

Can the Common Fisheries Policy achieve Good Environmental Status in exploited ecosystems: the west of Scotland fisheries example

Alan Baudron¹, Natalia Serpetti², Niall Fallon¹, Sheila Heymans², Paul Fernandes¹



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 613571

West of Scotland

3 main fisheries

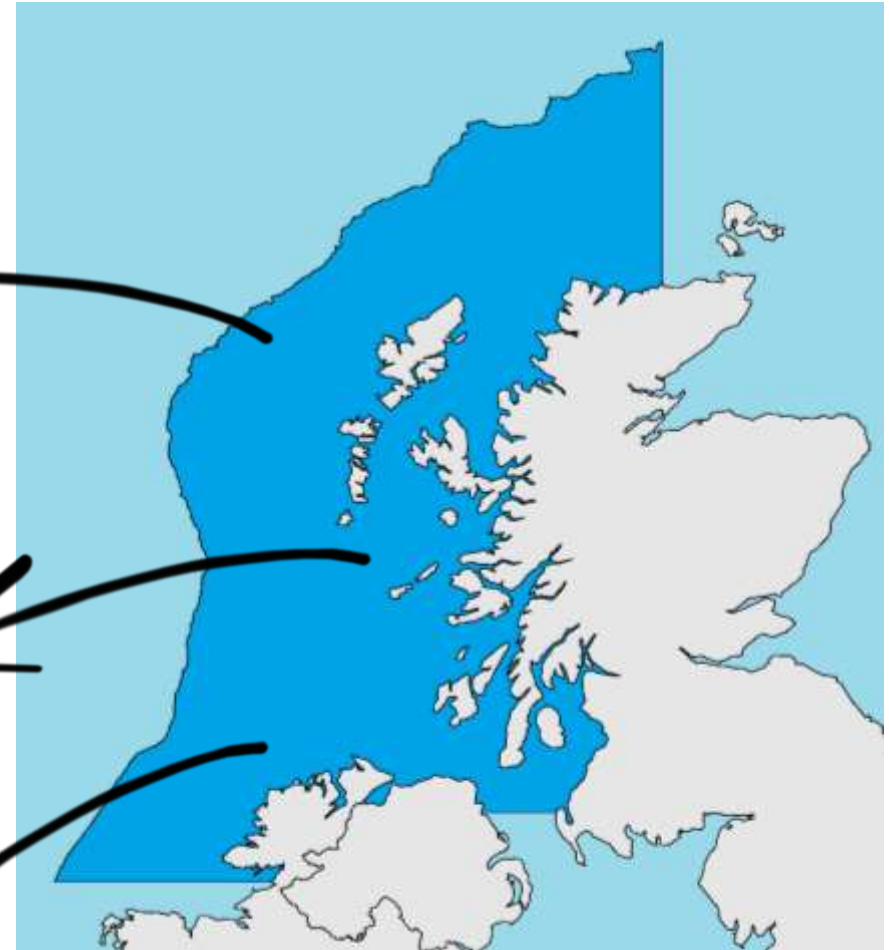
Mixed demersals



Crustaceans



Pelagic

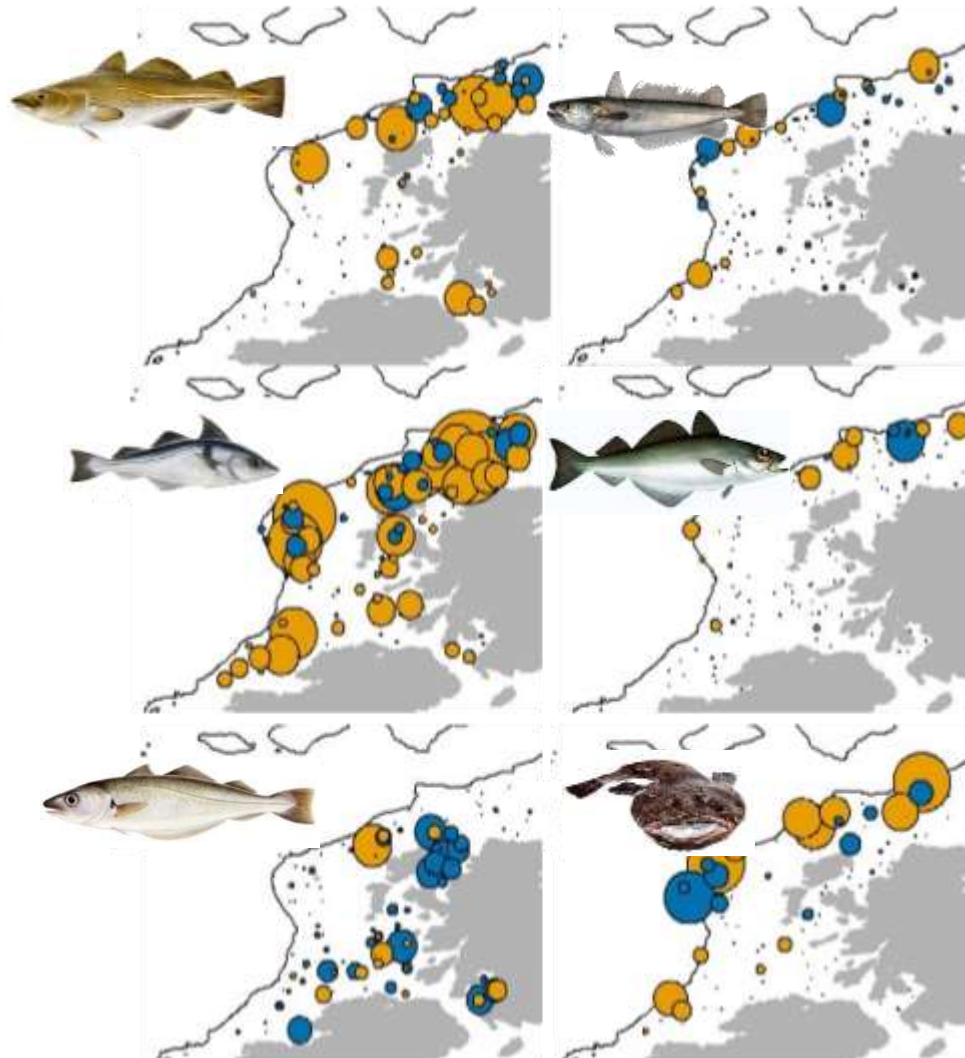


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West of Scotland

3 main fisheries

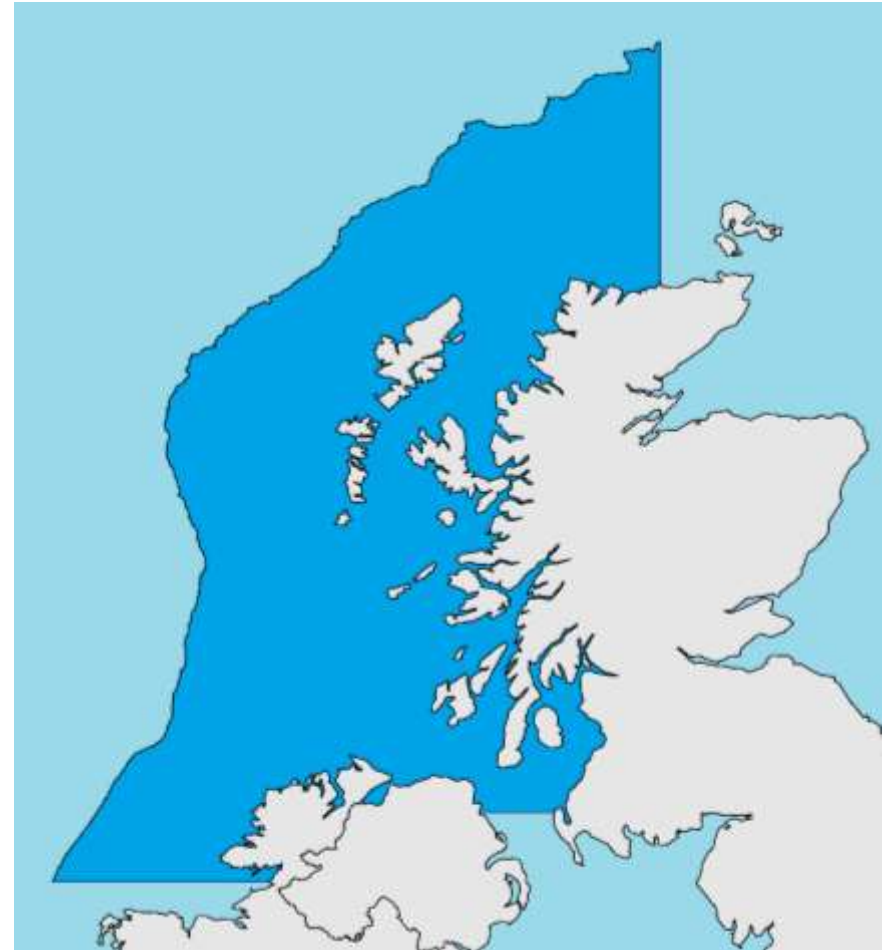
Mixed demersals



West of Scotland

MareFrame

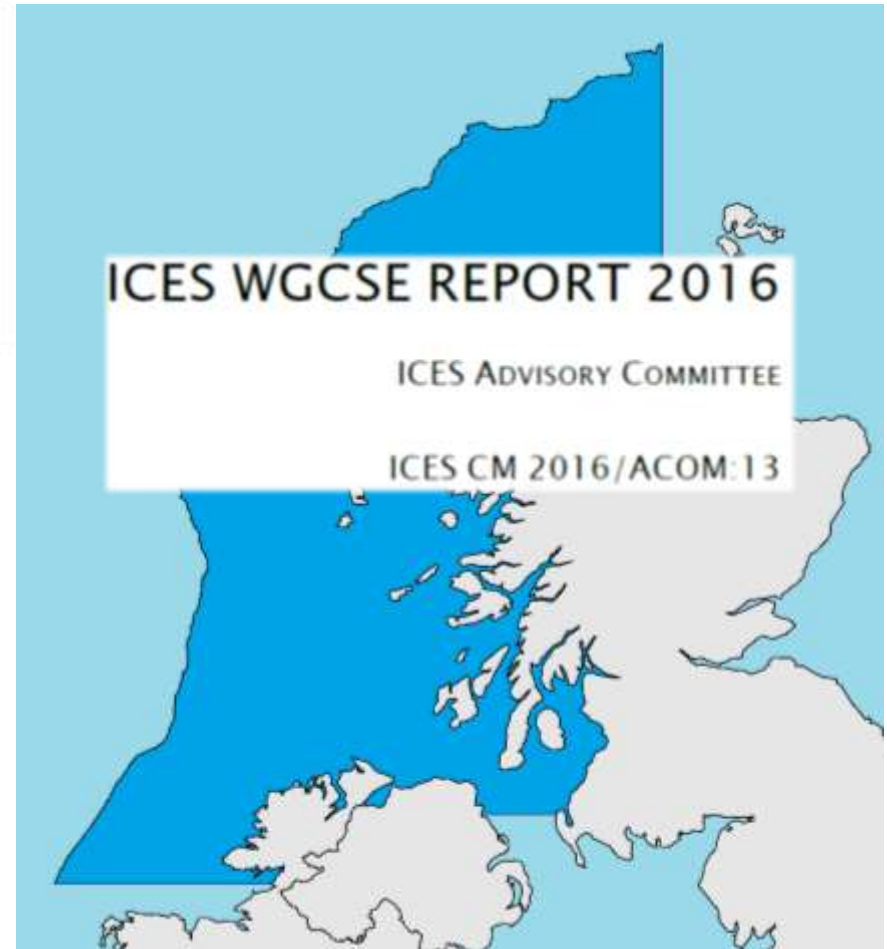
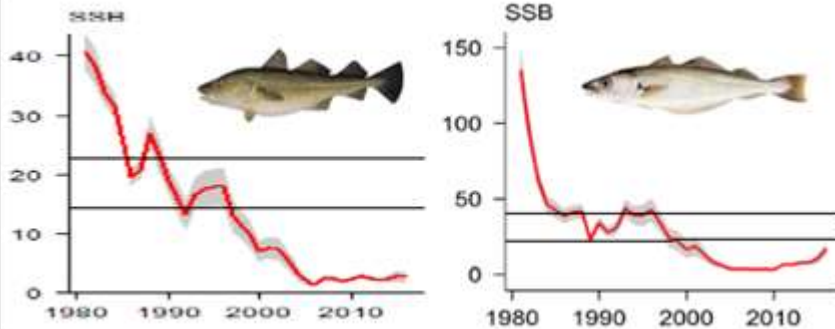
3 management issues



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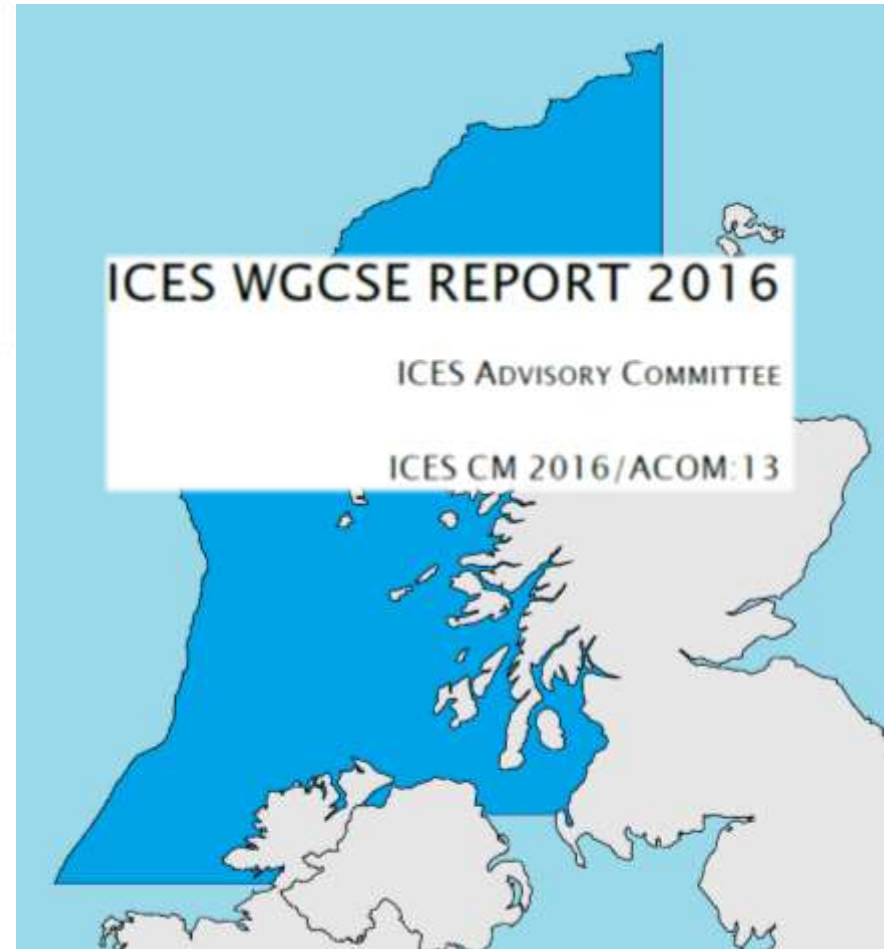
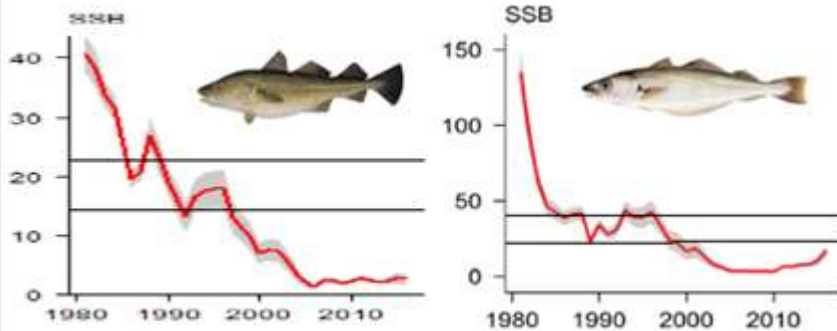
West of Scotland

3 management issues



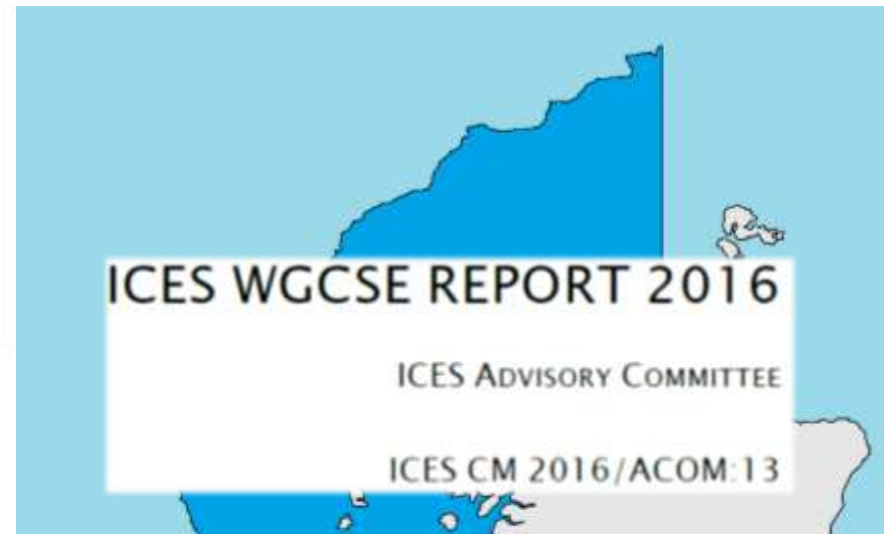
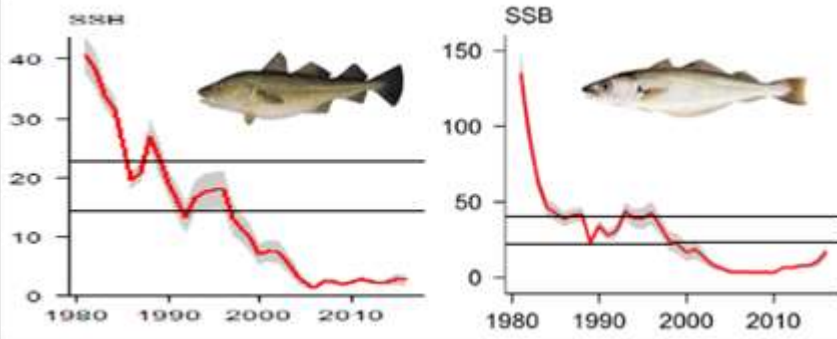
West of Scotland

3 management issues



West of Scotland

3 management issues



Journal of Applied Ecology 

Journal of Applied Ecology 2015, 52, 969–979 doi: 10.1111/1365-2664.12439

Grey seal predation impairs recovery of an over-exploited fish stock

Robin M. Cook^{1*}, Steven J. Holmes^{2,3} and Robert J. Fryer³



The effects of grey seal predation and commercial fishing on the recovery of a depleted cod stock

Robin M. Cook and Vanessa Trijoulet



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Common Fisheries Policy



EU fisheries managed on a single-stock basis














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Common Fisheries Policy

EU fisheries managed on a single-stock basis

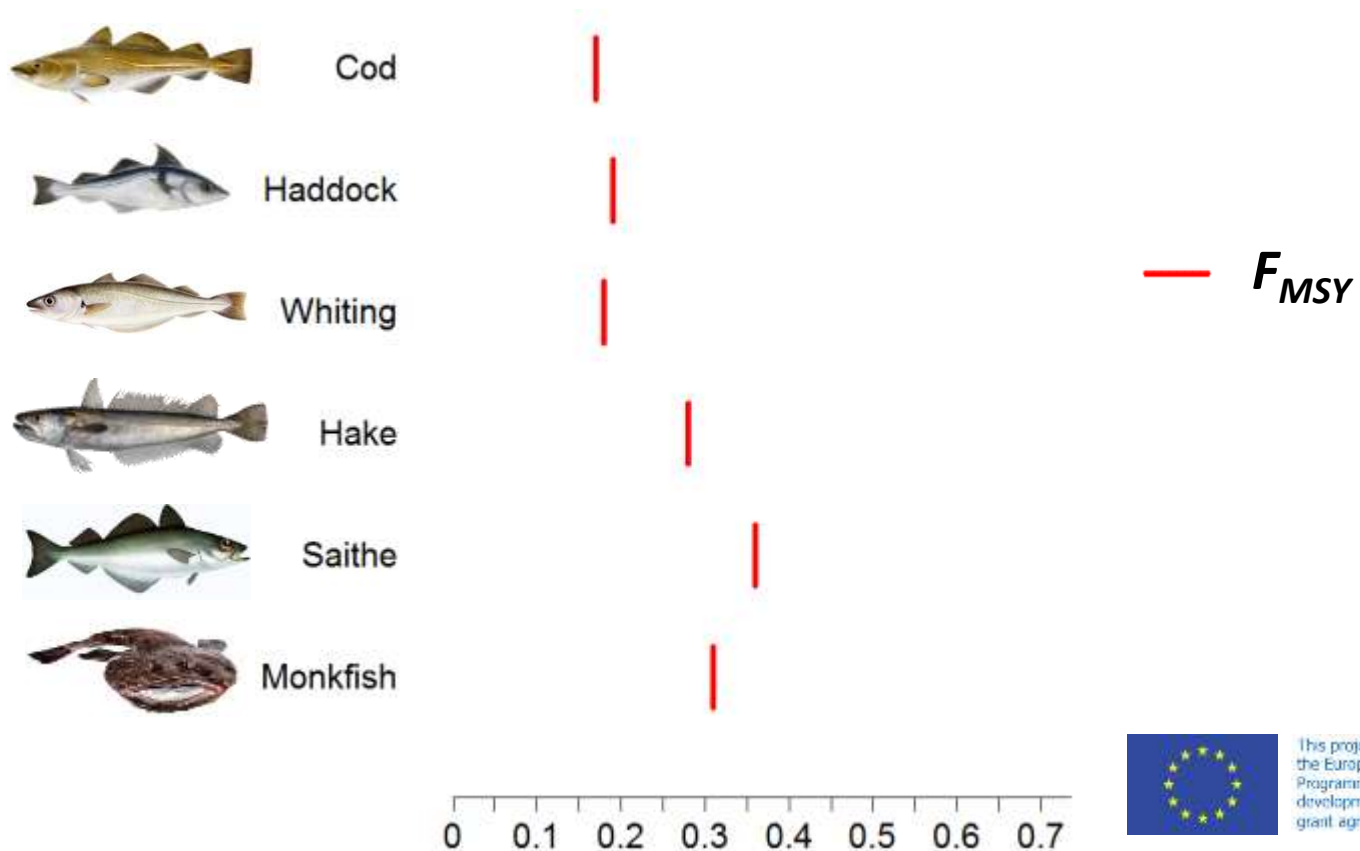
Maximum Sustainable Yield: stock-specific F_{MSY}

	Species	F_{MSY}	Reference
	Cod	0.17	WGCSE 2016
	Whiting	0.18	WGCSE 2016
	Haddock	0.19	WGNSSK 2016
	Saithe	0.36	WGNSSK 2016
	Hake	0.28	WGBIE 2016
	Monkfish	0.31	WGBIE 2016
	Herring	0.16	HAWG 2016
	Mackerel	0.22	WGWIDE 2016
	Horse mackerel	0.09	WGWIDE 2016
	Blue whiting	0.30	WGWIDE 2016
	Nephrops	0.109	WGCSE 2016

Common Fisheries Policy

EU fisheries managed on a single-stock basis

Maximum Sustainable Yield: stock-specific F_{MSY}

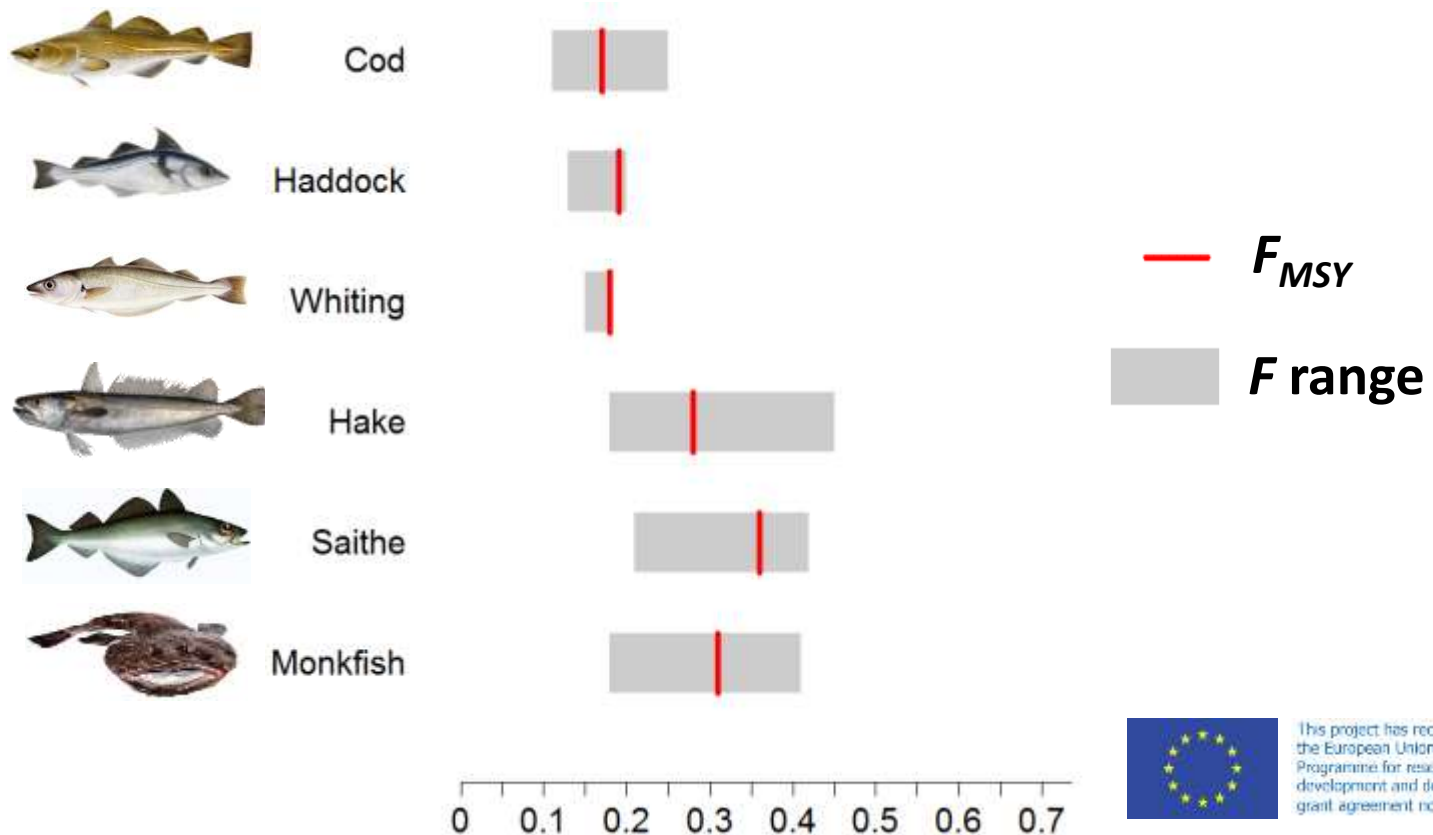


Common Fisheries Policy

EU fisheries managed on a single-stock basis

Maximum Sustainable Yield: stock-specific F_{MSY}

Mixed fisheries: F ranges



Good Environmental Status



Marine Strategy Framework Directive: achieve GES by 2020



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Good Environmental Status



Marine Strategy Framework Directive: achieve GES by 2020



GES described by 11 descriptors



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Good Environmental Status



Marine Strategy Framework Directive: achieve GES by 2020



GES described by 11 descriptors

3 descriptors relevant for fisheries

Commercial species – Biodiversity – Food web



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Good Environmental Status



Marine Strategy Framework Directive: achieve GES by 2020



GES described by 11 descriptors

3 descriptors relevant for fisheries

Commercial species – Biodiversity – Food web

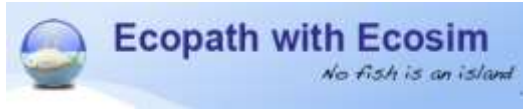
Descriptors assessed via indicators



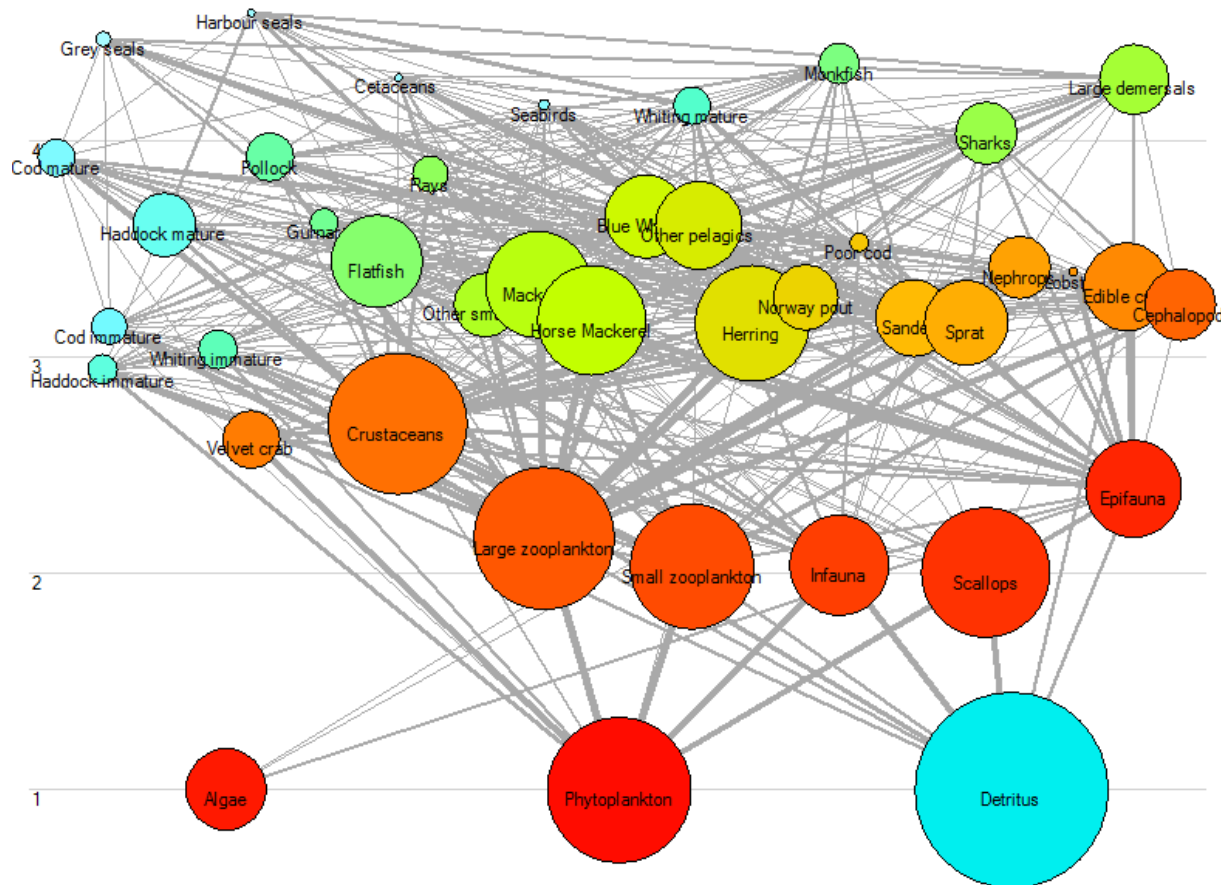
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Ecosystem modelling



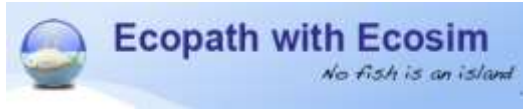
Foodweb ecosystem model



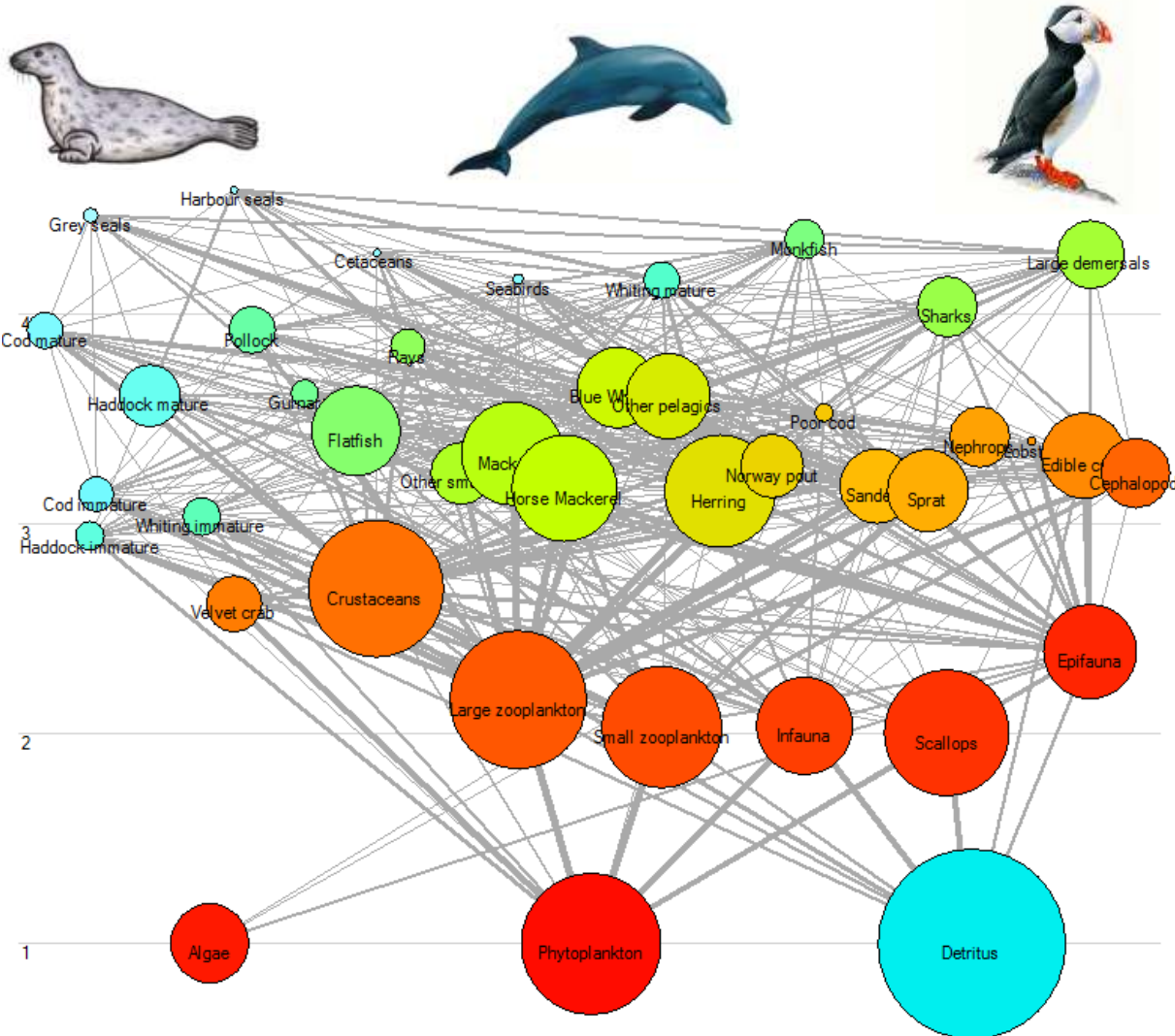
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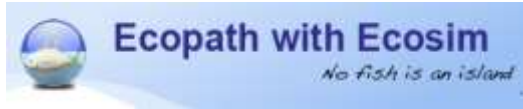
Ecosystem modelling



Foodweb ecosystem model



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Foodweb ecosystem model

SCIENTIFIC REPORTS

OPEN

Impact of ocean warming on sustainable fisheries management informs the Ecosystem Approach to Fisheries

Received: 28 February 2017
Accepted: 20 September 2017
Published online: 18 October 2017

N. Serpetti¹, A. R. Baudron², M. T. Burrows¹, B. L. Payne¹, P. Helaouët³, P. G. Fernandes² & J. J. Heymans¹

Parameterisation: **1985 to 2013**

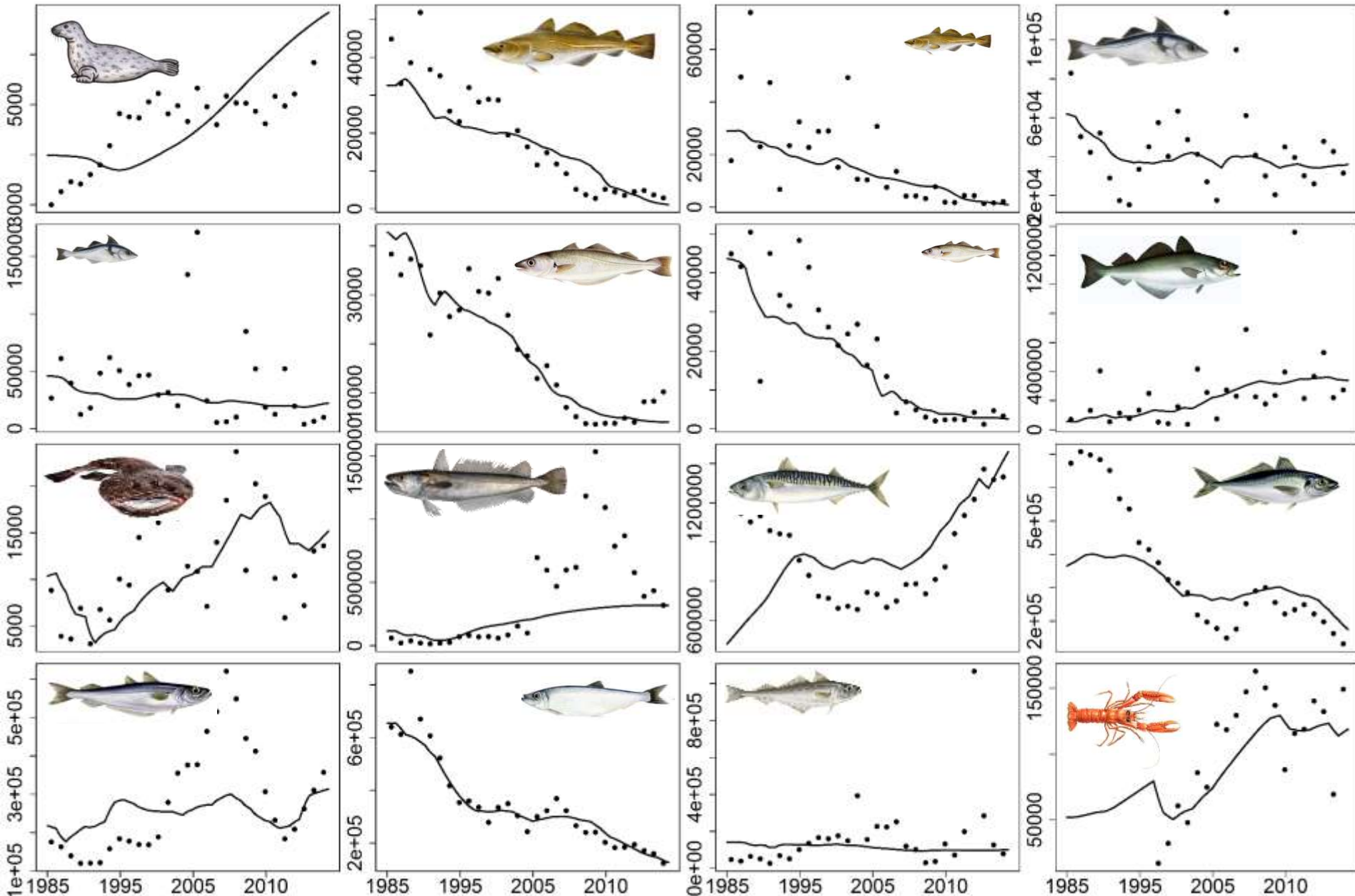


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Ecosystem modelling

MareFrame





Ecosystem indicators

MareFrame



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Ecosystem indicators



Shannon's diversity index - ***Biodiversity***



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Ecosystem indicators



Shannon's diversity index - ***Biodiversity***

Marine Trophic Index - ***Trophic structure***



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Ecosystem indicators



Shannon's diversity index - ***Biodiversity***

Marine Trophic Index - ***Trophic structure***

Mean Maximum Length - ***Species composition***





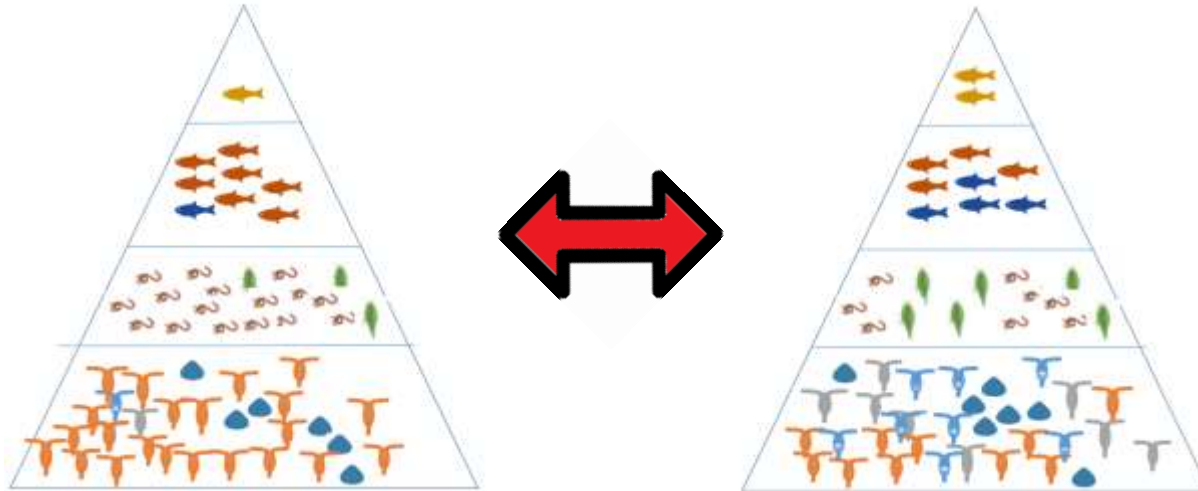
Ecosystem indicators

Shannon's diversity index - ***Biodiversity***

Marine Trophic Index - ***Trophic structure***

Mean Maximum Length - ***Species composition***

Balance evenness - ***Evenness***



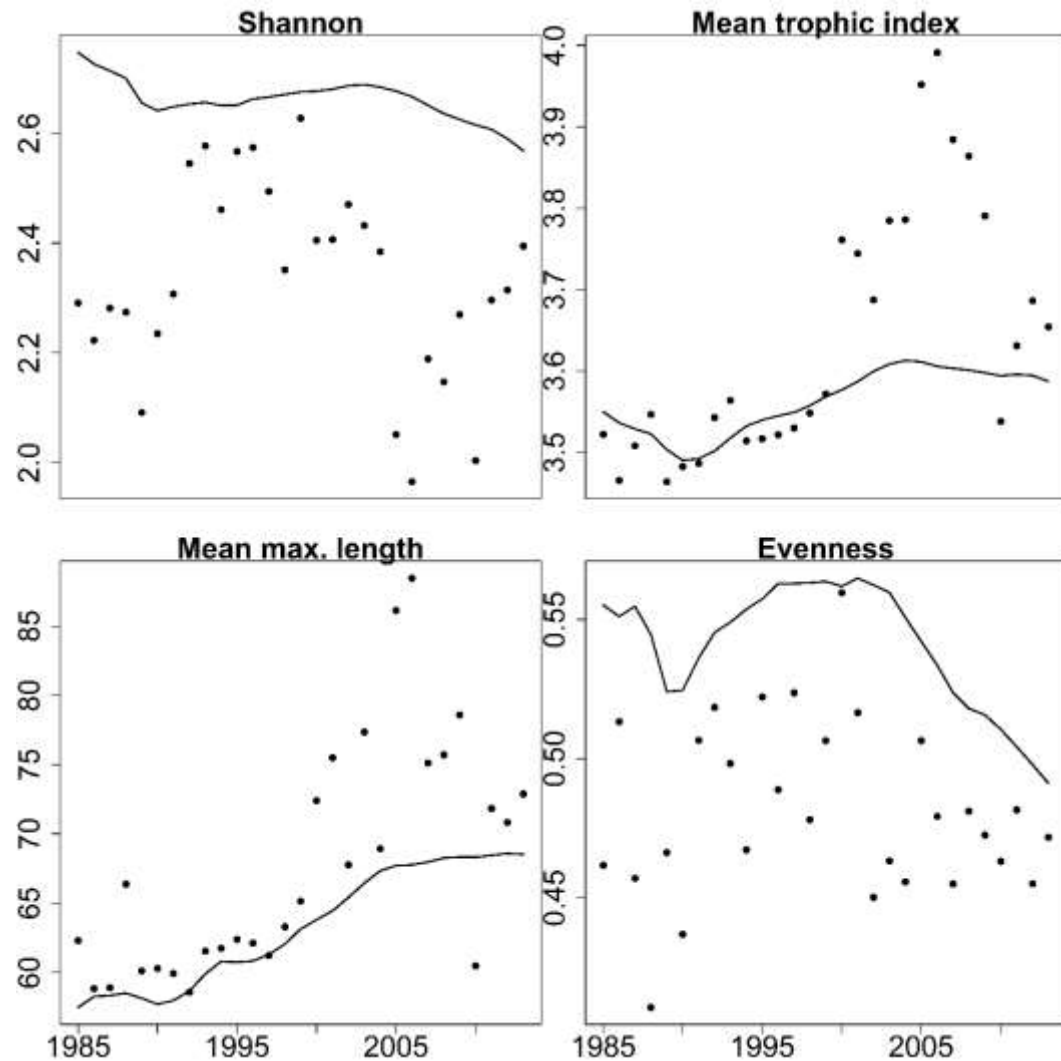
(Bauer et al., *In prep.*)





Ecosystem indicators

MareFrame



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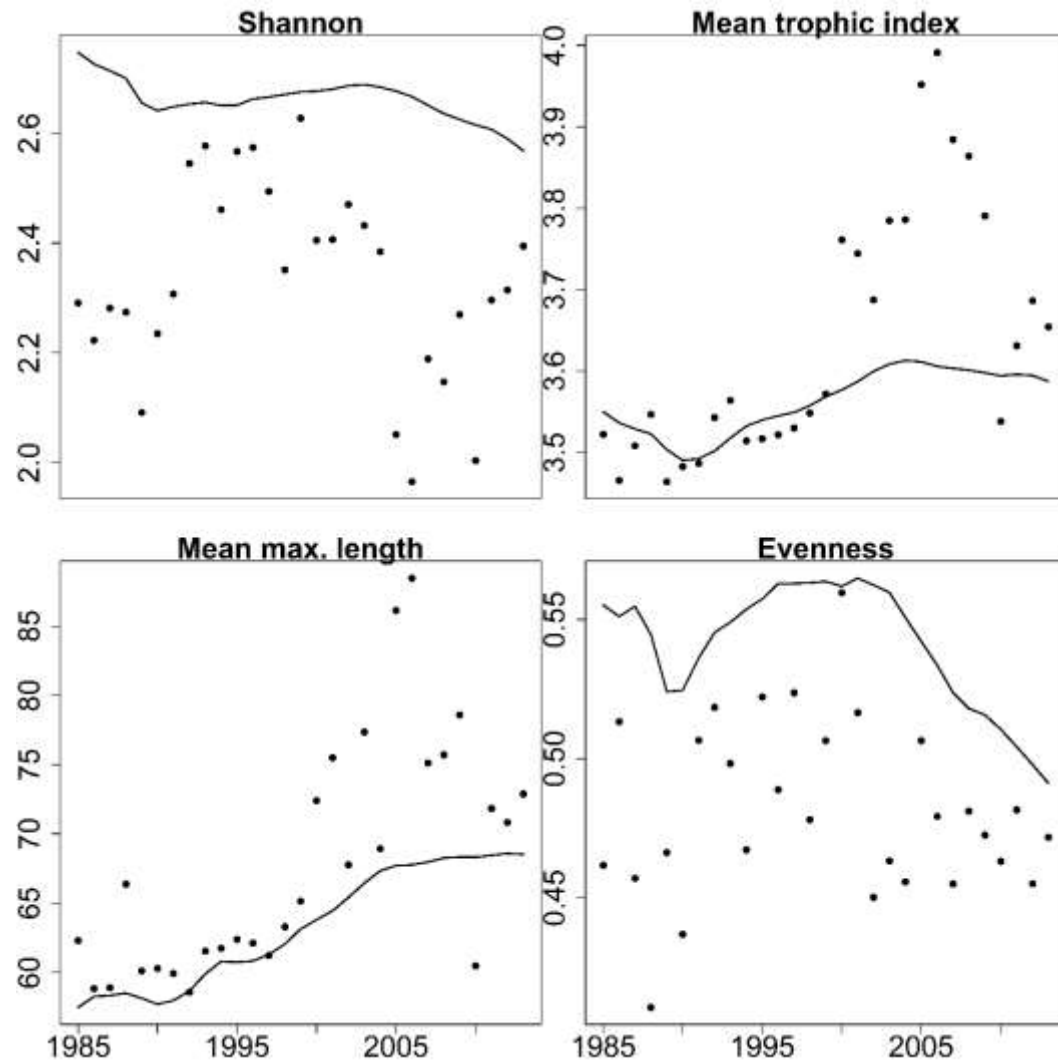


Ecosystem indicators

MareFrame

Scenario comparison

Which management achieves 'best' GES?

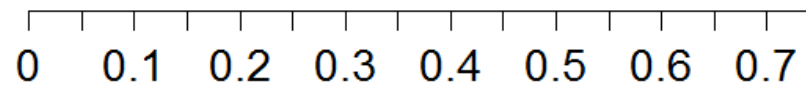
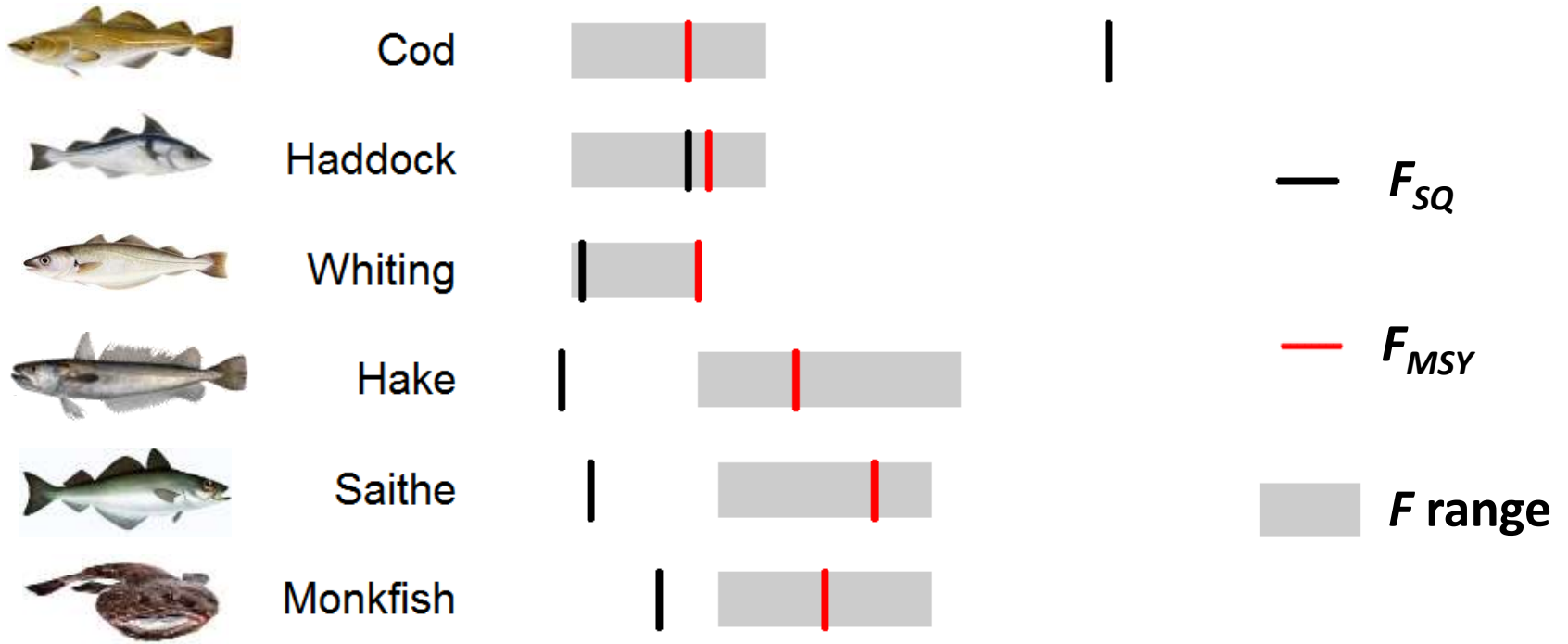


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Scenario simulations

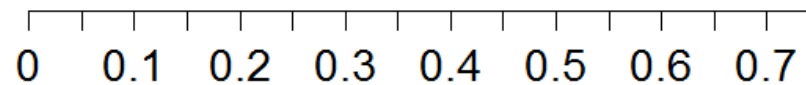
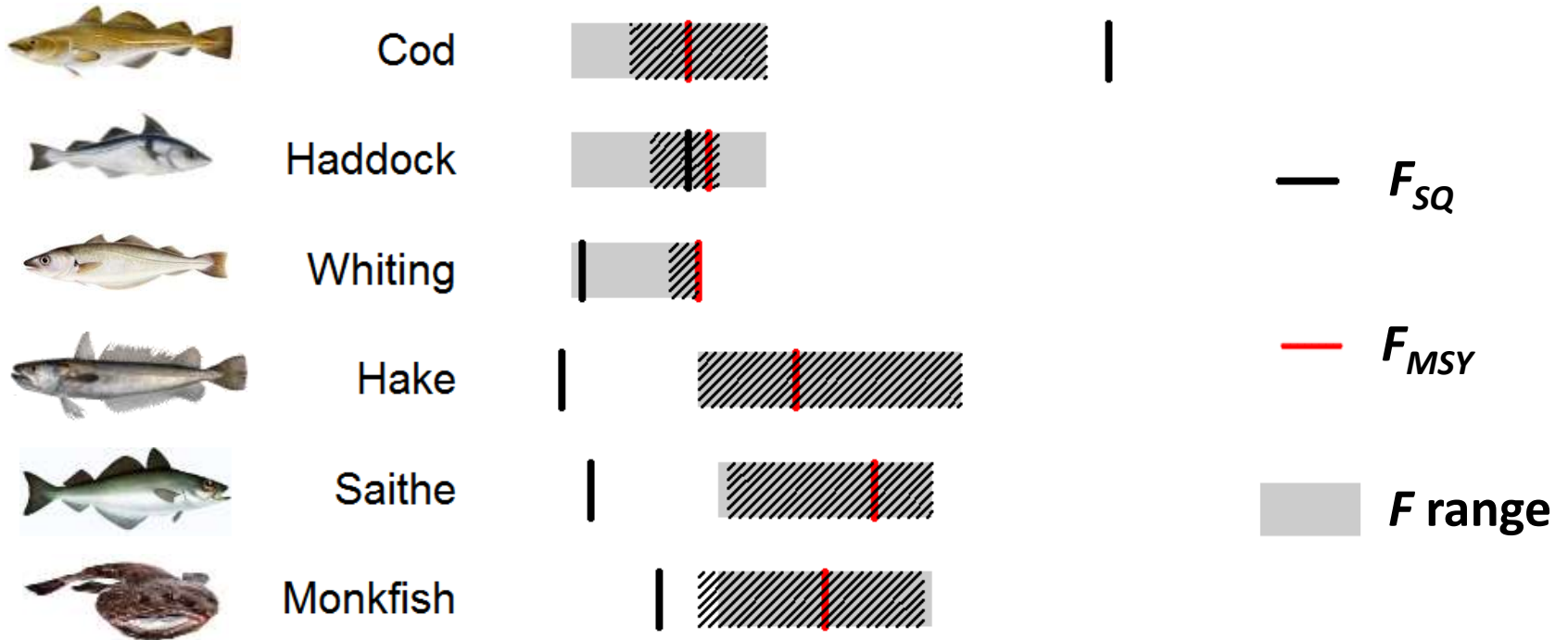
2014 to 2033





Scenario simulations

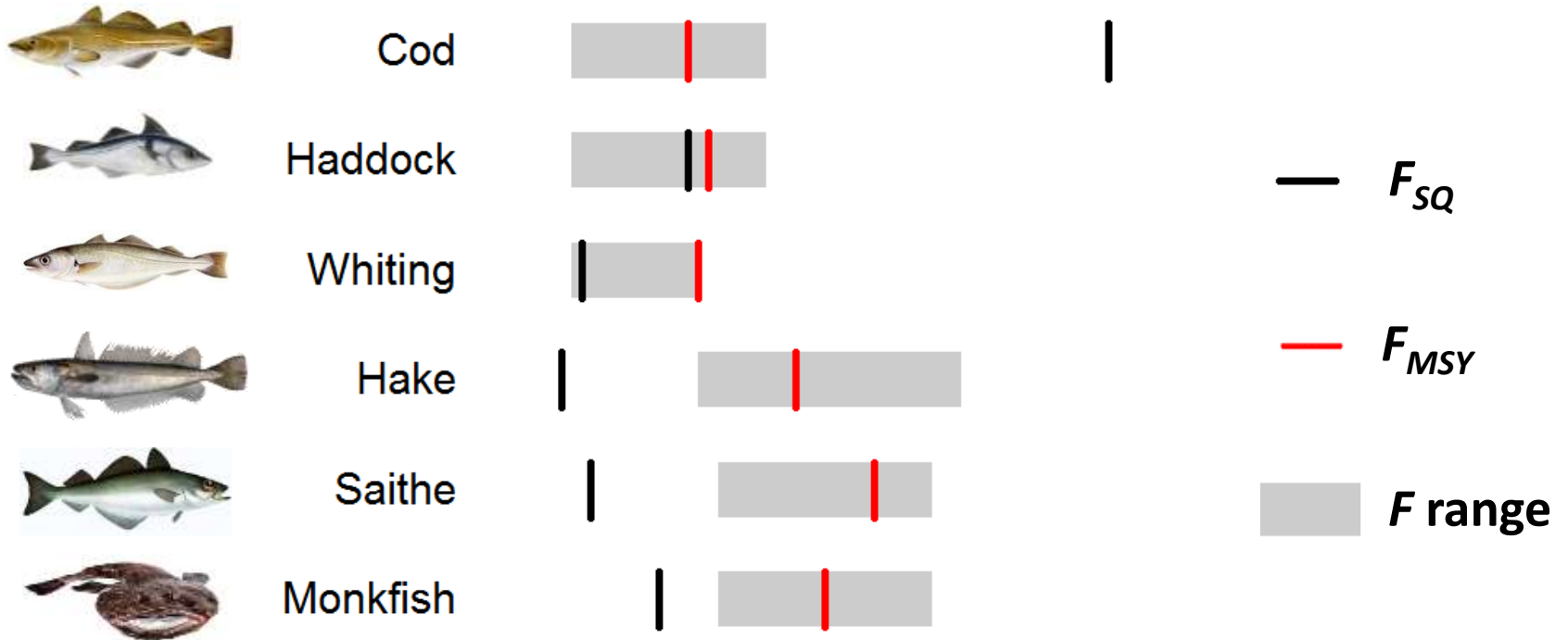
2014 to 2033



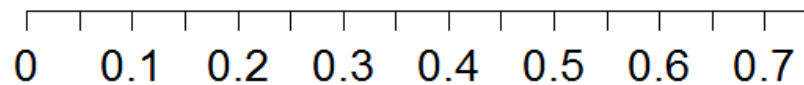


Scenario simulations

2014 to 2033



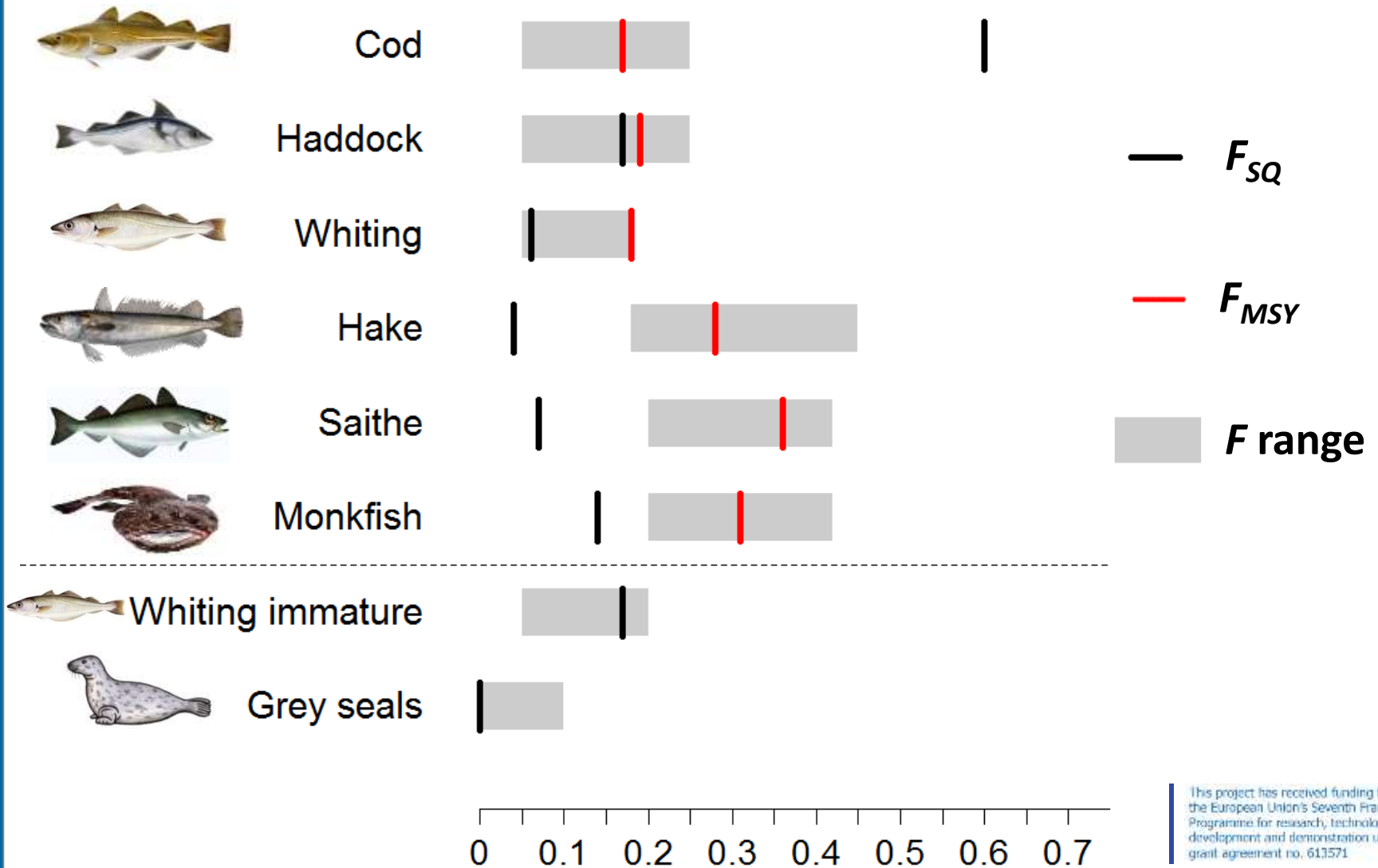
Other species (i.e. pelagics & Nephrops) fished at F_{MSY}





Scenario simulations

2014 to 2033





Scenario simulations

0.05 increments * all possible combinations = 180,000 simulations





How to identify GES scenario(s)?

MareFrame

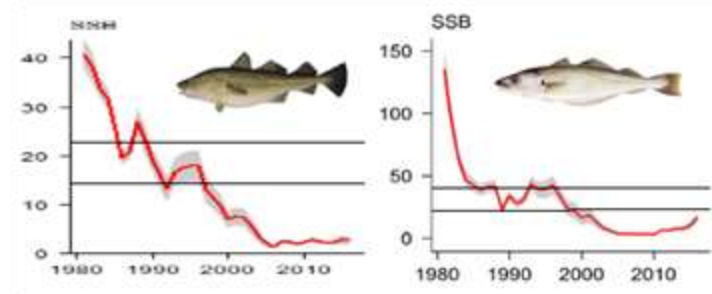


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How to identify GES scenario(s)?

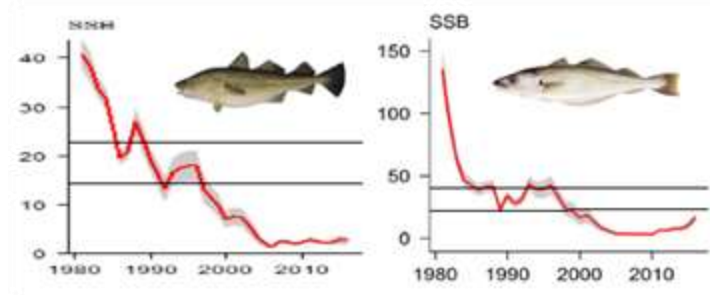
1. Recover cod and whiting stocks





How to identify GES scenario(s)?

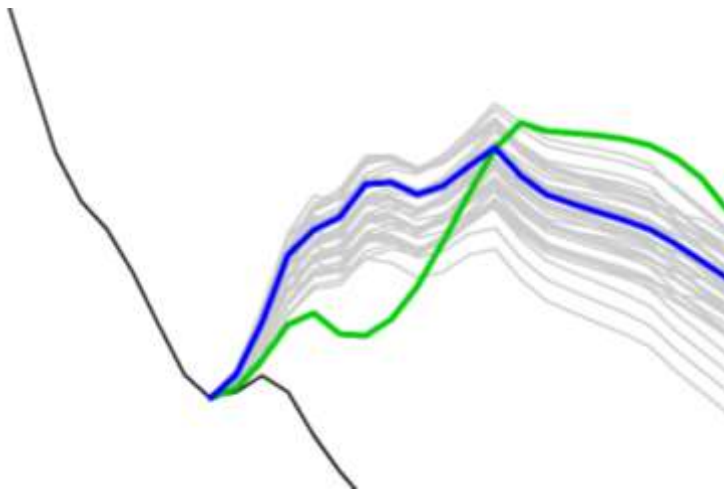
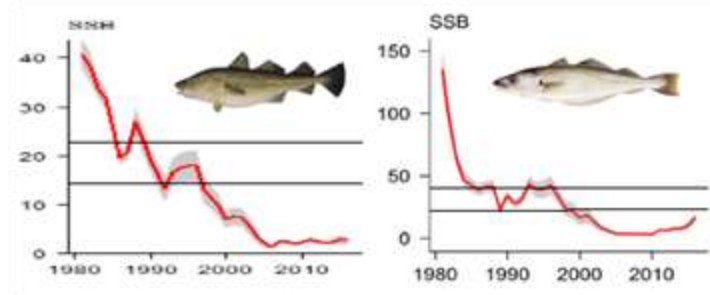
1. Recover cod and whiting stocks
2. Earliest recovery





How to identify GES scenario(s)?

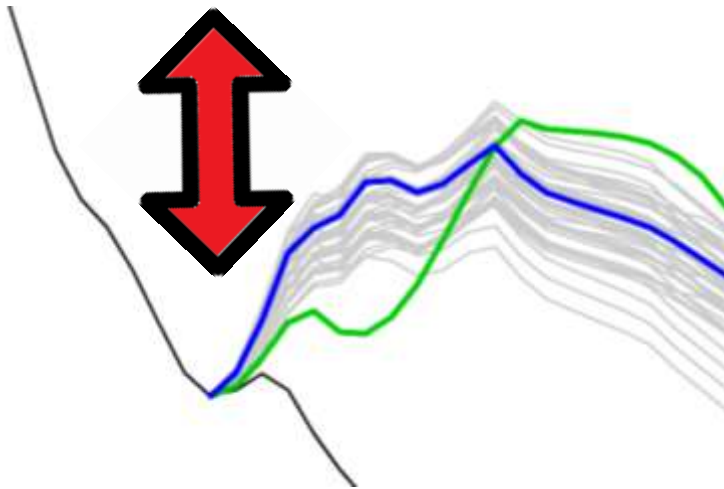
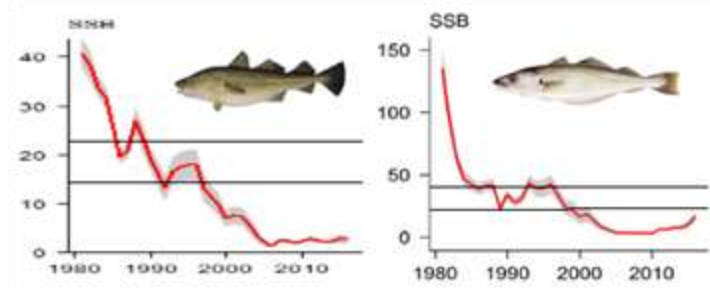
1. Recover cod and whiting stocks
2. Earliest recovery
3. Best GES indicators





How to identify GES scenario(s)?

1. Recover cod and whiting stocks
2. Earliest recovery
3. Best GES indicators



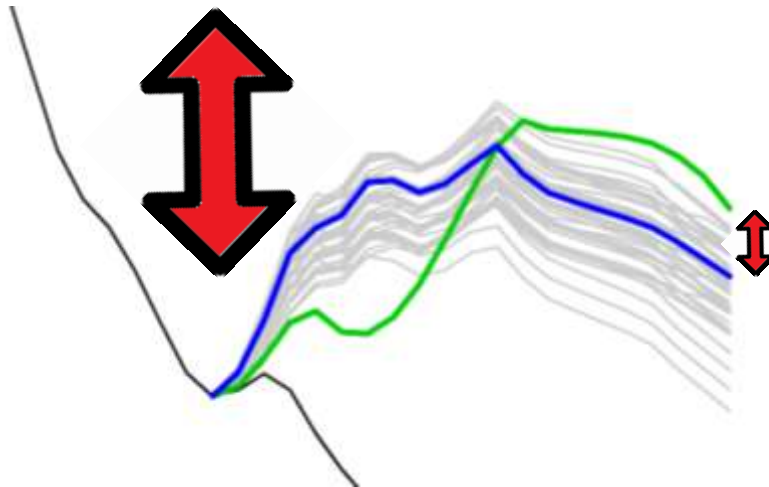
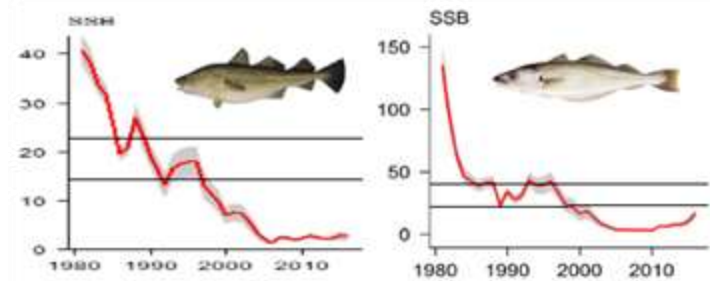
Standardise amplitude





How to identify GES scenario(s)?

1. Recover cod and whiting stocks
2. Earliest recovery
3. Best GES indicators



Standardise amplitude

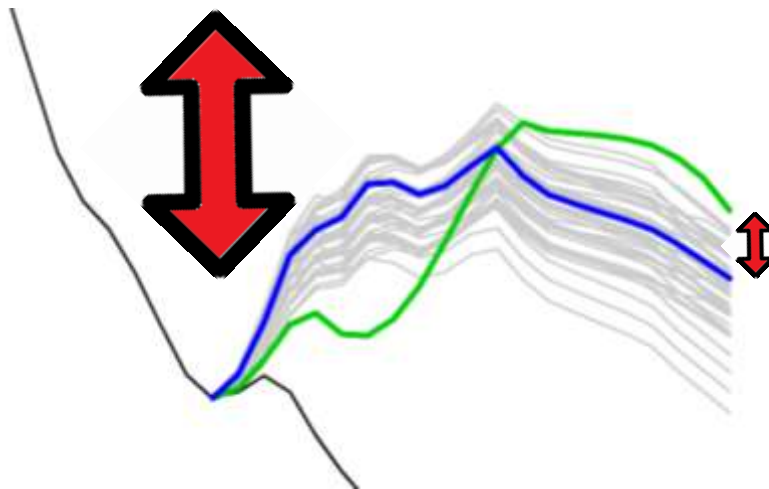
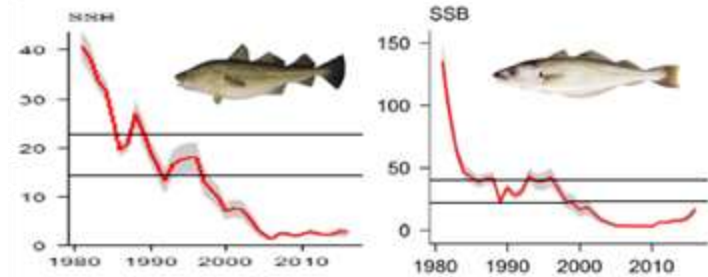
Difference with max.





How to identify GES scenario(s)?

1. Recover cod and whiting stocks
2. Earliest recovery
3. Best GES indicators



Standardise amplitude

Difference with max.

*Minimise sum of differences
across scenarios*



Identifying GES scenario(s)



260 / 180,000 scenarios recover cod and whiting $> B_{pa}$



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Identifying GES scenario(s)

260 / 180,000 scenarios recover cod and whiting $> B_{pa}$

Earliest recovery:

No seal cull



5% seal cull



10% seal cull



2026

2026

2025



2027

2028

2029



Identifying GES scenario(s)

260 / 180,000 scenarios recover cod and whiting $> B_{pa}$

Earliest recovery:

No seal cull



2026

2027

5% seal cull



2026

2028

10% seal cull



2025

2029

Cod predate on whiting (= trade-off)



Identifying GES scenario(s)

260 / 180,000 scenarios recover cod and whiting $> B_{pa}$

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No seal cull



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10% seal cull



2026

2026

2025



2027

2028

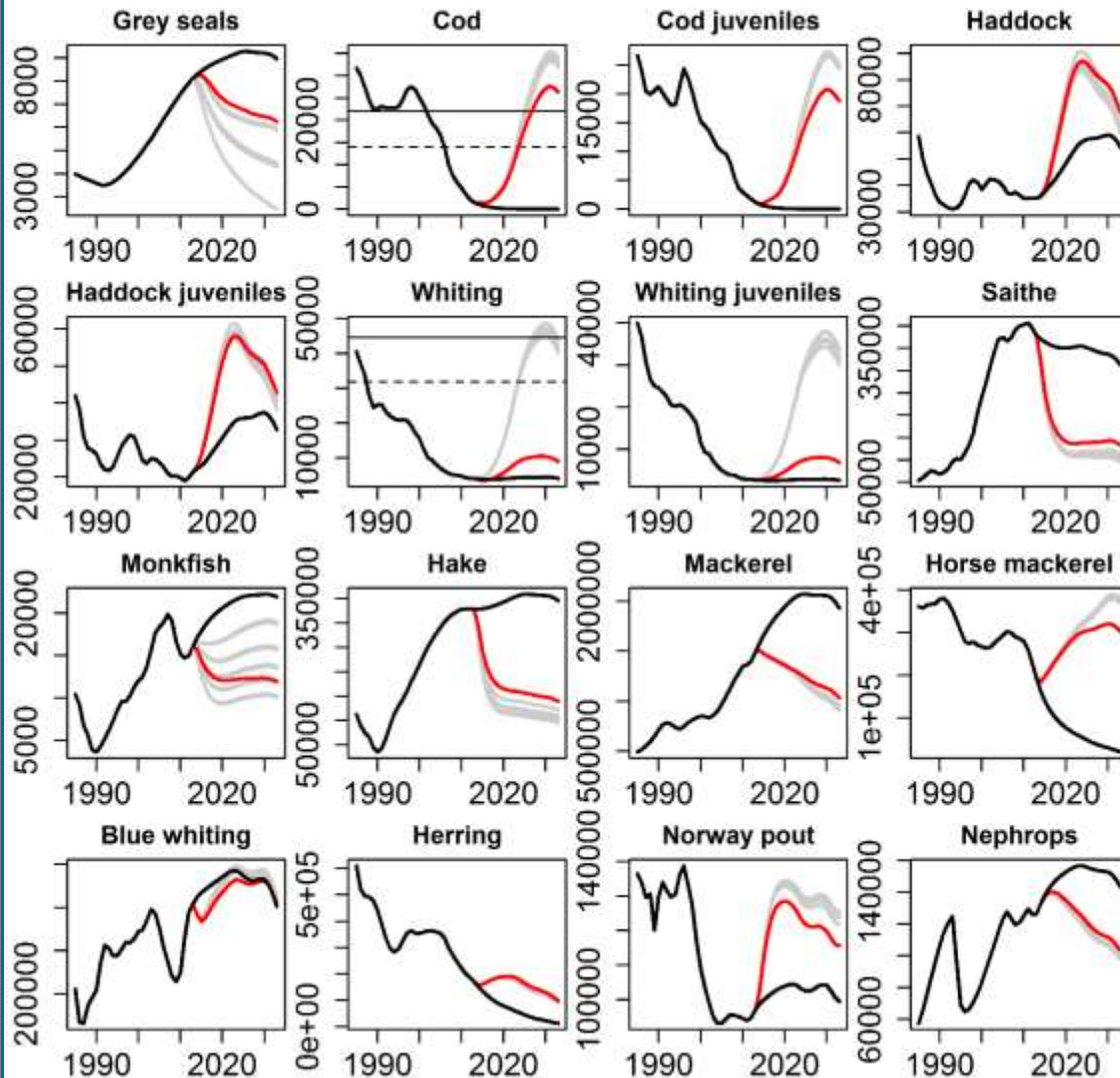
2029

Cod predate on whiting (= trade-off)

Earliest recovery: 35 / 180,000 scenarios

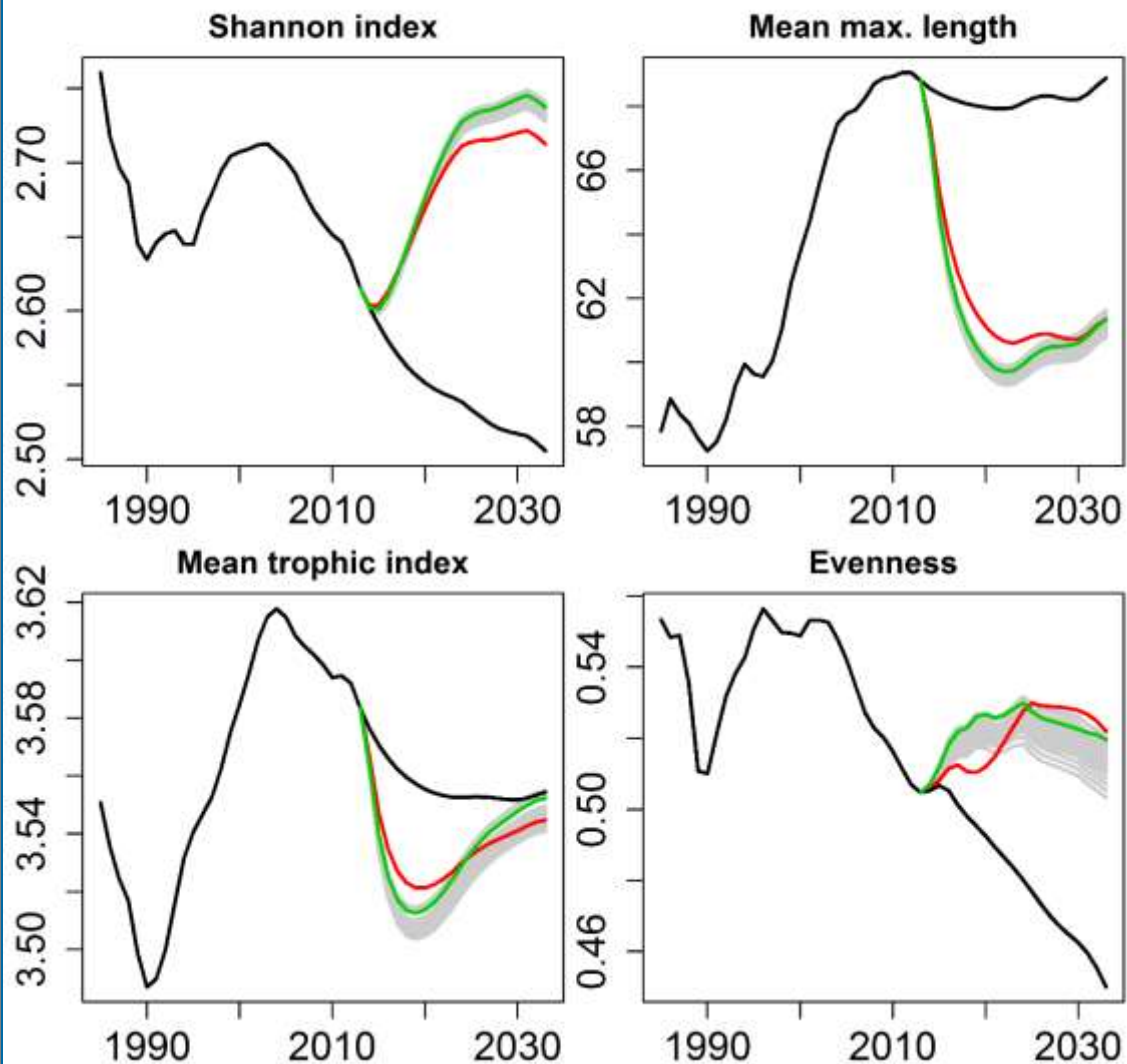


Identifying GES scenario(s)



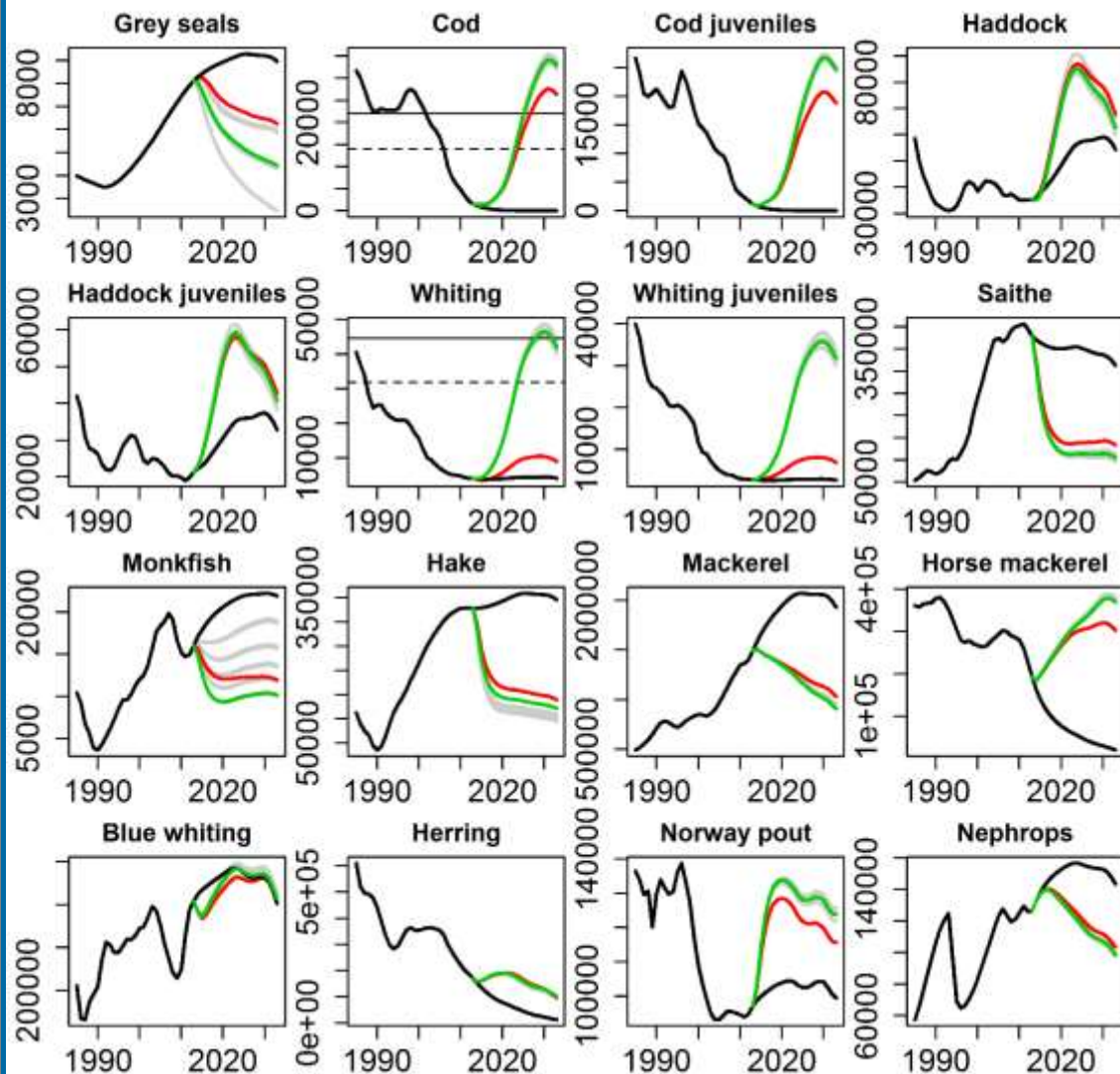
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Best GES scenario



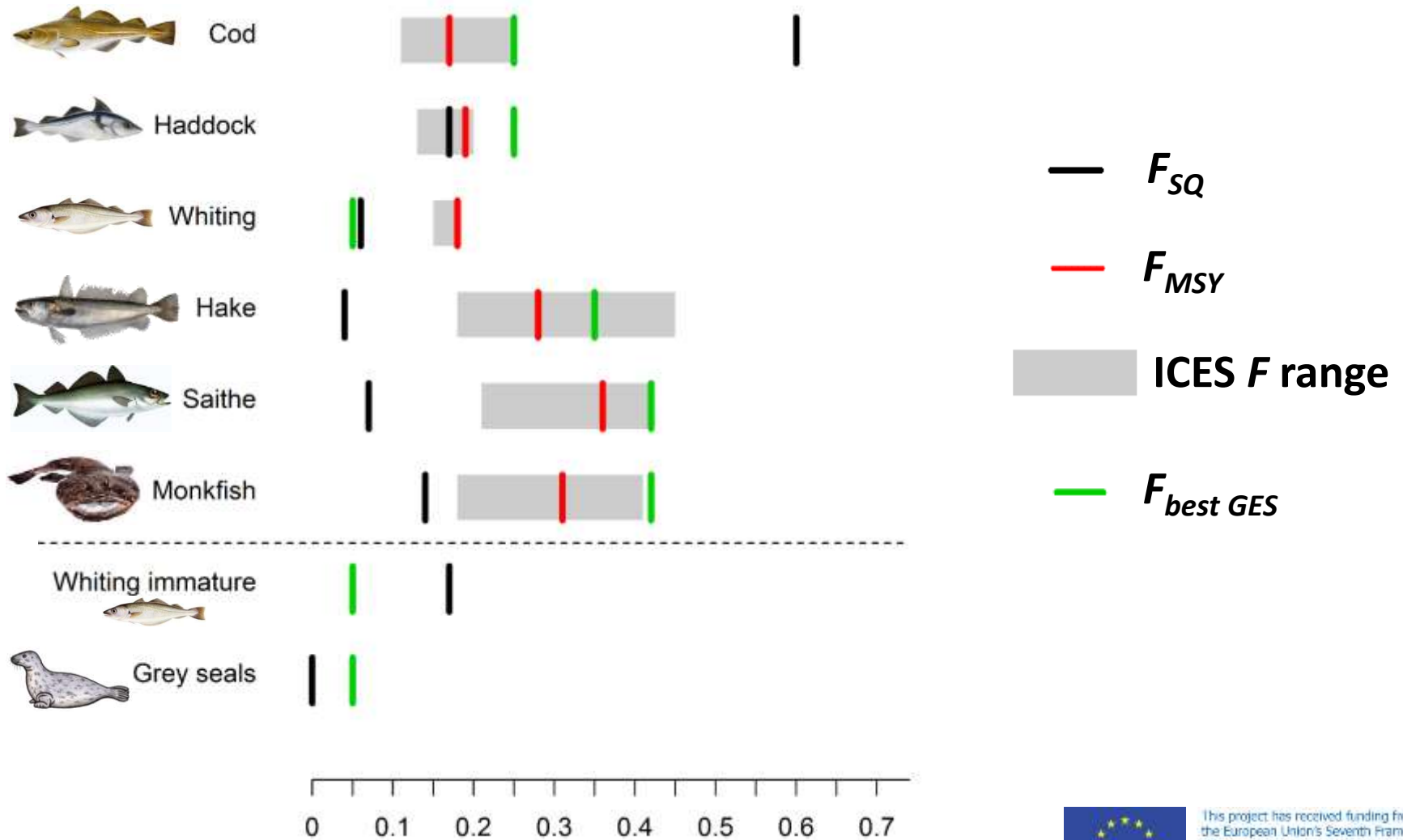
Best GES scenario

MareFrame



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Can the CFP achieve GES?



— F_{SQ}

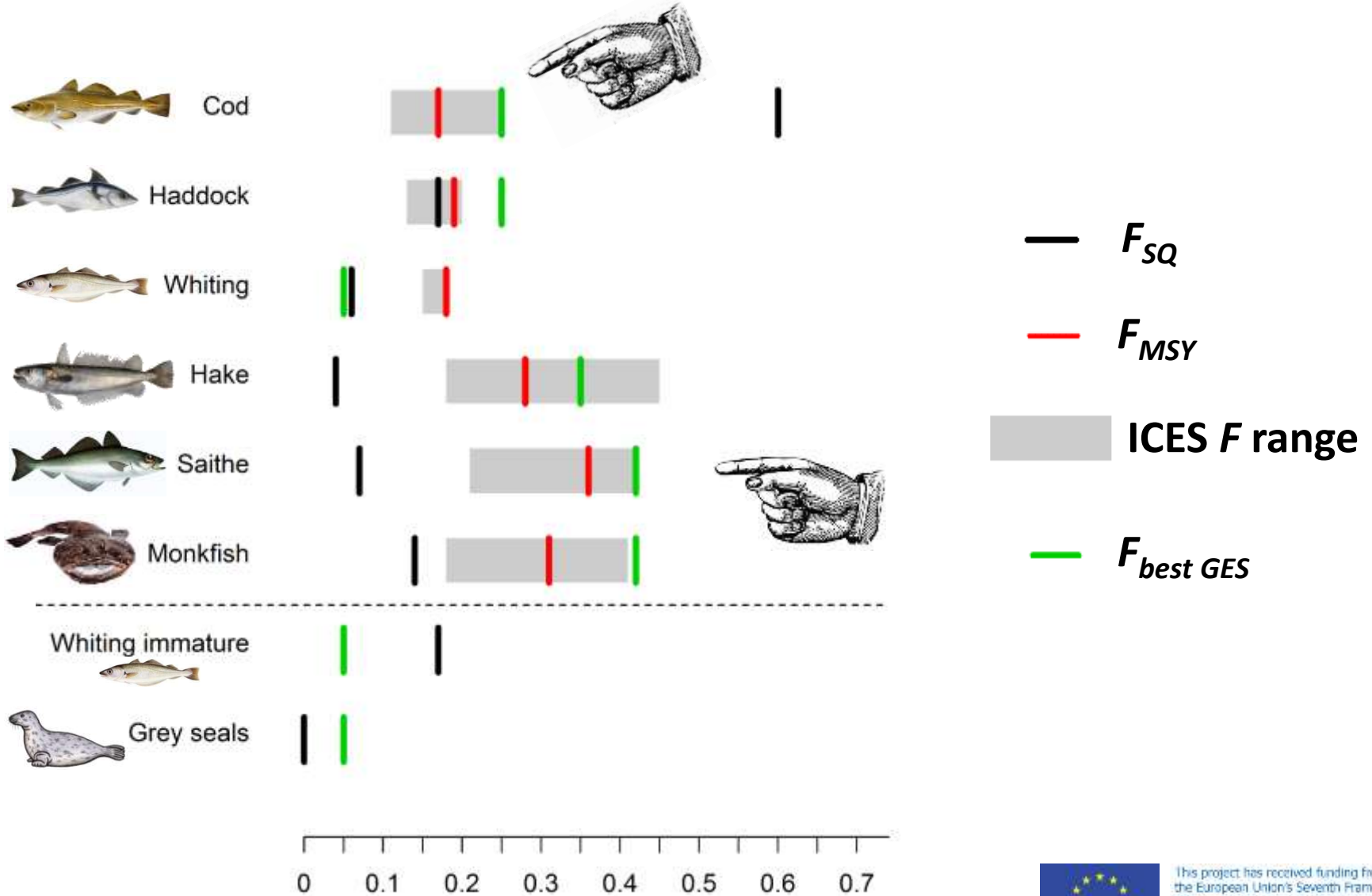
— F_{MSY}

■ ICES F range

— $F_{best\ GES}$



Can the CFP achieve GES?



— F_{SQ}

— F_{MSY}

■ ICES F range

— $F_{best\ GES}$

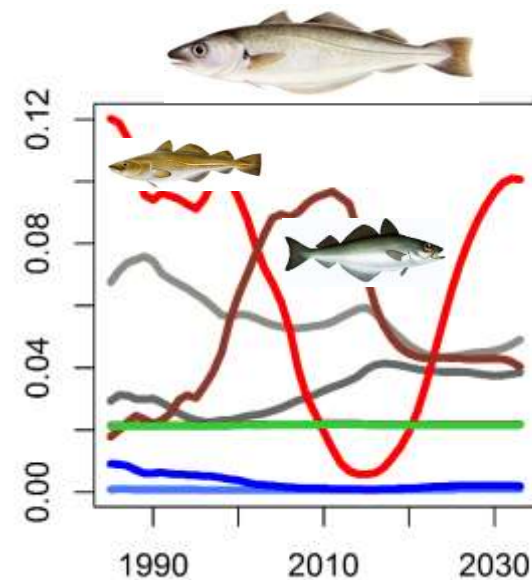
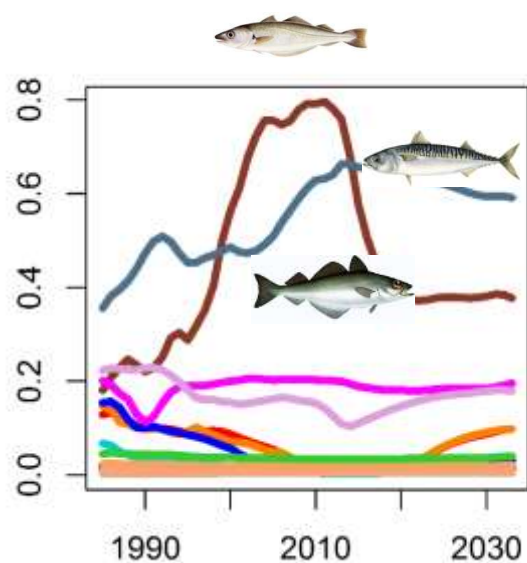
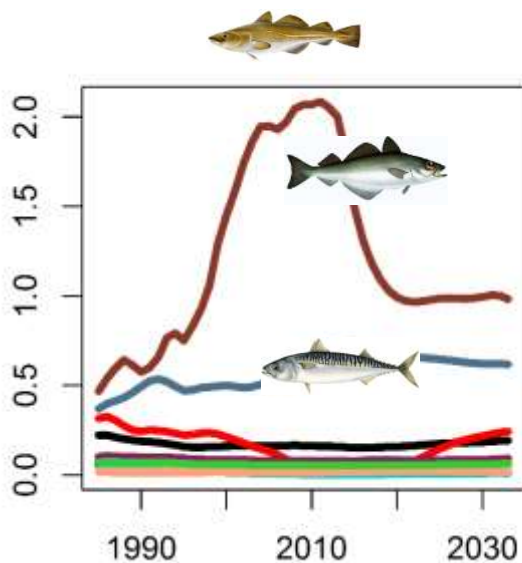


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Can the CFP achieve GES?

MareFrame



Importance of predation



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Can the CFP achieve GES?

MareFrame

ICES WGECCO REPORT 2016

ICES ADVISORY COMMITTEE

ICES WGECCO REPORT 2014

ICES ADVISORY COMMITTEE

ICES CM 2014/ACOM:26

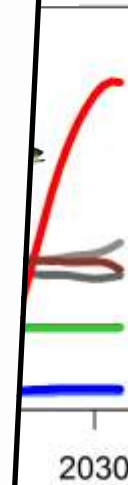
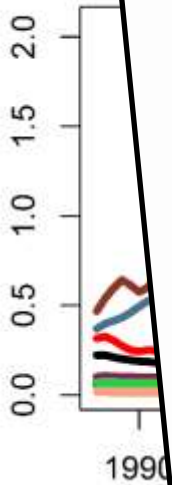
5 Use the data available to evaluate the ecological consequences of restoring stocks to MSY levels and the degree to which fisheries are "balanced" (ToR c)

Report of the Working Group on the Ecosystem Effects of Fishing Activities (WGECCO)

6-13 April 2016

Report of the Working Group on the Ecosystem Effects of Fishing Activities (WGECCO)

8-15 April 2014



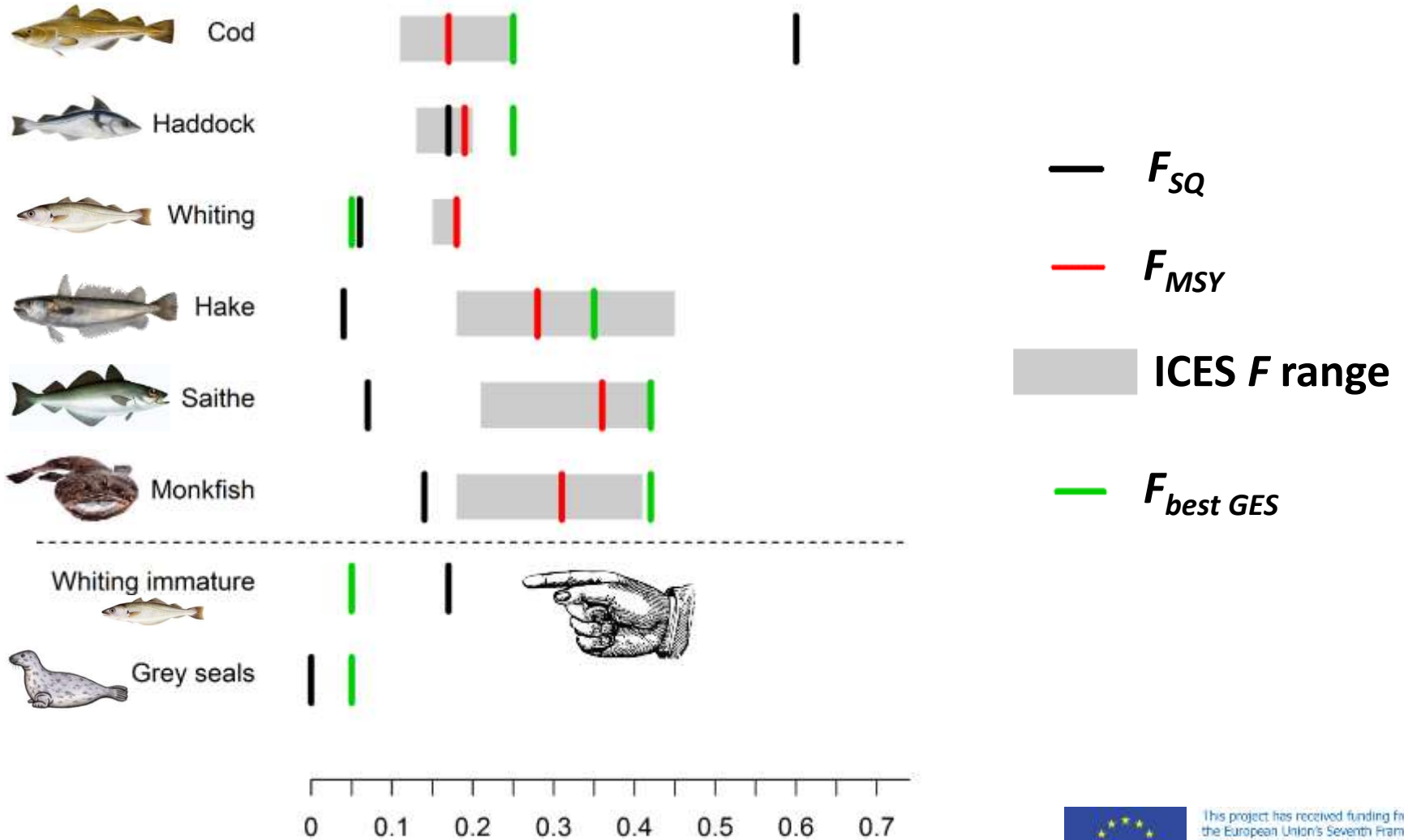
Import

Consistent with WGECCO - impact of large predators increase



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Can the CFP achieve GES?



- F_{SQ}
- F_{MSY}
- ICES F range
- $F_{best\ GES}$



Can the CFP achieve GES?



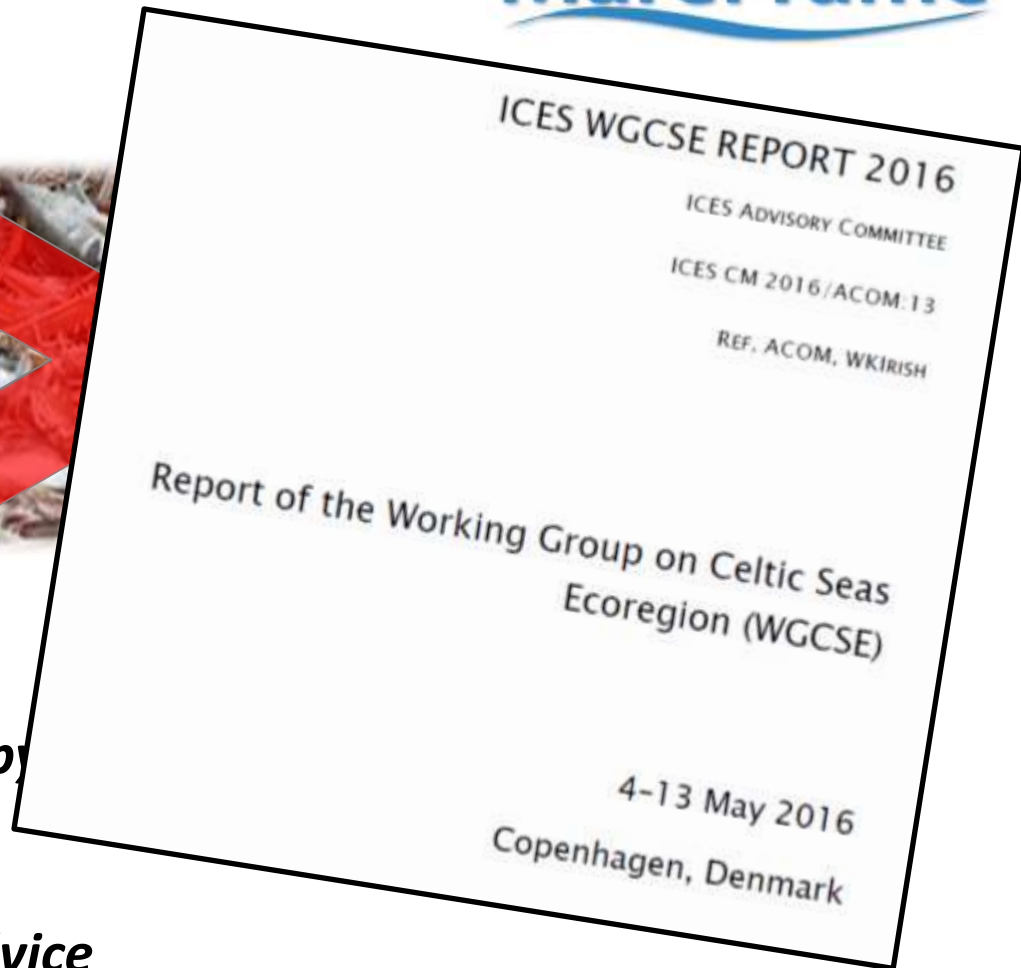
Whiting recovery: reduce bycatches of juveniles





Can the CFP achieve GES?

MareFrame



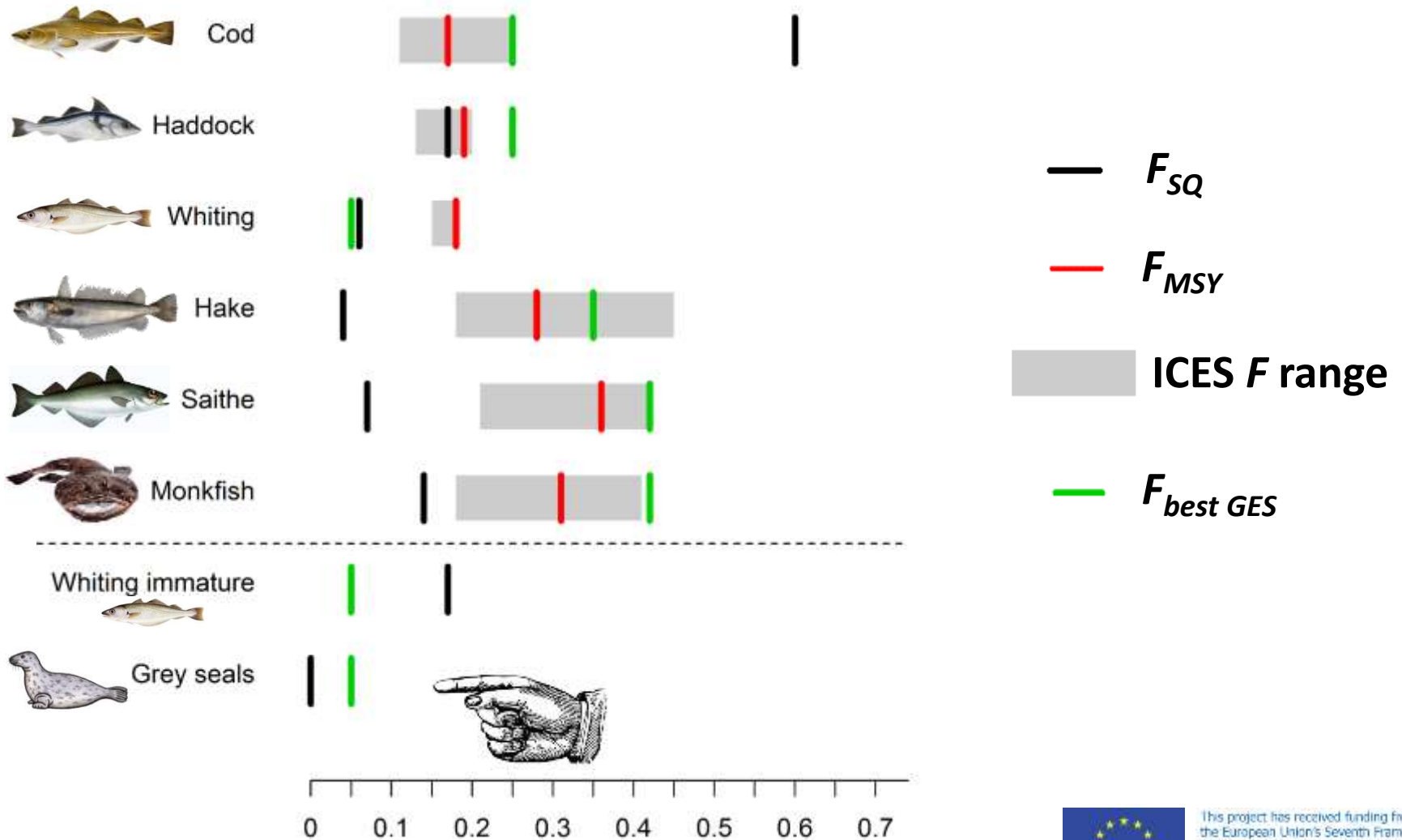
Whiting recovery: reduce by

Consistent with WGCSE advice



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Can the CFP achieve GES?



— F_{SQ}

— F_{MSY}

■ ICES F range

— $F_{best\ GES}$





Can the CFP achieve GES?



Seal predation: relatively small impact

Some impact on GES





Can the CFP achieve GES?



Journal of Applied Ecology

Journal of Applied Ecology 2015, 52, 969–979

Grey seal predation impairs recovery of an over-exploited fish stock

Robin M. Cook^{1*}, Steven J. Holmes^{2,3} and Robert J. Fryer³



doi: 10.1111/1365-2664.12439



The effects of grey seal predation and commercial fishing on the recovery of a depleted cod stock

Robin M. Cook and Vanessa Trijoulet

Slow down cod recovery

Consistent with existing studies



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Can the CFP achieve GES?



Potentially:

Single-stock F_{MSY} scenario not that far off the $F_{best\ GES}$ scenario

ICES F ranges encompass the $F_{best\ GES}$

Except for whiting!





Can the CFP achieve GES?

Potentially:

Single-stock F_{MSY} scenario not that far off the $F_{best\ GES}$ scenario

ICES F ranges encompass the $F_{best\ GES}$

Except for whiting!

But only if:

Reduce bycatch of juvenile whiting

Account for predation to achieve balanced fisheries



Thank you!

