challenge for scientists, industry and managers

The challenge (II)

The common fisheries policy names multiple objectives:

- the CFP shall ensure that "…*fishing and aquaculture activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies.*"

- The CFP shall apply a precautionary and ecosystem based approach to fisheries management to restore and maintain "…*populations of harvested species above levels which can produce the maximum sustainable yield and to ensure that negative impacts of fishing activities on the marine ecosystem are minimised*."

➔ *MSY (or F_{MSY}) needs to be reached while respecting the ecosystem approach to fisheries management*

➔ *At the same time economic and social constraints need to be respected*

➔ *Different stakeholder groups put different weights on these objectives*

Main questions

In the MYFISH North Sea case study we tried to answer the following questions:

- What are the preferences of stakeholders when confronted with trade-offs and multiple objectives?
- How severe are trade-offs in North Sea fisheries and can the MSY concept be adapted to resolve trade-offs?
- How can science be used to resolve a multi-dimensional trade-off space?

General approach

1. A Problem framing workshop to identify MSY objectives and constraints and rank options

2. Two Management reflection workshops to discuss the rankings and refine options

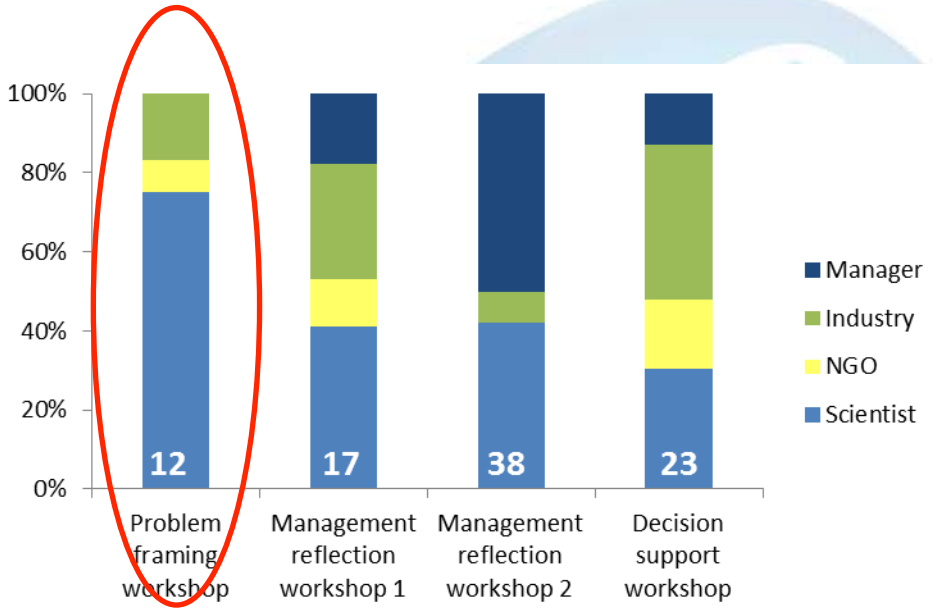
3. Scenario modelling of preferred options to prepare Decision Support Tables

4. A Decision support workshop for stakeholder feedback and validation on preferred option scenarios

Problem Framing Workshop

MYFISH Kick-off meeting 12th of April 2012

12 participants visited the
North Sea regional workshop



<u>Main questions:</u>

What do we want to maximise?

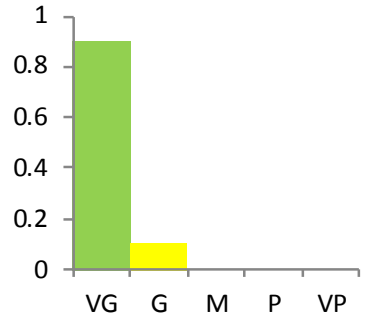
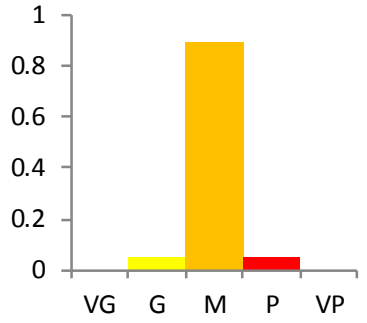
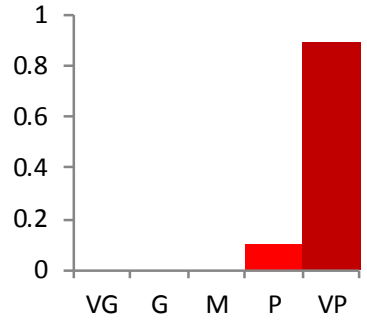
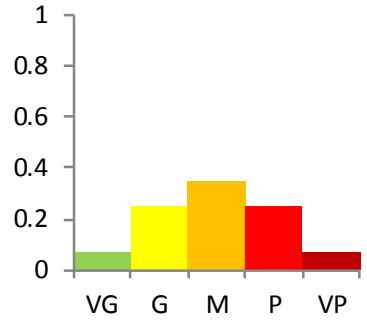
What constraints are important?

<u>Approach:</u>

List of potential objectives and constraints has been agreed in pan-regional workshops
Excel based tool to measure preferences and uncertainty in the group

Problem Framing Workshop

Example distributions based on ratings and uncertainty in the group

R	Very good		R	Medium	
U	Very low		U	Very low	
R	Very poor		R	Medium	
U	Very low		U	High	

What do we want to maximise?

Priority	MSY objectives	Exp. Util
1	Maximise inclusive governance	0.46
	Maximise yield of fish/litre of fuel (or CO2) or similar energy unit	0.47
	Maximise yield in value of key commercial species	0.53
	Maximise consumer welfare/happiness	0.62
	Maximise yield in value	0.77
	Maximise yield in tonnes of key commercial species	0.77
	Maximise stability	0.78
2	Maximise Net Present Value	0.82
	Maximise Gross Value Added	1.14
	Maximise fisher welfare/happiness	1.52
	Maximise GVA over the entire value chain	1.57
3	Maximise yield in tonnes	1.66
	Maximise useful knowledge	1.78
	Maximise Social Yield	1.80
	Maximise willingness to invest in the future fisheries	1.87
	Maximise fishing community viability	1.93
	Maximise resilience	2.22
4	Maximise stability of stocks	2.41
	Maximise Resoure Rent	3.12

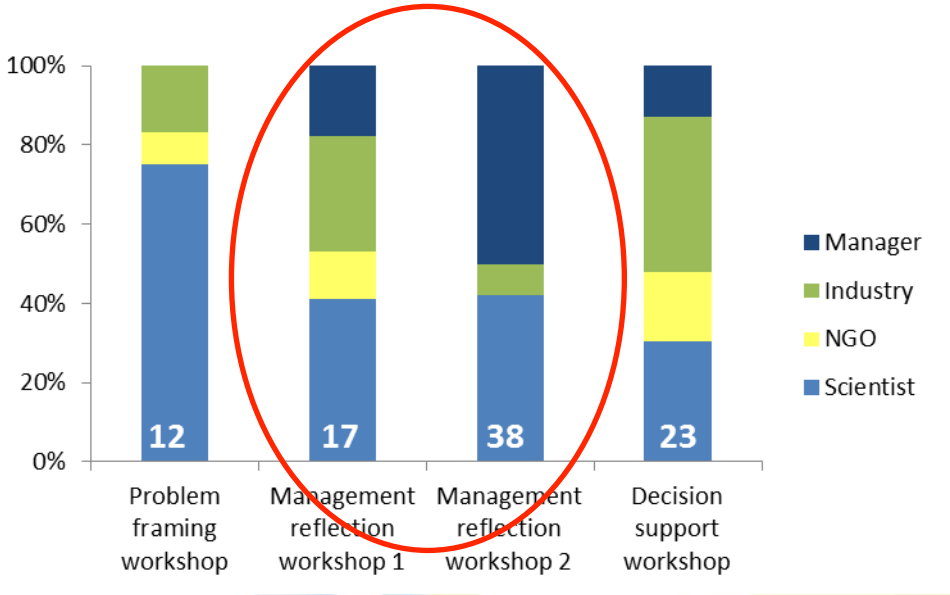
What are the most important constraints

Priority	Constraint	Expected utility
1	GES descriptors of commercial species above reference level	0.10
	GES descriptors of biodiversity above reference level	0.10
	GES descriptors of food web functioning bove reference level	0.10
	GES descriptors of seafloor integrity above reference level	0.10
	Areas wth fishing restriction (eg Natura 2000)	0.10
	Mortality of PET and other vulnerable species below specified level	0.10
	Discard of non-target species below specified level	0.10
	Legislation adhered to/compliance	0.10
	Maintain relative stability	0.10
	Human accidents at sea below a specified level	0.10
	Maintain trust among industry participants	0.67
2	Profits above a minimum level	1.04
	Carbon footprint less than specified level	1.06
	Maintain trust among all stakeholders and stakeholders	1.06
	Equity of income	1.06
	Increase level of self-determination for fishing actions by fishers	1.06
	Maintain fishing rights and ownership to achieve small fishing sector	1.21
3	Stability of landings	2.00
	Retain subsidies	2.00
	Maintaining small communities at a specified level	2.00
	Maintaining vessel size distribution at a certain level	2.00
	Maintain consumer choice for different kinds and sources of fish	2.00
4	Maintain human food supply above specified level	2.96
5	Management cost below specified level of GVA	3.90
	Technical selectivity unaltered	3.90
	Employment above a specified level	3.90
	Increase status of fishers	3.90
	Reduce barriers to mobility in the fishing industry (to join or leave the industry)	3.90

Management reflection workshops

ICES/MYFISH WKM-Trade (October 2012) and ICES/Nordic Council of Ministers workshop (February 2013)

17 and 38 participants respectively



Main outcomes:

Scientists should not make decision on trade-offs but only give options within a sustainable exploitation space

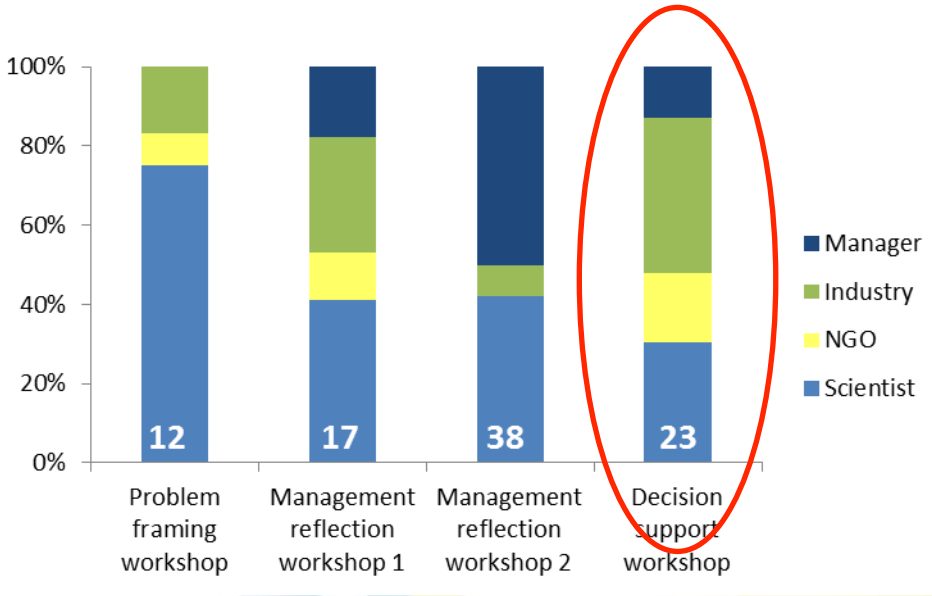
Aim of fisheries management must be compatible with the stocks being maintained above precautionary limits

It is not politically feasible to reach a consensus on decisions where one country would have to loose yield in order for the summed European yield to be maximised

Decision support workshop

MYFISH/ North Sea Advisory Council Workshop in Amsterdam 7 July 2014

23 Participants



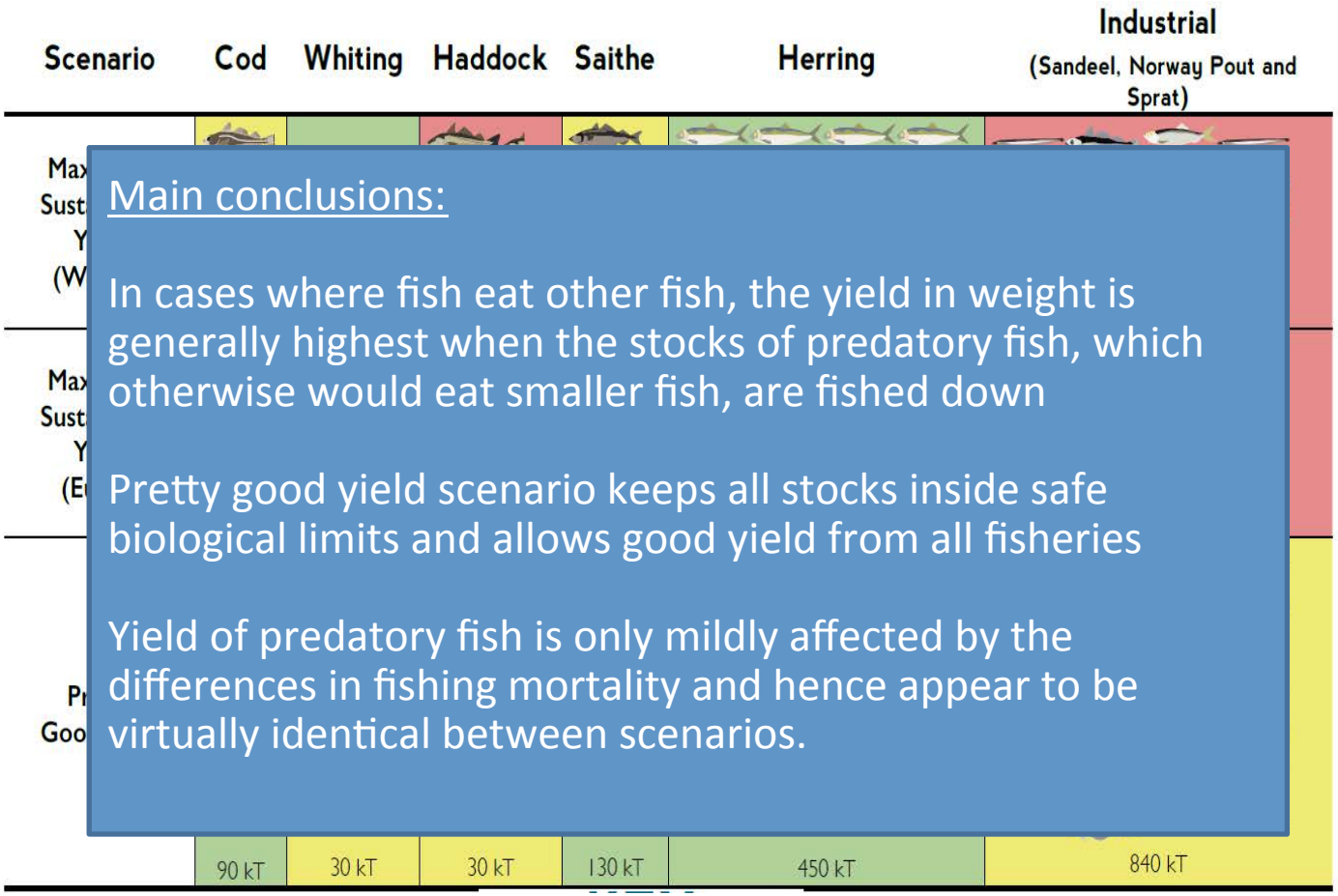
<u>Main approach:</u>

Presentation of three Decision Support Tables:

1. Biological interactions (whole North Sea, SMS)
2. Technical interactions in the mixed roundfish fisheries (Fishrent)
3. Consequences of aiming for MSY, MEY and GES in the southern North Sea (Simfish and Ecopath with Ecosim)

General discussion and questionaire (ranking of scenarios, uncertainty about ranking and free text to give reasons for ranking)

DST Biological Interactions



Main conclusions:

In cases where fish eat other fish, the yield in weight is generally highest when the stocks of predatory fish, which otherwise would eat smaller fish, are fished down

Pretty good yield scenario keeps all stocks inside safe biological limits and allows good yield from all fisheries

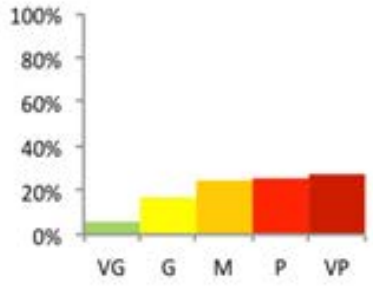
Yield of predatory fish is only mildly affected by the differences in fishing mortality and hence appear to be virtually identical between scenarios.

DST Biological Interactions

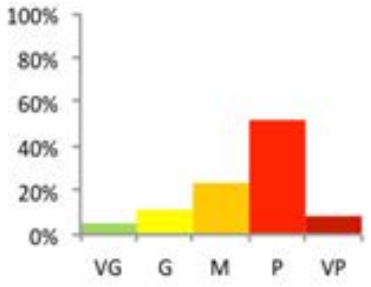
Discussions and stakeholder preferences:

Pretty good yield was evaluated to be most suitable, but maybe difficult to implement.

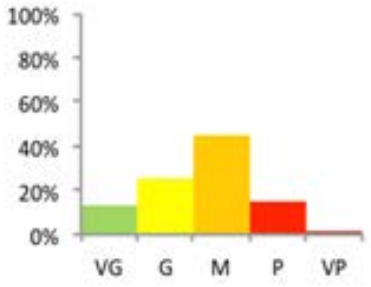
Stakeholders discussed especially the uncertainties in complex simulations and difficulty to resolve trade-offs caused by biological interactions



Maximum Sustainable Yield (weight)

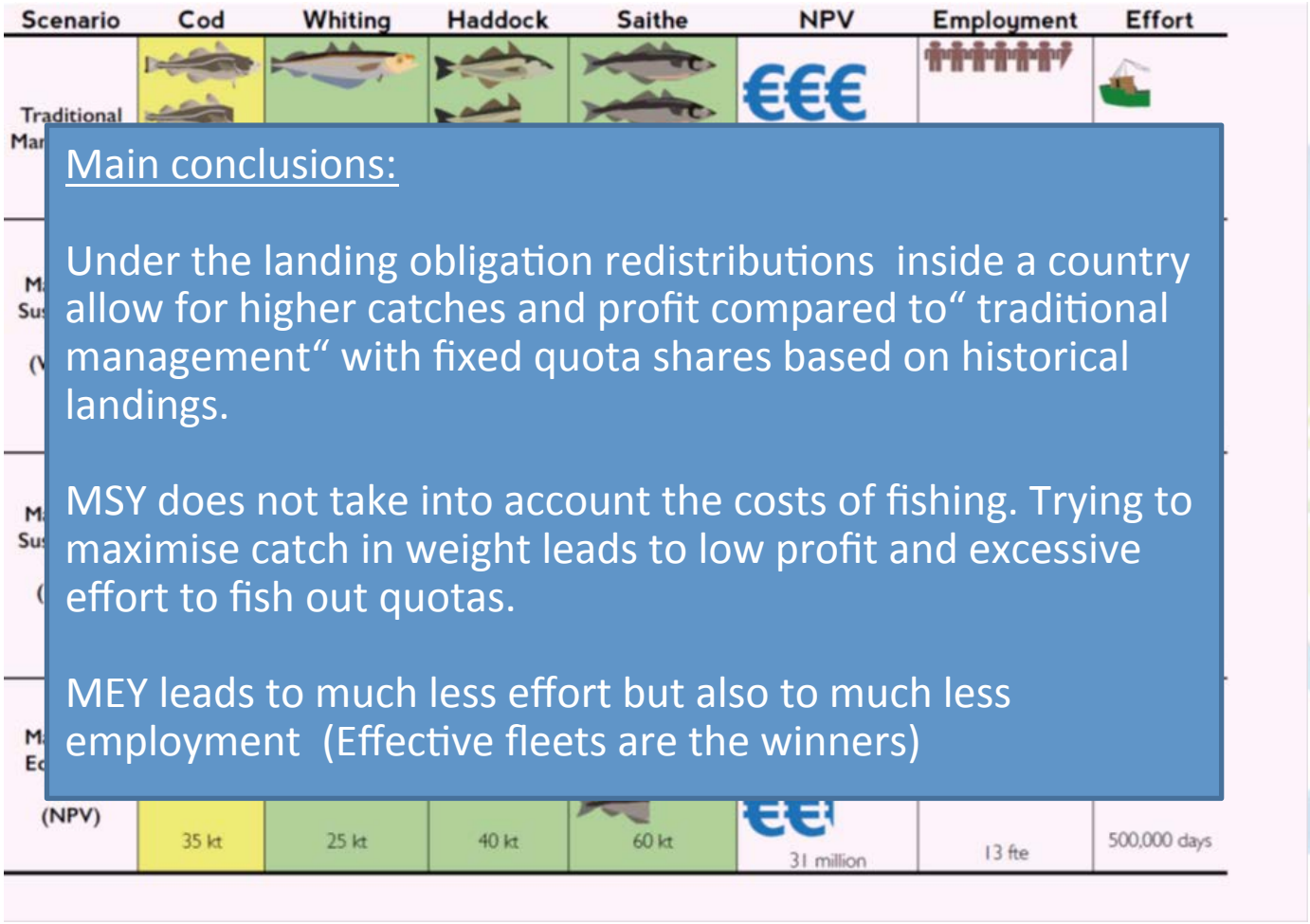


Maximum Sustainable Yield (Euros)



Pretty Good Yield

DST technical Interactions

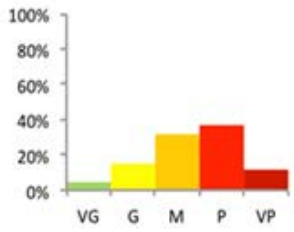


DST technical Interactions

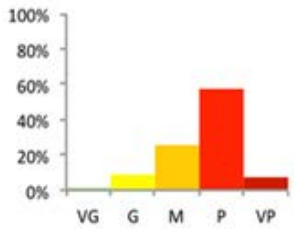
Discussions and stakeholder preferences:

"MEY maximize net present value" was deemed most suitable. The loss in employment was the main argument against MEY.

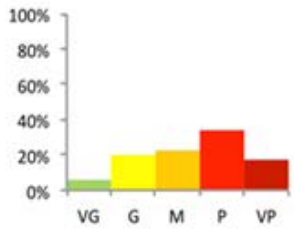
The socio-economic consequences of aiming for MEY instead of MSY as well as associated assumptions on fixed prices and costs were discussed



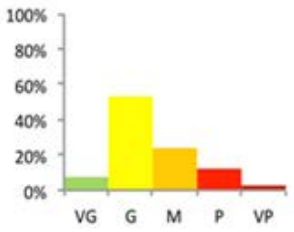
Traditional Management



Maximum Sustainable Yield (weight)

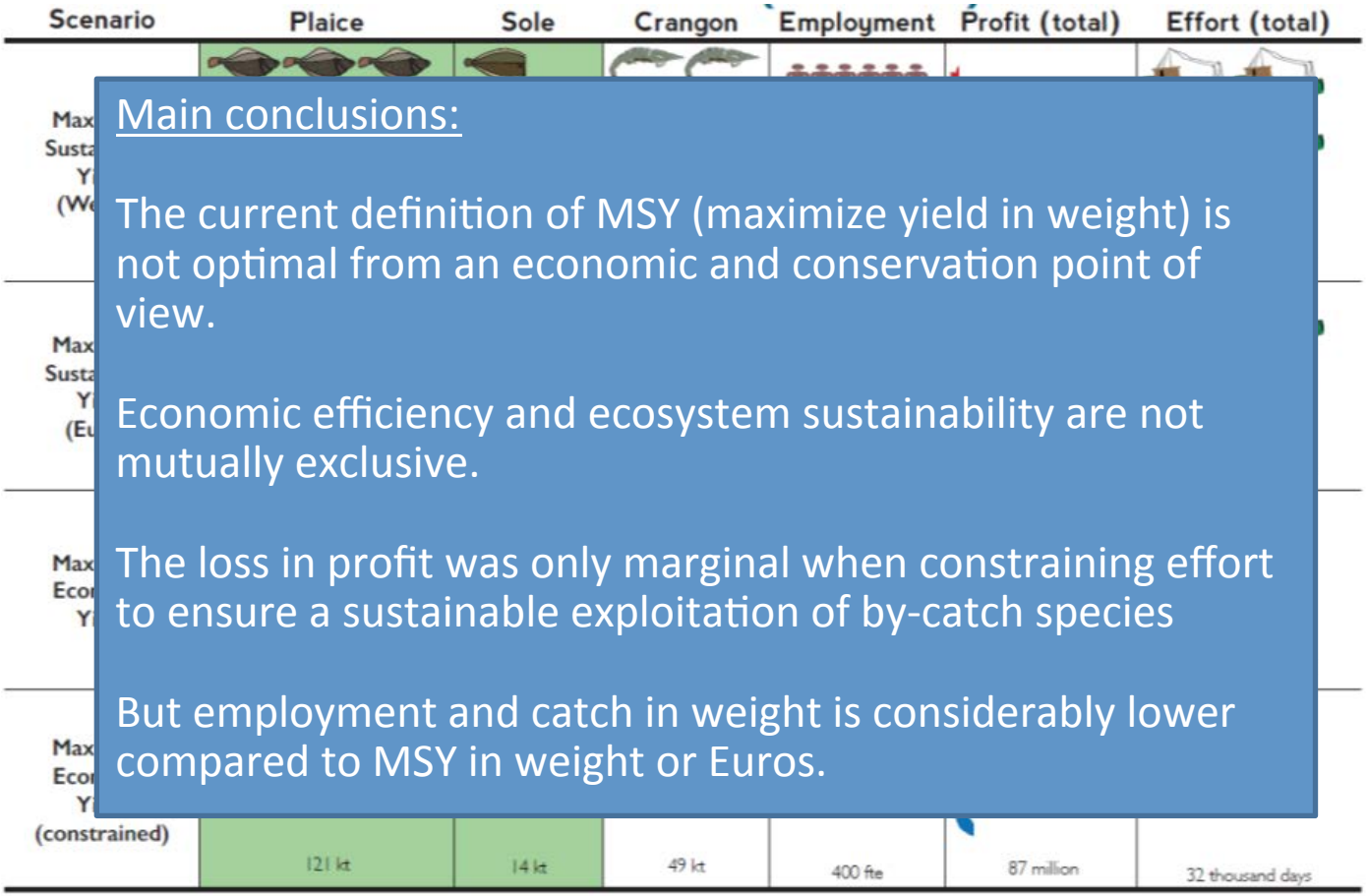


Maximum Sustainable Yield (Euros)



Maximum Economic Yield (NPV)

DST Southern North Sea



Main conclusions:

The current definition of MSY (maximize yield in weight) is not optimal from an economic and conservation point of view.

Economic efficiency and ecosystem sustainability are not mutually exclusive.

The loss in profit was only marginal when constraining effort to ensure a sustainable exploitation of by-catch species

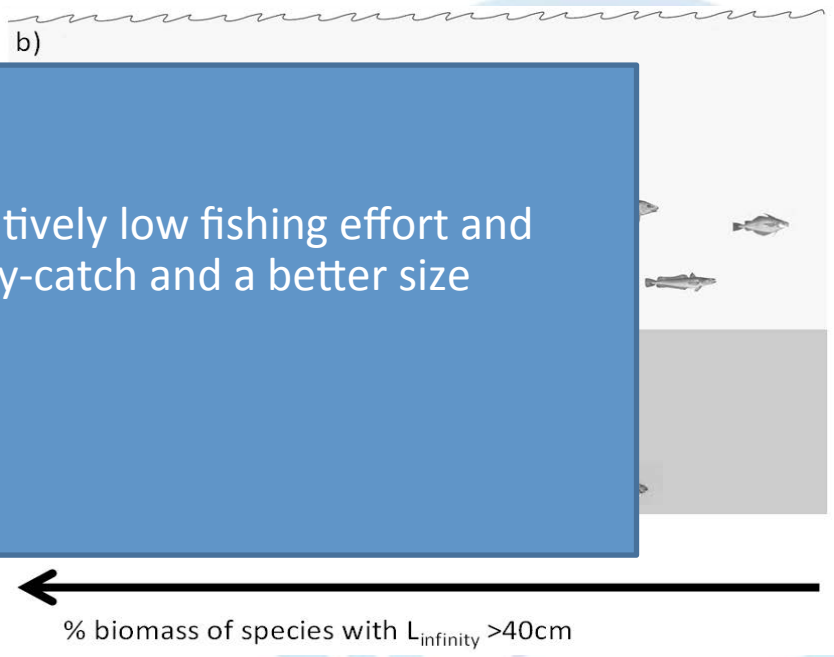
But employment and catch in weight is considerably lower compared to MSY in weight or Euros.

DST Southern North Sea

a)

Scenarios / Constraints	Maximum Sustaina Yield (We	Maximum	Maximum	Maximum Economic
Turbot F<=F_{MSY}	X			
Effort constraint thornback and spotted ray	X			
Effort constraint starry ray	X			

b)



Main conclusions:

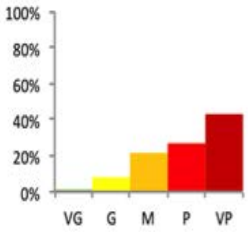
Aiming for MEY leads to a relatively low fishing effort and therefore to a relatively low by-catch and a better size structure in the ecosystem.

DST Southern North Sea

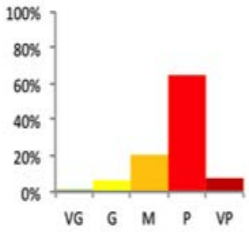
Discussions and stakeholder preferences:

”MEY constrained” scenario was deemed most suitable/ least negative

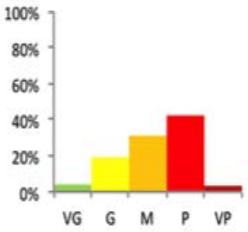
Discussions focussed again on pros and cons of MEY and MSY next to the “choke species” effect from by-catch species under the landing obligation



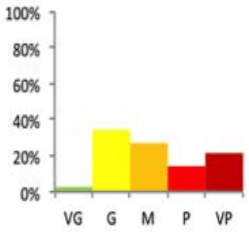
Maximum Sustainable Yield (weight)



Maximum Sustainable Yield (Euros)



Maximum Economic Yield (NPV)



Maximum Economic Yield (constrained)

Lessons learned

Main trade-offs:

Trade-off between having a large stock of predators, or reducing the predatory stocks to achieve a higher yield of prey fish is extremely difficult to resolve. Politicians avoid to trade yield of one country against that of another country.

The MSY and MEY dichotomy leads to the question what benefits society most in the long run?

➔ Fisheries contribute most economically
➔ or higher employment and higher food supply can be maintained

Sustainable exploitation of target and by-catch species leads to trade-offs in mixed fisheries under the landing obligation

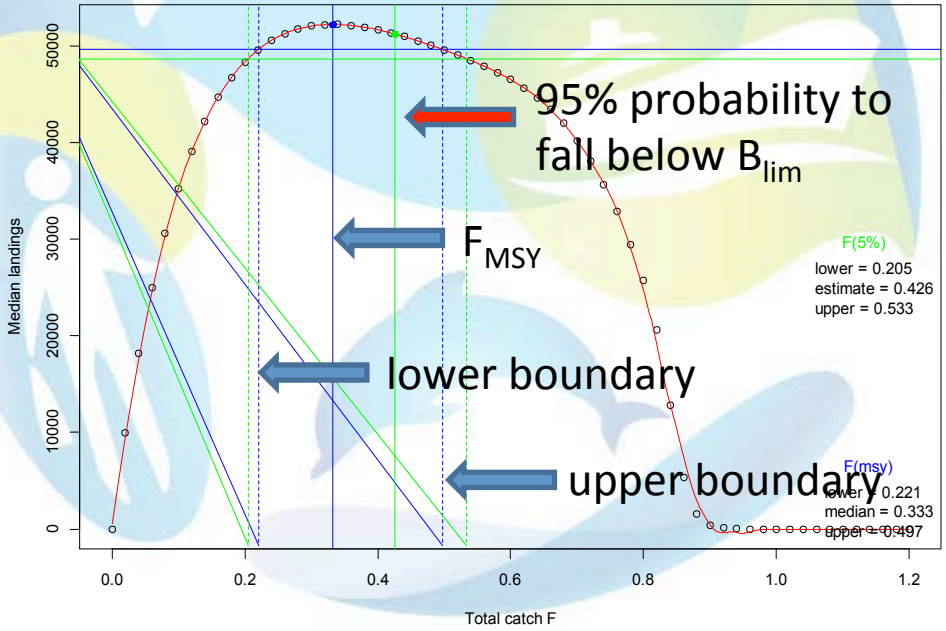
➔ Relative stability principle makes the problem worse but otherwise countries loose guaranteed access to quotas.

Lessons learned

How to resolve the trade-offs?

Stakeholders gave high priority to GES related constraints. But fisheries have to be also economically viable and social concerns should not be sacrificed. Science should only give options within a sustainable exploitation space! Single species approach preferred!

➔Pretty good yield concept



Pros:

More flexibility because ranges satisfy different objectives (e.g., lower boundary associated with F_{MEY} and upper boundary can be used in urgent cases to minimise choke effect in mixed fisheries).

Cons:

Ranges include $F > F_{MSY}$

Each year still decisions needed where to go within the ranges for each stock

Lessons learned

How to resolve the trade-offs?

Stakeholders gave inclusive governance a high priority!

➔ Studies show that inclusive governance is important to increase the acceptance of management decisions

➔ In our approach we included stakeholders from the beginning to discuss options and preferences. Science was used in the workshops and in the DSTs to support informed decisions

➔ But a challenge and strength of inclusive governance are the interests of different participants in the governance process

➔ A well-structured decision making process with clear responsibilities is needed to finally resolve trade-offs! Non-scientists clearly don't want that scientists make decisions. But often the other stakeholder groups also don't want to decide!

Perspectives

Ranges for F_{MSY} and Pretty Good Yield are seen as potential alternative management concepts by ICES and the Commission

ICES/MYFISH provided sustainable ranges for North Sea stocks. The ranges are the backbone of mixed fisheries management plans currently under development

STECF evaluated a draft management plan for the North Sea demersal fisheries and concluded that F_{MSY} ranges could lead to more flexible sustainable management of mixed-fisheries, provided that TACs are not blindly set at the maximum of the range each year

But it is still unclear whether and how exactly F_{MSY} ranges will be finally implemented. For example, Norway also has to agree on F_{MSY} ranges. Is F above F_{MSY} compatible with the CFP and MSFD?

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Maximizing yield of fisheries while balancing ecosystem, economic and social concerns

Thank you for your attention!

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