



OPPF-4



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FONDO EUROPEO MARÍTIMO  
Y DE PESCA (FEMP)



MEMBER OF  
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# AZTI Tool Evaluation of Management Measures Impact

Sonia Sánchez-Maróño and Dorleta García

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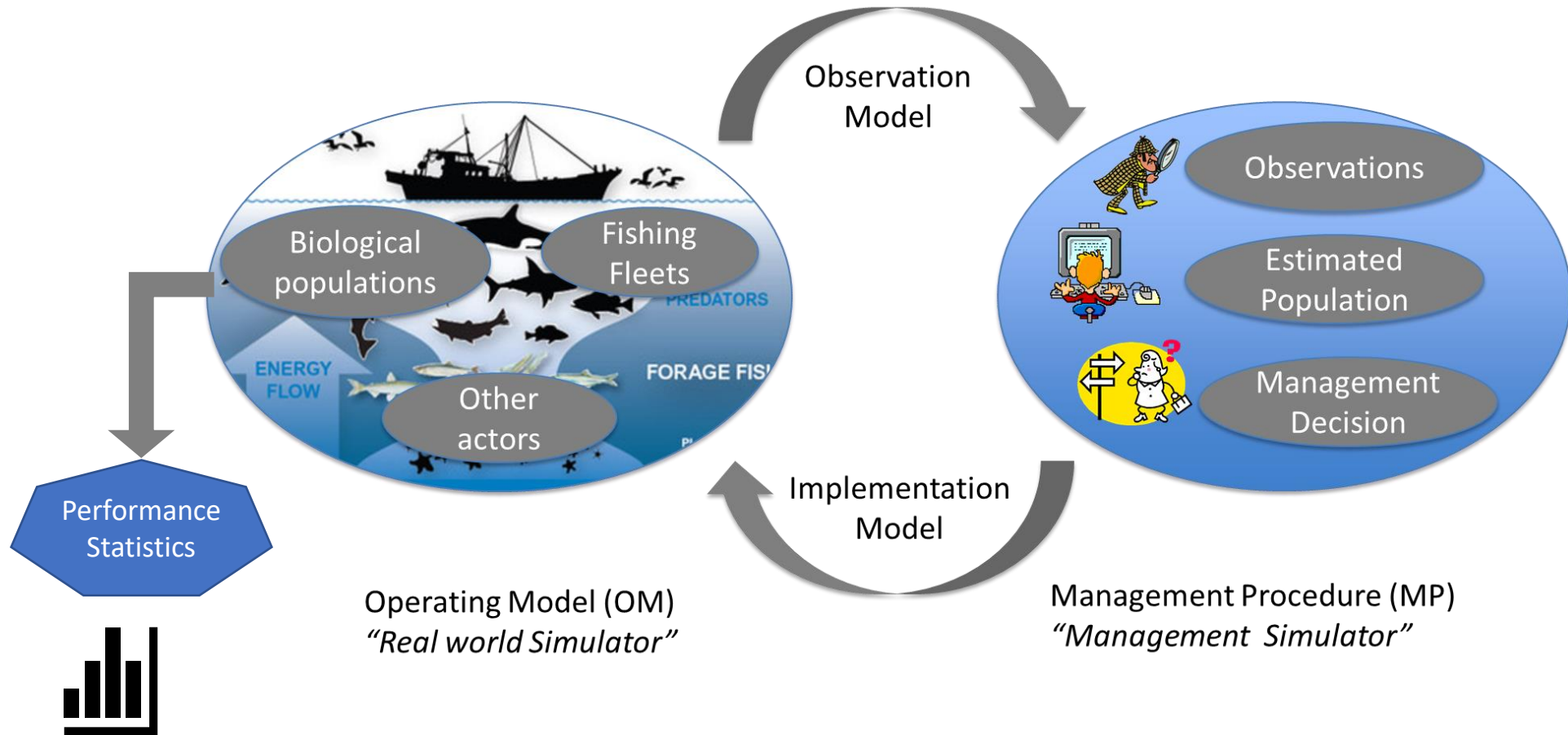
NWWAC – Landing Obligation Focus Group 28th November 2022



# Management Strategy Evaluation (MSE)



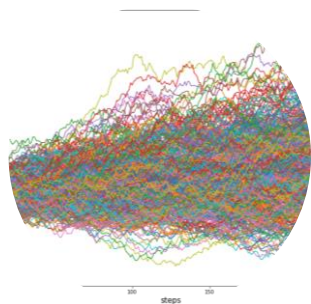
# Management Strategy Evaluation (MSE)



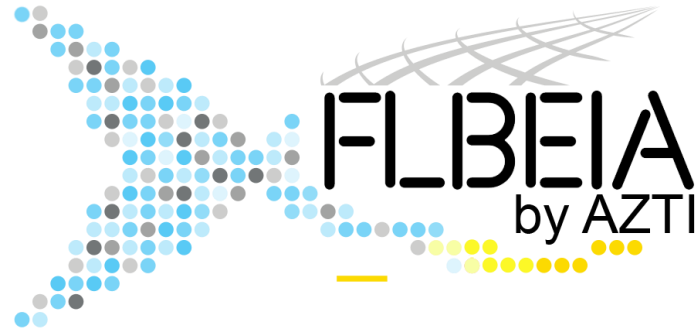
# FLBEIA: Bio-Economic Impact Assessment in FLR



**Bio-economic evaluation**  
MSE



**Stochastic**  
(Monte Carlo simulation)



**Multi-stock + multi fleet**

Source:  
[https://www.researchgate.net/publication/236866843\\_The\\_unintended\\_consequences\\_of\\_simplifying\\_the\\_sea\\_Making\\_the\\_case\\_for\\_complexity](https://www.researchgate.net/publication/236866843_The_unintended_consequences_of_simplifying_the_sea_Making_the_case_for_complexity)



**R package**



**Seasonal**

Source:  
<https://www.istockphoto.com/es/foto/collage-de-la-temporada-de-tree-four-gm1287244794-383509723>



## FLBEIA

# Resources

- Scientific paper
- Source code: <https://github.com/flr/FLBEIA>
- Webpage: <http://flbeia.azti.es/>
- Documentation:
  - <https://www.flr-project.org/>,
  - [https://github.com/flr/FLBEIA/blob/master/vignettes/FLBEIA\\_manual.pdf](https://github.com/flr/FLBEIA/blob/master/vignettes/FLBEIA_manual.pdf)

## FLBEIA: A simulation model to conduct Bio-Economic evaluation of fisheries management strategies



Dorleta Garcia <sup>a,\*</sup>, Sonia Sánchez <sup>b</sup>, Raúl Pallezo <sup>a</sup>, Agurtzane Urtizbera <sup>b</sup>, Marga Andrés <sup>a</sup>

Screenshot of the GitHub repository page for `flr/FLBEIA`. The page shows the repository name, public status, and navigation options like Code, Issues (25), Pull requests (4), Actions, Projects, Wiki, Security, and Insights. It also displays the current branch (master), 10 branches, 1 tag, and 926 commits. The repository description is "Bio-Economic Impact Assessment of Management strategies using FLR".

Screenshot of the FLR project website showing the "TUTORIALS" section. The page title is "MSE with FLBEIA". The list of tutorials includes:

- Statistical catch at age models in FLA4a
- Modelling growth and its uncertainty in FLA4a
- Natural mortality modelling in FLA4a
- Stock assessment using eXtended Survivors
- Conditioning FLBEIA using Smart Conditioning Functions
- [A simple example on how to use FLBEIA](#)
- A simple example with multiple dimensions in

FLBEIA

# Applications

## Stock-based

- Bay of Biscay anchovy.
- Iberian sardine.
- Bay of Biscay sardine.
- Northern hake.
- Redfish.
- Greenland Halibut - NAFO.
- NAFO COD (3M).
- ...

## Fleet-based

- Basque offshore fleet.
- Basque inshore fleet.
- Spanish OPPF-4 fleet.
- French mixed fisheries.
- Mixed Fisheries:
  - Iberian Waters
  - Bay of Biscay
  - North Sea
  - Celtic Sea
- Data-poor fisheries in the red sea.
- ...

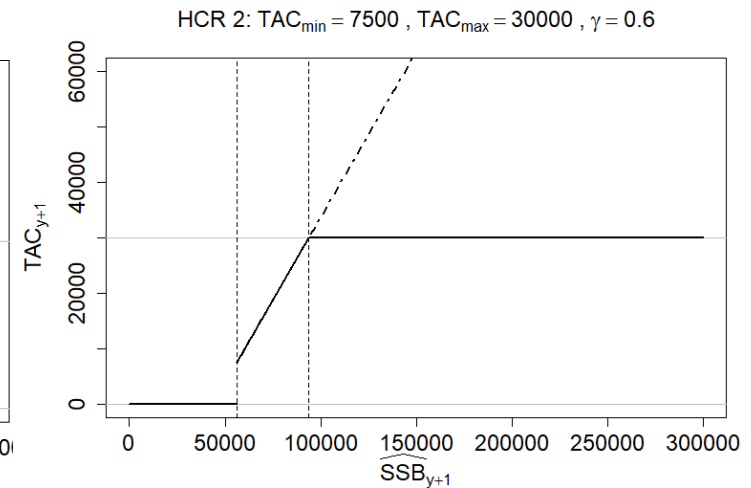
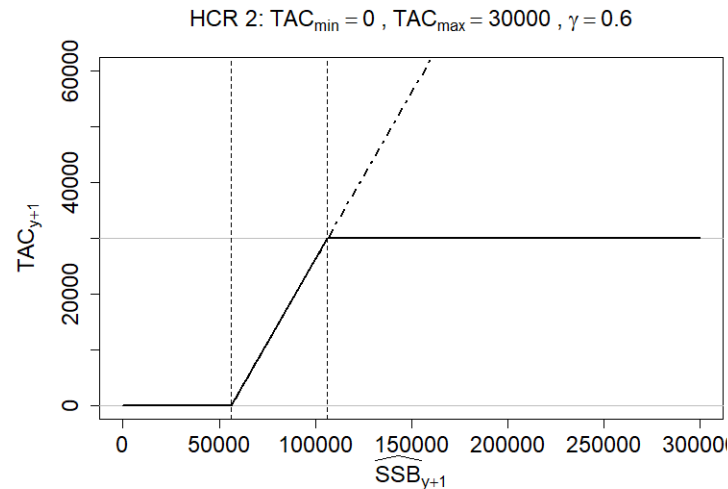
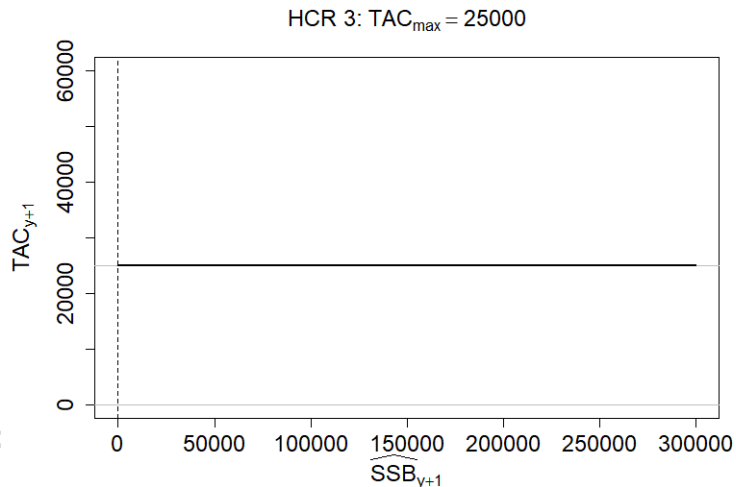
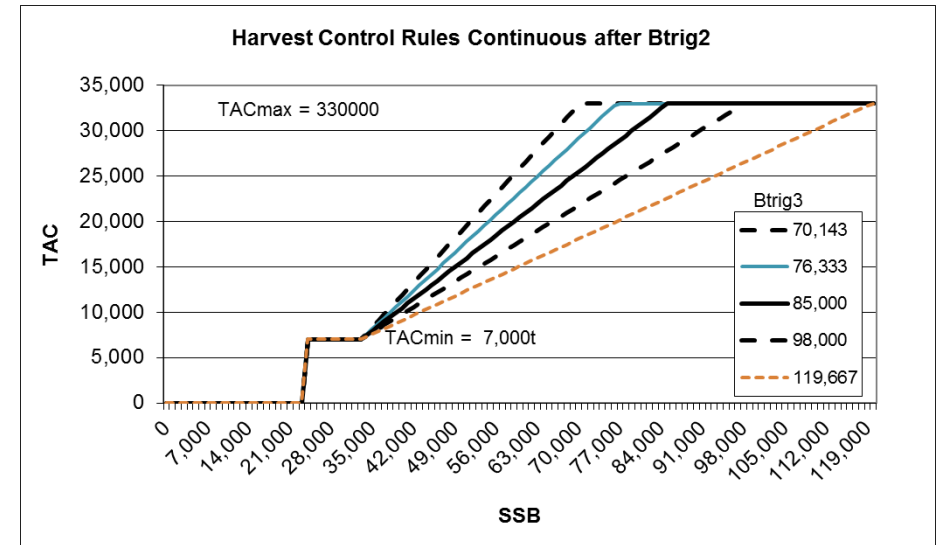
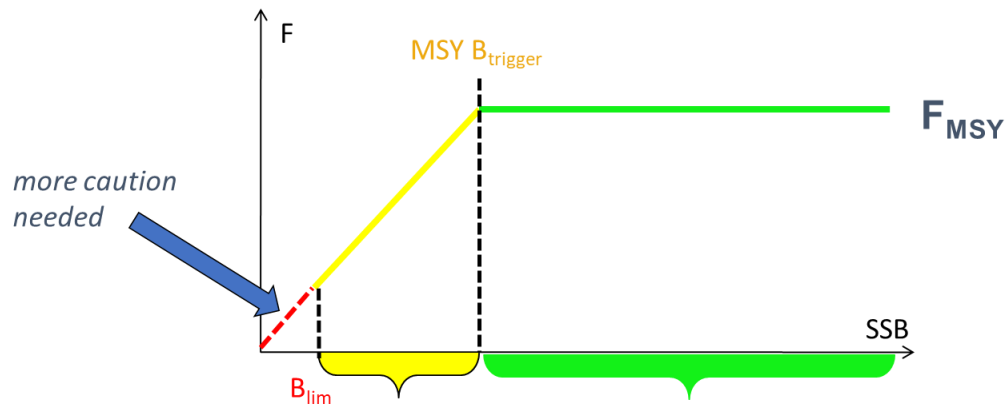
# Management Objectives

## Definition of clear objectives is required

- Stock or fleet management?
- Yearly or multi-year management?
- Fixed TACs or HCR-based?
- Management objectives:
  - i. Biological sustainability (level of acceptable risks)
  - ii. Catch stability (maximum % TAC variation, minimum or maximum TACs....)
  - iii. Catch levels based on MSY, % above  $B_{lim}$ ...

# Examples: long-term management plans

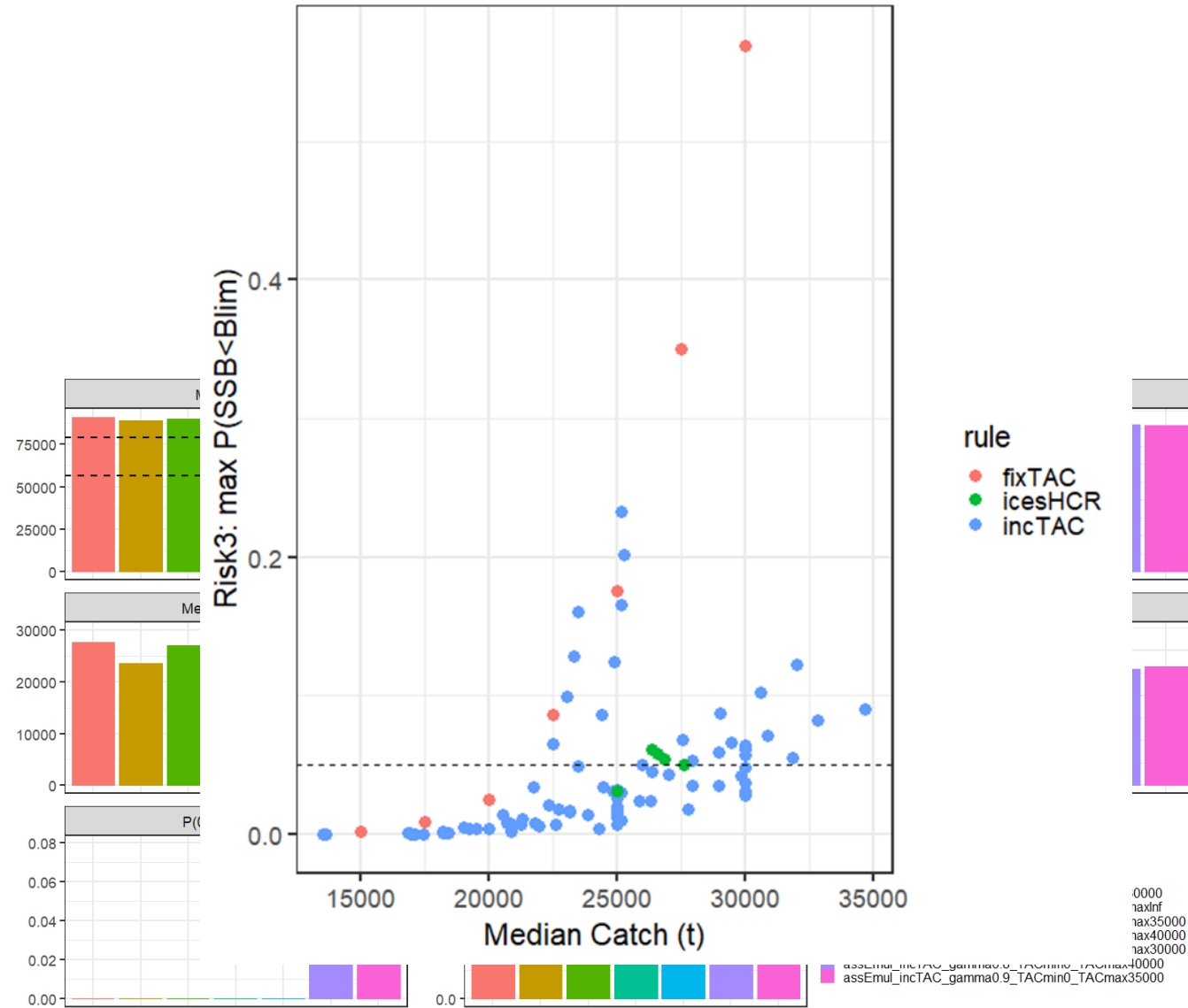
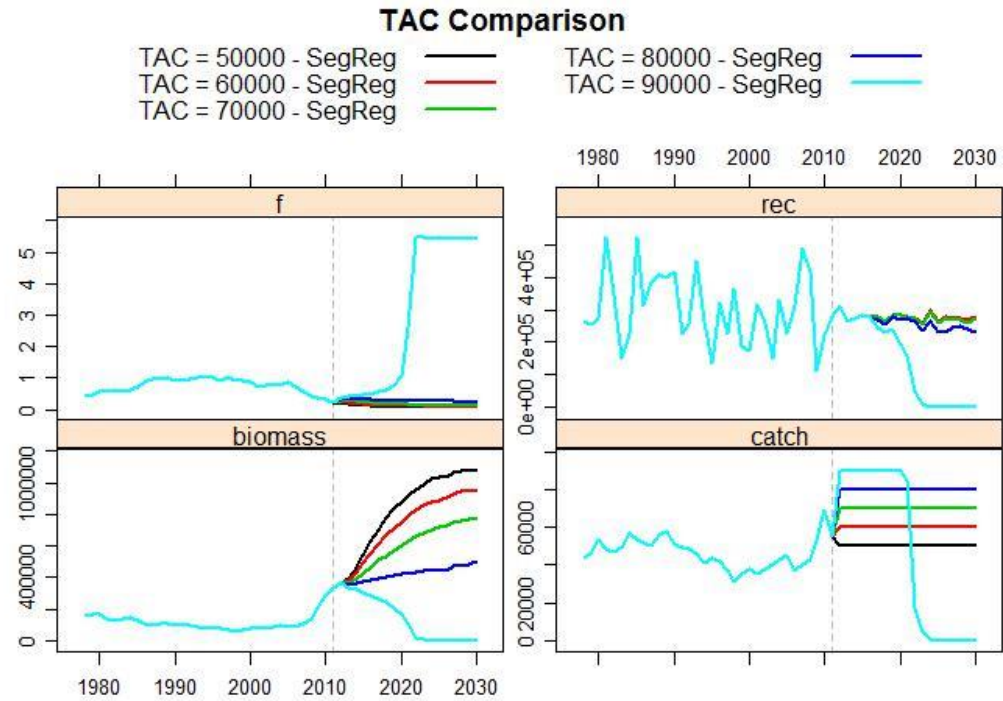
- Harvest Control Rules (single stock)





# Examples: long-term management plans

- Results



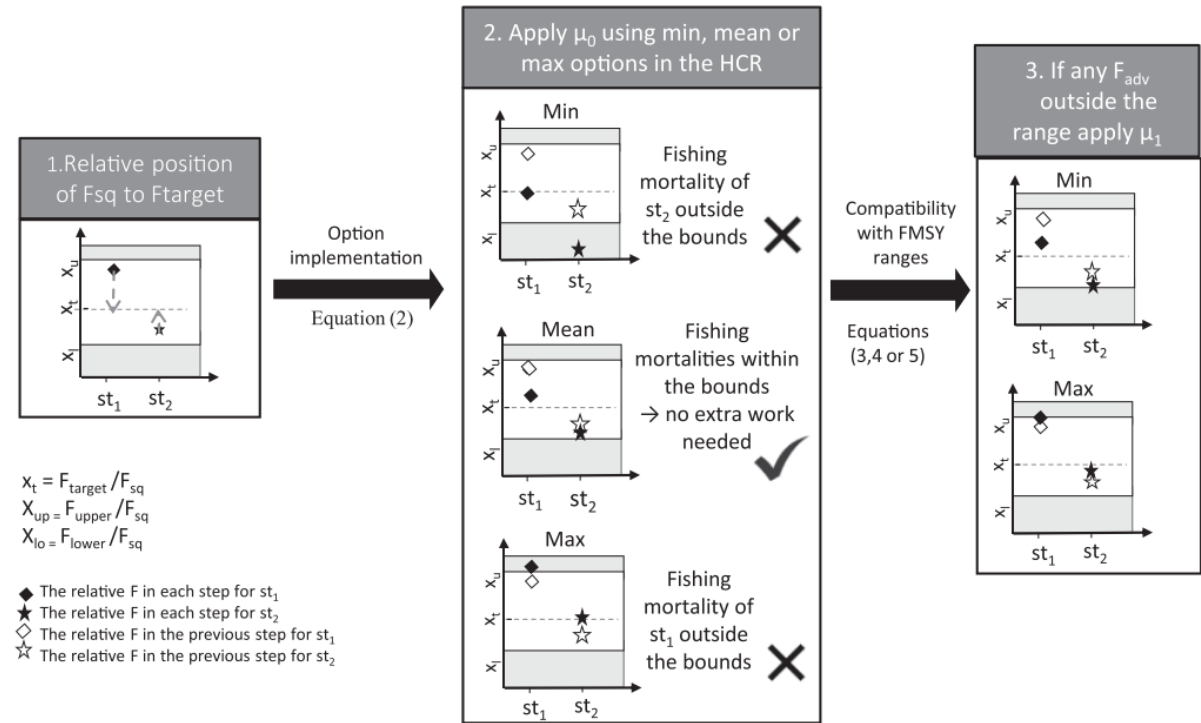
# Examples: long-term management plans

- Harvest Control Rules (multi stock)

## Multi-stock HCR

A multi-stock HCR was developed with the objective of fulfilling the following conditions:

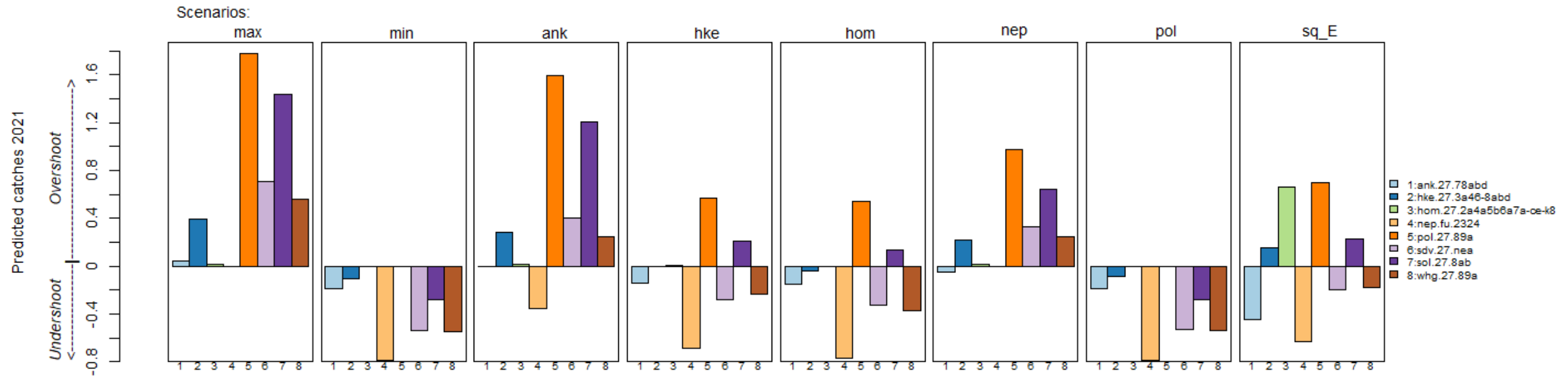
- To produce compatible catch advice among the stocks.
- To maximize uptake of fishing opportunities.
- To generate fishing mortality levels compatible with FMRs.



# Examples: impact of ICES advice on Mixed fisheries

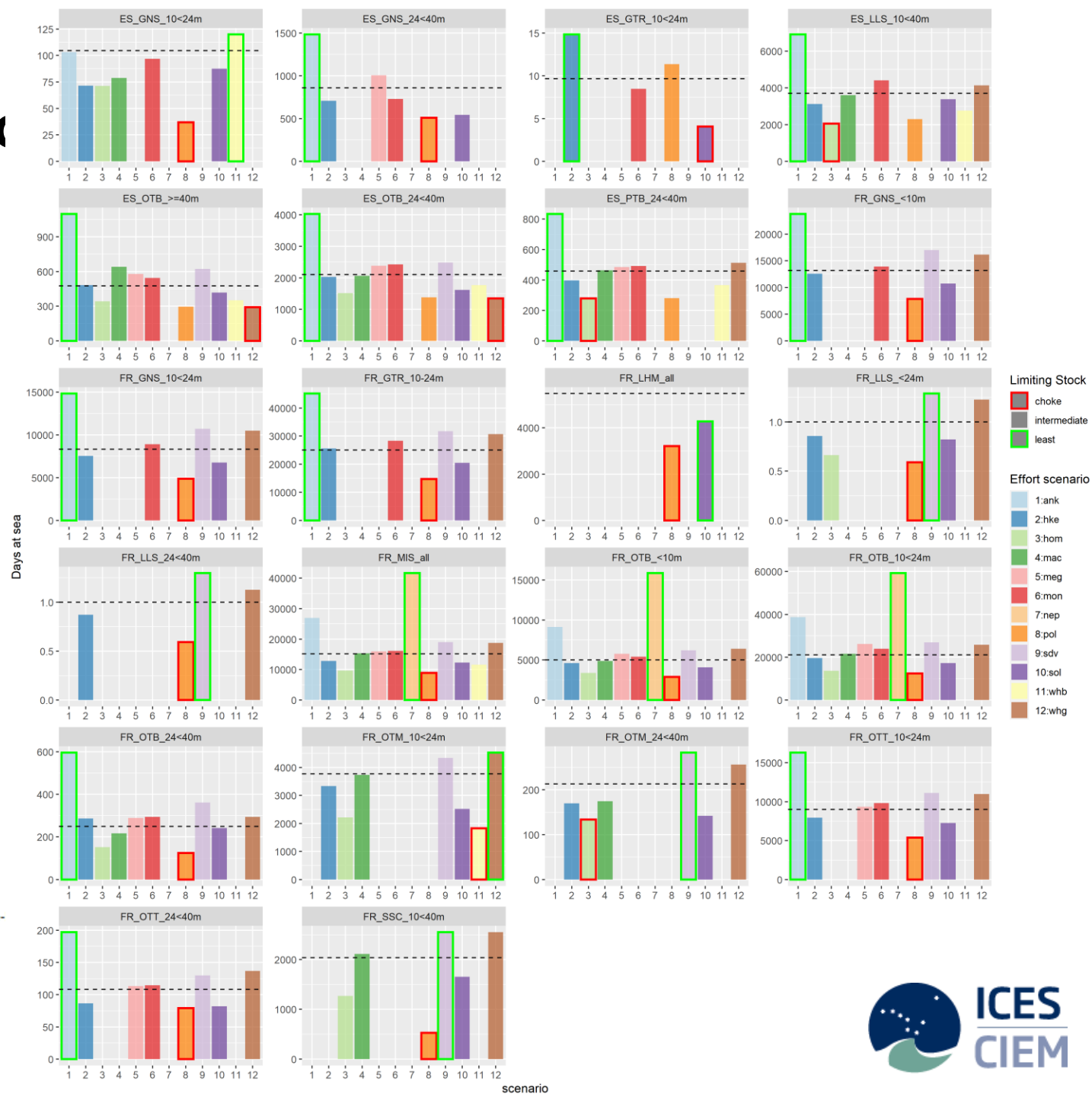
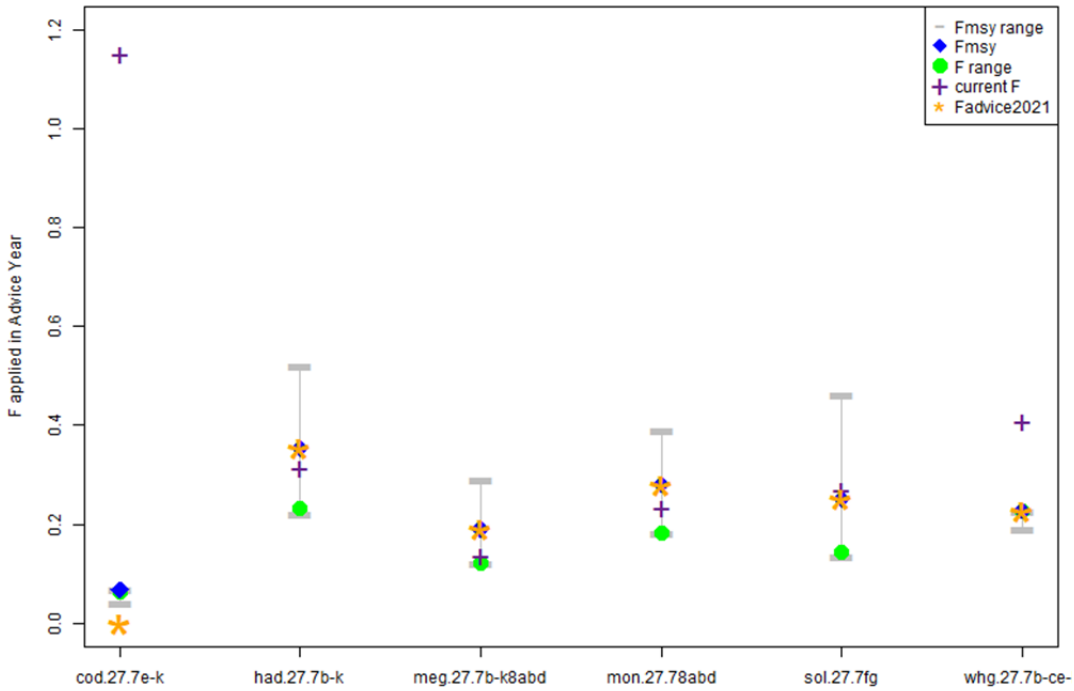
- Bay of Biscay

Predicted catches for 2021 per stock and scenario



# Examples: impact of

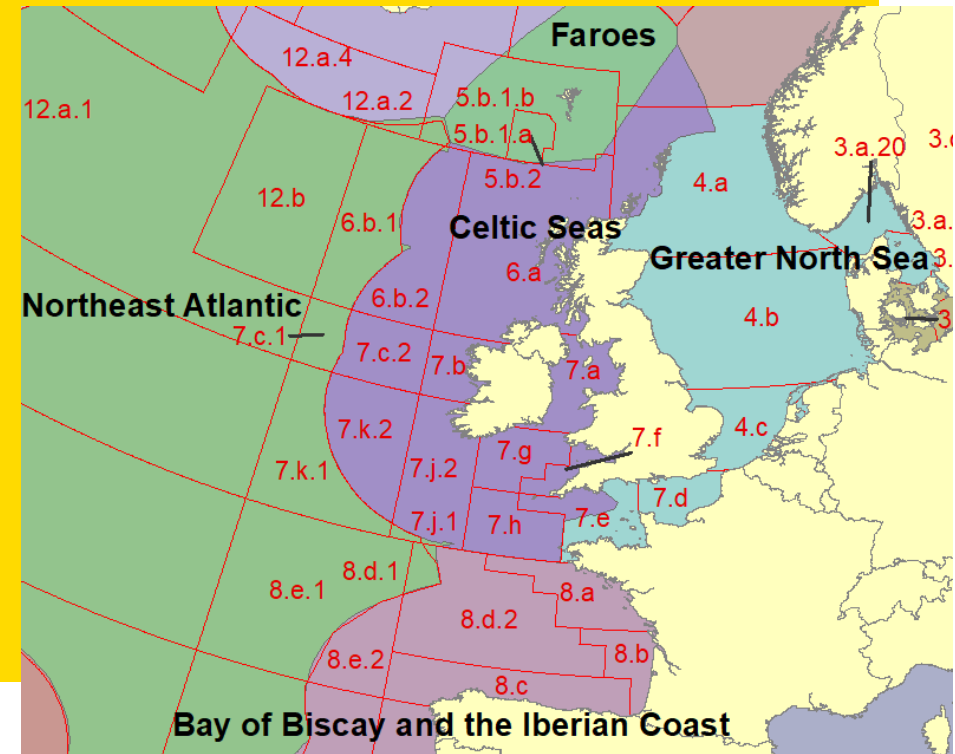
- Bay of Biscay





# OPPF4 fleet

ICES subarea 7



ICES subarea 7: Irish Sea, West of Ireland, Porcupine Bank, Eastern and Western English Channel, Bristol Channel, Celtic Sea North and South, and Southwest of Ireland - East and West

# OPPF-4 fleet

## OBJECTIVE:

Assess the impact of the socio-economic impact of the implementation of management measures in the fleet.

### Model conditioning: data requirements

- Stocks: based on best available science (e.g. ICES assessments)
- Fleets: requires fleet information with specific resolution
  - Effort
  - Fixed & variable costs
  - Prices
  - ...

# OPPF-4 fleet

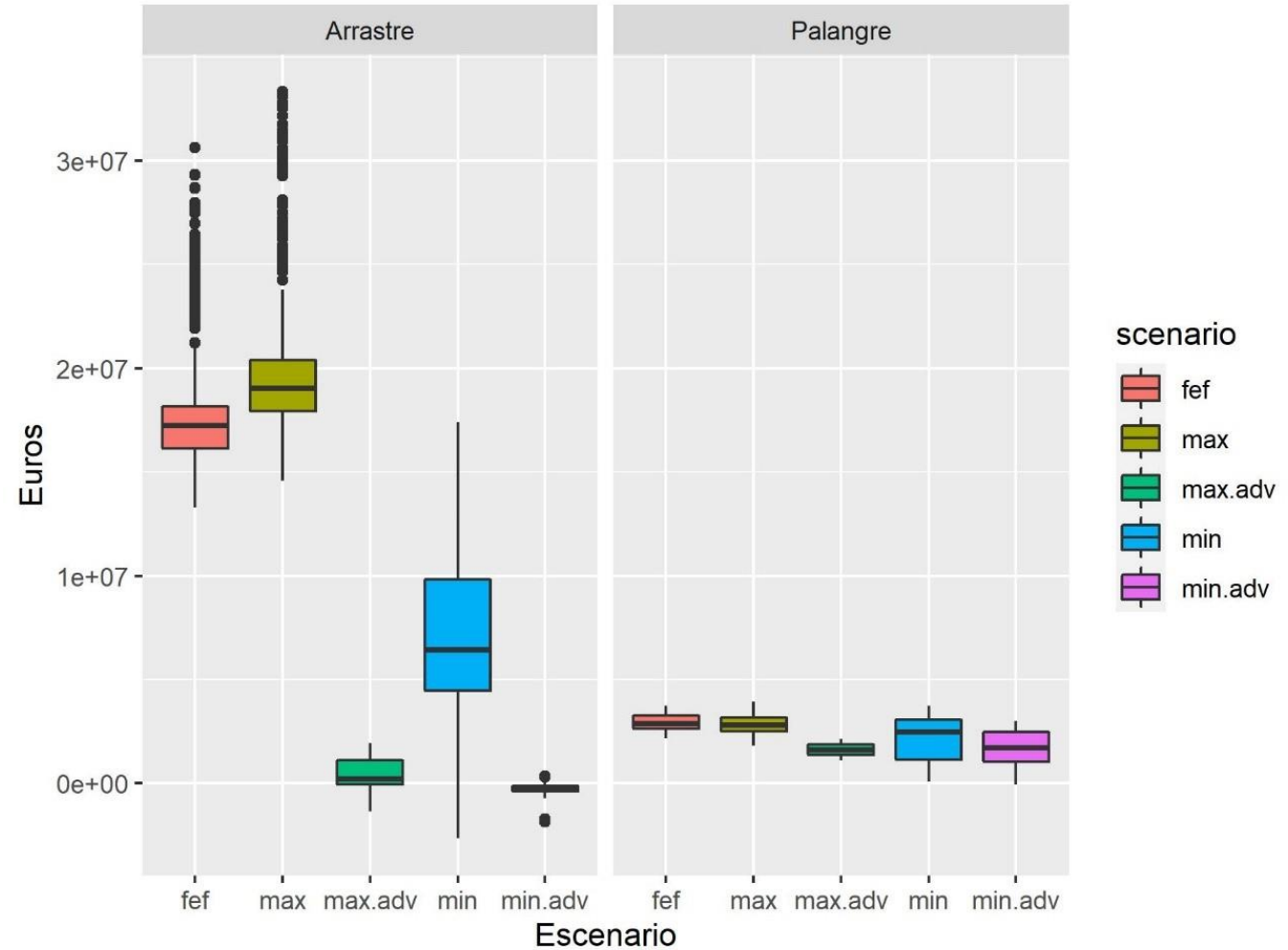
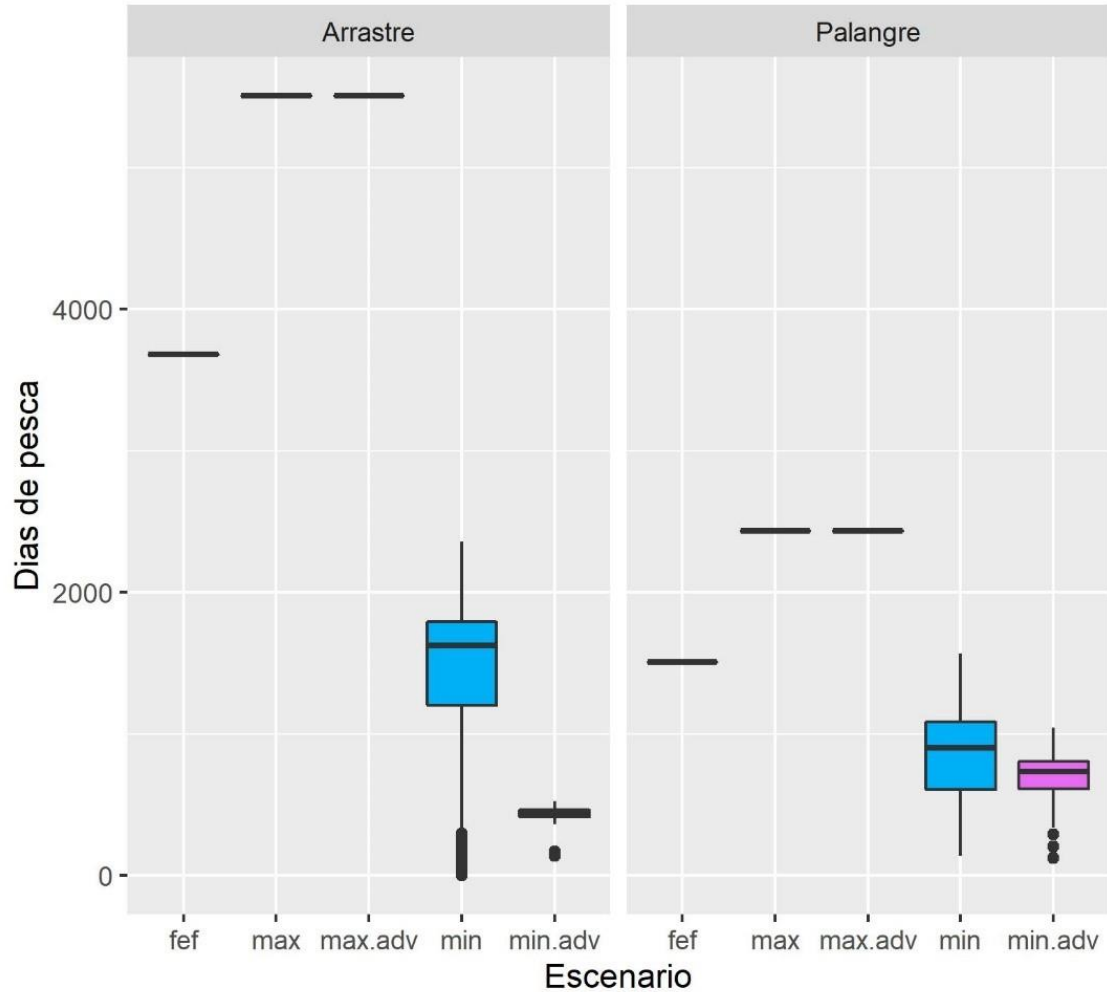
## OBJECTIVE:

Assess the impact of the socio-economic impact of the implementation of management measures in the fleet.

## Simulations:

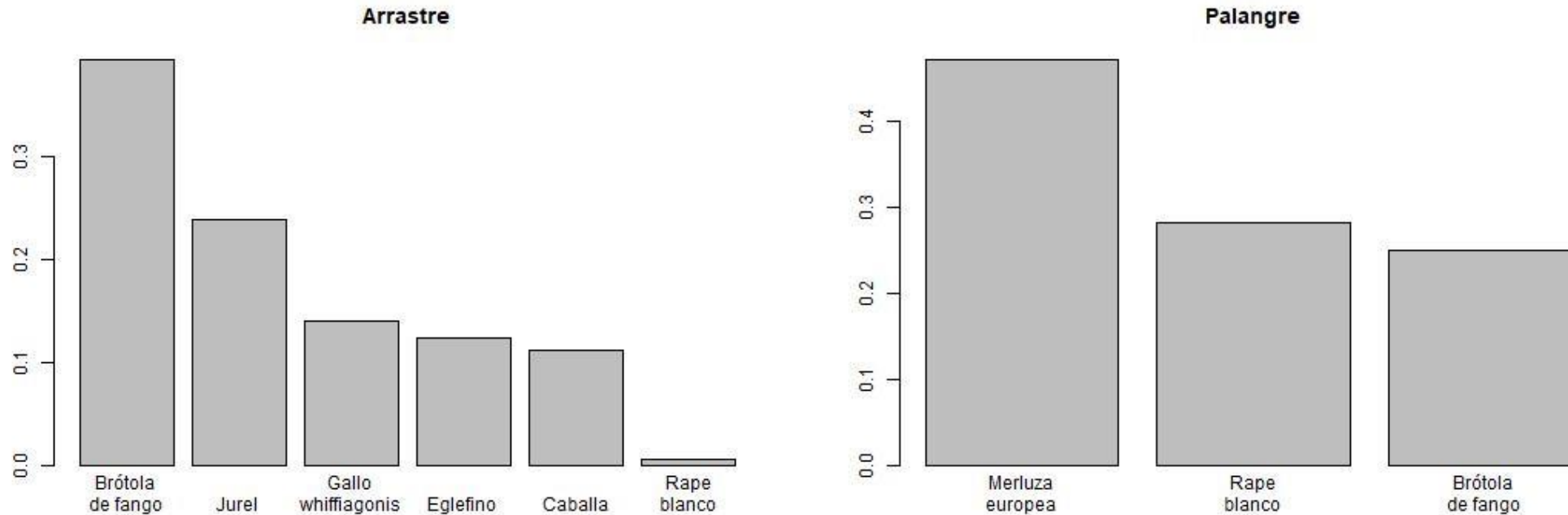
- Assessment of specific management measures (e.g. ICES advice on quotas for following year)
- Alternative strategies (under landing obligation):
  - Same effort as in previous years (fef)
  - Stop fishing when any quota is exhausted (min)
  - Continue fishing until last quota is exhausted (max) --> under LO the excess is discarded

# Results: impact of ICES advice on OPPF-4 fleet





# Results: impact of ICES advice on OPPF-4 fleet



# OPPF-4 fleet: stakeholders

## USER-FRIENDLY TOOLS



**R code**  
Running  
alternative  
scenarios  
(short-term)

```

ARVI_FLBEA_ajemplo_fun.R  ARVI_FLBEA_resultados.R
25
26
27 # Cargar funciones necesarias
28 # Cargar funciones necesarias
29 # Cargar funciones necesarias
30
31 source(file.path("Fun", "resARVI_fun.R"))
32
33
34 # Ejecutar resultados
35 # Ejecutar resultados
36 # Ejecutar resultados
37 # Ejecutar resultados
38
39 # sumARVI: función que nos junta todos los resultados disponibles en la carpeta output,
40 # y los guarda en el fichero (resultados_ST(1)-xlsx)
41
42 sumARVI( output.path = "output", ST = TRUE) # Corto plazo
43 sumARVI( output.path = "output", ST = FALSE) # Largo plazo
44
45 # webappARVI: función que nos junta todos los resultados disponibles en la carpeta output,
46 # y abre una web App para visualizarlos
47
48 webappARVI( output.path = "output", ST = FALSE)
49
50
51

```



**Tutorial**  
How to proceed



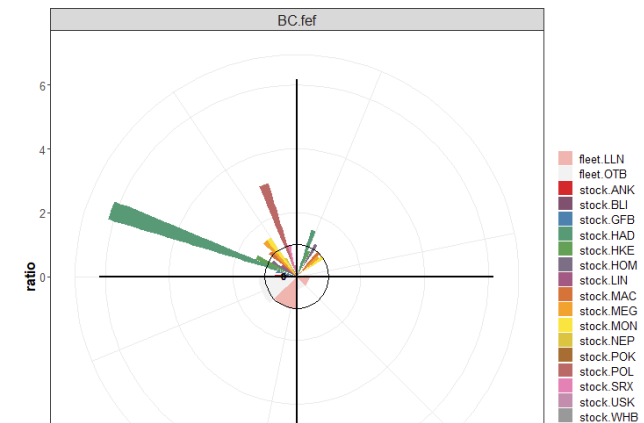
ARVI: guía para realizar cambios en las asunciones del caso base  
Sonia Sánchez y Dorleta García

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**Shiny app**  
Visualising  
conditioning and  
results







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